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Bilthoven, The Netherlands, 9-13 April 1973
Report of the proceedings

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WORLD HEALTH ORGANIZATION
INTERNATIONAL REFERENCE CENTRE FOR COMMUNITY WATER SUPPLY

MEETING OF DIRECTORS OF INSTITUTIONS COLLABORATING WITH THE
WHO INTERNATIONAL REFERENCE CENTRE FOR COMMUNITY WATER SUPPLY
BILTHOVEN, NETHERLANDS
9 - 13 April 1973

REPORT

Bulletin no. 5

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THE HAGUE - THE NETHERLANDS

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Summary

The present document reports on a meeting of Directors of Institutions collaborating with the WHO International Reference Centre for Community Water Supply and representatives of organizations, carrying out international programmes in this field. The objective of the meeting was to evaluate the work of the WHO International Reference Network for Community Water Supply, to discuss organizational aspects which may lead to an improved output, and to identify specific activities needed in research, development, training and dissemination of information.

Based on a review of the activities performed thus far, by the IRC and the Collaborating Institutions (chapter 3), it was emphasized that both the Dutch Government and WHO would have to consider an increased financial support to the IRC, to secure continuation of activities. Collaborating Institutions would consider this possibility also, together with support by means of secondment of staff for clear-cut programmes of work.

It was agreed that IRC - in agreement with WHO - will formulate the specific duties of a Collaborating Institution, which will be used for the designation of new institutions, and in which the functioning as national focus, the routine activities and a number of specific tasks will be defined. Collaborating Institutions will nominate a staff member to act as a contact-person who will be responsible for the provision of information. It was a general consensus that initiatives should emerge from the IRC. Collaborating Institutions should, however, sustain IRC's efforts as much as possible; IRC will annually report on the collaboration. It was proposed that the Network be periodically reviewed and that Collaborating Institutions, which are not performing their duties should be invited to withdraw from the Network.

The Network will be further extended both by means of the nomination of new Collaborating Institutions in additional countries, and through increased national contacts of Collaborating Institut-

ions with other institutions and executing agencies in their own countries. WHO will consider the set up of additional Regional Reference Centres.

A plenary discussion of problems and needs in industrial and developing countries resulted in a general agreement on the nature of present and future research and development programmes (chapter 4).

Specific proposals for future activities in research, development and training were discussed in working groups, and allocated priorities (chapter 5). Six projects - regarded as the most urgent ones - received a special priority (chapter 6):

- No. 1 Health aspects of water reuse
- No. 7 Health effects of trace elements in water
- No. 15 Slow sand filtration in developing countries
- No. 16 Review and application of relevant technologies
- No. 20 Impact of community water supply
- No. 25 Development and implementation of systematic training programmes in developing countries

Based on the outcome of the meeting, WHO and IRC in consultation will take initiatives to start an international programme of action, to be carried out in collaboration with the International Network for Community Water Supply.

Preface

A meeting of Directors of Institutions Collaborating with the WHO International Reference Centre for Community Water Supply (IRC/CWS) was held from 9 to 13 April 1973 at the National Institute for Public Health, Bilthoven, The Netherlands. Detailed planning and arrangements for the meeting were carried out by the IRC/CWS assisted by its host institute, the Government Institute for Water Supply at The Hague.

Mr. P. Santema, Director of the IRC/CWS opened the meeting and welcomed the participants. He expressed his appreciation to the Director of the National Institute for Public Health who had made the conference rooms and other facilities available for the meeting and stressed the importance of this meeting for the future expansion of the activities of the Reference Centre.

Mr. L.A. Orihuela, Chief Community Water Supply and Sanitation Unit, Division of Environmental Health, of the World Health Organization, welcomed the participants on behalf of Dr. B.H. Dieterich, Director of the Division. He thanked the IRC's staff for the good work they had done in arranging the meeting and recognized that a number of participants had travelled long distances with considerable personal inconvenience and expense. The interest thus shown was an encouraging indication of the prospects for success of the meeting.

Dr. R.G. Allen was elected Chairman of the meeting; Professor K. Symon and Professor A.M. Wright Vice-Chairmen and Mr. Th.G. Martijn and Professor M.B. Pescod Rapporteurs. Dr. R.C. Ballance assisted the Secretariat in the drafting of this final report.

1. INTRODUCTION

Much progress in community water supply has been achieved since the establishment of WHO in 1948. However, much remains to be done. A recent study*) shows that in order to reach the water supply targets of the Second United Nations Development Decade some formidable obstacles will have to be overcome. The target is to provide all urban dwellers with safe water supplies, 60% by house connections and 40% by public standposts, and to provide reasonable access to safe water for 25% of the rural population. The target date for these achievements is 1980 and the estimated costs are US \$13200 million. The size of the task is almost incomprehensible.

Especially sensitive are those areas described as rural. Data concerning 1970 conditions indicated that only 12% of rural people had access to safe water. Population increase, however, far outstrips the planned rate of water supply development. Reaching the 1980 targets will produce an improvement in the percentage served, but even so there will be 50 million more rural people without water than there were in 1970.

Developing countries are also being confronted with a host of problems arising from rapid urbanization. The migration of rural people to urban areas has resulted in the uncontrollable growth of most peri-urban settlements on the fringes of every city. These settlements are characterized by substandard housing and inadequate sanitary services. Frequently the basic essentials for sanitation - water supply, excreta disposal and refuse disposal - are totally lacking. This unplanned and uncontrolled fringe growth creates a critical hazard to the public health.

The problems of water supply in developing countries are compounded by two major factors, which, although not unique to develop-

*) Community Water Supply Programme. Progress Report by the Director General (1972) (WHO Document A25/29)

ing countries, are more intense than in industrialized countries. These factors are:

- insufficient allocation of finances;
- shortages of skilled personnel.

Moreover some of the characteristics which apply to the basic sanitation services in many developing countries include:

- absence of integrated national environmental health programmes within health ministries;
- inadequate or no legislation, regulations, standards, criteria or codes of practice relating to water supply;
- shortages of competence as to administration and management of water supply programmes and facilities;
- unsatisfactory and unsound fiscal structures for financing of water supply projects;
- lack of information on water resources and existing water systems;
- insufficient research and adaptation of technology to meet local difficulties and to maximize the utilization of available resources.

It is felt that Collaborating Institutions can play an active role in the solution of many of these problems, and international cooperation through the Network can in a large measure support their efforts.

The purpose of the meeting therefore was to review and evaluate the work of the International Reference Centre for Community Water Supply and the Collaborating Institutions and to develop an administrative and operation strategy for an effective strengthening of the IRC/CWS-CI network.

An area of particular emphasis was the review of research needs and the identification of specific activities in which collaborative efforts and coordination within the network can be intensified, and the formulation of detailed programmes, with the allocation of appropriate priorities.

At the U.N. Conference on the Human Environment in June 1972,

in Stockholm, it was recommended to direct efforts to the setting up and improvement of water supplies and priority was designated for research on water supply; in this connection relevant programmes of a short term nature discussed at the present meeting could be of interest to the U.N. Governing Council for Environmental Programmes which is establishing an Environmental Fund for such purposes.

Many of the problems of water supply in developing countries might be solved by the application, adaptation or innovation of relatively simple technology. The task of the meeting in this area, therefore, was to explore the ways and means by which information on such technology might be collected and disseminated in a usable form. This recognized relationships among research and development, the dissemination of information on research findings and the training of workers for research and its application to practice.

The meeting was considered to be of considerable importance to the various organizations represented. The International Reference Centre is expected to overcome most of its early problems soon and the network of Collaborating Institutions for which it acts as the nexus, is now operative. The meeting provided an opportunity for the establishment of a realistic policy outline within which future activities may be formulated.

2. INTERNATIONAL PROGRAMMES IN THE COMMUNITY WATER SUPPLY FIELD

2.1 The WHO Community Water Supply Programme

The Role of WHO*

Community water supply together with related activities for the improvement of basic sanitary services is considered to be an

*) Problems of the human environment, Official Records of the World Health Organization, 1971, No. 193, Annex 13.

essential prerequisite for the prevention and control of communicable disease and the promotion of physical, mental and social well-being. The role of WHO is to provide direct assistance to governments in achieving national objectives, the collection and assessment of data on sanitary conditions, the preparation of documents for dissemination of information and the stimulation of research and development activities. WHO works cooperatively with other international organizations and agencies, particularly when projects have an interdisciplinary character. Assistance to governments takes a number of forms, as briefly described below.

Direct assistance

WHO assigns, on request, experienced staff to work with national counterparts on the various tasks where assistance is needed. These assignments are frequently of a two-year duration and the terms of reference are specific to the needs consistent with the overall programme. Within the subject of water supply, the most frequent assignments relate to national water supply programmes and the training of personnel. Technical and administrative support is supplied by WHO Regional Offices and WHO Headquarters.

Sector studies on community water supply and wastes disposal

A fairly recent development within WHO is the conduct of sector studies wherein a team comprising technical, administrative and financial expertise will conduct a situation evaluation within a developing country. The comprehensive report which results provides governments with the background information so essential for decision making.

Pre-investment studies

The purpose of these studies is to assist Member States to plan and conduct technical, institutional, economic, social and financial studies on the feasibility of specific schemes, identified by sector studies or otherwise, for urban and rural community water supply and wastes disposal. These projects are financed by

the United Nations Development Programme; WHO acts as executing agency, supplying a project manager and retaining the technical services of an internationally selected consultant engineering firm on a sub-contract basis.

Data collection

Data collection and assessment has a vital place in the WHO programme. At the country level it permits national planning. On the global level it provides the basis on which WHO and other international organizations can establish priorities and allocate resources. This is especially important to donor countries within the international family which must allocate funds to bilateral as well as international aid programmes.

Training

Training of technical personnel is accomplished by two main methods. The assignment of WHO staff to assist in the implementation of national programmes has already been mentioned. Most WHO-sponsored projects include a training component wherein fellowships are provided for national staff who have already reached some level of accomplishment. Candidates for fellowships are elected by the national government and WHO attends to the detailed arrangements of the fellowships. Many hundreds of persons have received training in water supply under WHO auspices.

Research and development

Research and development in water supply is conducted through the International Reference Centre for Community Water Supply and its affiliated network of Collaborating Institutions and Regional Reference Centres about to be designated at the time of the meeting. The WHO financial support of this arrangement is minor - perhaps inadequate - the major cost of supporting the IRC/CWS is borne by the host government. The network services to stimulate and catalyze research and development activities and to disseminate research findings and other information which is specific to developing country needs. In addition, contractual technical services

agreements are made with collaborating institutions for the conduct of specific research projects. These projects aim at simplifying water supply facilities by the adaptation of existing technology, at the utilization of local materials and skills, at the collection and dissemination of technical and scientific information and at the development of criteria and guidelines for water supply practice. The training of research workers is also included under the mantle of research and development. Many of the collaborating institutions have some form of training as an essential part of their ongoing activities and these provide an excellent opportunity for workers from developing countries to expand their knowledge and technique of research methodology.

Publications

The publications of WHO are another method whereby assistance and information are made available to developing countries. These publications are meant to supplement the many books and periodicals available through normal commercial sources and usually are oriented towards developing country situations. Several techniques are used for their initial preparation; the most common are preparations by an individual author under a contractual arrangement and the calling of a meeting of experts to discuss and prepare a report on a specific subject.

2.2 Activities of WHO Regional Offices

Regional Offices have the direct responsibility for all aspects of implementation of WHO programmes at the country and inter-country level. Regions also cooperate on the implementation of inter-regional programmes and collaborate with Headquarters in these as well as in programmes that have global aspects. Water supply is a functional responsibility of the Regional Adviser in Environmental Health. In one region - the Eastern Mediterranean Region - there is a Regional Adviser in Community Water Supply.

EURO

The Regions have the authority to initiate research and commission the preparation of documents for publication.

The European Region, which was represented at the meeting, has published, for instance, "European Standards for Drinking Water" and has a number of research studies in progress. In this Region major emphasis is directed towards projects most directly related to pollution and pollution control.

AMRO

The Region of the Americas is unique in that the Pan American Sanitary Bureau is the Executing Agency of the Pan American Health Organization and serves as the Regional Office of the World Health Organization. The projects in engineering and environmental sciences carried out by PASB are mostly directed toward Latin American and the Caribbean Region. The majority of the publications in the environmental sciences field are produced in Spanish, with some in Portuguese and English. An important and unique feature within the region has been the establishment in 1968 of the Pan American Centre for Sanitary Engineering and Environmental Sciences (CEPIS) which was represented at the meeting by its Director. The Centre has its headquarters at Lima, Peru and is jointly financed by the Pan American Health Organization, World Health Organization, and the Peruvian Government. The Centre, through the provision of advisory services and dissemination of selected information, collaborates with the countries in the strengthening of their scientific and technical infrastructure, mainly by supporting research and training and education, improving the communication among scientific workers and other technical people and by the provision of technical and scientific support. Special attention is being given to the development and application of more efficient methods of water treatment, to the technical improvement of laboratories for the control of water quality and water resources. Some written outputs of use also outside the Region have been a series of manuals on treatment methods, on water meters, and other subjects concerning water supply.

2.3 Activities of other Organizations represented at the meeting

1. The International Bank for Reconstruction and Development
(IBRD)
Water Supply Division I
Washington, D.C., U.S.A.

The World Bank is financing projects which assist economic development of developing countries. As the conventional terms of bank lending make these loans unattainable for many countries, the International Development Association (IDA) was established in 1960 to provide development capital at easier terms (soft loan). In the water supply and sewerage sector, well-justified water projects also merit the Bank's support, although in the past emphasis was on projects in urban areas where public health effects are greatest and economic criteria can be met. Bank assistance may include evaluation and help to improve water and sewerage programmes, strengthen institutions, improve project selection preparation and execution, and help finance the more important and complex programmes.

In allocating scarce funds, better criteria and measures of economic benefit should be developed; other research interests are to improve water demands analysing and forecasting and to identify pricing policy options.

The cooperation with the World Health Organization is in pre-investment studies for water and sewerage projects which are financed by the United Nations Development Programme and for which WHO has been designated "Executing Agency".

2. African Development Bank (ADB)
Abidjan, Ivory Coast

Since its inception in 1964, the Bank has given due importance to investments in the fields of water supply and sewage disposal. The Bank is promoting long term planning by means of a master plan, and by setting order or priority for implementation of the viable projects. Pre-investment studies include preparation of a master plan, feasibility and preliminary engineering studies, in some cases also detailed engineering for the first phase of the master plan; they could also cover organization,

management, financial and legal aspects for the water and sewerage undertakings. These studies can be financed out of the Bank's ordinary resources on a loan basis or as a grant. Implementation of construction has been limited, the conventional terms of bank loans being a constraint.

An agreement for the establishment of the African Development Fund, will increase the capability for dealing with projects in environmental health. The Fund should be operational by October 1973, and will provide a possibility for the granting of loans with easy repayment terms for projects with a social character which cannot support financing on conventional terms.

The lack of qualified nationals to provide the required background information and statistics for the formulation of bankable projects and take over the running facilities after construction, is very much felt. Training institutes in the developing countries should therefore be set up.

3. U.S. Agency for International Development Washington, D.C., U.S.A.

The Agency was established in 1961 as an agency within the Department of State to carry out development assistance programmes overseas designed to promote the economic and social modernization of developing countries. Most programmes operate on the basis of bilateral agreements with the assisted countries in which the latter should take the active application step.

The programmes comprise: 1. Technical assistance through assignment of technical experts, participant training, research; 2. Capital assistance; 3. Commodity assistance; 4. Sector assistance; 5. Supporting assistance. Financing is provided in the form of development loans or development grants (e.g. through the African Development Bank) for pre-investment studies.

Among the 450 projects underway around the world, 30 are concerned with water supply. Some 3000 relevant publications are being distributed to meet requests from the field. In the research sector the following subjects are being studied: optimum size of small water supplies; control of schistosomiasis; development of a handpump; lower cost methods of water and waste treatment.

4. Office of International Health,
U.S. Department of Health, Education and Welfare
Washington, D.C., U.S.A.

The Assistance Secretary for Health in the Department directs the activities of the Public Health Service, provides health policy direction for and coordinates all health and health-related programmes in the Department, coordinates the health and health-related functions of the Department with those of other federal agencies and provides advice and assistance on health matters to such agencies as requested, provides advice and technical support to international health organizations and has major staff responsibilities in the fields of health and medicine, population dynamics, scientific affairs and international health activities.

The Office of International Health serves as the official contact with WHO, PAHO and other organizations for the U.S. Government on health matters. It is working closely with AID in different fields (population matters, environmental health, health planning), also in its research programmes e.g. on lower cost methods of water and waste treatment.

5. University of Oklahoma Research Institute
Norman, Oklahoma, U.S.A.

In the Institute's Less Developed Countries' Water and Waste Treatment programme, an AID sponsored 3 years programme on "Lower Cost Methods of Water and Waste Treatment in less developed countries" is being undertaken. Most promising and applicable techniques and systems of providing and maintaining simple lower cost water and waste treatment facilities will be determined and verified by actual field demonstrations. For these practical field studies regional centres will be selected, capable of providing assistance to other locations in their respective region.

6. School of Environmental Sciences
University of East Anglia
Norwich, U.K.

A study is being undertaken of the present state-of-the-art in rural water supply and sanitation in developing countries, with the support of the International Development Research Centre

in Ottawa and in collaboration with the Organization for Economic Cooperation and Development. Crucial points in the improvement of rural water supply and sanitation conditions in developing countries will be assessed and evaluated in order to arrive at a plan for increasing the rate of progress in this field. Critical issues to be further investigated are quantity (criteria in various countries under varying conditions), quality (what standards is it essential to meet) and technology (which is the most suitable technology that can be adopted on a broad scale).

7. The International Water Supply Association (IWSA)
London, U.K.

The IWSA was created in 1947. Amongst its objectives are to secure concerted action in improving the knowledge of public water supplies, to secure a maximum exchange of information on research and on methods of supply of water, and to encourage better understanding between people engaged in the public supply of water. In furthering these objects the Association holds an International Water Supply Congress every 2-3 years. Until now 9 congresses were held, all in Europe, except the one in New York in 1972. The next congresses will take place in Brighton, U.K. (August 1974) and Amsterdam (1976).

a. The Standing Committee on Education and Training of Waterworks Personnel (represented at the meeting) was created in 1970. The objectives include the encouragement of an international exchange of information on education and training matters and the establishment of a bank of knowledge on this subject; the consideration of new developments in this field; and - lately - the stimulation of application of the existing knowledge and methods to developing countries. The first activities concerned the establishment of an international glossary of terms and a review of job descriptions, and the establishment of training needs in a number of countries.

b. The Standing Committee on Problems of Water Supplies in Developing Countries (not represented at the meeting) in operation since September 1972, aims in general at the stimulation of scientific and technical assistance to water supplies in the latter countries.

8. The WHO International Reference Centre for Wastes Disposal
Dübendorf, Switzerland

To foster the programme of WHO in the wastes disposal field, the Federal Institute for Water Resources and Water Pollution Control (EAWAG), at Dübendorf was designated in 1968 as International Reference Centre for Wastes Disposal. It cooperates with Regional Reference Centres (to date 1) and Collaborating Institutions (up to now 43) located all over the world. Through this network, coordination of research and development programmes, exchange and dissemination of technical and scientific information are aimed at. The objective is to assist countries - particularly developing countries - to construct their wastes disposal systems in a more efficient and more economic way. Its training function aims at the training of research and other personnel, preparation of guides, codes of practice, training manuals and the organization of courses and seminars for participants from developing countries.

3. THE WHO INTERNATIONAL REFERENCE NETWORK FOR COMMUNITY WATER SUPPLY

3.1 The International Reference Centre

Scope and objectives

Within the framework of the WHO-programme mentioned earlier, it is IRC's objective to stimulate and consolidate efforts directed to the improvement and development of water supplies in both industrialized and developing countries. In connection with the serious problems in the latter - as described above - a great deal of IRC's activities will apply to this category of countries, within the context of the targets of the Second United Nations Development Decade.

The IRC endeavours to fulfil its objectives as the nexus of the worldwide network of Collaborating Institutions. The activities are carried out in cooperation with its host institute, the Netherlands Government Institute for Water Supply, as well as many other organizations and institutions in and outside the Netherlands.

The targets of the IRC fall under three main headings:

1. Information exchange. The collection and dissemination of information on community water supply, including the transfer of knowledge to developing countries, and the preparation of codes of practice, training manuals and state-of-the-art papers.
2. Research and development. The identification of research needs and institutional facilities, and the promotion and conduct of research and development in all aspects of community water supply.
3. Training. The training of scientific and technical workers and others by the planning and implementation of courses and the exchange of research workers.

It has already been proven that the International Reference Centre with its network of Collaborating Institutions, can deliver a valuable contribution to the improvement of weaknesses in communication existing all over the world, and through this can accelerate the activities leading to better water supply services. It provides an appropriate infrastructure to make possible the coordination of research and development and training programmes and to assist in the transfer of existing technology from industrialized to developing countries. Yet a number of constraints has delayed the desirable increase of potentiality of the IRC. It is expected however, that the present considerations of the organizational and financial structure of the IRC by the Dutch Government will result in a sound Centre that will be able to assist and take the lead in the implementation of programmes based on needs brought forward at the International Conference on Research and Development in Community Water Supply, in Dubrovnik in October 1970 and at the present Conference.

Publications

As one of IRC's activities so far can be mentioned the Newsletter which appears to be a useful medium for the dissemination of information of general interest and for the exchange of news between IRC and the Collaborating Institutions as well as many other institutions and organizations. At present the Newsletter has a monthly circulation of approximately 2500 copies in English and

2200 copies in French. A provisional agreement was made with the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS), Lima, Peru, concerning translation into Spanish and dissemination in Latin America. Apart from that more than 10 periodicals regularly quote items mentioned in the Newsletter.

Another regular series is the IRC bulletins, giving reviews of institutional facilities, training programmes and research activities at Collaborating Institutions and other organizations. A general paper "Information on Collaborating Institutes" (1970) and four bulletins have been issued so far:

Bulletin no. 1: "Community Water Supply Research 1971" (1971)

Bulletin no. 2: "Training Courses in Community Water Supply"(1971)

Bulletin no. 3: "Community Water Supply Research 1972" (1972)

Bulletin no. 4: "The Story of CIPHERI" (1972)*)

In the IRC technical paper series, in which scientific and technical information is being published, has been issued:

"Plastic Pipe in Drinking Water Distribution Practice" (1971), a bibliography, which will soon be followed by a second paper on this subject: "Plastic Pipe Standardization". In preparation is a report of a meeting of a Consultant Group, convened by the IRC (with WHO as sponsor) in February 1973 in The Hague, on the toxicity of new water supply materials, under the title "Health Aspects Relating to the Use of uPVC Pipes for Community Water Supply". Emanating from the same meeting a report will be published on "Health Aspects Relating to the Use of Polyelectrolytes in Water Treatment for Community Water Supply". Representatives of 7 Collaborating Institutions, together with other experts took part in these meetings.

On behalf of WHO a study on the disinfection of water in wells and village tanks using iodine dosing devices was carried out together with CIPHERI, Nagpur, India and published in technical paper no.2 "The Suitability of Iodine and Iodine Compounds as Disinfectants for Small Water Supplies" (1972).

Directed to water supply for small households is "The Purification of Water on a Small Scale" (1973, technical paper no. 3), a revised and updated version of R.N. Clark's paper published in the

*)CIPHERI: Central Public Health Engineering Research Institute, Nagpur, India

WHO Bulletin in 1956.

A "Summary of the Questionnaire on the Relation River Water - Drinking Water and on a Water Pollution Index" provided a preliminary report on a study concerning the set up of a "Water Pollution Index" as a general criterion for the degree of pollution of rivers.

Documentation

Within the framework of the activities of building up the IRC falls the establishment of a documentation storage and retrieval system. A simple thesaurus for this purpose has been prepared. The system primarily aims at the provision of information concerning unpublished reports, papers and proceedings, including those very difficult to obtain, with respect to projects to be carried out and requests for information received. This activity may ultimately result in an abstracting service and the publication of summarizing papers on special subjects. An example of collaborative activities of the Network in this field is a survey of the distribution of levels of nitrates about which many useful data were collected through the support of the Collaborating Institutions. Another example is the request of Prof. Burton, Visiting Professor at the University of East Anglia, Norwich, U.K., who is carrying out a study of the present state-of-the-art in rural water supply and sanitation. Upon request to the IRC to support this study with expertise available in the Network, many Collaborating Institutions cooperated to a great extent.

Meetings and visits

In a number of meetings IRC staff members played an active part, viz. the WHO Expert Meeting on Effluent Reuse: Methods of Wastewater Treatment and Health Safeguards (1971), Working Group of the IWSA Standing Committee on Education and Training of Water Works Personnel (1971), the first Session on Problems of Water Supplies in Developing Countries during the 9th IWSA Congress (1972), the Meeting of Directors of Institutions collaborating with the WHO International Reference Centre for Wastes Disposal

(1972) and the WHO Meeting of Regional Advisers in Environmental Health (1972).

So far visits were paid to 9 Collaborating Institutions in India, Israel and Turkey (1971), Brazil, Italy and Venezuela (1972) and the United Kingdom (1973) and to SEARO (1971), AMRO and CEPIS (1972) and to several other institutions, organizations and conferences on the same journeys.

Training

In the field of training the IRC acts as a starting point for guests and visitors who come to The Netherlands for field studies, orientation, short training programmes and visits to institutions. Programmes were prepared for French speaking post-graduate students of the Centre de Génie Sanitaire at Rabat, Morocco (1971 and 1972) and for several WHO-fellows. More than 30 experts and specialists from Collaborating and other Institutions paid brief visits to the IRC.

Future work

Apart from a continuation of activities as mentioned above, the IRC sees the improvement of its position and the strengthening of the network as an important task for the near future. Current specific activities fall within the projects brought forward at the present meeting, which form a framework on which further planning can be based. Emphasis will be placed on problems in developing countries in general and on rural water supply studies in particular.

At present four staff members are working full time with the IRC, assisted by employees of the Government Institute for Water Supply. Steps are being taken to improve the position of the IRC as to personnel and budget. Discussions have been initiated with the Dutch Government on the formation of an "IRC Foundation". This would enable Collaborating Institutions and other organizations to support the IRC financially. It would at the same time improve the operational potentialities of the Centre in its dealing with projects financed by other bodies and with travel arrangements. In the meantime a memorandum of association and regulat-

ions have been drafted which are now awaiting approval of the Minister of Public Health and Environmental Hygiene.

3.2 Regional Reference Centres (RRC's)

It is believed that the designation of Regional Reference Centres for Community Water Supply will effect a more efficient way of operation of the Network, both in the establishment of contracts, the exchange of relevant information, the inventory of needs and the performance of research and development work directed to regional requirements.

The designation of the PAHO/WHO Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS) at Lima, Peru and the Central Public Health Engineering Research Institute (CPHERI) at Nagpur, India as Regional Reference Centres for Community Water Supply (RRC/CWS) are anticipated. (The latter Institute was recently designated RRC for Wastes Disposal).

The functions and responsibilities of the RRC's will be similar to those of the IRC, but the scope will be restricted to a geographic region. In contacts on regional and local matters, lines of communication will be from the IRC to the RRC's and from the RRC's to the CI's and national institutions, and vice versa. A specific example may be the application of existing expertise in Latin America concerning water supply in developing areas in other Regions. Communication on matters with worldwide significance (e.g. participation in projects) can be held between IRC and CI's directly.

3.3 The Collaborating Institutions

The tremendous task of the development and improvement of water supplies for millions can only be carried out by way of international cooperation. The network of Collaborating Institutions forms a framework through which the aid of research, educational and other institutions working in the field of community water supply is enlisted. It provides an appropriate infrastructure to make possible the coordination of research and development program-

mes, provide the means for an effective exchange and dissemination of technical and scientific information, promote education and training programmes and assist in the transfer of existing technology from industrialized countries to developing countries.

The International Reference Network for Community Water Supply consists mainly of universities and research establishments. At the Conference on Research and Development in Community Water Supply, Dubrovnik 1970, a Collaborating Institution - formally designated as such by WHO - was defined as an institution that is already engaged in research and development in community water supply or intends to undertake such activities and is prepared to collaborate in a world wide programme. At present the Network comprises 31 institutions, 16 in developing countries and 15 in industrialized countries (see annex 3). The functions of the Collaborating Institutions were for the first time discussed at the Dubrovnik Conference. The present meeting reviewed the decisions made at this Conference and commented as follows.

Information exchange

Under information exchange would fall the preparation and exchange of annual reports and lists of available publications; periodic preparation of news items for IRC's Newsletter and transfer of requested information from their countries to the IRC; provision of information and reports related to projects carried out by the network, which are mentioned in IRC's annual reports; assisting governments in carrying out national research and development programmes in their countries and provision of information thereon; provision of information on institutional services, training programmes, conferences and seminars, and documentation facilities in their countries, on request by IRC.

Research development

One of the major inputs of Collaborating Institutions is of course the cooperation in research projects, which will be further referred to in following chapters. Particularly in the adaptation of findings to local situations and the transfer of that knowledge to bodies in their countries CI's can play an important role. Conduct of developmental investigations in respect of new methods or procedures could

form another task.

Training

In the training field the CI's have a function to provide facilities for the training of research and other personnel. The exchange of personnel within the Network can in large measure contribute to a strengthening of the Network on the one hand and the education of personnel on the other. In the organization of local courses and seminars and the translation into local languages of existing knowledge, the CI's can play an important role. Another task in this field would be to make an inventory of training needs in their country.

Twinning

Some thought is also to be given to establishing a "twinning" relationship between Collaborating Institutions to promote the direct exchange of workers between a developing and an industrialized country. Such an arrangement has double benefits in updating the knowledge and experience of developing country workers more acquainted with developing country problems.

Public relations

An activity which might have a favourable impact on community water supply programmes especially in developing countries could be the stimulation of professional society activities at the national level. In general CI's should serve as focal point of national activities for research and development in community water supply and give publicity to the functions of the Network in their country.

It is assumed that Collaborating Institutions are able to contribute to the international programme within their normal range of activities. Although WHO or IRC have no financial resources readily available for the support of the above mentioned activities, the provision of funds for certain specific undertakings under contractual technical services agreements may be possible. Upon request of the government concerned, WHO may also be in a position to provide specialized consultants to a Collaborating Institution to advise on specific problems. In a further stage of its development the IRC might be able to act as a liaison in other cases on request.

The activities of the Network will mainly be concerned with aspects of community water supply. It is felt however that a more integrated approach to sanitary problems, especially in developing countries, and cooperation between the activities of this Network and the Network for Wastes Disposal must be pursued. Further, seeing the large emphasis on water resources problems in developing countries, the Network might have to include such problems in its future programme.

A number of specific activities in international programmes are carried out by the Collaborating Institutions on an individual basis. Such programmes are reported on in IRC's bulletin series as mentioned in chapter 3.1.

3.4 Methods to improve the practical output of the system

In order to improve the practical output of the system and to arrive at better communications both within the present Network and with other bodies and institutions, a number of recommendations were put forward and were endorsed by the meeting.

a. Strengthening of the IRC

- The Director of the Dutch Government Institute for Water Supply will request his Government to increase the input to the IRC to such an extent that a least a minimum base for continued activities is assured. Such a minimum base should include, among other things, at least 10 staff members. Activities to have the IRC transformed into a foundation will be continued.
- WHO will investigate the possibilities of increasing its contribution for financing the IRC.
- Collaborating Institutions will consider possibilities of contributing financial support to the IRC and inform the IRC accordingly.
- The CI's and especially the government-based institutions will consider whether it will be possible for them to assign one or more of their staff members to the IRC for periods of 6 months or more. The salary and subsistence allowance and

the funds for international travel will be provided by their institutions or government. Secondment will be on a voluntary basis and for a clear-cut programme of work. IRC will regularly inform CI's of future work for which the secondment of staff would be welcomed. CI's will inform IRC accordingly.

b. Communication within the Network

- In addition to the existing criteria for the designation of an institution as a CI, the IRC - in agreement with the WHO - will formulate the specific tasks of a CI, and circulate these within the Network. Such a formulation will include the functioning as national focus, the routine duties (sending annual and/or quarterly reports, lists of publications, selected reports and state-of-the-art papers, lists of congresses, seminars, training courses, research projects, etc.) and a number of specific tasks broadly defined and to be specified afterwards.
- Collaborating Institutions are to report to the IRC annually on their activities within the scope of the Network. IRC will prepare an annual review of the collaboration by the institutions in the Network as of 1973.
- IRC will send preprinted forms for supplying information for the Newsletter (as of July 1973) and for the handling of requests. Reminders will be sent if the information is not coming forward.
- The CI's will nominate within three months after the meeting a staff member with the specific task to act as a contact-person for the work of the CI within the Network and inform the IRC accordingly.

c. Extension of the Network

- The WHO, together with the IRC will take the necessary steps for the extension of the network of CI's in additional countries. Before an institution is designated as a CI the functions of a CI should be personally discussed by the management of the institute and staff members of WHO and IRC.

- The WHO in consultation with the IRC will take the necessary steps to make the designation of an institution as a CI known to the national government concerned, asking this government to assist as much as possible, so as to enable it to carry out its functions.
- Collaborating Institutions should extent the flow of information beyond the Network to executing agencies in their countries, if possible through a formalized system. If more than one CI is operating in a country, they should be in close contact.
- WHO will consider the setting up of additional Regional Reference Centres. Secondment of staff from CI's and IRC to such Centres and vice versa should be considered.

It was a general consensu that initiatives should emerge from the IRC. The IRC should build up the framework further and on the base of periodical evaluations as to the output make the appropriate modifications. CI's should on the other hand sustain IRC's efforts as much as possible. They are to assist the IRC in enlarging the publicity of the Network, both within their institutions and in their countries and they should make known in their countries that they act as a reference point on community water supply. There was a general indication of the willingness of CI's to work towards achieving more effective collaboration in the future.

It was proposed most strongly that the Network be periodically reviewed and that CI's who are not able nor willing to perform their duties properly, should be invited to withdraw from the Network.

Participants found great value in the contacts the meeting provided and believed that further meetings of representatives of CI's should be convened at regular intervals.

4. THE NATURE OF PRESENT AND FUTURE RESEARCH AND DEVELOPMENT PROGRAMMES

4.1 Industrialized countries

Most of the industrialized countries have extensive installations for water extraction, treatment and distribution. For many countries problems relate to ever increasing pollution and contami-

nation of water sources. The vast number of complex chemical compounds commonly used in agriculture, in industry and in the home have forced research to investigate methods for the detection and removal of wide variety of materials from raw water. Much effort is also being expended on determining the health effects associated with the use of water containing trace elements; in general there is a need for more research on toxicity of materials. Simultaneously there are public demands for reduced environmental pollution as a means of improving the quality of life. This has had a tendency to bring wastewater treatment and drinking water treatment closer together.

Within government institutions and universities in the industrialized countries there is a tendency to concentrate on long term fundamental research. Applied research or development is more rightly a function of industry and industry-supported institutions. Research and development has resulted in extremely sophisticated methods for water treatment. The industrialized countries can accommodate this, however, since they have the wealth, the expertise, the infrastructure and the will to overcome the problems. There is a general feeling that some coordination of research activities in the industrialized countries is needed to avoid duplication of effort. Research should be more predictive, that is, it should be directed towards future problems in an attempt to prevent or curtail them. An example mentioned was the growing problem of disposal of sludges and residues from water treatment. Projects such as this should be studied and budgetary provisions should be made for the developmental work necessary to apply research findings to a practical situation.

4.2 Developing countries

There are vast differences among developing countries in their stage of development, their financial resources, their pool of skilled manpower, their geographic, climatic, water resources and demographic conditions, and their priorities for community water supply. The common feature in all developing countries is that there is intensive competition among various sectorial interests for the allocation of resources, both human and financial, within an overall development strategy. The health benefits of a good community water

supply are difficult - perhaps impossible - to express in tangible quantitative terms. Research in water supply is even more difficult to evaluate in monetary terms. Economic planners, therefore, often assign relatively low priorities to the tremendous benefits to health that can result from improved sanitary services. Participants recognized the problem but no universally acceptable solution was forthcoming.

Clearly, the water supply needs of developing countries are enormous. The extent of the needs discussed in other sections of this report, as is the overall allocation of priority to urban areas. There are few problems of water supply in developing countries that cannot be solved with currently available technology, so technology, per se, is not an overwhelming constraint. The cost and the operation of modern and sophisticated systems does present a problem, however, and research must be directed towards system simplification and cost reduction. Much care must be taken to ensure that systems are powerful and durable and that repairs and changes to the various elements of the systems can be made quickly and easily.

Research and development needs

In reviewing the research and development needs for water supplies in developing countries, there was general agreement among the participants that:

- there is a need for data collection;
- the identification of research needs is of high importance;
- research in developing countries should relate to the existing water supply needs and often does not require a high degree of sophistication;
- research will often be concerned with national problems and the operating and/or executing agencies should be involved;
- a strategy to make research findings applicable is needed;
- research and development experience from industrialized countries should be applied, but only after thorough consideration of the local conditions;
- past water supply projects should be evaluated to provide feedback;
- in order to get projects running more emphasis must be put on the building of an adequate institutional framework;

- projects must be bankable;
- low cost technology in community water supply is of high priority;
- use of locally available materials and services should be encouraged to make the best use of available funds;
- there is a need for water quality and quantity criteria for rural and urban supplies, adapted to local conditions;
- attention must be given to social and economic factors to produce locally acceptable solutions and to make people want the supplies.

5. IDENTIFICATION OF SPECIFIC ACTIVITIES AND PROJECTS FOR RESEARCH AND DEVELOPMENT WITH PRIORITY ALLOCATION

5.1 Introduction

A request for preliminary proposals for projects had been sent to all Collaborating Institutions well in advance of the meeting and in response to this a total of 63 proposals were submitted for consideration. Since the proposals covered a wide range of interests within the broad scope of community water supply, it was considered expeditious to subdivide them into subject headings for detailed evaluation by committees. The subject headings used were:

1. Health aspects of community water supply
2. Urban water supply
3. Rural water supply
4. Administration and management
5. Training and training programmes
6. Dissemination of information

A few projects were rejected. The basis for rejection was that the proposals had insufficient direct relationship with water supply and were more directed towards waste treatment or pollution control. Some projects were proposals for activities that are currently underway within the IRC and/or WHO. The content of rejected projects is to be made known to institutions and organizations which have a direct interest in, or are otherwise concerned with the subject matter.

There was a considerable opportunity for consolidation of projects which had a similar character. Research on slow sand filters,

for instance, was suggested in 6 separate proposals and participants recognized that the projects could be combined into one major proposal. As a result of committee evaluation and consolidation, 28 projects remained for consideration by plenary sessions of the meeting. These were allocated priorities for implementation in accordance with the following classification:

- Priority A* - Special Priority
- Priority A - Very High Priority
- Priority B - High Priority
- Priority C - Low Priority

Participants agreed unanimously that all the retained projects were worthy, were needed and should be implemented. The priorities assigned were intended to indicate the areas where benefits from project implementation would have the most immediate and the most profound effect. It was further recognized that some of the special priority projects would have the most immediate impact in industrialized countries with longer term benefit to developing countries. These are identified in the priority listing by placing an I in parentheses after the priority allocation, e.g. A*(I). Those projects of greater importance to developing countries are identified with the letter D, e.g. A*(D).

Project titles, the source of the proposals and priorities are given below:

5.2 Index of projects

<u>No.</u>	<u>Title / Proposed by</u>	<u>Priority</u>
	<u>1. Health aspects</u>	
1.	Health aspects of water reuse / long term health effects of consuming renovated water. by: Hebrew University, Environmental Health Lab., Israel Water Research Association, U.K.	A*
2.	A rapid method for the quantitative isolation of viruses from polluted water. by: Hebrew University, Environmental Health Laboratory, Israel.	A

<u>No.</u>	<u>Title / Proposed by</u>	<u>Priority</u>
3.	Assembling of information on engineering measures for control of schistosomiasis. by: U.S. Agency for International Development, U.S.A.	A
4.	Distribution studies on intestinal indicators. by: University of Newcastle-upon-Tyne, U.K.	B
5.	Toxicological evaluation of bromine and its derivations in drinking water. by: Hebrew University, Environmental Health Laboratory, Israel	B
6.	Study of water quality in arid and semi-arid regions. by: CIPHERI, India	B
7.	Study of the health effects of trace elements in water. by: Institute of Hygiene and Epidemiology, Czechoslovakia	A*(I)
8.	Effects of modern agricultural inputs on water quality. by: CIPHERI, India	C
9.	Comparison of the health effects of desalinated and saline drinking water in arid regions. by: Meeting	A
<u>2. Urban water supply</u>		
10.	Optimization of water treatment systems. by: University of Newcastle-upon-Tyne, U.K. IRC/CWS	A
11.	Coagulants and coagulant aids from local materials. by: CEPIS, Peru IRC/CWS	A
12.	Simplified water filtration. by: CEPIS, Peru	A
13.	A study of the mechanism and prevention of membrane fouling in the application of reverse osmosis in water treatment. by: Hebrew University, Environmental Health Laboratory, Israel.	C

<u>No.</u>	<u>Title / Proposed by</u>	<u>Priority</u>
14.	Field trials of fixed bed chlorination of water. by: WHO/CWSS	A
<u>3. Rural water supply</u>		
15.	Slow sand filtration in developing countries. by: Asian Institute of Technology, Thailand CPHERI, India Middle-East Technical University, Turkey University of Science and Technology, Ghana IRC/CWS	A*(D)
16.	Review and application of relevant technologies. by: Water Research Association, U.K.	A*(D)
17.	Hand pumps. by: U.S. Agency for International Development, U.S.A. University of Science and Technology, Ghana	A
18.	Development of simple and inexpensive testing methods for examination of water. by: IRC/CWS	B
<u>4. Administration and Management</u>		
19.	Criteria for rates and tarriffs for water supply. by: Water Research Association, U.K.	A
20.	Impact of community water supply. by: University of Science and Technology, Ghana	A*(D)
21.	Seminars on administration and management. by: IRC/CWS	A
22.	The determination of unit and total consumption of domestic water - present and future estimates with emphasis on alternatives to reduce wastage. by: CEPIS, Peru Middle-East Technical University, Turkey	A

<u>No.</u>	<u>Title / Proposed by</u>	<u>Priority</u>
	by: University of Oklahoma, U.S.A. Water Research Association, U.K. WHO/CWSS	
23.	Case histories of successful water supply in developing countries. by: Water Research Association, U.K	B
24.	Community water supply projects in evaluation. by: Asian Institute of Technology, Thailand.	C
<u>5. Training and training programmes</u>		
25.	Development and implementation of systematic training programmes in community water supply based on assessment of manpower and training needs in developing countries. by: Asian Institute of Technology, Thailand CEPIS, Peru Water Research Association, U.K. WHO/CWSS IRC/CWS	A*(D)
26.	Seminars on urban and rural water supply. by: IRC/CWS	A
<u>6. Dissemination of information</u>		
27.	Review of field use of WHO technical publications related to water supply. by: Water Research Association, U.K.	B
28.	Selection, translation and distribution of selected technical publications on water supply subjects. by: CEPIS, Peru.	A
5.3	<u>Analysis of projects with priorities</u>	

	Total	A*	A*			A	B	C
			A*(D)	A*(I)	A*(I+D)			
Health aspects	9	2	-	1	1	3	3	1
Urban water supply	5	-	-	-	-	4	-	1
Rural water supply	4	2	2	-	-	1	1	-
Administration and management	6	1	1	-	-	3	1	1
Training	2	1	1	-	-	1	-	-
Dissemination of information	2	-	-	-	-	1	1	-
Total	28	6	4	1	1	13	6	3

The allocation of 4 special priorities to projects directed to problems in developing countries reflects the general feeling at the meeting, that the role to be played by the network in these countries is more urgent than in industrialized countries. The allocation of two special priorities for rural water supply projects is in accordance with the emphasis the meeting wanted to place on this category.

That training projects - in spite of their importance - received only one special priority allocation, is because one large general project is proposed, which in practice will consist of a series of sub-projects with different character in different regions.

Dissemination of information was regarded to be of prime importance, but main activities will fall under the several projects. Information exchange was recognized as one of IRC's routine activities.

The total number of projects in the 6 different categories are no indication of the importance of the problems in those categories. The variety of numbers is largely due to the fact that the projects are not always of comparable scope.

5.4 Project descriptions

5.4.1 Health aspects of Community Water Supply

No. 1

Title of project: Health aspects of water reuse - Long term effects of consuming renovated water.

Project agency: One or more collaborating institutions.

Objectives of project:

- a. To evaluate experimentally the long term health effects of consuming renovated water produced by selected treatment processes which are under active consideration for potential water renovation programs for human consumption.
- b. To concentrate, identify and test the acute and chronic toxic effects of specific residual organic micro-constituents found in renovated wastewater.
- c. To evaluate long term health effects on humans consuming renovated water.
- d. To establish the safe limits of concentration of organics in drinking water which has been renovated from wastewater or a polluted source.

Description of project:

- a. Identify the full range of contaminants possibly present in municipal wastewaters which might affect the safety of the public health and the palatability of the water, and the range of concentrations.
- b. Determine the degree to which these contaminants are removed by various types and levels of treatment.
- c. Determine the long range physiological effects of continued use of reclaimed

water for domestic use.

The proposed research plan involves the evaluation of the health effects of consuming renovated water by long term feeding experiments with laboratory animals. Municipal wastewater treated by three different processes will be studied.

The processes will include a physical-chemical train; a combination of conventional biological treatment together with physical-chemical treatment as well as a full scale ground water recharge system under study for eventual local consumption.

Physiological, biological and neurological parameters will be studied on animals chronically fed with normal and concentrates of renovated wastewater. Residual organic pollutants remaining in renovated water will be concentrated and separated into fractions for identification and toxicological screening.

In the second phase of this study it is proposed to carry out a prospective health evaluation among a population group to be supplied with renovated water from the full scale water renovation project (Dan Region Project) studied experimentally during phase one.

Assistance required:

1. By WHO: Financial support
2. By IRC: Coordination and publication of findings
3. By CI : Project implementation

Priority:

A* (Developing and industrialized countries)

No. 2

Title of project: A rapid method for the quantitative isolation of viruses from polluted water.

Project agency: A qualified collaborating institution.

Objectives of project:

- a. To utilize the ability of the fluorescent antibodies to demonstrate the presence of viral antigens within infected tissue culture cells, long before the appearance of the cytopathic effects, and thus confirm the isolation of viruses from water sources in 12 - 24 hours.
- b. To examine the different types of cells in tissue culture in order to select the most suitable for the development of the method.
- c. To evaluate the reliability of polio-virus of vaccine strain origin as an indicator for enteric virus contamination in polluted water in the same way as E.coli is used as a bacterial indicator. The purpose is to simplify the use of the fluorescent antibody method proposed. This is based on the assumption that all major communities in advanced countries carry out year round vaccination against polio in almost all infants.
- d. To test the method both under laboratory and field conditions, and to compare the new method with the existing one.

Description of project: The project will be carried out in three stages:

- a. research and development of the suggested method

- b. evaluation and testing under field conditions;
- c. enlarging the method to include other enteroviruses.

During stage (a) different approaches will be tried and examined in order to obtain a practical method for the isolation of polio virus from water and their identification by fluorescent antibodies. The following material will be used:

Viruses

The 3 polio virus types which were isolated in our laboratory.

Tissue cultures

Primary monkey kidney cells; primary human amnion cells; cell line such as verio- and Hela cell lines.

Fluorescent antibodies

Anti-polio antisera for the preparation of fluorescent antibodies will be prepared in rabbits. Labeling of the sera and staining techniques will be done according to the method described in previous publications. Each antiserum will be labeled separately, thus obtaining 3 specific labeled antisera: antipolio I, II, II, respectively.

The different variables employed in virus isolation will each be thoroughly examined. The minimal time period required for the appearance of fluorescence antibody stained cells will be determined. Special attention will be paid to small virus doses of 1-3 PFU/tissue culture. The combination that will prove to be most suitable and rapid for

each of the polio types separately, will also be examined with mixtures of the 3 types. Fluorescent antibodies will be used as separate and pooled labeled antisera. It is thus hoped to be able to develop a method which, under laboratory conditions, will prove to be a sure and rapid way of isolation, quantitation and identification of polio-viruses in water.

The selected method will be tried and tested with water taken from different sources (raw sewage, various stages of treated sewage, renovated wastewater, lake and river water, sea water). The virus concentration method to be employed will be the phase separation method or method for large volumes of water such as membrane filtration or insoluble polyelectrolytes.

Finally, the selected method will be tested under true field conditions and will be compared with other accepted methods.

Assistance required:

1. By WHO: Financial support
2. By IRC: Dissemination of findings
3. By CI : As specified above

Priority:

A

No.3

Title of project:0

Assembling of information on engineering measures for control of schistosomiasis.

Project agency:

U.S. Agency for International Development (Office of Health, Technical Assistance Bureau), Washington, D.C.

Objectives of project:

To prepare a manual presenting appropriate engineering measures contributing to the control of schistosomiasis. Manual to enable engineers to work effectively with other professionals in the design and operation of schistosomiasis control programmes and to enable epidemiologists, planners, administrators and others to understand the role or potential role of engineers in control programmes.

Duration of project:

Two years

Description of project:

Extend previous work to include actual examples, sketches and schematics of engineering facilities favourable to schistosomiasis control in the field.

Investigate how engineering measures may be institutionally implemented within agricultural and water resources development agencies.

Develop a manual of general hydraulic design aids incorporating the special schistosomiasis control information.

Assistance required:

1. By WHO: Construction review of draft manuscript by Headquarter and Regional staffs; assistance in distributing final

publication.

2. By IRC: Supplying of information available in countries where water resource development activities have contributed to the prevalence of schistosomiasis.
3. By CI's: Coordination with USAID and/or WHO projects where planning or construction of water resource development projects is contemplated.

Priority:

A

No. 4

Title of project: Distribution studies on intestinal indicators.

Project agency: One or more collaborating institutions.

Objectives of project: To find the most useful indicators of faecal pollution for testing raw water sources in tropical and subtropical countries.

Description of project:

- a. Collection and isolation of bacterial cultures from sewage, a variety of raw waters and soil.
- b. Detailed identification of cultures.
- c. Evaluation of regional differences in composition of intestinal flora.
- d. Preparation of recommendations for regional criteria and methods of examination of water sources.

Assistance required:

1. By WHO : Financial support for staff to supervise arrangements for collection and transport of cultures.
2. By IRC : Assistance with organization for collection and with dissemination of findings.
3. By CI's : Assistance with collection of cultures and wherever possible with identification.

Priority: B

No. 5

Title of project: Toxicological evaluation of bromine and its derivatives in drinking water.

Project agency: A collaborating institution, such as the Hadassah Medical School of the Hebrew University, Israel and related institutions.

Objectives of project: To investigate the practicability of the use of bromine and its derivatives as disinfectants in drinking water to overcome the deficiencies of chlorine, i.e. chlorine's low effectiveness against viruses and low effectiveness when in the combined form.

Description of project:

- a. Examination of acute and sub-acute toxicity of bromine at concentrations effective for water disinfection.
- b. Toxicological evaluation of bromine products such as bromine, bromamines and other possible compounds and the water disinfection effectiveness of these compounds.

Assistance required:

1. By WHO : none
2. By IRC : none
3. By CI : implementation

Priority: B

No. 6.

Title of project: Study of water quality in arid and semi-arid regions.

Project agency: One or more collaborating institutions.

Objectives of project: In arid and semi-arid regions in many parts of the world, waters of high salinity and minerals are still being consumed for want of better sources. This process is likely to continue for some more time until the economics favour the developing countries to bring in better water from longer distances. It is important to know the adverse health effects of such poor quality water on humans and cattle, to improve the water quality criteria and to develop standards. The project envisages a correlation between unwanted elements and radicals such as fluorides and nitrates and trace metals with the bad effects on human and cattle health.

Description of project: Some information about trace elements and radicals in excess of limites suggested for normal waters is already available. One or two regions where the conditions are acute will be surveyed for the water quality and health effect in that region.

Budgetary, manpower and time requirements:

Budget : \$ 100,000

Manpower : One medical doctor

Two scientists

Four scientific assistants and other auxiliary manpower

Time : 4 years

Assistance required:

1. By WHO : Financial support
2. By IRC : Assistance with literature review and coordination

Priority: B

No. 7

Title of project:

Study of the health effects of trace elements in water

Project agency:

A collaborating institution such as the Institute of Hygiene and Epidemiology, Prague.

Objective of project:

To evaluate present knowledge and to prepare experimental project.

Description of project:

- a. Collection of the present publications from the whole world.
- b. Critical evaluation of the present knowledge.

Assistance required:

1. By WHO : Assistance in contacts with people interested in the problem, financial support for some visits.
2. By IRC : Assistance in collection of world literature.

Priority:

A* (Industrialized countries)

No. 8

Title of project: Effects of modern agricultural inputs on water quality.

Project agency: A collaborating institution such as CPHERI.

Objectives of project: Modern agriculture involves inputs of fertilizers and pesticides designed to increase the yield of crops. The run off of the residues of these inputs into surface and ground waters is known to cause considerable adverse effects on the quality of the receiving waters or aquifers. Such waters cannot readily be used as source of raw water for drinking purposes nor can be easily purified to avoid such contaminants. The project envisages the measurement of fertilizers and pesticides into the receiving waters under various conditions of crops growing on fertilizers and pest control.

Description of project: The project envisages collection of run off and percolated samples of water from fields wherein fertilizers and insecticides have been used for improving crop yield. Samples will be collected both at surface and under ground and analysed. Samples will be collected from field receiving flood irrigation or limited irrigation for raising different types of crops in different seasons.

Budgetary, manpower and time requirements:

Budget : \$50,000

Manpower : Two scientists

Two scientific assistants and

other auxiliary staff.

Time : 3 years

Assistance required:

1. By WHO : Financial support and coordination with FAO.
2. By IRC : Assistance in coordination with other institutions.

Priority:

C

No. 9

- Title of project: Comparison of the health effects of desalinated and undesalinated drinking water in arid regions.
- Project agency: IRC and interested collaborating institutions.
- Objectives of project: With the increasing utilization of desalinated water in many parts of the world (e.g. Kuwait and Israel) it would be appropriate to determine the quality of desalinated water by various processes and to assess the effects on the health of consumers in contrast to the effects on those continuing to use highly mineralized ground water. The ultimate objective would be to establish desalinated water quality criteria and standards.
- Description of project:
- a. Collection of available information and data on the quality of ground water and desalinated water in countries like Kuwait and Israel.
 - b. Carrying out surveys to determine the daily intake of liquids with respect to quantity and quality.
 - c. Initiating plans for future extensive epidemiological surveys of different sections of the population utilizing highly mineralized ground water as well as those depending on desalinated water.
- Assistance required:
1. By WHO : Financial support
 2. By IRC : Coordination of the activities of a number of institutions
- Priority: A

5.4.2 Urban water supply

No. 10

Title of project: Optimization of water treatment systems.

Project agency: IRC/CWS and University of Newcastle-upon-Tyne.

Objectives of project: To help to reduce the costs of urban water treatment plants by refining the design criteria and finding the optimum combination of treatment units.

Description of project:

- a. Collection and collation of data on quantity and quality of water required.
- b. Collection and collation of data relating influent and effluent qualities of the various treatment units and of whole systems, related to design criteria, and to such operating parameters as efficiency, cost and maintenance.
- c. Formulation of equations describing the operation of the various treatment units, including costs functions.
- d. Development of an optimization model of a complete water-treatment system.

Assistance required:

1. By WHO : Salary of one research worker at IRC
2. By CI's : Collection of data on treatment plant design and operation costs.

Time required: 2 years

Priority: A

No. 11

Title of project: Coagulants and coagulant aids from local materials.

Project agency: CEPIS, and other collaborating institutions such as the Bandung Institute of Technology.

Objectives of project: Study possibility of using low cost, locally available materials to replace more costly imported coagulants and polymers in water treatment.

Description of project:

- a. Developing a laboratory process for extracting ferric aluminium sulfate from wastes from bauxite mines.
- b. Investigate production of ferric chloride on plant premises using iron or/and chlorine.
- c. Investigate availability, cost, and effectiveness of natural polymers, such as starches, tuna syrup, alginates, as compared to standard polyelectrolytes.
- d. Set up pilot plants for producing coagulants and coagulant aids and conduct tests of these materials in water treatment plants.

Time required : 2 years
Estimate funds needed : US\$100,000

Assistance required:

1. By IRC : Information on preparation and use of such coagulant materials in other countries.
2. By CI's: Conduct laboratory and pilot scale production studies and tests of materials.

Priority: A

No. 12

Title of project: Simplified water filtration

Project agency: One or more collaborating institutions.

Objectives of project: To study most economical methods for filters with constant and declining rate avoiding the use of equipment difficult to maintain and repair in developing countries.

Description of project: The efficiency of equally split flow filters in comparison with different designs of declining rate filters would be studied.

Design parameters such as total depth of filter box required, maximum water level variation that can be expected, control systems, etc. would be determined.

Economical comparisons between conventional filters and simplified filters would be made.

Assistance required:

1. By WHO : Financial support
2. By IRC : Collaboration in the collection of bibliography and dissemination of the results obtained in this project.
3. By CI's: Development of the project, by itself or in collaboration with interested agencies. Preparation of progressive and final reports.

Priority: A

No. 13

Title of project:

A study of the mechanism and prevention of membrane fouling in the application of reverse osmosis in water treatment.

Project agency:

A collaborating institution such as the Hadassah Medical School and Institutions in industrialized countries.

Objectives of project:

- a. To develop methods - both chemical and physical - of reducing the effect of membrane fouling in the reverse osmosis treatment of water.
- b. To estimate the economic impact of water treatment prior to reverse osmosis and the subsequent possible reduction of membrane fouling as compared with no pretreatment and an increased necessity for membrane cleaning and/or replacement.

Description of project:

Some work on membrane fouling and membrane cleaning is underway at various locations throughout the world. Examination of the present stage of knowledge is essential, but difficult, because there are few publications. Information from unpublished experiments will be sought.

Current membrane cleaning techniques will be critically examined with further testing on standardized raw water. New cleaning techniques will be investigated.

Costs of cleaning will be evaluated relative to the time-phased throughput in experimental systems for each quality of raw water used in the testing series. Estimates of cleaning costs and down-time will be developed for fouled systems. This pro

full scale systems. This procedure will permit a comparison of the effect of applying pretreatment processes to raw water prior to subjecting it to treatment by reverse osmosis.

Assistance required:

1. By WHO : none
2. By IRC : Assistance in developing communication channels with institutions undertaking or contemplating similar work.
3. By CI's: Project implementation

Priority:

C

No. 14

Title of project: Field trails of fixed bed chlorination of water.

Project agency: Several collaborating institutions.

Objective of project: Simplification of water chlorination procedures.

Description of project:

- a. Field trials at various locations and under various climate conditions of the "Fixed Bed Chlorination" technique.
- b. Install a number of fixed bed chlorinators at locations near to a number of CI's and to monitor the results over a meaningful period.
- c. Report the results individually to the IRC for correlation and analysis.

Assistance required:

1. By WHO : Financial support
2. By IRC : Collection of detailed information on the experimental process, obtain materials not locally available, coordinate research activities and publish final report.
3. By CI's: Conduct field tests and report results.

Priority: A

5.4.3 Rural water supply

No. 15

Title of project: Slow sand filtration in developing countries.

Project agency: WHO, IRC/CWS and a number of collaborating institutions in industrialized and in developing countries.

Objectives of project: To encourage the use of slow sand filters for treatment of drinking water in developing countries and to develop design criteria appropriate for tropical and semi-tropical countries.

Description of project:

- a. Review of the literature on the subject, especially that relating to tropical and semi-tropical installations.
- b. Investigate, as necessary, the operating performance of known installations, e.g. the Gezira region of the Sudan. Operating performance to be recorded relative to the variables of design, construction, operation, climate, raw water quality, etc.
- c. Develop a standard design of an experimental filter for construction at a number of test sites. Develop a standardized experimental design procedure and reporting system.
- d. Investigate the effects resulting from the use of locally available and less than optimum filter media.
- e. Extend to a pilot plant basis at a restricted number of typical sites.
- f. Prepare guidelines for design, standard

designs and detailed directions for the operation of slow sand filters.

- g. Investigate adjunct operations such as pretreatment and continuous removal of schmutzdecke.

Assistance required:

1. By WHO : Financial and technical assistance for experiment design. Publication of guidelines, standard designs and directions for operation.
2. By IRC : Design of experiment, coordination of work. collation of results and preparation of report.
3. By CI's: Conduct of experiments and report of individual experimental results.

Priority:

A* (Developing countries)

No. 16

Title of project: Review and application of relevant technologies.

Project agency: IRC/CWS in collaboration with a number of CI's in industrialized countries.

Objectives of project: Identification of successful simple, low-cost technologies, used in industrialized and developing countries and to investigate the practicability of using such technology, particularly in rural areas.

Description of project: Virtually all of the industrialized countries have water supply systems which contain elements that were installed fifty to one hundred years ago in accordance with what was then current technology. (In water plants of civil and military installations very often such systems are still in use). Similarly, European explorers and settlers of earlier years established basic water supply systems at various centres throughout Asia and Africa. Many of these systems may still be functional. These systems based on early technology were appropriate for the then current conditions of low cost labour and difficult problems of materials delivery and parts replacement. To some degree similar conditions obtain today in developing countries, especially as compared with industrialized countries. It is logical therefore to presuppose that systems which utilize locally producible materials and are both constructed and operated by labour intensive methods could be suitable for many current needs. Consequently in many develop-

ing countries such systems have already been developed.

This study would investigate systems and elements of systems which have withstood the ravages of time and are still functional. The study could result in the production of guidelines for effective utilization of standard and simple technical solutions to water supply problems.

Assistance required:

1. By WHO : Financial support for the individual studies within the project and publication of the guidelines.
2. By IRC : Literature review, coordination of the study and dissemination of data collected.
3. By CI's:
 - (a) On site investigation of water system elements that were installed by labour intensive methods and utilized locally produced materials.
 - (b) Field trials.

Priority:

A* (Developing countries)

No. 17

Title of project:

Hand pumps .

Project agency:

Collaborating Institutions from developing countries.

Objectives of project:

To develop a number of hand pumps adaptable for use in rural communities in the developing countries.

Description of project:

In a number of rural communities in developing countries, where ground water constitutes the cheapest and safest source of water, hand pumps will continue to be used extensively. Such pumps are particularly useful in remote inaccessible communities where technical know-how is limited. Under such conditions hand pumps must be cheap, robust and easily maintained. A number of available hand pumps fail to meet these criteria. This project which is designed to evolve reliable hand pumps for rural communities will have the following facets:

- a. Review of previous work on hand pumps.
- b. Identification of major operation and maintenance problems with existing hand pumps.
- c. Design of appropriate hand pumps to overcome short-comings of existing pumps.
- d. Field trials of new pumps.
- e. Preparation of guidelines for local production of the new hand pumps.

Assistance required:

1. By WHO : none
2. By IRC : Literature review
3. By CI's : Supply of information on experiences with available pumps.

Priority:

A

No. 18

Title of project: Development of simple and inexpensive testing methods for field examination of water.

Project agency: IRC

Objectives of project: Examination of water samples in the rural areas has to be undertaken frequently for which unsophisticated techniques, adequate for field requirements need to be developed.

Description of project: Study of available literature and make available a suitable kit together with instruction manual which may be sent to several CI's and have it tested in the field. This will meet two purposes:

- (a) to check water quality
- (b) to evaluate treatment efficiency.

Modify the kit to meet regional requirements and make the information available to countries concerned.

Assistance required: Funds to IRC to sub-contract the preparation of the kit and the manual.
CI's to be approached to test the kit in the field.

Priority: B

5.4.4. Administration and Management

No. 20

Title of project: Impact of community water supply.

Project agency: A collaborating institution in a developing country.

Objectives of project: To evaluate the impact of community water supply and sanitation projects on community health and on the socio-economic life in a community.

Description of project:

- a. Literature review on health and socio-economic impact of water and sanitation projects.
- b. Preparation of a complete socio-economic and health survey of selected pilot study areas before and after introduction of community water supply and sanitation projects.
- c. Planning and execution of community water supply and sanitation projects in selected pilot study areas.
- d. Quantifying the benefits of introducing water supply systems.

Assistance required:

1. By WHO : Personnel, equipment and supplies for project.
2. By IRC : Supply of available information.
3. By CI's: Local information and experience on the impact of such projects.

Priority: A* (Developing countries)

No. 21

Title of project: Seminars on administration and management.

Project agency: WHO

Objectives of project: To give an opportunity for advanced training in administration matters to managers and high officials of community water supply agencies.

Description of project: During a five-year period special meetings would be held in the different WHO regions. Special manuals and information material would be prepared for each meeting according to local situations and conditions.

Assistance required:

1. By WHO : Consultantship services, fellowships, visual aids and special grants.
2. By IRC : Information and reference material on administrative techniques applicable to the management of CWS
3. By CI's: Coordination with the WHO region or country projects in the arrangements with the national agencies who are supporting such projects.

Priority: A

No. 22

Title of project:

The determination of unit and total consumption of domestic water. Present and future estimates with emphasis on alternatives to reduce wastage.

Project agency:

A number of collaborating institutions.

Objectives of project:

- a. To determine unit consumption figures and their characteristics for developing nations.
- b. To explore population forecasting techniques and unit consumption projections to providing a basis for estimating future water need.
- c. To investigate various technical and social alternative use to reduce water requirements.

Description of project:

- a. Gather and analyze from existing sources unit use of water and pertinent variables, e.g. social and technical. Primarily for developing countries.
- b. Explore population technology applicable and suitable to water projection needs.
- c. Explore technical and social alternatives of saving water.

Technological:

- plumbing systems, fixtures
- flow limiting devices and peak control
- innovative solutions

Sociological:

- modes of water use and alternates in households

- modes of water use and alternates in the community
 - social acceptance and economic benefits.
- d. Impact of use of alternatives on future requirements.
Cost and benefit (a) to the individual;
(b) to the community.
- e. Identification, if any, of pertinent differences between urban and rural location.

Assistance required:

1. By WHO : none
2. By IRC : Organize a "twinning or pairing" relationship between developed and developing CI's, and different regions. Coordination of activities.

Priority:

A

No. 23

Title of project: Case histories of successful water supply in developing countries.

Project agency: Collaborating institutions with WHO guidance.

Objectives of project: To make available histories of successful and unsuccessful water supply projects as examples to others.

Description of project: The compilation of case histories of successful water supply projects, especially in the rural areas of developing countries, with special emphasis on the benefits (socio-economic) which have accrued.

Assistance required:

1. By WHO : Publication of case-study reports.
2. By IRC : Establishment of criteria for evaluating projects.
3. By CI's: On-site evaluation of projects and preparation of individual case-studies.

Priority: B

No. 24

Title of project: Community Water supply projects evaluation.

Project agency: A number of collaborating institutions.

Objectives of project: To collect data on a routine basis from past water supply projects to provide a feedback of information on water demands, system design weaknesses and operational problems and community benefits resulting from the system.

Description of project:

- a. Plan data collection in relation to local conditions and select projects.
- b. Collect data over a five-year period from different types of community and water supply service (including no supply system).
- c. Evaluate data on a continuous basis and prepare interim reports so that water supply development can take advantage of the information.
- d. Prepare final project evaluation report and make recommendations.

Assistance required:

1. By WHO : Providing budget to IRC
2. By IRC : Coordinate programme, select CI's on basis of proposals presented, administer budget, assist in developing project data collection and project selection and prepare joint report.
3. By CI's : Prepare proposal for submission to IRC, select projects and design data collection system, collect and evaluate data and prepare interim and final reports.

Priority: C

5.4.5 Training and training programmes

No. 25

Title of project: Development and implementation of systematic training programmes in community water supply on the base of assessment of manpower and training needs in the water supply field in developing countries.

Project agency: IRC and CI's in developing countries.

Objectives of project: To obtain an accurate assessment of the manpower situation in the water supply field in developing countries.

To identify critical areas such as existing capabilities, utilization of personnel, labour turnover, training programmes and training needs.

To make recommendations on specific plans and actions to meet the identified needs.

To develop specific training projects directed towards the needs identified by the manpower and training assessment to form programmes relevant to each level of employment.

Description of project: The project would be carried out in interested countries with the cooperation of CI's and relevant agencies. Methods and techniques would be developed by IRC to undertake the study. The data gathered would be thoroughly analyzed to determine manpower and training needs and specific plans proposed for the manpower development programme. Then specific training projects by IRC in collaboration with CI's and consultants

as required to include training manuals and teaching aids would be prepared. CI's would organize pilot training projects in collaboration with water executing agencies in developing countries using the training materials supplied by IRC. Such collaboration would involve active participation of the management of the executing agency. CI's could continuously give assistance to executing agencies in carrying out their own training programmes on a face-out basis. Developed training projects would be made available to other countries by IRC.

Assistance required:

1. By WHO : Technical advice on planning, execution and appraisal of the project. Financial support of project.
2. By IRC : Development of guidelines for carrying out the project. Collaboration in the planning stage of the project and in the dissemination of results. Provision of literature and information on the subject and of training materials. Preparation and coordination of the specific training projects.
3. By CI's: Promotion of the activity. Coordination with the governments to participate in the project. Assistance during the execution of the study at country level. Compilation of the preliminary report with an appraisal of results, conclusions and recommendations. Collaboration on the revue and publication of the final documents. Assistance in the specific training projects as specified above.
4. By external organizations: Technical advice (possible sources AWWA, IWSA, and other professional and training institutions.)

Priority:

A* (Developing countries).

No. 26

Title of project: Seminars on urban and rural water supply.

Project agency: WHO

Objectives of project: To provide a forum for the exchange of ideas and experiences on urban and rural water supply with a view to developing new ideas for more effective operations.

Description of project: Collaborating institutions would present papers on urban and rural sanitation practices in their countries. The venue for the seminars should be chosen with due regard for appropriate field visits. Efforts should be made to display relevant literature, diagrams and materials. If appropriate, the seminars may be travelling seminars.

Assistance required:

1. By WHO : Funds for sponsoring participants and for equipment and supplies.
2. By IRC : Assistance in collating information on existing urban and rural water supply practices.
3. By CI's : Information on existing urban and rural sanitation practices, and on proposed innovation.

These seminars should be followed by refresher courses for those involved in the planning and administration of water supply programmes.

Priority: A

5.4.6 Dissemination of Information

No. 27

Title of project: Review of field use of WHO technical publications related to water supply.

Project agency: IRC

Objectives of project: To investigate how they were distributed and if the material is available for the interested agencies and individuals.
To see how the scientific and technical knowledge contained in the publications has been appreciated and used by the interested sectors.

Description of project: The IRC will contact the collaborating institutions to determine the availability of the documents considered in the study and to inform about the usefulness of them for the interested agencies and individuals.

Assistance required:

1. By WHO :
2. By IRC :
3. By CI's:

Priority: B

No. 28

Title of project:

Selection, translation and distribution of selected technical publications on water supply subjects.

Project agency:

IRC and interested CI's.

Objectives of project:

To translate the selected technical publications of major interest to students, professionals and other groups in developing countries.

To use the resources of the International Network for Community Water Supply to develop this project through a coordinated action.

Description of project:

Selection of textbooks of high interest, translation and distribution to the interested countries.

Selection of the best pamphlets, manuals and booklets produced by associations, agencies, etc. for distribution; translated whenever possible.

Review of periodicals and selection of papers containing information of high interest to the countries participating in the project. Translation and/or distribution of them whenever possible.

Assistance required:

1. By WHO : Technical advice on the planning, execution and appraisal of the project.
2. By IRC : Collaboration in the search and selection of material.
3. By CI's: Translation, printing and distribution.

Priority:

A

6. PROPOSED PROGRAMME

6.1 Projects

With regard to the specific activities and projects for research and development identified in chapter 5, participants concluded that elaboration in greater detail is needed before actual performance and manpower and costs involved can be considered.

Participants had also in mind the possibility of certain projects of a short-term nature being of interest to the UN Governing Council for Environmental Programmes which is establishing an Environment Fund to be "used for financing such programmes of general interest as regional and global monitoring assessment and data-collecting systems, including as appropriate, costs for national counterparts; improvement of environmental quality management; environmental research; information exchange and dissemination; public education and training; assistance for national, regional and global environmental institutions; promotion of environmental research and studies for the development of industrial and other technologies best suited to a policy of economic growth compatible with adequate environmental safeguards; and such other programmes as the Governing Council may decide upon. In the implementation of such programmes due account should be taken of the special needs of developing countries."*) The Fund is expected to amount to 100 million dollars for the first five-year period.

Furthermore, at the UN Conference on the Human Environment priority areas have been designated for research on "water supply, sewerage and waste disposal systems adapted to local conditions, particularly in semi-tropical, tropical, arctic and sub-arctic areas" (recommendation 4(c)(VII)) and the World Health Organization has been designated as the principal agency responsible for this undertaking. Particular reference can further be made to the recommendations 4-1(c)(1), 4-1(c)(v), 4-2, 9, 10 and 52-1(b) of the same Conference.

*) United Nations General Assembly (1972) Report of the United Nations Conference on the Human Environment held at Stockholm, 5-16 June 1972 (document A/CONF.48/14), p.64

Participants at the Meeting concluded that the following projects should be drawn to the attention of the World Health Organization and other organizations who would be interested in cooperation, supporting or assisting in implementation of the projects.

- No. 1 Health aspects of water reuse / long term health effects of consuming renovated water (of interest to both industrialized and developing countries).
- No. 7 Study of the health effects of trace elements in water (of interest mainly to industrialized countries).
- No. 15 Slow sand filtration in developing countries (directed to developing regions).
- No. 16 Review and application of relevant technologies (directed to developing countries, but also of interest to certain regions in industrialized countries).
- No. 20 Impact of community water supply (of interest to developing countries).
- No. 25 Development and implementation of systematic training programmes in community water supply based on assessment of manpower and training needs in developing countries (in the first place directed to developing countries, but certainly also of interest to many industrialized countries).

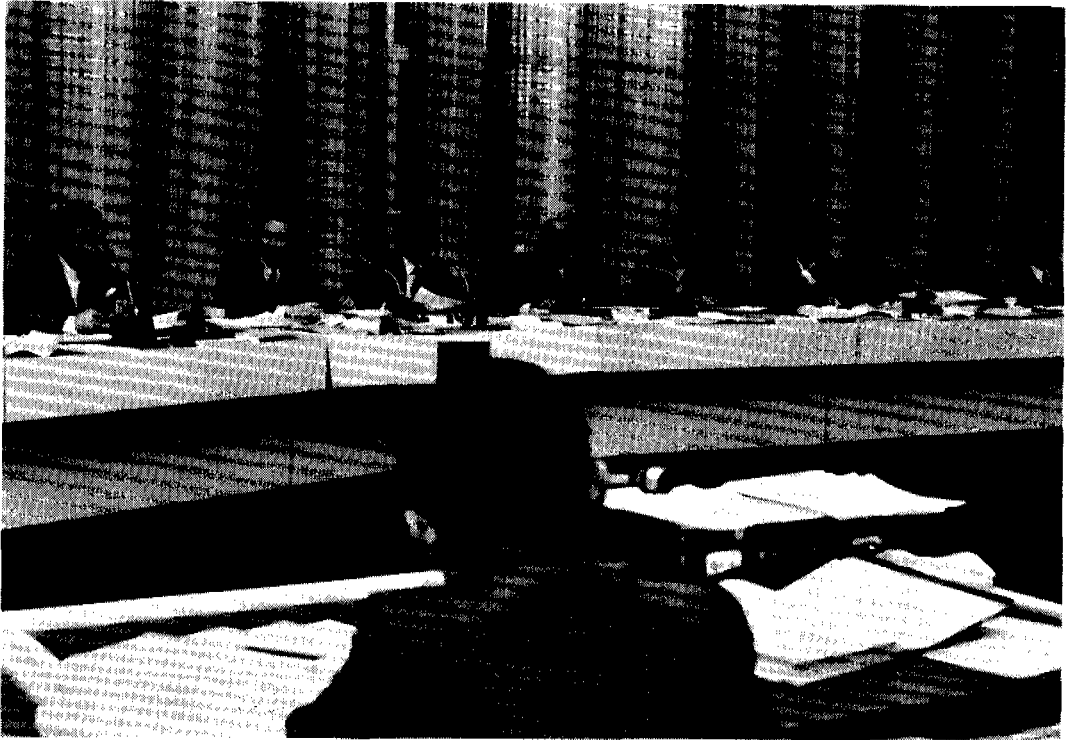
6.2 Future work for the Network

It was suggested that IRC and WHO in consultation should develop the special priority proposals into comprehensive research projects with a view to their early implementation funded from the WHO regular budget, the UN Environment Fund or any other agencies budget, as appropriate. It is considered IRC's task to see if additional agencies can be found willing to finance projects as discussed at the meeting. Consequently, IRC will take steps in this respect, if appropriate in consultation with WHO.

In due time, WHO, IRC, and the Collaborating Institutions will have as a function to cooperate in the performance of these projects, as preliminary stated on the several proposals.

Participants identified 19 additional high priority projects which are listed in the report. IRC will consider further work on some of the proposals in the future; subject to availability of funds, WHO may be in a position to stimulate implementation of these projects through consultation with IRC and Collaborating Institutions. In addition, the Collaborating Institutions may be interested in referring to them when developing their own research and development proposals. The same goes for the low priority projects, elements of which may be used in future programmes of Collaborating Institutions. The content of the proposals, which did not have direct relationship with water supply and are consequently not mentioned in this report, will be transferred to appropriate organizations and institutions.

It was a general feeling of the Meeting that the International Reference Network for Community Water Supply - after giving follow-up to the agreements mentioned in section 3.4 - provides the appropriate infrastructure to coordinate and implement programmes proposed at the meeting, thus adding to the solution of crucial problems in water supply in the world of today.



View on the Chair:

Left to right: Dr. Allen, Mr. Van Damme, Professor Wright,
Professor Symon, Mr. Martijn, Mr. Orihuela,
Dr. Ballance, Mr. Sperandio.

MEETING OF DIRECTORS OF INSTITUTIONS COLLABORATING WITH THE
WHO INTERNATIONAL REFERENCE CENTRE FOR COMMUNITY WATER SUPPLY

Bilthoven, Netherlands

9 - 13 April, 1973

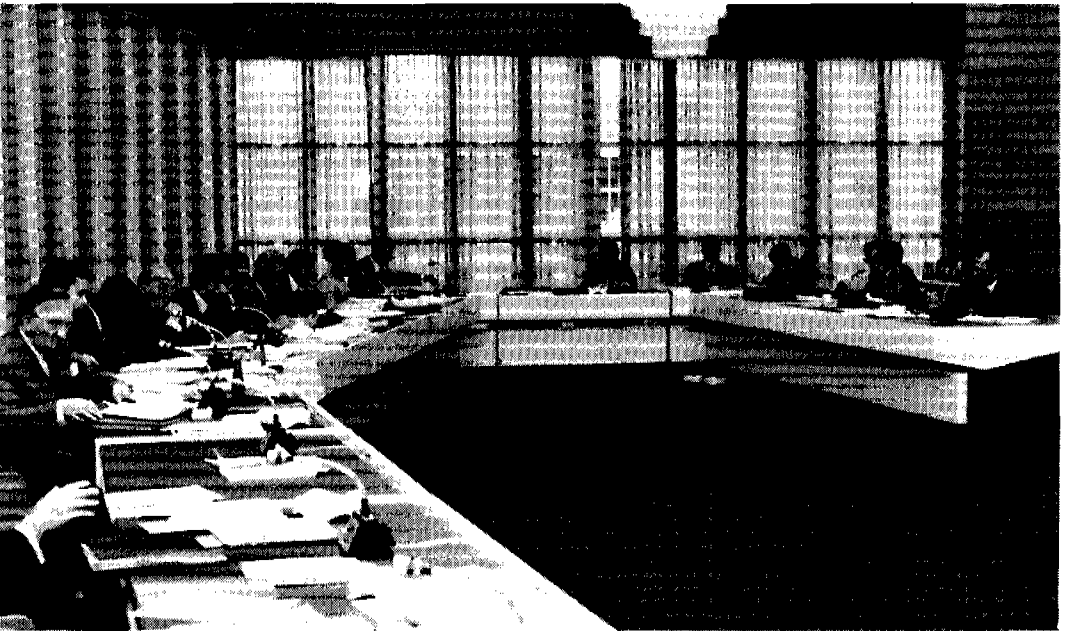
Agenda

1. Opening of the meeting
2. Election of Chairman, Vice-Chairman; appointment of Rapporteurs
3. Adoption of the agenda
4. Statement of Manager IRC
5. International programmes in the community water supply field
 - 5.1 The WHO Community Water Supply Programme
 - 5.2 Activities of the WHO Regional Offices
 - 5.3 Activities of other organizations represented at the meeting
6. The WHO International Reference Network for Community Water Supply
 - 6.1 Review of work of WHO International Reference Centre for Community Water Supply (IRC/CWS)
 - 6.2 Review of work of Collaborating Institutions (CI's)
7. Research needs in WHO Member States
 - 7.1 Nature of present and future research and development in industrialized countries
 - 7.2 Nature of present and future research and development in developing countries
8. Possible methods of strengthening and improving the practical outputs of the IRC/CWS/CI-Network.
9. Implication of the recommendations from the UN Conference on the Human Environment
10. Proposals on specific activities and projects for research and development.
 - 10.1 Health aspects of community water supply
 - 10.2 Urban water supply
 - 10.3 Rural water supply
 - 10.4 Administration and management
 - 10.5 Training and training programmes
 - 10.6 Dissemination of information
11. Presentation of specific proposals with priority allocation
12. Formulation of proposed programme for future collaborative action with priority allocation and consideration of ways and means to achieve this programme.
13. Concluding session



Participants of the meeting:

left to right: Mr. Hockman, Mr. Tjiook, Professor Majumder,
Dr. Gruener, Dr. Martins, Professor Aftim
Acra, Dr. Ayoub, Mr. Wijnstra, mr. Barrett,
Mr. Barker, Mr. Shipman



Participants of the meeting:

left ro right: Dr. Allen, Mr. Van Damme, Professor Symon,
Mr. Martijn, Mr. Orihuela, Dr. Ballance,
Mr. Sperandio, Dr. Labeau, Mr. Kepinski,
Professor Reid, Mr. Swisher, Dr. Talboys,
Professor Pescod, Professor Rivas-Mijares.

MEETING OF DIRECTORS OF INSTITUTIONS COLLABORATING WITH THE
WHO INTERNATIONAL REFERENCE CENTRE FOR COMMUNITY WATER SUPPLY

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List of Participants

Representatives of Collaborating Institutions

- Professor Aftim Acra, Associate Professor of Sanitary Chemistry and Chairman of the Department of Environmental Health, School of Public Health, American University of Beirut, Beirut, Lebanon
- Dr. R.G. Allen, Director, The Water Research Association, Ferry Lane, Medmenham, Marlow, Bucks. SL7 2HD, England (Chairman)
- Dr. G.M. Ayoub, Associate Professor of Civil Engineering, Head Sanitary Engineering Division, Faculty of Engineering and Architecture, American University of Beirut, Beirut, Lebanon
- Dr. F. Chiapetti, National Research Council, Via Reno 1, 00189 Rome, Italy
- Dr. N. Gruener, Senior Biochemist, Environmental Health Laboratory, Hadassah, Medical School, The Hebrew University, Jerusalem, Israel
- Mr. E.L. Hockman, Special Assistant, Water Supply Division, Environmental Protection Agency, Washington, D.C. 20460, U.S.A.
- Professor P.C.G. Isaac, Professor of Civil and Public Engineering, Head of Department of Civil Engineering, University of Newcastle upon Tyne, Newcastle upon Tyne, NE1 7RU, England
- Dr. M. Labeau, Drinking Water Laboratory, Institute of Hygiene and Epidemiology, Department of the Environment, 14, Rue Juliette Wytzman, Brussels 1050, Belgium
- Mr. J. Liefvering, Public Relations Officer, Testing and Research Institute of the Netherlands Waterundertakings KIWA Ltd., P.O. Box 70, Rijswijk 2109, Netherlands
- Dr. B. Martins, Lecturer, Faculty of Engineering, University of Lagos, Lagos, Nigeria
- Mr. Th. G. Martijn, Deputy Director, Testing and Research Institute of the Netherlands Waterundertakings KIWA Ltd., P.O. Box 70, Rijswijk 2109, Netherlands (Rapporteur)
- Professor N. Majumder, Director, Central Public Health Engineering Research Institute, Nehru Marg, Nagpur-10, India
- Professor M.B. Pescod, Chairman, Environmental Engineering Division, Asian Institute of Technology, P.O. Box 2754, Bangkok, Thailand (Rapporteur)
- Dr. G. Rivas-Mijares, Dean Graduate School and Professor in Sanitary Engineering, Universidad Central Venezuela, Vice-Rectorado, Caracas, Venezuela
- Professor K. Symon, Chief, Centre of General and Environmental Hygiene, Institute of Hygiene and Epidemiology, Srobarova 42, 10042 Prague-10 Czechoslovakia, (Vice-Chairman)
- Professor A.M. Wright, Associate Professor, Acting Head Civil Engineering Department, University of Science and Technology, Kumasi, Ghana (Vice-Chairman)
- Mr. G. Wijnstra, Director, Testing and Research Institute of the Netherlands Waterundertakings KIWA Ltd., P.O. Box 70, Rijswijk 2109, Netherlands

Representatives of other interested organizations

- Mr.S.G. Barrett, Chairman, IWSA Standing Committee on Education and Training of Waterworks Personnel, 104A, Park Street, London W1Y 4HU, England
- Mr.H.W. Barker, IWSA Standing Committee on Education and Training of Waterworks Personnel, 104A, Park Street, London W1Y 4HU, England
- Mr.S. Bishara, Waterworks Consultant (UNDP), c/o African Development Bank, P.O. Box 1387, Abidjan, Ivory Coast.
- Professor I. Burton, Professor of Geography, Institute of Environmental Sciences and Engineering, University of Toronto, Toronto, Canada (till August 31, 1973: Visiting Professor of Environmental Science, University of East Anglia, Norwich, England)
- Dr.A.W. Fonds, Deputy Chief, Laboratory of Soil, Water and Air, National Institute of Public Health, Ant. van Leeuwenhoeklaan 9, Bilthoven, Netherlands
- Professor G.W. Reid, Regents Professor, School of Civil Engineering and Director, The Bureau of Water and Environmental Resources Research, The University of Oklahoma, Norman, Oklahoma 73069, U.S.A.
- Mr.H. Shipman, Chief, Water Supply Division I, Public Utilities Project Department, International Bank for Reconstruction and Development, 1818 H, Street, N.W., Washington, D.C. 20433, U.S.A.
- Mr.D. Stichelberger, Assistant Manager, WHO International Reference Centre for Wastes Disposal, Federal Institute for Water Resources and Water Pollution Control (EAWAG), Ueberlandstrasse 133, CH-8600 Dübendorf, Switzerland
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- Dr.A.P. Talboys, Chief Sanitary Engineer, Office of International Health, Department of Health, Education and Welfare (North Building), Washington, D.C. 20201, U.S.A.

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- Dr.M.J. Suess, Regional Officer for Environmental Health, World Health Organization, Regional Office for Europe, 8, Scherfigsvej, 2100 Copenhagen, Denmark

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INSTITUTIONS AND ORGANIZATIONS
COLLABORATING IN THE PROGRAMME OF WORK OF THE
WHO INTERNATIONAL REFERENCE CENTRE FOR COMMUNITY WATER SUPPLY

Director: Mr. P. Santema
Manager : Mr. J.M.G. van Damme

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