

71
CEHA 86

WHO-EM/ES/392-E (CEHA/4-E)
June 1987

INTERCOUNTRY WORKSHOP ON LOW-COST
WATER SUPPLY AND SANITATION OPTIONS

Amman, Jordan 13-17 December 1986

WHO Project No. : ICP/RUD/001



المكتب الإقليمي لمنظمة الصحة العالمية لشرق البحر المتوسط

WHO REGIONAL OFFICE FOR THE EASTERN MEDITERRANEAN
BUREAU RÉGIONAL OMS DE LA MÉDITERRANÉE O

71-CEHA86-4615

WORLD HEALTH ORGANIZATION
REGIONAL OFFICE FOR THE EASTERN MEDITERRANEAN
CENTRE FOR ENVIRONMENTAL HEALTH ACTIVITIES (CEHA)

WHO-EM/ES/392-E (CEHA/4-E)
June 1987

INTERCOUNTRY WORKSHOP ON LOW-COST
WATER SUPPLY AND SANITATION OPTIONS

Amman, Jordan 13-17 December 1986

WHO Project No. : ICP/RUD/001

LIBRARY, INTERNATIONAL REFERENCE
CENTRE FOR COMMUNITY WATER SUPPLY
AND SANITATION (IRC)
P.O. Box 93190, 2309 AD The Hague
Tel. (070) 314911 ext. 141/142
ISN 4615
RN:
C.O: 71 CEHA 86

CEHA
P.O. Box 926967
AMMAN, JORDAN

TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT	i
LIST OF ABBREVIATIONS	ii
1. INTRODUCTION	1
2. OPENING CEREMONY	1
3. ELECTION OF OFFICERS	1
4. WORKSHOP STRUCTURE AND COMPONENTS	1
5. SUMMARIES OF PAPERS PRESENTED	2
6. WORKING GROUP DISCUSSIONS	7
7. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS OF THE WORKSHOP	9
ANNEXES	
I PROVISIONAL AGENDA	11
II PROGRAMME	12
III LIST OF PARTICIPANTS	13
IV LIST OF BASIC DOCUMENTS	16
V REPORTS OF WORKING GROUPS	17
1. LOW-COST WATER SUPPLY	17
2. LOW-COST SANITATION	18
3. SOFTWARE GROUP	19
SUMMARY OF RECOMMENDATIONS OF WORKING GROUPS	23

ABSTRACT

The Inter-Country Workshop on Low-Cost Water Supply and Sanitation Options held in Amman, Jordan, 13-17 December 1986, reviewed the appropriate technologies mostly used in rural and urban fringe areas in the Countries of the WHO Eastern Mediterranean Region for water supply and sanitation schemes. It was emphasized that all low-cost technologies should be accompanied by essential software components such as health education, community participation, institution-building and information transfer. Major problems and constraints were identified and recommendations formulated as regards the general scarcity of water resources in the Region, high population density in urban fringe areas, overlapping responsibilities of national agencies amplified by insufficient coordination and cooperation, lack of adequate human resources planning and appropriate mechanisms for technology transfer, aggravated by the current economic crisis that most of the countries were facing. The Workshop was sponsored by the WHO Regional Centre for Environmental Health Activities (CEHA), Amman, in collaboration with the Ministry of Health, Jordan, the Host Country. 18 participants from 10 countries took part in this meeting with WHO staff.

LIST OF ABBREVIATIONS

CEHA	CENTRE FOR ENVIRONMENTAL HEALTH ACTIVITIES
EH	ENVIRONMENTAL HEALTH
EMR	EASTERN MEDITERRANEAN REGION
IDWSSD	INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE, 1981 - 1990
UNCHS/ HABITAT	UNITED NATIONS CENTRE FOR HUMAN SETTLEMENTS
WHO	WORLD HEALTH ORGANIZATION
WS&S	WATER SUPPLY AND SANITATION

1. INTRODUCTION

During the period 13 - 17 December 1986 an Inter-country Workshop on Low-cost Water and Sanitation Options was held at the Centre for Environmental Health Activities (CEHA) in Amman, Jordan. The Workshop was sponsored by WHO in collaboration with the Ministry of Health, Jordan. The agenda and programme of the workshop are given in Annex 1 and 2 respectively.

Participants in the Workshop included representatives from Democratic Yemen, Egypt, Iraq, Jordan, Oman, Pakistan, Saudi Arabia, Somalia, Sudan and Yemen, in addition to WHO staff. A list of all participants is given in Annex 3.

2. OPENING CEREMONY

The opening ceremony was held at the Ambassador Hotel. Opening speeches were represented by H.E. the Minister of Health, Dr Zeid Hamza, Mr M.M. Dajani, Chief, Division of Environmental Health, Ministry of Health, and Mr S. Bishara, Interim Coordinator, CEHA who delivered a message from Dr Hussein A. Gezairy, Regional Director, Eastern Mediterranean Region of WHO.

3. ELECTION OF OFFICERS

Mr M. Dajani was unanimously elected as Chairman. Three rapporteurs were also appointed: 1. Mr Khidhir A. Putres (Iraq), 2. Mr S.M. Al Behlany (Oman) and 3. Mr Mohammed El Fatih (UNICEF).

4. WORKSHOP STRUCTURE AND COMPONENTS

4.1 Reports by WHO Secretariat

Papers were presented by the WHO Secretariat, followed by discussions. Summaries of the papers presented are given in the section 5 of this report. A list of these papers and the other basic documents of the Workshop is provided as Annex 4.

4.2 Country Reports

National representatives presented country reports which were also followed by discussions. Each representative described the technologies applied in his country outlining both success achieved and problems encountered. It was evident that different technologies were applied by different countries because of varying economic, political and cultural factors.

4.3 Working Groups

Three working groups were formed for discussions and recommendations on three major topics. These were as follows:

Group 1 - Low-Cost Water Supply System

Pakistan
Democratic Yemen
Somalia
Jordan
WHO staff member (engineer) (Yemen)

Group 2 - Low-Cost Sanitation Systems

Iraq
Pakistan
Saudi Arabia
Yemen
Sudan
WHO temporary adviser

Group 3 - Software Components

Oman
Egypt
Jordan
UNICEF (SUDAN) SOMALIA, YEMEN
WHO consultant

Summaries of working group discussions and recommendations are given in the sections 6 and 7 respectively of this report.

5. SUMMARIES OF PAPERS PRESENTED

5.1 Water Supply and Technology Options in the Countries of WHO Eastern Mediterranean Region, by Mr Shawky Bishara, WHO consultant

In his presentation, Mr Bishara highlighted the common problems and options available within the Region. He stressed the importance of identifying means of reducing the cost of providing essential water supply and sanitation services. He pointed out that this was particularly important, given the present climate of economic difficulties in the Region.

Mr Bishara also discussed the technology options available within the Region. He strongly urged countries consider lower-cost technology options for water supply. He pointed out that the use of the reverse osmosis system was cheaper than the conventional multistage flash distillation systems in the countries, such as for example Qatar, where brackish water was abundant.

Mr Bishara also stressed the importance of conserving water by means of effluent reuse especially in view of a common problem within the Region, namely, the scarcity of water resources.

Mr Bishara expressed the view that, in order to achieve the objectives of the International Drinking Water Supply and Sanitation Decade (IDWSSD), countries should focus their services more on the rural communities. With respect to sanitation, WHO review at end 1983 had shown that rural sanitation was lagging behind water supply facilities. Mr Bishara's presentation emphasized the need for providing adequate sanitation services in the rural subsector in order to minimize or eliminate the spread of enteric and other water-borne and water-related diseases. Moreover, it emphasized that, in considering low-cost technological options, countries need to take cultural and social factors into consideration.

In his concluding notes, Mr S. Bishara pointed out that technological low-cost options will not by themselves ensure success. Other factors, such as organization, local skills, resources, institution-building, health education and human resources development, are all critical components of water supply and sanitation programmes.

5.2 Low-Cost Water Supply and Treatment Technologies by Professor M.B, Pescod

Professor Pescod's presentation focused on the low-cost water supply options available to EMR countries. These options, he felt, need to be considered because the current economic conditions (among other factors) of this EM Region do not favour the use of expensive technological options which cannot be maintained and operated by the local skills available. Some of the options surveyed in his paper include hand pumps, different forms of filtration systems available for surface water upgrading, slow sand filtration and other low-cost technological options for upgrading the drinking water quality of rural communities.

Professor Pescod also presented a WHO publication entitled "Slow Sand Filtration - A Low-Cost Treatment for Water Supplies in Developing Countries". He encouraged country representatives to give particular consideration to slow sand filtration as a water treatment option wherever feasible.

5.3 Safe Drinking Water for Small Communities by Dr H.G. Gorchev, WHO consultant

The paper covered the importance of providing safe drinking water and its impact on health. Dr Gorchev placed priorities as regards water quality for small water supply systems as: (1) to provide water; (2) to improve the microbiological and biological quality of water; (3) to protect the water source from contamination by faecal material and (4) to raise the level of health education in communities; microbiological/biological quality covering bacterial pathogens, the virological quality, protozoa and helminths.

Dr Gorchev also reviewed the chemical aspects of water quality, fluoride, nitrate and nitrate, total dissolved solids (TDS), turbidity, etc., and their significance and effects on water quality.

With regard to rural water supply, emphasis should be placed on:
(1) selection of safe source; (2) sanitary surveys;
(3) bacteriological testing; (4) continuous provision of adequate chlorine residual and (5) ensuring simple, reliable operation.

Dr Gorchev also distributed a paper presented at the International Water Supply Association Congress, 6 - 10 September 1982, Zurich, Switzerland.

5.4 Design of Low-Cost Water Treatment and Distribution by Professor M.B. Pescod

In this paper Professor Pescod covered the different stages where the cost of water treatment and distribution can be reduced to a minimum. The paper covered the following topics:

- supply standards
- source selection with special emphasis on rainwater harvesting
- aeration, to remove some chemical impurities from water
- in-situ filtration, screening, sand dams, bank infiltration and slow-sand filters
- storage
- sedimentation
- prefiltration, horizontal prefilter, rapid sand filter
- slow-sand filtration, principle, design, operation
- disinfection.

The paper also reviewed the following aspects with regard to distribution of water supplies:

- level of service
- water use
- water demand
- design criteria
- layout
- dimensions
- staged development
- materials
- storage and pumping.

5.5 Low-Cost Sanitation Technologies by J. Lumbers

The range of low-cost appropriate sanitation technologies was described and the particular advantages identified. Examples of some of the difficulties faced in EMR countries were described, in particular the following aspects:

- high water table
- excessive seepage (due to space or permeability problems)
- high-density housing

The common practice of using water for anal cleansing indicates the need for a convenient water supply and also suggests that pour-flush toilets may be feasible.

The importance of matching the provision of water supply with that of sanitation was emphasized strongly. The potential health hazards of excessive wastewater lying in pools near houses, in streets, etc., were stressed.

5.6 Design of Low-Cost Sanitation by J.P. Lumbers

This paper reviewed the various characteristics used to clarify low-cost sanitation systems. The design basis for the various options was described in the paper and particular emphasis placed on whether or not the systems were able to handle the disposal of sullage. The common problem of proper sanitary sullage disposal was discussed and the possibility of using small-bore sewer systems considered.

The discussion centred on the problems of high-density, low-cost housing areas where the plot sizes are too small for on-site seepage. Where access permits, on-site systems for excreta only could be feasible, provided an emptying service is available. Sullage could be kept separate and passed to small-bore sewers for collection and treatment.

The disposal of sludge poses a problem in many countries and discussion emphasized the need for proper facilities for treatment and disposal.

5.7 Institutional Development, Technology Transfer and Training by Professor M.B. Pescod

In this presentation Professor Pescod reviewed many examples of overlapping responsibilities in the fields of water supply and sanitation, and the problems that have arisen or will arise due to these conditions.

He mentioned the need to establish, develop or amend the existing agencies and systems so as to facilitate and improve the extent and level of coverage in both of water supply and sanitation, starting from planning and proceeding through implementation towards operation and maintenance.

The presentation also covered deficiencies in information transfer mechanisms and activities related to water supply and sanitation technologies, and suggested some mechanisms for information transfer.

Manpower training/human resource development was highlighted as being a major factor in achieving the objectives of adequate water supply and sanitation for all.

5.8 Low-Cost Wastewater Treatment by Professor M.B. Pescod

The presentation covered the different aspects with regard to the application of stabilization ponds for wastewater treatment and reviewed the different types, namely anaerobic, facultative and maturation ponds. Also, aerated lagoons, high-rate aerated ponds, macrophyte ponds and the possible combinations of these types were discussed.

A description was given of the details and design criteria of different types of ponds which determine an adequate size, depth, stages, etc., to obtain the required effluent quality. In addition, the paper dealt with physical design aspects, cost of pond systems, location, preliminary treatment, geometry, geotechnical considerations, inlet and outlet structures, security and the operator facilities.

Professor Pescod also discussed the question of biogas production from wastes.

5.9 Effluent Reuse and Resource Recovery by J. Lumbers

The presentation dealt with the basis and standards for quality of wastewater which is to be reclaimed and reused for different purposes, with special focus on agricultural reuse.

Reuse and water conservation, reuse and water resources, selection of appropriate treatment methods, risk evaluation, development of standards, sludge disposal/reuse and the basis for effluent reuse standards were among the aspects covered.

Also the following selected literature on the subject was reviewed:

- WHO Technical Report Series No. 517 "Reuse of Effluents: Methods of Wastewater Treatment and Health Safeguards", Report of a WHO Meeting of Experts, 1973
- Water Reuse and Recycling (1979), U.S. Department of the Interior
- Water reuse in Federal Republic of Germany
- Effluent reuse for agriculture in Kuwait
- Effluent reuse in Saudi Arabia
- Sewage treatment and its reuse for irrigation in Jordan

Recommendations for standards and measures were given for various practices of wastewater reuse.

The paper emphasized the importance of effluent reuse as an **integral part of water resources management in most countries.** Concepts of direct and indirect reuse were described and the area of agricultural irrigation identified as the major current and potential use of treated effluent.

Some shortcomings of the WHO Report No. 517 were discussed and the relative importance of standards along with other measures outlined. In particular, the need was stressed for the use of appropriate treatment methods to ensure satisfactory removal of pathogens, along with controls on the type of crops, application rates in relation to soil drainage and the method of irrigation.

Discussion of the paper revealed a common opinion that standards for effluent reuse were often set too high in relation to the risks involved; the coliform standard of 1000 faecal coliform per 100 ml. was receiving most support in the current literature. The importance of a nematode egg count was discussed; it was noted that no standard sampling and analysis methods exist at present. Further this factor was recognised as being more relevant to the reuse of night soil or sludges than to effluents.

5.10 Evaluation of On-site Sewage Disposal Systems in Jordan by Dr Saqer S. Al Salem

The presentation identified the existing and projected alternative collection/treatment systems and aimed to evaluate the performance of the on-site disposal systems. With this in view, the presentation surveyed the existing and future collection/treatment systems in different areas in Jordan and on-site disposal systems currently in use were described.

The presentation explained the relationship between the density of on-site disposal systems and the zoning considerations. It also covered the failure and/or problems of on-site systems and current maintenance practices. The lack of existing standards and regulations for these systems was noted.

6. WORKING GROUP DISCUSSIONS

6.1 Three working groups were established to discuss three different topics, namely: low-cost water supply, low-cost sanitation and software components (health education, community participation, institutional development and technology transfer). The composition of the groups is given hereunder:

Group 1 Low-Cost Water Supply

Chairman:	Mr J. Kozinski	WHO
Rapporteur:	Dr Javed A. Aziz	Pakistan
Members:	Dr Anis Ali	Democratic Yemen
	Eng. Abdi Ali Aynab	Somalia
	Mr A. Juneidi	Jordan

Group 2	Low-Cost Sanitation	
Chairman:	Dr Saqer Salem Al Salem	WHO Temporary Adviser
Rapporteur:	Mr J.P. Lumbers	WHO consultant
Members:	Dr Khidhir Alias Putres	Iraq
	Mr Ghulam Shabbir	Pakistan
	Mr Abdullah Mohamed Ali Al Aboodi	Saudi Arabia
	Mr Abdullah Mohamed Homaïd	Yemen
	Mr Osman Yahya Owan	Sudan
Group 3	Software Components of Water Supply and Sanitation	
Chairman:	Professor M.B. Pecod	WHO consultant
Rapporteur:	Mr Salim M. Al-Behlany	Oman
Members:	Eng. M. Hamdi	Egypt
	Mr M. Abu Kaf	Jordan
	Mr M. Al Fatih	UNICEF (Sudan)
	Mr Abdi Ali Aynab	Somalia
	Eng. Abdullah Abdel Malik Badr	Yemen

Their resulting recommendations and summaries are given below.

6.2 Summaries and Recommendations of the Working Groups:

6.2.1 Group 1: Low-Cost Water Supply:

The Working Group recommended that, in order to meet Decade objectives EMR countries promote the use of appropriate technologies which would provide safe water at affordable costs. Technologies should be selected on the basis of each country's economic, social and environmental conditions. Because of the scarcity of water resources and other limiting factors each country should strive to conserve its water resources by minimizing wastage and encouraging the reuse of effluent.

6.2.2 Group 2: Low-Cost Sanitation:

The Working Group felt that the term "low-cost technology" should be replaced by "appropriate technology". It was reasoned that low-cost technology is not always appropriate. As with the provision of water supply, sanitation services should be selected only after careful consideration has been made with regard to acceptability, available resources, space and water. The Group recommended that wastewater treatment/disposal facilities should **start with an evaluation of land treatment and stabilization ponds** before other processes were considered. Furthermore, on-site systems should be the first choice of sanitation whenever feasible.

It was also recommended that countries revise their effluent standards. The current standards are considered to be too strict and as a result may discourage the use of effluent despite the lack of any concrete epidemiological evidence of serious potential health risks.

6.2.3 Group 3: Software Components of Water Supply and Sanitation:

This Working Group stressed the necessity of including software components such as: health education, community participation institutional development, and technology transfer, along with low-cost technologies for water supply and sanitation. It was suggested that WHO/CEHA and other international bodies should play a major role in providing positive and practical assistance to all countries of the Region. Recommendations that could be supported by WHO/CEHA include:

- (1) The collection of information on techniques and materials used in some EMR countries related to health education and its dissemination to other Regional countries.
- (2) The promotion of community participation in water supply and sanitation schemes through support for practical demonstration projects in EMR, drawing on the experience of those countries which have tried such an approach.
- (3) WHO/CEHA may consider assessing major regional training needs in the sector and assist developing suitable training courses.

Finally, it was strongly recommended that governments be encouraged to review existing water supply and sanitation agencies with a view to minimizing duplication of responsibilities and staffing. Exchange of information and experience on this sector among EMR countries should be promoted by WHO/CEHA.

7. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS OF THE WORKSHOP

It is known that the cost of achieving Decade objectives will be many times greater than what was originally anticipated (ref. WHO Review of Decade Progress, December 1983). This problem is further complicated when other factors are also considered, including the current economic environment and the scarcity of water resources (which are at present being over-utilized, wasted and polluted).

In order to overcome these obstacles, countries need to change the direction of their efforts and resources by applying the most appropriate technologies at the lowest cost. This is a challenging responsibility that requires careful planning and consideration of all alternatives and all factors that could influence such technologies.

In selecting the appropriate technologies, governments need to consider the most economical options in order that a wider range of the population may be covered with water supply and sanitation services (WS & S).

All low-cost technologies, should be accompanied by essential software components such as health education, community participation, institution-building, human resources development and other essential elements. Furthermore, all programmes should be tested and evaluated with full participation of community members at all phases, including planning, design, construction, operation and maintenance.

One of the major components behind any water supply and sanitation programme is the organization of those agencies responsible for this sector. It is suggested that governments should review such agencies with a view to minimizing duplication of responsibilities and staffing; this is particularly important given the present climate of economic difficulty in the Region.

Reports of the working groups are given in Annex V.

PROVISIONAL AGENDA

1. Opening Session
2. Workshop structure and components
3. Water supply and technology options in EMR Countries
4. Low-cost water supply and treatment technologies
5. Safe drinking water for small communities
6. Design of low-cost water treatment and distribution
7. Low-cost sanitation technologies and design.
8. Institutional development, technology transfer and training
9. Low-cost wastewater treatment
10. Effluent reuse resource recovery
11. Evaluation of on-site sewage disposal
12. Waste stabilization ponds
13. Case study on water and sanitation technologies in Yemen Arab Republic
14. Conclusions and recommendations
15. Closing Session

PROGRAMME

Saturday, 13 December 1986

- 08:30 - 09:00 - Registration
- 09:00 - 09:30 - Inaugural Session
- 09:30 - 10:00 - Coffee break
- 10:00 - 10:15 - Election of Officers; Adoption of Agenda
- 10:15 - 10:30 - Introduction: Scope and purpose of the Workshop
- 10:30 - 11:00 - Common problems and options for water and sanitation systems in EMR countries (Mr J. Lumbers/Mr S. Bishara).
- 11:00 - 12:30 - Country presentations
- 12:30 - 12:45 - Break
- 12:45 - 13:45 - Low-cost water supply and treatment technologies (Professor M. Pescod)
- 13:45 - 14:30 - Country presentations (cont'd)

Sunday, 14 December 1986

- 08:00 - 09:00 - Interpretation of WHO Water Quality Guidelines (Dr G. Gorchev WHO)
- 09:00 - 13:00 - Field visit
- 14:30 - 15:30 - Low-cost sanitation technologies (Mr J. Lumbers)

Monday, 15 December 1986

- 08:00 - 09:00 - Design of low-cost water treatment and distribution systems (Professor M. Pescod)
- 09:00 - 10:00 - Design of low-cost sanitation systems (Mr J. Lumbers)
- 10:00 - 10:30 - Coffee break
- 10:30 - 12:30 - Country presentations (cont'd)
- 12:30 - 13:30 - Institutional development, technology transfer and training (Professor M. Pescod)
- 13:30 - 15:00 - Lunch break
- 15:00 - 17:00 - Working groups discussion

Tuesday, 16 December 1986

- 08:00 - 09:00 - Low-cost wastewater treatment (Professor M. Pescod)
- 09:00 - 10:00 - Effluent reuse and resource recovery (Mr J. Lumbers)
- 10:00 - 10:30 - Coffee break
- 10:30 - 11:30 - Evaluation of on-site sewage disposal (Dr S. Al Salem)
- 11:30 - 13:30 - Presentation of reports by Working Groups
- 13:30 - 15:00 - Lunch break
- 15:00 - 15:30 - Discussions

Wednesday, 17 December 1986

- 08:00 - 09:00 - Introduction to Manual on waste stabilization ponds (Professor M. Pescod)
- 09:00 - 10:00 - Case study on water and sanitation technologies in Yemen (Mr J. Kozinski, WHO)
- 10:00 - 10:30 - Coffee break
- 10:30 - 11:30 - Presentation of conclusions and recommendations (Mr J. Lumbers)
- 11:30 - 12:00 - Adoption of recommendations
- 12:00 - 12:30 - Closing Session

LIST OF PARTICIPANTS

- DEMOCRATIC YEMEN Mr Anis Yousuf Ali
Sanitary Engineer
Directorate-General of Local Government
Aden
- EGYPT General (Eng) Kamal El-Din Hegab
Chairman of General Organization of
Greater Cairo Water Supply
Cairo
- Eng Mohamed Hamdy Sayed Ahmed
Director of Planning and Research
Department, Cairo Water,
Cairo
- IRAQ Mr Khidhir Alian Putres
Head
Environmental Engineering Department
Directorate of Environmental Protection
and Improvement,
Ministry of Health
Baghdad
- JORDAN Mr Mohammad M. Dajani
Chief, Division of Environmental Health
Ministry of Health
Amman
- Mr Abdel Aziz Wishah
Water Authority of Jordan
Amman
- Mr Mohammad Abu Kaf
Head, Environmental Monitoring and Control Section
Ministry of Health
Amman
- OMAN Mr Salim Mohamed Al behlany
Head,
Environmental Health Section
Ministry of Health
Muscat

PAKISTAN

Dr Javed Anwar Aziz
Professor of Public Health Engineering
Institute of Public Health Engineering and Research
University of Engineering and Technology
Lahore

Mr Ghulam Shabbir
Associate Professor of Public Health Engineering
Institute of Public Health Engineering and Research
University of Engineering and Technology
Lahore

SAUDI ARABIA

Mr Abdullah Mohamed Ali Al-Aboodi
Network Manager
Riyadh Sewerage Operation and Maintenance Project
Riyadh

Mr. Khaled Ahmed Uraif
Ministry of Health
Jeddah

SOMALIA

Mr Abdi Ali Aynab
Water Development Agency
Mogadishu

SUDAN

Mr Arman Yahia Omran
Director of Khartoum N. Drainage Scheme
Administration of Public Health Engineering
Khartoum

Mr. Abd El Magid Sir El Khatim
Senior Engineer
National Water Corporation
Khartoum

YEMEN

Eng. Abdulla Abdul Malik Badr
Director of Hydrogeological Department
Rural Water Supply
Ministry of Public Works
Sana'a

Eng. Abdalla Mohamed Hamid
Engineer in Design/Construction
Department of Rural Water Supply
Sana'a

OTHER UN ORGANIZATIONS

UNICEF

Mr Mohamed El Fatih
Water Section (Sudan Office)
UNICEF
Amman

WHO SECRETARIAT

Dr (Mrs) H. Galal Gorchev	Division of Environmental Health	Scientist, WHO, Geneva, Switzerland
Mr S. Bishara	Interim Coordinator and Secretary of Meeting	CEHA, Amman, Jordan
Professor M.B. Pescod	WHO Consultant	Head of Department Civil Engineering Department, University of Newcastle upon-Tyne United Kingdom
Mr Jeremy P. Lumbers	WHO Consultant	Imperial College of Science and Technology London, UK
Dr Saqr S. Al Salem	WHO Temporary Adviser	Director of Treatment Plants Department Water Authority of Jordan Amman
Mr J. Kozinski	WHO Sanitary Engineer	Sana'a, Yemen

LIST OF BASIC DOCUMENTS

1.	Provisional Agenda	EM/INC.WKP.LWC.WSO/1
2.	Provisional Programme	EM/INC/WKP.LWC.WSO/2
3.	Provisional List of Participants	EM/INC.WKP.LWC.WSO/3
4.	Common problems and options for water and sanitation systems in EMR Countries (Mr J. Lumbers)	EM/INC.WKP.LWC.WSO/4
5.	Low-cost water supply and treatment technologies (Professor M. Pescod)	EM/INC.WKP.LWC.WSO/5
6.	Interpretation of WHO Water Quality Guidelines (Dr H. Galal Gorchev)	EM/INC.WKP.LWC.WSO/6
7.	Low-cost sanitation technologies (Mr J. Lumbers)	EM/INC.WKP.LWC.WSO/7
8.	Design of low-cost water treatment and distribution systems (Professor M. Pescod)	EM/INC.WKP.LWC.WSO/8
9.	Design of low-cost sanitations systems (Mr J. Lumbers)	EM/INC.WKP.LWC.WSO/9
10.	Water and Sanitation case study (Mr J. Kozinski)	EM/INC.WKP.LWC.WSO/10
11.	Low-cost wastewater treatment (Professor M. Pescod)	EM/INC.WKP.LWC.WSO/11
12.	Effluent reuse and resource recovery (Mr J. Lumbers)	EM/INC.WKP.LWC.WSO/12
13.	Institutional development, technology transfer and training (Professor M. Pescod)	EM/INC.WKP.LWC.WSO/13
14.	Evaluation of on-site sewage disposal (Dr S. Al Salem)	EM/INC.WKP.LWC.WSO/14
15.	Introduction to Manual on waste stabilization ponds (Professor M. Pescod)	EM/INC.WKP.LWC.WSO/15
16.	Water supply and sanitation technology options in EMR Countries (Mr S. Bishara)	EM/INC.WKP.LWC.WSO/16

REPORTS OF WORKING GROUPS

1. LOW-COST WATER SUPPLY

In order to meet the goals of the International Drinking Water Supply and Sanitation Decade (IDWSSD) the use of appropriate technologies which may provide safe water at affordable cost should be widely promoted in the Eastern Mediterranean Region.

1. The Workshop agreed that "low-cost" technology would be interpreted different ways in different countries.
2. In view of the financial constraints faced by many countries of the Region, the rehabilitation and improvement of existing systems should be considered as an alternative to their complete replacement.
3. Countries of the Region should try to assess their needs and develop their own design criteria for water supply systems.
4. Wherever possible, groundwater sources should be preferred over surface water sources due to their minimal treatment requirements.
5. Water source selection should be based on yield and quality characteristics. Means should be adopted to protect the source from contamination and, if possible, to upgrade the quality of water at the point of obstruction.
6. Tariff systems should be employed by countries in the Region to conserve water. There is also a need to cut down excessive water losses through an effective management system.
7. For shallow aquifers with acceptable water quality the use of hand pumps is strongly recommended. Countries in EMR should improve upon the existing design of their hand pumps to render them more reliable and effective. There is also a need to improve upon the design of hand pumps for deeper aquifers (60-70 m).
8. Conversion of open to covered wells should be encouraged through the use of low-cost hand pumps.
9. If a rural water supply requires treatment, careful consideration must be given to whether it can be afforded and reliably operated.

10. Use of slow-sand filters for surface water treatment should be encouraged as they provide better health protection than other water treatment processes, apart from disinfection, and are lower-cost.
11. Since roof storage tanks and intermittent supplies pose a health hazard to consumers, efforts should be made to upgrade such systems whenever the necessary funds are available.
12. To maximize the rate of coverage of water supply development in slums and squatter settlements as well as in rural areas, the use of properly designed standposts within 250 m of every dwelling should be preferred over yard or house connections, unless private funds cover the marginal costs involved.
13. The practice of providing excessive water storage in distribution systems should be reviewed and only the optimum storage capacity to suit local needs be provided.
14. To promote national economies the use of locally manufactured products should be encouraged even in spite of their somewhat inferior quality; designs should take account of this.
15. Research areas in the water supply sector should be carefully identified by each member country of the Region; technical institutions/universities should be involved to achieve appropriate solutions of local problems through continued programmes.

2. LOW-COST SANITATION

The group identified a number of points of concern, some overlapping, related to low-cost sanitation. These included:

- the definition of "low-cost"
- the definition of "rural communities"
- special problems of high population density housing areas
- problems of high water table areas
- desirability of communal facilities
- need for operator training
- need for encouragement and guidance of householders for on-site sanitation provision.

It was felt that the term "low-cost" was a misnomer and should be substituted by "appropriate". The main factors defining "appropriate" were identified as being:

- within that affordable by a householder, with no on-going subsidy from the government;
- easy to operate and maintain;
- requiring minimum skilled manpower;
- that which builds on existing customs and practices;
- in line with availability of materials.

A common definition of a rural community was one having less than 5000 population. However it was felt that the main factors determining so-called "rural" conditions were population/housing density and economic status.

Few of the countries represented had clear standards for the design of on-site sanitation systems, although it was agreed that on-site disposal should be considered as the first choice in wastewater disposal. Only where this is not feasible should other systems be considered. It was noted that Iraq has legislation for septic tanks. In other countries the regulations refer only to the distance from the road or next building and state that the disposal of effluent from septic tanks is the responsibility of the householder. In Saudi Arabia heavy fines are levied for allowing septic tanks to overflow.

3. SOFTWARE GROUP

Health education

- Health education is critical to the success of WS&S programmes. All forms of appropriate media should be used to reach the target population: television, radio, mobile cinema, etc. Special programmes should be produced.
- Existing experience should be exchanged.
- Health education should be introduced into school curricula and included in training of community workers. Local personalities, (e.g., school teachers, village or religious leaders and women's groups) should be used to disseminate information.
- Health authorities should publish information on water-borne diseases.
- WHO/CEHA should collect information on techniques and material used in some EMR countries to provide health education to the public and make this available to other countries in the Region.

Community participation

- Programme or project objectives should be explained to recipient communities to involve them from the beginning so as to allow them to participate in all phases of project planning and implementation. This will inevitably involve health education.
- Communities should share in the cost of implementing projects, either through cash contributions or other forms of input, such as land, materials, labour provision, etc.
- Recipient communities should take on some responsibility for operation and maintenance of systems. However, the responsible agency must provide some technical back-up.
- The government must take account of the local political and social structure in reaching decisions on community involvement.
- Where feasible, informal sector development to produce components for WS & S schemes within the community should be considered. This will involve training and financing.
- UN agencies such as WHO and HABITAT (UNCHS) should be invited to assist in promoting community participation in WS&S schemes by support for practical demonstration projects in EMR, drawing on experience in those countries which have tried such an approach.

Institutional Development

- Governments should be encouraged to review existing WS&S agencies with a view to minimizing duplication of responsibilities and staffing, WS&S activities in one agency are soon to integrate. WS&S agencies should collaborate with national universities and research centres with a view to the development of appropriate technological systems. Each agency should allocate part of its budget for research.
- Central authorities should maintain regional and field offices to provide direct linkages with local communities.
- WS&S agencies should have adequate trained manpower and resources. Training opportunities should be available for staff at all levels and suitable incentives should be provided to encourage high productivity.
- WHO/CEHA should assess major regional training needs in the sector and assist in developing suitable training courses.

- Managerial staff will benefit from regional and international exchange visits; WHO may consider supporting such exchanges.
- Personnel selected for training programmes should have duties in the specific area covered by the training and should be evaluated after receiving training.

Technology Transfer

- The exchange of information and experience on WS&S among countries of the EMR should be promoted by WHO/EMRO.
- There are opportunities for transfer of expertise among countries of the Region.
- WHO/CEHA should play a major role in identifying the most appropriate mechanisms for technology transfer within the Region.

It was agreed that there was a need to encourage householders to build correctly designed on-site systems by:

- giving design advice free
- free supervision of construction
- provision of some materials.

Guidelines should include information on household pipework and connections, septic tank design, sizing the seepage area or pit and provision for possible future connection to a sewer. Communal facilities were not regarded as socially feasible in most circumstances, unless the municipal authorities maintain a communal septic tank.

Sludge disposal appears to be a universal problem with few examples where proper reception and treatment facilities are provided.

The problems of sanitation in high-density areas were discussed and consideration given to the separate disposal of sullage. Sullage would have a higher seepage rate or could be collected by small-bore sewers for disposal/treatment.

Small-bore sewers may not be always cheaper than conventional ones. Current World Bank recommendations are for minimum 100 mm diameter for maintenance purposes. The minimum sewer size in Jordan and Egypt is 200 mm, Iraq 150 mm and Pakistan 225 mm. The extra cost of the larger pipe may be marginal compared to the cost of excavation, backfill and reinstatement. However, the gradients can be flatter and the manhole spacing greater if it is ensured that solids do not enter the system.

In high water table areas it may be feasible to combine drainage for lowering the water table with the drainage of sullage water. Sullage disposal to open ditches has been practised in Pakistan, Jordan and other countries and has been found to be very unsatisfactory, due to blockage with garbage and refuse.

The principal options in the countries represented were cesspits and septic tanks for those houses with water supply. Pour-flush pans are not readily available in many of EMR countries, although this technology was considered to be desirable.

A brief discussion was held on low-cost treatment and the following priority list formulated:

1. land application where suitable
2. stabilization ponds
3. aerated lagoons
4. biological filters
5. activated sludge systems

A major factor was considered to be the problem of sludge disposal within the constraints of the desired effluent quality. It was strongly felt that effluent standards should be related to the use of receiving waters and not be uniform. Disinfection is not always required or justified.

SUMMARY OF RECOMMENDATIONS OF WORKING GROUPS

1. The term "low-cost" should be replaced by "appropriate".
2. National guidelines are required for the design of on-site sanitation systems.
3. On-site systems should be the first choice for sanitation and only discarded if not feasible.
4. There is a need to encourage householders to construct their own sanitation systems by providing free advice, supervision and provision of some materials.
5. Communal facilities are unlikely to be acceptable in the Region except where the municipal authority undertakes to maintain them.
6. The problems of treatment and disposal of sludge are common and represent an important potential hazard.
7. In high-density areas where seepage is limited by space, consideration should be made of sullage, possibly using small-bore sewers.
8. The selection of wastewater treatment/disposal facilities should start with an evaluation of land treatment and stabilization ponds before other processes are considered. Sludge production, treatment and disposal are major factors influencing choice.
9. Effluent standards should relate to the end use and assimilation capacity and/or of the receiving water. Disinfection is not always justified.
10. Standards being used in the Region for effluent reuse should be reviewed.