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POLICY ASPECTS OF WATER- RELATED ISSUES

Report on a WHO Consensus Meeting

Yerevan, Armenia
9-11 April 1997

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WATER QUALITY

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

ABSTRACT

The supply and quality of drinking-water have high priority as environment and health concerns in Armenia, where outbreaks of waterborne disease have occurred in recent years. To follow up a 1996 WHO workshop, the Ministry of Health of Armenia, with support from WHO and Italian Cooperation, organized a national interministerial consensus meeting. The participants comprised 53 representatives of the ministries for health, the economy, ecology, finance, agriculture and urban construction and of local government, and two WHO staff. The participants unanimously adopted a resolution with recommendations calling for the development of a financial and legislative basis for the sustainable management of water supplies, the revision of relevant legislation, the creation of multisectoral coordination mechanisms, the development of a master plan for water management, and a pilot project to assist in these tasks. In the resolution, the participants affirmed their intention, as representatives of the appropriate national agencies, to take immediate action to address these issues.

Keywords

WATER SUPPLY
WATER QUALITY
DRINKING WATER
HEALTH POLICY
CONGRESSES
ARMENIA

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1. BACKGROUND

Drinking-water supply and quality is a priority health and environment issue in Armenia and a number of waterborne outbreaks of disease have been identified in recent years.

The Ministry of Health of Armenia, with the support of WHO and Italian Cooperation, has initiated a programme of activities intended to assist the Armenian national authorities in prevention and control of waterborne disease. The programme addresses managerial and technical aspects of safe drinking-water supply, as well as development of epidemiological methodologies for outbreak investigation and situation assessment.

A group of experts, including representatives of the Ministry of Health, water supply enterprises and communal hygiene authorities met at the WHO workshop on the prevention and control of outbreaks of waterborne disease in September 1996. The Meeting identified a series of key policy and technical concerns and specifically recommended, as a high priority, that national authorities, with the assistance of WHO, organize a policy meeting in Yerevan to identify methods to overcome critical limiting factors.

This report concerns a national policy meeting, the first of its kind involving all the ministries dealing with water.

2. INTRODUCTION

A meeting on the policy aspects of water-related issues was held in Yerevan, Armenia, 9–11 April 1997. The seminar arose from national concerns regarding recently recognized waterborne disease outbreaks and the specific recommendations of a national seminar on the prevention and control of waterborne outbreaks of diseases, Tsakhkadzor, Armenia, 15–21 September 1996.

The workshop was supported by WHO, Italian Cooperation and UNDP.

The seminar was hosted by the National Academy of Sciences with logistic support from the Institute for University Cooperation (ICU). The workshop was conducted in English and translated into Armenian.

There were 53 participants at the Meeting, representing the Ministry of Health, Ecology, Agriculture, Economy, Finance, Urban Construction and local government authorities.

The seminar's aim was to assist the Armenian authorities in reviewing the national situation with regard to water related policy, legislation and prepared legislative changes. It was expected that the workshop would provide a critical review, identify specific priorities and actions needed to address them.

The list of participants is included as Annex 1 of this report, final timetable as Annex 2 and list of working papers as Annex 3.

3. OPENING

The Meeting on the policy aspects of water-related issues was opened by Ararat Mkrtchian, Vice-Minister of Health, who welcomed participants to Yerevan, Armenia and to the seminar. He highlights the importance of waterborne disease in Armenia and especially concern for the recent series of waterborne disease outbreak, noting the need for coherent sectorwide policy and legislation in order to address this and other water-related priorities.

Dr Jan Theunissen welcomed the participants on behalf of WHO and conveyed the best wishes of the Regional Director, Dr Jo Asvall to the Meeting. He outlined the objectives of the Meeting and asked to the participants to introduce themselves.

Ms A. Simonian of UNDP welcomed participants to Armenia and to the workshop on behalf of UNDP, co-sponsors of the Meeting. She noted the importance of water health, social and economic development.

During the opening and subsequent sessions representatives of a number of international agencies addressed the workshop. Mr John Linn, Programme officer of EC/TACIS described the work of his agency in Armenia, noting interest to learn of the recommendation of the workshop and proposed follow-up actions. Mr Jan Villianson of the Norwegian Refugee Agency described the work of his agency, emphasizing activities related to water and sanitation and the important issue of displaced persons in the country. Ms Christina Laria spoke on behalf of FAO, describing the work of that agency in relation to legal development and noted potential interest in supporting follow-up concerning improvement of water law.

The co-chairpersons of the Meeting were Dr A. Gulian, Dr A. Mkrtchian and Dr A. Karapetian.

4. ORGANIZATION OF THE WORK

Following the opening session the participants met in plenary to discuss a series of critical review papers from national authorities and keynote papers from outside experts.

At the beginning of the second day participants met again in plenary to hear and discuss a presentation concerning the recently drafted law on drinking-water supply. During the second day of the meeting participants subsequently met in three working groups to discuss the following clusters of issues:

- legislation and coordination
- financing and water supply management
- technical issues.

Each group was asked to produce a brief report with recommendations which were presented and discussed at a plenary session on the last day of the meeting.

5. LEGISLATION AND INTERSECTORAL COORDINATION

A keynote presentation on sectoral coordination was made by Dr Jamie Bartram of WHO to the Meeting.

A paper was presented to the Meeting on "Selected International Trends in Water Law" by Ms C. Leria, Legal Officer Development Law Service, FAO. The paper illustrates trends in selected aspects of water law based on a comparative analysis of recent legislation and on the experience of relevant countries with the administration of such legislation. Of the sub-topics analyzed in the paper the most complex and mixing question in water law, i.e. striking the "right" balance between equity and efficiency in ensuring access to water by all users and in allocating it for use.

The working group made the following observations and recommendations concerning legislative aspects and intersectoral coordination.

5.1 Legislative aspects

The absence of clear and implementable laws and effective provisions for their implementation create a series of problems which impact upon human health and impede social and economic development. The development of a simple, clear legislative framework and platform of regulations and standards is therefore a high priority.

The preparation of a law on drinking-water (initially based upon the draft law presented at the meeting and recommendations of the meeting) should be prepared by an intersectoral group constituted as described below. The same group should support in parallel the revision of the existing basic water code and identify other legislative instruments required for the achievement of the objectives of the water code. The participating agencies agreed that the present proposal to submit a revised drinking-water law to the Government was not realistic and strongly recommended that this be delayed to provide time for proper multisectoral participation in its development.

The water code, once revised, should include:

- a statement of basic principles and policy such as ownership and use of resources and of infrastructure; priority of use and licensing/permits; conflict resolution; general policy towards penalties and sanctions; and international aspects;
- provision for intersectoral coordination including creation of a standing commission or equivalent with specified responsibilities and authorities and initial constitution (as indicated below). The Commission should be accountable at a supraministerial level;
- identification of authorities and responsibilities of specified agencies in broad terms.

The overall objective of the drinking-water law should be to facilitate achievement of the target of continuous supply of safe disinfected water from protected groundwater or treated surface water sources through household connections to the whole population of Armenia. A legal framework in which local supply agencies could operate in a financially sustainable manner was urgently required.

The drinking-water law should:

- Identify the authorities and responsibilities of specified agencies in specific terms; agencies should include the diverse types of supply agencies, regulatory agencies, and individuals.
- The above should include a clear indication of responsibility and authority to develop and apply specific regulations and standards and with whom to coordinate in this. Such

regulations/standards should include water supply service quality (continuity, cost and quality); source quality and include provisions for exemptions and derogations there.

- Separation and specification of the responsibility of water supplier to monitor and report on supply service quality; and of regulatory agencies to monitor and enforce fulfilment of laws, regulations and standards.
- Clear statement of the acceptable financial bases and regulatory mechanisms governing water supply agencies.

5.2 Intersectoral coordination

Because of the multiple sectors using water and affecting its flow and quality it is essential that provision be made for intersectoral coordination and coherent overall management of water resources to national benefit.

Because of the diverse sectors and governmental and non governmental organizations involved, no single agency is properly positioned to exercise the function of intersectoral coordination. It is therefore recommended that a Water Commission be established. In order to be effective it is recommended that the Commission have responsibilities and authorities defined in legislation and be accountable to government/prime minister.

The area of activity of the Commission should be these areas of water policy, legislation and activity of intersectoral character or impact. In such areas it should, in principle, have authority over individual interested sectors. It should not interfere in single-sector management issues without good reason based upon multisectoral activity and impact.

The functions (including specific responsibility and authority) of the commission may include all or some of the following:

1. Orientation of policy regarding interregional or interbasin transfer of water, including authority to permit such transfer on the basis of health, social and economic development and determine compensation, financial or otherwise for such transfer.
2. To act as the national lead institution in discussions regarding international aspects of water management and relations with neighboring states.
3. Oversight of subsidiary intersectoral bodies (including approval of their membership and composition) responsible for:
 - (a) management of the resolution of conflicts between user groups in assigning abstraction licensees
 - (b) other issues of multisectoral importance
4. To oversee the activities of river basin authorities, including those of lake Sevan and Ararat Valley.
5. To act as the only body through which guidance to parliament regarding the need for new or to update legislation is provided.
6. To coordinate and manage intersectoral information sharing and dissemination; including the preparation of annual report on the status trends and important development concerning water in Armenia.
7. To develop and monitor implementation of a National Master Plan for water.

5.3 Possible composition of the Commission

Full members

- minister or minister's delegate of the principle ministries concerned (e.g. Agriculture, Environment, Economy, Local Government, Energy, Health);

Observers

- representatives of other concerned Ministries and other interested parties (e.g. Ministry of Industry, Finance, Justice; user group representatives; professional associations);

Ad hoc members

- such as experts and other interested parties may be invited at the suggestion of the members.

Chairperson: by fixed rotation among members.

The commission would require a small technical secretariat.

5.4 National plan

Because of the present situation with regard to water supply in Armenia there is an urgent need for a national master plan for water including sub-elements addressing drinking-water and water for rural development.

6. FINANCING OF WATER SUPPLY

A keynote presentation on "The sharing of roles between the public and the private sectors in the management of water services" was made by Dr Jean-Louis Oliver of the Ministry of Public Works, France to the Meeting.

The Working Group made the following observations and recommendations.

The paper stressed the responsibilities that have to remain one way or another, in the charge of public authorities:

- elaboration (at the central level), implementation and enforcement (at the local level) of water legislation and regulations;
- integrated and global water resources management (quantity/quality aspects; surface/groundwater);
- sanitary and safety specifications, norms and structures for engineering, construction and operation of water works;
- establishing the financing system and the tariff basis.

The different types of management and contractual agreements between the public and private partners were described:

- direct management;
- full privatization;
- delegated management, including concerning/B.O.T., leasing/affernage, management, contracts.

Then the required constructions for private sector participation in water service management were presented, as well as recommendations for realistic training, implementation and development.

7. TECHNICAL ASPECTS

A keynote presentation on technical aspects was made by Professor G. Ziglio to the Meeting.

In his presentation Professor Ziglio underlined the importance of adopting a multi-barrier approach to safe water supply, which extends from source protection through intake proper construction, treatment, distribution system to monitoring and personnel training. He also gave more detailed technical details on disinfection, performance requirements according to the raw water quality and performance variation following traditional and new procedures. The role of filtration and the "cxt" concept were briefly addressed. He underlined the advantages of chlorine/disinfection and the disadvantages related to the formation of the related products. In the present situation of water-related disease outbreaks, he concluded that no reason exists to renounce the use of this effective chemical disinfectant. He then stressed the importance of design and operation of distribution systems to ensure an adequate quantity and quality of supplied water and a sufficient constant pressure in the system. General notes were also made in maintaining and operating the distribution system. He concluded by suggesting possible ways for on-site and off-site staff and personnel training and education, including operator certification programme. The benefits of a good training and continue education were emphasized.

The Working Group made the following observations and recommendations.

7.1 Gravity-fed water supply

In the water supply systems of Armenia, the proportion of systems operated by pumps is high. In the system of the Armenian Water Utility this share is 45%, and in the system of Yerevan, 60%. Taking into account the distribution of groundwater sources, and great possibilities for gravity water supply, one of priority tasks is the transition to gravity-fed systems.

Based on the location and direction of gravity water pipes, it is possible and desirable to organize micro hydro power plants which can generate up to 120 million kWh of electric energy.

Transition to gravity-fed systems will allow to reduce the present day energy consumption from 0.76 kWh per m³ to 0.18–0.20 kWh. This will promote reduction of energy demand and improve the reliability of water supply.

7.2 Water chlorination

The disinfection of water supplied to residential areas in this country is done mainly with liquid chlorine and by outdated equipment. Since no repair of chlorinating plants has been done in recent years, the plants are now in emergency condition. Liquid chlorine is procured at Yerevan "Nairit" chemical plant, at relatively high prices.

In order to improve disinfecting of drinking-water, it is necessary:

- to repair and reconstruct the functioning chlorinating plants;
- to introduce modern technologies of chlorinating;

- to acquire movable/emergency chlorinating units;
- to regulate the price on liquid chlorine.

7.3 Monitoring and training

Improving monitoring to know sub-areas at more risk could be of help in reducing the frequency of outbreaks of waterborne disease. To undertake this, and for other reasons, the Regional Centers of Hygiene and Anti-epidemic Surveillance need improvement as follows.

- Microbiological laboratories should be able to perform greater numbers of analyses and operate with more efficiency.
- Field equipment to measure conventional indicator parameters as pH, temperature, conductivity and disinfectant residuals, (chlorine) should be available to intensify monitoring in the distribution system.
- Methodology for outbreak identification and for distribution performances evaluation should be improved.
- Laboratory analytical tools for detecting tracers of water pollution (hydrocarbons, and other organic or inorganic components) should be available.
- Centralized data storage and evaluation system (program and hardware) to better manage the collected data should be implemented.

7.4 Training and education needs

Qualified and motivated people working in organizations sharing responsibility for all water related aspects are a prerequisite for improving the water and this is even more important when dealing with services experiencing problems such as shortage of human and financing resources.

Three sectors have been identified as the most important:

1. Technical staff at water companies need to improve their experience in the field of management, supervision and system operation and maintenance.
2. Skilled and trained operator need to use of advanced and available technology in drinking-water chlorination.
3. Staff involved in water quality surveillance need to improve their skills in waterborne disease control transmission, microbiologists and chemical monitoring.

Consumers and the general population should be informed and educated on aspects related to role of water in disease transmission, the need to modify personnel habits and measures being taken in the water field.

7.5 Water distribution systems

About 57% of residential water supply networks were built over 20 years ago, and 35%, over 30 years ago.

As a result of deterioration of networks, 50–55% of drinking-water flowing through the systems is lost in the form of leakages. On average, in the last decade the number of breakdowns has increased almost twofold, to 1.95 breakdowns per kilometer of the system, per year. The sewer networks are also in the same condition. In such conditions, it is impossible to provide adequate

water supply to the population. Water is provided on an hourly rationed basis. The water supply of certain districts, apartment buildings and upper floors is done with irregular disruptions.

Such technical condition of networks creates dangerous prerequisites for origination and proliferation of epidemics.

It is necessary to repair and reconstruct water supply and sewer networks, through stage by stage programmes.

The enterprises operating water supply and sewer systems require the necessary equipment, spare parts, materials and machinery.

7.6 Metering

For lack of water meters, there is no water-metering system in the domain of water supply. Nowadays, the problem of procurement and installation of water meters is the basis of an integrated improvement and rehabilitation programme.

The necessity of the metering system follows from:

1. structural improvements prepared by the Government;
2. adoption of a new financial (tariff) policy;
3. fairness of payment calculation which will promote the rate of collection;
4. technical improvement of systems (improvement of leakage estimation and repair efficiency).

Obviously, water meters do not have an effect on water quality improvement, however, they may promote the culture of economical water use.

7.7 Recommendations

- The integrity and reliability of the distribution system is absolutely essential for having a safe drinking-water. Its restoration and reconstruction should be done according to a carefully planned (designed) phased programme.
- Water gravity feeding is to be expanded to minimize present energy cost in water production according to existing and partially enforced programmes.
- The local price of chlorine has to be lowered to permit its increased and optimized used to reduce spreading of waterborne diseases. In the meantime system rehabilitation has completed.
- International leading firms should be strongly encouraged to collaborate with local technical structures in applying their technology in water chlorination.
- Epidemiological surveillance, microbiological and chemical (chlorine residual) monitoring should be increased.
- Education and training at all technical level have to be better developed. Out of the country stages for in-the-job training should be facilitated.

- Consumers and general population should be informed and educated on aspects related to role of water in diseases transmission, needs to modify personal habits and measures being taken on water field.

8. MEETING RESOLUTION

Taking into account the detailed recommendations of the individual working groups, the Meeting unanimously adopted the following resolution:

1. The technical condition of drinking-water supply and sanitation systems in Armenia is presently poor. This results in outbreaks of water-related diseases and impedes social and economic development. It is urgent and essential that a financial and legislative basis for the sustainable management of local water suppliers be established. Water supplies need clearly defined authorities and responsibilities.
2. There is at present little experience in Armenia with the management of drinking-water supply by independent agencies and with their regulation. A pilot project should be implemented to develop further experience and support implementation of the later recommendations. This should especially address the supplier financing; tariff setting and collection; and monitoring of compliance with agreed service quality targets.
3. The Meeting stressed the need for a water legislative revision. In that respect, we refer to the specific recommendations made by the working groups.
4. Due to the fact that water use and its impact on water flow has a multilateral multisectoral nature it is essential that an intersectoral governmental coordinating commission is created. The Meeting recommended that by governmental decree a preparatory group be established under the leadership of the Ministry of Economy and including representatives of all concerned sectors uncharged to formulate clear and detailed proposals for the revision of the Water Code, the creation of a law on drinking-water supply and establishment in law of an intersectoral governmental commission as referred to in Paragraph 1 with specified authorities and duties. The preparatory group should submit these proposals within twelve months and be dissolved upon creation of the intersectoral governmental commission.
5. There is an urgent need for a national master plan for water including sub-elements addressing drinking-water and water for rural development.
6. Because of the severity of the present situation, appropriate national agencies should take immediate actions, wherever possible, to address the priority issues identified above and in particular the need to ensure the adequacy and operation of existing water supply and sanitation infrastructure; and to ensure the availability of chlorine for disinfecting of water supplies.

9. CLOSURE

Mr Hrair Aslanian spoke on behalf of WHO staff present. He thanked the expert advisers and translators for their support, recognized the excellent logistical and organizational support provided by the ICU and wished the participants every success as they returned to their jobs.

Dr Ararat Mkrтчian closed the Meeting. He thanked all participants, advisers and support staff at the Meeting and wished participants a pleasant journey home.

Annex 1

PARTICIPANTS

Ministry of Health		
	Name/surname	Position
1	Ararat Mkrтчian	Vice-Minister
2	Manvel Manrikian	Head of San-Epid Department of the Ministry
3	Margarita Khachatryan	Head Doctor of the Republican SEC
4	Gabriel Deroian	Head of the Chair, Medical University
Group of specialists on sanitary hygiene		
	Name/surname	Position
5	Nune Bakunts	Specialist of San-Epid Department
6	Sergei Karapetian	Head of Department, Republican SEC
7	Armen Nazinian	Head Doctor Ijevan SEC
8	Norair Zohrabian	Head Doctor Charentsavan SEC
9	Larisa Afandian	Head of Department, Mashtots SEC
Group of epidemiologists		
	Name/surname	Position
10	Paitsar Dilbarian	Epidemiologist of San.-Epid. Department
11	Emma Mirzoian	Head of Department, Republican SEC
12	Pavel Manukian	Head of Department, Sevan SEC
13	Karine Simonian	Head of Department, Kotaik SEC
14	Inesa Nazarian	Epidemiologist, Miaskian SEC
Ministry of Finance		
	Name/surname	Position
15	Martun Eranosian	Head of Budget Planning Department
16	Ashot Abrahamian	Head Specialist, Budget Planning Department
17	Gayane Ajabian	Head Specialist on Health
Yerevan Water Supply Department		
	Name/surname	Position
18	Henzel Khachatryan	Head Engineer
19	Hovanes Marutian	Vice-Director
20	Romik Harutunian	Director of Water Supply Enterprise
Ministry Ecology		
	Name/surname	Position
21	Ashot Khandanian	Vice-Minister
22	Hosnik Kirakosian	Head of Department, Water Resources
23	Volodia Narimanian	Vice-Head of Department, Water Resources
24	Anahit Alexandrian	Head Specialist

Ministry of Urban Construction		
	Name/surname	Position
25	Andranik Andreasian	I Vice-Minister
26	Arben Gulian	Gen. Director, State Enterprise "Armwatersupply"
27	Manuk Zakarian	Director, Institute "Armcommuneproject"
28	Robert Tadevosian	Vice-Head of Dept, "Commune Department"
29	Martun Poghosian	Head of Chair, Architecture-Construction Institute
30	Ashot Malkhasian	Head Engineer, State Enterprise "Armwatersupply"
31	Suren Tarian	Vice-Head Engineer, State Enterprise "Armwatersupply"
32	Rosa Muradian	Head of Department,, State Enterprise "Armwatersupply"
33	Felix Sahakian	Director, "Kotaik" Enterprise
34	Edward Mesropian	Director, "Jinj" Enterprise
Ministry of Economy		
	Name/surname	Position
35	Shiraz Kirakosian	Vice-Minister
36	Arsen Karapetian	Head of Department
37	Svetlana Galoian	Head Specialist
38	Harutunian Hrachia	Head specialist
Ministry of Agriculture		
39	Samvel Stepanian	I Vice-Minister
40	Kazarian Gagik	Director, Institute of Water System
41	Jora Khachatryan	Head of Department
World Health Organization		
	Name/surname	Position
42	Hrair Aslanian	Liaison Officer in Armenia
43	Anna Hovhanisian	Interpreter
Representatives of International Organizations		
	Name/surname	Position
44	Koriun Danelian	TACIS, Country Coordinator
45	Jan Villianson	Norwegian council for refugees,
46	Vivien Davalibi	Programme officer, UNHCR
47	John Lynn	Programme officer, TACIS
WHO Representatives at the Regional Office for Europe		
	Name/surname	Position
48	Jan Theunissen	Acting Coordinator, WHO/EURO/COR
49	Giuliano Ziglio	WHO Expert
50	Jean-Louis Oliver	WHO Expert
52	Jamie Bartram	Manager, Water and Wastes WHO/EURO/ECEH
53	Cristina Leria	FAO Expert

Annex 2

TIMETABLE

	Wednesday	Thursday	Friday
09.30	Official opening and welcome: Dr Ara Babloian, Minister of Health of Armenia; Dr Jan Theunissen, Acting Coordinator, WHO Regional Office for Europe; Adoption of programme Election of Chairman	09.00 Presentation on law Short discussion	09.00–10.00 Presentation and discussion of findings of Working Group 1 10.00–11.00 Presentation and discussion of findings of Working Group 2
10.15	Coffee	Coffee	Coffee
10.45	Introduction of all participants Presentations on national policy on water issues: Representatives of the Ministry of Health Ministry of Ecology Ministry of Agriculture Ministry of Urban Construction Municipality of Yerevan Short discussions/clarifications	Working groups 1. Financing of the water supply sector 2. Technical and training aspects 3. Sector coordination, organization and legislation	11.00–12.00 Presentation and discussion of findings of Working Group 3 12.00–13.00 Final plenary discussion and adoption of recommendations of the Meeting and the law on water 13.00 Official closure
12.30	Lunch	Lunch	13.15 Lunch
13.30	1. Professor Ziglio – Technical aspects and training 2. Mr Oliver – Public/private sector 3. Mr Bartram – Sector coordination 4. Ms Leria – Legislation	Working groups (contd)	
15.00	Coffee	Coffee	
15.30	Presentations from previous workshops: 1. Outbreak investigation 2. Water quality control 3. Engineering aspects Presentations by other agencies Discussions	Working groups (contd)	
17.30	Meeting of local and international facilitators		

Annex 3

WORKING PAPERS

1. **LAW (DRAFT)**
"On Providing the Population of the Republic of Armenia with Drinking-water"
2. **CRITICAL ASSESSMENT PAPERS**
 - 2.1. Ministry of Environment and Underground Resources
 - 2.2. Ministry of Health
 - 2.3. Ministry of Urban Constructions
 - 2.4. Ministry of Agriculture
 - 2.5. Municipality of Yerevan, State Enterprise for Water Supply and Sewerage Service.
3. **CONCEPT PAPERS**
 - 3.1. JAN-LOUIS OLIVER: "The Sharing of Roles between the Public and Private Sectors in Management of Water Services"
 - 3.2. GIULIANO ZIGLIO: "Technical Approach on Preventing and Controlling Waterborne Diseases: Assessment, Strategy and Priorities"
 - 3.3. STEFANO BURCHI: "Selected International Trends in Water Law"
 - 3.4. JAMIE BARTRAM: "Institutional Frameworks for Effective, Safe, Drinking-water Supply"
 - 3.5. JAMIE BARTRAM: "Water Sector and Water Supply Legislation and Regulations"
4. **REPORT ON A WHO WORKSHOP, TSAKHKADZOR, ARMENIA, 15–21 September 1996**
"Epidemiological Aspects of Investigation of Outbreaks of Communicable Diseases and Surveillance and Control of Water Quality".