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WORLD HEALTH ORGANIZATION

WHO/CWS/RD/71.4  
ORIGINAL: ENGLISH

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WHO 70

ORGANISATION MONDIALE DE LA SANTÉ

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**INTERNATIONAL CONFERENCE ON RESEARCH AND DEVELOPMENT IN  
COMMUNITY WATER SUPPLY**

Cavtat, Dubrovnik, Yugoslavia, 7-14 October 1970

Record of Proceedings

An International Conference on Research and Development in Community Water Supply was held at the Hotel Albatros, Cavtat, Dubrovnik, Yugoslavia, from 7 to 14 October 1970, under the joint sponsorship of the Governments of Yugoslavia and the United States of America, and of the World Health Organization.

The Government of the Federal Socialist Republic of Yugoslavia, through the Federal Administration for International Technical Co-operation, agreed to serve as host for the Conference, and appointed the Croatian Institute of Public Health of Yugoslavia to undertake the necessary administration and local organization.

The Government of the United States of America, through the Department of Health, Education and Welfare, Public Health Service, Bureau of Water Hygiene, provided the necessary financial support by direct agreement with the Government of Yugoslavia, and also assisted in the conduct of the Conference by the provision of staff members and a consultant as participants in the discussions.

The World Health Organization, through the Community Water Supply Unit, Division of Environmental Health, carried out the technical arrangements for the Conference. Mr P. Bierstein, at that time Chief of the Community Water Supply Unit, was Conference Secretary.

Thirty-three participants from 27 countries attended; in the main, they consisted of directors of research institutions active in the field of water supplies, and were drawn from both developed and developing countries. Other interested bodies were invited to send observers. A list of participants, observers and supporting staff is attached as Annex A.

The purpose of the Conference was to discuss problems of mutual interest and, more specifically, to consider practical ways of improving:

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- (1) the international interchange of information on community water supply research and development;
- (2) the stimulation and strengthening of interest and activity in problems of operational interest;
- (3) the training of personnel of developing countries in the methodology and techniques of research and development;
- (4) the involvement of research and development institutions in the training of water supply professionals and technicians;
- (5) the creation or strengthening of collaborative efforts and exchange of ideas and information between operative agencies and research and development institutions; and
- (6) the co-ordination of the work of the network of collaborating institutions through the WHO International Reference Centre for Community Water Supply, within the WHO Research and Development Programme.

#### Opening of Conference

The Conference was opened by Dr Branko Plese, Head of the Environmental Hygiene Department, Institute of Public Health of Croatia, as local organizer on behalf of the host Government.

The inaugural address on behalf of the Government of Yugoslavia was presented by His Excellency, Dr Nikola Georgievski, President of the Federal Council for Health and Social Policy.

Dr Georgievski extended greetings to the Conference on behalf of the Government of Yugoslavia and expressed confidence in the success of the Conference. He emphasized the importance of water supply as an essential problem in development, but pointed out the needs for solutions to many problems in the developing countries. He reported that substantial progress had been achieved in Yugoslavia since 1945, and especially since a national survey in 1949 revealed inadequacies of water supplies to be widespread in the country. Progress since that time has been notable, including the adoption of national standards for water supply service and personnel in which WHO has been most helpful.

Referring to the presence of 10 million tourists each year, he pointed to the need for the protection of their health and the importance of water supply in that connexion, as well as to serve the needs of the population.

He expressed appreciation to the World Health Organization and to the Government of the United States of America for their support of this Conference.

Mr Raymond J. Albright, Counsellor for Economic Affairs, from the American Embassy in Belgrade, representing Ambassador William Leonhart, conveyed the Ambassador's regrets for being unable personally to welcome the participants. Ambassador Leonhart's address, read by Mr Albright, pointed out that the meeting and the subject were timely and purposeful as water supply is essential to health and to economic development.

He reported that President Tito and President Nixon, in their recent discussions of the needs of the lesser developing countries, had recognized the importance of international co-operation in achieving solutions to those needs. The developed countries also had their problems of water quality, as reported by a national survey (1969) within the United States. The timeliness of this Conference was also reinforced by the current cholera pandemic.

In concluding, Ambassador Leonhart commended the World Health Organization, the Institute of Public Health of Croatia and the United States Public Health Service for this timely Conference and indicated that he was impressed by the agenda, and had noted that the Conference was organized for a worthy purpose in an action-oriented way.

Mr C.H. Atkins, Director, Division of Environmental Health, World Health Organization, Geneva, joined with the previous speakers in extending greetings, and expressed his welcome on behalf of the Director-General of the World Health Organization.

Mr Atkins expressed appreciation to the participants for their time and interest, pointing out that the success of the Conference would be measured by the value of their contributions. Referring to the purpose of the Conference, he called for discussion of research in new techniques, methods and materials that could result in safer, more widespread and less expensive water supplies, and of development which, in this context, consists of the application and adaptation of existing knowledge toward these objectives. In referring to the multiple problems of the developed and developing countries, he urged the research institutions to concentrate on the solution to these problems in producing simplified designs and methods, better tools, cheaper materials and other measures to improve efficiency and output.

He particularly stressed the need for close liaison between research and implementation to ensure that the results of research and development would be applied for the national benefit.

Mr Ivo Ljubcic, Vice-President of Dubrovnik, extended a warm welcome to the Conference on behalf of the citizens of Dubrovnik and the Mayor of Dubrovnik. He expressed confidence in the success of the deliberations, with mutual benefit to the institutions represented.

Dr Branko Plese, Head, Environmental Hygiene Department, Institute of Public Health of Croatia, on behalf of the participants to the Conference, extended thanks to the distinguished host speakers.

#### Election of Officers

Professor Milivoj Petrik, formerly Professor of the Andrija Stampar School of Public Health, Zagreb, Yugoslavia, was elected Chairman of the Conference by acclamation and assumed the Chair.

Professor S.J. Arceivala, Director, Central Public Health Engineering Research Institute, Nagpur, India, was elected Vice-Chairman by acclamation.

The Chairman then invited Mr A.I. Gobeaux, Chief Engineer & Honorary Director of the Office of Waste Water Treatment, Ministry of Public Health, Liège, Belgium, to act as Rapporteur (French), and Professor F.E. McJunkin, Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina, Chapel Hill, USA, as Rapporteur (English).

Opening Statement on WHO's Research and Development Programme in Community Water Supply, and Purpose of Meeting (Conference Secretary)

Mr Bierstein presented his greetings to the Conference, opening his remarks by defining WHO's objective in the field of health - the complete well-being of mankind. One of the Organization's contributions toward that objective was to assist all people in the world to have a safe and ample supply of water. A WHO study,<sup>1</sup> undertaken in 1962, indicated that within the 75 developing countries considered one-third of the urban population had piped water in their homes, one-third had access to piped water from standpipes, and the remaining third had no access to piped water supply. Those served with water often suffered from intermittent service, receiving water of doubtful quality.

Both water quality and quantity relate to health, and the World Health Organization has seen fit to assist developing countries over a broad spectrum of problems not confined strictly to health, but also concerning organization, training, finance and institutional development.

WHO is also co-operating with the World Bank in the preparation of sector studies as a basis for instituting national planning.

The question of money always arises. The extent to which developing countries had been able to absorb external financing for community water supplies is indicated by external assistance for the 11 years from 1958 to 1969, as shown below:

External Assistance (1958 - 1969)

International agencies	\$ 220 million
Regional agencies	\$ 407 million
Bilateral agencies	\$ 268 million
Total:	<u>\$ 895 million</u>

In addition to this external assistance, the countries themselves have invested another \$ 900 million during this period for the same purpose.

In preparing for the second UN Development Decade (1971 - 1980), WHO has estimated as feasible goals the following targets for the developing countries:

Targets for Second Development Decade

<u>Urban Population Served (%)</u>	<u>Now</u>	<u>By 1980</u>
Household or courtyard service	25%	40%
Public standpipe	26%	60%
No service	49%	0%
Rural Population Served (%) less than	10%	20%

In terms of additional people served, this would mean that in urban areas 175 million would receive water in their houses and 245 million would receive water through nearby standpipes. An additional 200 million people would be served in rural areas.

<sup>1</sup> Urban Water Supply Conditions and Needs in Seventy-five Developing Countries, World Hlth Org., Public Health Paper No. 23 (1963).

In terms of funds required, some US\$9 100 000 000 would be required in new capital investment, broken down as follows:

US\$7 500 000 000 in urban areas, and  
US\$1 600 000 000 in rural areas.

One quarter of this might come from external sources, but the remaining three-quarters must come from the resources of the countries concerned.

A major effort by the collaborating institutions should be the attempt, through research and development, to enable all countries to produce water more economically without sacrificing quality. As a gauge of their level of effort, research institutions should compare the cost for water supply research and development with the total capital cost for water supply, and should also compare these research and development expenditures with those made by other utilities and in industry.

Briefly stated, the aim of the WHO Community Water Supply Programme is to assist governments, particularly those of developing countries, in any way possible to enable them to render the construction and operation of their community water supplies more safe, more efficient, more economical, and more widespread. WHO thereby hopes that as quickly as possible the maximum number of people will be continuously supplied with water of a quality which will meet national standards.

As means to this end, WHO promotes increased use of local materials and skills, the local manufacture where feasible of items for waterworks construction and operation, simplification of construction and operation techniques, and adaptation of methods which have proved successful in one country to suit the needs and conditions in others.

#### Adoption of Agenda

The Provisional Agenda and Conference Procedure were adopted as proposed by WHO. A copy of this Agenda and background discussion notes is attached as Annex B.

#### The Role of Collaborating Institutions in Developed Countries (agenda item 1.1)

This topic was introduced by Mr Leland J. McCabe, Director, Division of Epidemiology and Biometrics, Bureau of Water Hygiene, U.S. Public Health Service, Cincinnati, United States of America. He commented that efforts to dramatize the problems of community water supply research and development needs in the United States had met with little success because of public concern with water pollution. Resources allocated to water supply research in the United States are limited due to a feeling by some planning authorities that serious drinking water supply problems do not exist in the U.S. to the extent that a central agency programme is necessary.

A recent nation-wide study<sup>1</sup> of 969 public water supplies disclosed that 41 per cent. of the supplies examined exceeded recommended minimum limits and 16 per cent. exceeded mandatory limits. Fifty-six per cent. were operating with some major deficiencies. Surveillance procedures were found to be inadequate for about 90 per cent. of the public supplies studied. Problems within smaller community supplies were much more prevalent. Mr McCabe suggested regionalization of small supplies following the examples in the United Kingdom and France.

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<sup>1</sup> Community Water Supply Study, Analysis of National Survey Findings, U.S. Department of Health, Education and Welfare (1970).

Mr McCabe proposed several areas for international collaboration including establishment of international and national recommended drinking water standards (the rationale for difference within the standards must be thoroughly explained). He also proposed evaluation of the safety of waterworks chemicals and coagulant aids, and a study of human populations naturally exposed to different levels of contamination. Examples of the latter are Maskovic's work on the role of silicates in endemic nephritis in Serbia, Yugoslavia, and Shuval's work on nitrates in Israel. A new hazard facing water supplies is the trend towards use of reclaimed waste waters.

Note: Agenda items 1.1 and 1.2 were combined for discussion purposes.

The Role of Collaborating Institutions in Developing Countries (agenda item 1.2)

Professor S.J. Arceivala, Director of the Central Public Health Engineering Research Institute, Nagpur, India, introduced this topic. He proposed the following functions to fulfil national and international responsibilities of collaborating institutions:

1. Take a continuing interest in the national water supply programmes.
2. Devote skills and ideas to the identification and solution of the country's water problems:
  - (i) Basic design criteria
  - (ii) Simpler unit processes and unit operations
  - (iii) Standardization in construction
  - (iv) Import substitution
  - (v) Testing and analysis
  - (vi) Quality standards
  - (vii) Public relations
  - (viii) Finances
3. Encourage, assist and train individuals to accomplish needed tasks:
  - (i) Field demonstrations
  - (ii) Short courses, refresher courses
  - (iii) Seminars and symposia
  - (iv) Graduate and undergraduate training programmes
  - (v) Preparation of guides and hand-books in local languages
  - (vi) Dissemination of literature, visual aids, etc.
4. Keep abreast with modern techniques and ideas:
  - (i) Exchange of information
  - (ii) Exchange of scientific workers
  - (iii) Use of consultants, if necessary.

He emphasized the paramount importance of exchange of information, suggesting that every collaborating institution could serve as an abstracting service for all available literature within its country for forwarding to the International Reference Centre. He suggested the possibility of exchange of scientific workers among collaborating institutions.

5. Act as liaison with fellow-workers all over the world: the possibility of mutual assistance in test checking new products or processes was proposed.

6. Serve as focal point of national activities for research and development in community water supply.

Discussion of agenda items 1.1 and 1.2.

The principal topics that arose included the following:

1. The role of the collaborating institution in a developed country compares with the role of that in a developing country. There was general agreement on the need for those collaborating institutions in the developed countries to assist institutions in the lesser developed countries. It was recognized that the institutions within the developed countries have more money, more staff and more equipment, generally speaking, and they are, therefore, in a better position to work in basic fundamental research. On the other hand, the collaborating institutions in the lesser developed countries should concentrate on applied research of the more practical kind, development oriented and related to local resources and manpower skills.
2. The problem of translating research from the laboratory to field practice is of major importance. The problems of "ivory tower", aloof researchers is all too well known. Several methods were proposed to alleviate this problem, including the exchange of personnel between operating and research agencies, the funding of research by operating agencies, participation in decision-making on research programmes by operating agencies and definite formal programmes, recognized as such, for translating research findings to field operations.
3. All involved should recognize that the ultimate goal is to provide water in safe and ample quantity to the consumer.
4. The exchange of communications, data and information between the collaborating institutions, the International Reference Centre and the World Health Organization are very definitely recognized as primary functions of the network.
5. Environmental engineers and others from developing countries undertaking academic work or educational travel within developed countries should be encouraged to focus their attention, particularly their research activities, on problems relevant to their own country's needs. The International Reference Centre might help in this regard by publishing a list of potentially useful research topics for consideration by academic institutions.
6. Collaborating Institutions should give consideration to maintaining mobilization readiness for emergency service in national and international disasters (cholera outbreaks, floods, etc.) as requested by WHO or the appropriate national agency.
7. The collaborating institutions should participate in the preparatory work involved in the formulation of recommended international drinking water standards.
8. The machinery of co-ordinated approach to common problems, exchange of information, and contact between individual research workers made possible through the International Reference Centre and collaborating institutions can be of benefit to developed and developing countries alike; with the growing emphasis upon environmental problems throughout the world, these benefits are likely to increase in the future.
9. The role of collaborating institutions in developing countries may be summed up as follows. To interest themselves in national water supply problems and to work toward their solutions; to support in any way possible the endeavours of the appropriate

operating departments and to help them to provide water to more people more quickly, more safely and less expensively; to encourage, assist and train individuals to accomplish these ends; to keep abreast of modern techniques and ideas from other countries that might be of value to their own; to act as liaison, through the WHO Research and Development Programme, with fellow workers all over the world; and generally to be a focal point of national activities in the field of community water supply research and development activities.

#### Identification of Research and Development Needs in Developing Countries (agenda item 2.1)

This topic was introduced by Dr Wilfredo I. Reyes, Associate Professor of Public Health Engineering, Institute of Hygiene, University of the Philippines, Manila, Philippines. Dr Reyes drew attention to the different approaches necessary in dealing with urban centres and fringe areas, and in areas of wide rainfall variation.

He stressed the importance of adequate data on the status of community water supplies, including activities, organization, legislation, patterns of utilization of water supply facilities, and development plans as a basic for defining research and development needs.

#### Discussion

Several participants emphasized that research and development institutions should have as a first obligation serving the national water supply research needs. The network of collaborating institutions through co-ordination of research undertakings could be mutually helpful in meeting the needs of individual countries. To facilitate this collaboration, a suggestion was made that the International Reference Centre undertake to stimulate the collaborating institution to develop national research plans in their respective countries. This information might then be collated by the International Reference Centre, thus enabling the matching of research interests to achieve a co-ordinated programme. The preparation of a world-wide master plan for water supply research could possibly be evolved in this manner. After some discussion, this proposal was endorsed as a recommendation to WHO and the International Reference Centre.

The need was agreed of finding ways of reducing not only capital costs, but also recurrent expenditures on operation and maintenance.

Consideration of the institutional base for research and development centres revealed some advantages and disadvantages of the university-based centre as related to the independent autonomous centre. It was pointed out that university-based institutions meet obstacles to the formation of realistic research and development programmes, find it difficult to maintain close contacts with operating agencies, and encounter many competing pressures for allocation of resources. On the other hand, universities were defended as sometimes possessing greater versatility, flexibility and resources of varied disciplines. It was pointed out that universities must relate to the society in which they exist if they are to maintain viability. Universities are helpful in cultivating interest in research among students, and offer many opportunities for individual research efforts to be carried out at little direct cost.

The point was made that there is enough work to be done to justify utilization of all available research resources and that universities and independent research centres have frequently been able to collaborate to their mutual advantage.



Research and development activities undertaken by institutions outside a country present problems unless the habits and customs of the user country are fully considered. Research workers based in other countries need to gain experience through association with the people and problems of the country utilizing their findings.

The financing of research and development centres is admitted to be a widespread problem, and several possible solutions were described. Financial support of research centres by the water supply industry has advantages in some instances, especially in achieving more effective application of research findings. Such support by industry is achieved in one country by basing membership fees on a percentage of water revenues, and in another by basing them upon volume of water produced.

Collaborating institutions could compare their own design criteria with those of nearby countries as a method of reviewing the validity and rationale of their own standards. Such outside comparison can be productive and useful.

Some research workers within the developing countries tend to accept without adaptation results of research carried out in industrialized countries. Research could profitably be undertaken in their own field installations under operational conditions.

Studies should be undertaken of public attitudes toward payment for water. There was a general consensus that the use of sociological and anthropological techniques could be helpful. Design practice might well take into account what rates people are willing or able to pay as opposed to design based upon agreed physical criteria, which may require unrealistic water rates to finance the water supply improvement. Pilot programmes of this nature are under way in Senegal and India.

The International Reference Centre might ultimately consider providing initial support in the form of "seed money" for projects undertaken by collaborating institutions. Although such financing might be small, it would have a value in demonstrating local competence. At this time, the International Reference Centre has no funds available for this purpose.

The collaborating institutions should support the organization of professional societies within their countries, and internationally.

In recommending maximum concentrations of deleterious substances, e.g., lead, cadmium, selenium, in water, collaborating institutions should consider total body intake including air, food, and other sources of exposure.

Seldom are technical problems met with in developing countries for which purely technical solutions do not already exist. What is more likely to be the case is that such solutions as found in the developed countries for similar problems are not applicable, either due to the high degree of sophistication involved or to the lack of foreign exchange for the importation of plant and equipment.

Another point which has to be borne in mind is that professional staff engaged in the provision of community water supplies in developing countries must re-orient their thinking and be ready to use what might be considered "unconventional" equipment and methods and to prescribe standards that are more suited to the reality of the situation. This problem is very real.

## Identification of Research and Development Needs in Developed Countries (agenda item 2.2)

This item was introduced by Dr R.G. Allen, Director, The Water Research Association, Medmenham, Bucks, UK.

Acknowledging the prevailing limitations of resources for research and development, Dr Allen stated that it is necessary to identify problems and determine priorities. Instinct and opinion can be used for this selection but the choice should depend substantially on relating benefit-cost ratios, which are not easy to apply in this field.

Research and development programmes should be well planned with appropriate allocations to fundamental research, applied research, introduction and assimilation of results of applied research, formulation of standards, and training. Results must be timely and must respond to community desires, which do not always coincide with needs. Attention must be given to waterworks economics, finance, administration and management. The programme should follow a carefully prepared long-range plan.

The research and development institutions should be organized to reflect the administrative structure of the water supply industry in the country, must strive to relate to the needs and desires of the user and should seek to derive some revenue from those using the results of the programme.

Dr Allen suggested that an important function of research and development centres in developed countries is to assist their countries in providing aid to the developing countries. In this effort, one must guard against applying techniques developed in one country for use in others, but should develop methods best suited to conditions of the consumer locality.

WHO can assist in the establishment of research and development centres in the developing countries by:

1. Finding more efficient ways of promoting effective research in universities, recognizing the problem of continuity of research staff.
2. Developing guidelines for national governments about to establish or re-organize research operations in the water supply field, including preferred type of organization and size of effort.
3. Promoting research into techniques useful to national governments which stimulate a national demand for better water supplies.

### Discussion

Discussion of the needs of developing countries for water systems designed to match local conditions and resources brought out the importance of considering the availability of local labour, which factor might dictate the economy of labour-intensive design rather than equipment-intensive design. Consulting engineers have at times given inadequate consideration to local needs and operational problems, basing their work on design standards and practice more appropriate to their home countries. Research and development institutions have an obligation to assist in economic and engineering studies, and to work for the relation of design to the local situation. Sophisticated automation and mechanization of water treatment plant units should be avoided in most developing country situations.

Research undertaken in collaborating institutions within the developing countries should not ignore the relationship between water supply and waste water treatment. The developing countries should avoid the mistakes made by the industrialized countries during their earlier stages of development.

While most industrialized and developed countries have the resources to deal with research and development needs specific to their own countries, it would be of value to international organizations such as WHO, as well as to associations such as the IWSA, if areas where international action is indicated could be clearly defined. Another aspect of this question is that notwithstanding the fact that developing countries would want to encourage the use of local materials and techniques as much as possible, there would still be a need for importation of certain items (e.g., treatment chemicals, plastic pipes). In such situations, the experience of developed countries, particularly with regard to standards, toxicity, etc., would be of immense value, not only in assessing products that are imported but also in establishing norms for production within the developing countries concerned.

Community water supply research should be undertaken within the context of total national water resources planning, and should be related to both long- and short-term planning.

Support to Research Institutions by WHO's Research and Development Programme through IRC (agenda item 3)

This topic was introduced by Mr T. Verheul, Director of the WHO International Reference Centre for Community Water Supply, The Hague, Netherlands, who outlined the tasks, duties, organization and ultimate goals of the IRC.

The Centre is expected to work with and to benefit both developing and developed countries. It has as its objectives (a) the stimulation and co-ordination of research and development on drinking water supply and (b) the development of criteria for design and operation of water supply facilities. These objectives will be followed with the assistance of the collaborating institutions. A list of the functions of the Centre is attached as Annex C, together with a list of additional functions suggested by participants.

The progress of work at the Centre was described briefly and reference was made to the first annual report that has been sent to all participants.

The primary function of the Centre, particularly in the initial stages, is seen as data collection, documentation and information exchange, including collection of relevant information from available sources such as collaborating institutions, water supply undertakings, national and international organizations, universities; literature, conferences, journal abstracts, etc; storage and retrieval of data. It is anticipated that a periodic newsletter will be published starting in the near future. It was the consensus of the Conference that such a newsletter is essential for keeping collaborating institutions and others interested informed of research and development activities world-wide. Planning also calls for a news bulletin in waterworks development and research progress, and related news, for the information of public authorities and administrators.

Other activities of the Centre will include co-ordination of research and development, publication of guidelines and criteria for the design of community water supplies, and compilation of information on training activities within collaborating institutions and elsewhere.

## Discussion

It was considered by the Conference that it would be desirable for the Advisory Board of the IRC to broaden its membership to secure expression of the needs of the collaborating institutions within developing countries.

Discussion also focused on various IRC services such as the provision of information, abstracts, translation services, maintenance of data banks, bibliographic services and catalogues of training opportunities. The need of a wide spectrum of services was recognized. Many questions of detail were asked but it was realized that the IRC is new and has to feel its way. It must evaluate the demands for its services against limited available resources. The resolution of many questions of operational detail can and will be resolved only by operational experience.

The IRC will attempt to use existing abstract services to the maximum possible extent and will call on collaborating institutions for assistance in responding to requests for information.

It is realized that initial input must be screened or the IRC is likely to be completely engulfed in paper. However, the consensus was that coverage of water supply and health relationships should be especially thorough.

The preparation of state-of-the-art and background papers would be helpful on such subjects as the relationship of water quality and cardiovascular diseases, and a compilation, by country, of expenditure for research and development and for capital investment in community water supply.

It was suggested that the IRC might also consider sponsorship of symposia. Mr Bierstein of WHO invited collaborating institutions to submit ideas for symposia, conferences and seminars that might be sponsored directly by WHO.

It must be emphasized that communication is a two-way process and the IRC, or for that matter WHO, cannot give out information that they do not have. It is necessary, therefore, for collaborating institutions to realize that the more information that they want from the IRC and WHO, the more information they must furnish.

## Needs of Research Institutions (agenda item 4)

This topic was introduced by Mr T.M. Aluko, Senior Research Fellow, Faculty of Engineering, University of Lagos, Lagos, Nigeria, who pointed out the wide spectrum of background, functions and experience of the collaborating institutions. He then spoke primarily of the needs of the newer collaborating institutions from the developing countries. They are often handicapped by their newness, small staffs, other demands on their resources ( e.g., teaching is the primary aim of many of the collaborating institutions), secondary interest in research and diversion of research interest to problems of "dirty water".

These institutions frequently need staff training and strengthening, laboratory equipment and literature resources.

The role of the International Reference Centre in assisting these collaborating institutions would be primarily to enable them to develop and improve liaison with more established organizations and to strengthen the informational resources available to them.

## Discussion

Discussion centered on a number of activities and programmes that would assist in meeting the needs of these collaborating institutions and in promoting the ultimate objective of better water supplies.

Various methods proposed included visits and exchanges between research workers in the collaborating institutions, sponsoring of fellowships, and advice from consultants. The function and programme of travel fellowships and consultantships must be precisely defined in order to be effective. Consultants should have local counterparts, such that the work undertaken will be continued following the departure of the consultant.

Although some institutions are small and lacking in resources, they should, nevertheless, "get on with it". Much university work can be done by individual research workers, student help can be used to supplement staff, research project proposals can be prepared in advance for seeking funding support, and teaching laboratories can also be utilized for research.

It should always be borne in mind that, if research and development work is to be completely useful and effective, it should be done by the residents of the country concerned where at all possible.

The need for research capability beyond the physical and engineering sciences must be recognized. The economic and social benefits of water supply particularly need to be studied.

A useful service that might be provided by the International Reference Centre would be publication of case studies of water supply research and development success stories.

Support and assistance for water supply research institutions is a continuing problem requiring intensive attention. Research and development programmes are born in, and must relate to, the water supply industry itself. Therefore, industry can and should be a source of support. The organization of research institutions should be carefully planned to enable them to be responsive to needs and opportunities. They require promotional efforts to maintain their stature and acceptance. In the case of forming a new institution, or strengthening a weak institution, the possibility of a twin or co-operating relationship with a nearby stronger institution was suggested.

Another technique proposed was that research laboratories should make available to other collaborating institutions any unique specialized services or capabilities they have acquired. The current trend of bilateral agreements in scientific research suggests a framework for such a relationship. There may be some situations where assistance for research and development programmes might be obtained through development loans by international lending institutions.

The United Nations Development Programme (UNDP) has provided financial assistance in the establishment of several sanitary engineering research and training centres. This assistance has included funds for equipment, consultants, fellowships, vehicles, etc.

Pre-investment projects, funded by UNDP, may sometimes include provision for an element of research. The International Reference Centre could be of assistance to collaborating institutions in providing information on international and foreign sources of potential support for research institutions. The point was made that there is no substitute for initiative, drive and imagination in undertaking the formation of a research centre.

The needs of countries which do not yet have institutions specifically devoted to research in the community water supply field merit special attention. In such cases, this task frequently falls on an academic institution, such as a university, whose main function is training. While such research would normally be undertaken by the faculty, it might be necessary to augment the strength of the faculty in order that they would have some leisure time from training activities that could be devoted to research. The general practice is to use students to carry out research projects under the guidance of one or more of the faculty staff. This works to the advantage of the faculty, the student and the country at large, but has certain shortcomings which have to be borne in mind and overcome. The tendency in such a situation is for students to take up projects that are more amenable to laboratory work, and those that can give results within the period of their graduate studies. This has the effect of ignoring subjects of vital importance that can only be pursued by studies of longer duration and often requiring field study by a number of scientific staff. Arrangements might be considered by which students could be given credit for working on a part of a long-term project while they are in the university, preferably in association with an operating department.

The possibilities of fabricating research equipment locally for the conduct of field trials and field testing need to be fully explored. There are certain items of testing equipment needed by research institutions in developing countries which may have to be imported from abroad, but the construction of simplified indigenous equipment and instrumentation for routine use of laboratories and waterworks would not only result in better operation of service facilities, but also result in saving of valuable foreign exchange. In special cases where equipment of high sophistication is required, it might be possible, by mutual arrangements, to have the tests carried out in another institution where such facilities are available.

#### Application of Research and Development (agenda item 5)

This topic was introduced by Dr H.I. Hamid, Head, Civil Engineering Department, University of Khartoum, Sudan. Dr Hamid emphasized the importance of application of research findings, suggesting that research should be directed to the solutions of problems, or development of new techniques or methods, with specific practical application. Pointing to the lack of communication between research workers and operating personnel, he suggested that some means of association should be established. It would be helpful for engineering students to engage in research of a practical nature, under supervision of field personnel, to cultivate a research awareness.

Seminars and symposia, coupled with opportunities for practising engineers to engage in research, and for research workers to gain field experience, would help to overcome the mutual lack of understanding and appreciation between these groups.

#### Discussion

In the context of the WHO Community Water Supply Programme, research and development can help to achieve the ultimate objective of bringing water to people in need. Application of research and development results are, therefore, highly essential.

A variety of techniques were proposed for securing wider and more prompt acceptance of research findings with practical implications. The IRC might consider preparation of a programme kit for the presentation of new techniques, methods, materials and equipment to the water supply field. A selection could be made from reports of recent research findings for such a programme kit to be field tested.

Collaborating institutions could be helpful in sponsoring seminars on research findings, not necessarily limited to their own activities, to promote their adoption and get reactions of practising engineers. Pilot or demonstration projects can be most helpful in evaluating feasibility and promoting adoption of new techniques or equipment.

One country (India) had organized a series of action-oriented conferences between top level research and operating personnel. Technical publications, journals, brief technical digests, films and other media also have a place in promoting research application. The need for selective and prompt application in the developing countries is urgent, but often difficult to achieve. All available techniques for stimulating application should be employed.

One suggestion called for the evaluation of research programmes by the extent of application of their results and improvements achieved thereby. An experience was cited in which it was found practicable to adopt a target period of time for arranging the implementation of research findings. A project in Poland supported by UNDP, with WHO as the Executing Agency, is related to the control of water pollution and to water supply investigations, involving a plan of studies, a work programme, an organizational and co-ordination study and a plan of developmental studies. Provision is made in the project for collaboration by laboratories in research institutions, and by a university, in the development of a training programme.

An encouraging development was noted in the recent establishment of three regional graduate programmes of sanitary engineering to include research programmes. Note was taken of the problem of stimulating student and faculty interest in research in the developing countries, due to the limited opportunity for professional recognition. Professional societies might be organized to improve this situation.

It is of great importance that research institutions should have continuing and close liaison with operative ministries or departments and carry out their field trials or pilot projects as much as possible in collaboration with them on actual installations wherever possible. Such liaison would also enable the operative departments to present their problems to the research institutions. A mutual confidence would thus be built up. There would be other advantages in such collaboration. Research institutions such as universities might have the technical qualified supervisory personnel but lack facilities and funds for carrying out field research. Operative departments, on the other hand, might have the funds, the equipment, plant and other facilities but be unable to spare their over-worked professional staff for conducting field studies. A linking up of the research institution and the operative agency in such a case would be the obvious solution. Where a new technique is developed, a research institution would find it of great advantage to establish field centres where staff of operative agencies could be trained in the new techniques by actual demonstration.

#### Standardization and Simplified Design (agenda item 6)

This topic was introduced by Professor T. Ishibashi of the Faculty of Engineering, University of Tokyo, Japan.

Professor Ishibashi suggested that standardization is necessary because it saves time and labour, minimizes errors, promotes utilization of less experienced engineers and is required in the process of review and approval by official agencies. He further claimed it offers benefits in saving construction costs, making design, construction, operation and maintenance easier to carry out, and facilitating the provision of construction materials. One drawback to standardization is the possibility of discouraging creativeness and originality by consulting engineers and manufacturers.

Standardization is advocated and implemented in various manners; sometimes by executing agencies and, in many countries, by professional societies. Research institutes should work with professional societies and executing agencies in the development of standards and be prepared to offer technical assistance in their application. In one country, a national professional society is responsible for design standards which are revised frequently and which are implemented through training courses and manuals.

#### Discussion

Attention was called to the fact that standards and simplified design may be quite different in application. Standardization of complete designs for waterworks were felt to be impractical and uneconomical. The one exception to this opinion is the case of very small rural water supply systems. While a large part of the standardization activity, especially in designs, would be undertaken by the executing agencies themselves it was felt that research institutions could give valuable guidance and assistance to the concerned operating departments in suggesting new methods, equipment and design procedures. In countries where the executive departments are understaffed, the research and development institution may have to carry the main burden of this task.

Standardization of component units of a water supply system, especially for small and medium sized systems, can result in speeding up design and construction, reducing demands on highly qualified design engineers, simplifying problems of spare parts, maintenance and operation and training. Engineering judgement must be applied in each design situation to avoid unwise and uneconomical selection of units. In the case of small supplies, standardization of component units makes possible the utilization of small local construction firms using local skills, usually at lower costs. Standardization of frequently used equipment items such as pumps, chlorinators, etc., is recognized as good management practice but does present some difficulties in procurement through open bidding.

Standard guidelines and criteria for design of water supply systems are felt to be useful if tailored to local conditions, and not merely accepted unchanged from industrialized countries by developing countries. In any case, they should be subject to periodic re-evaluation in which collaborating institutions could be helpful. In the application of standard criteria, provision should be made for a feed back from field experience and for flexibility in promoting innovative designs and equipment. Standard specifications for water supply materials could serve to protect importing countries especially if the manufacturing country has a certification programme to ensure compliance.

The International Reference Centre could usefully provide collaborating institutions with information on available glossaries of terms used in water supply activities, including terms used in specifications for equipment and materials.

#### Quality Control (agenda item 7)

This topic was introduced by Professor F.E. McJunkin, School of Public Health, University of North Carolina, Chapel Hill, USA, who discussed quality control in terms of the total programme needed by operating agencies; and research and development efforts that could be helpful to the objective of adequate water quality. The importance of source protection, sanitary surveys, establishment of standards, definition of responsibilities, establishment of laboratory controls, records and operating systems, development of quality surveillance programmes, implementation of remedial action, protection against contamination of treated water, protection against new threats from reclaimed water, new additives and new construction materials were briefly outlined. Problems relevant to particular systems were also outlined, e.g., such problems as lack of resources, need for simplification of requirements, water control surveillance in rural systems and the need for guidelines for operating and surveillance programmes.



Several suggestions for activities by collaborating institutions were outlined, including:

1. development of water quality awareness by the public, by decision-makers, et al;
2. development of guidelines and criteria appropriate for local conditions;
3. development and demonstration of technology for treatment and surveillance;
4. studies of the relationships of quality parameters to water supply objectives;
5. mutual support by the IRC and the collaborating institutions in "selling" water quality control;
6. evaluation of organizational arrangements.

### Discussion

In the discussion following Professor McJunkin's presentation, it was emphasized several times that water quality sampling had no value unless the laboratory reports reached the operating personnel. It was also noted that many waterworks are grossly deficient in taking remedial action, even when water quality surveillance programmes indicate such a need.

The membrane filter technique offers an as yet unrealized potential in many countries for improved water quality surveillance. It increases laboratory capacity and is suitable for emergency use, such as in epidemics. Comparative costs should be studied, however, in arriving at a choice. Training of technicians to use this equipment is inadequate in some areas. Distribution of a manual, such as the existing manual published by the United States Public Health Service, was suggested.

The development of newer and simpler analytic techniques is needed, e.g., a quick test for chlorine residual. One manufacturer was reported to have developed a dip test for residual chlorine, using a treated indicator paper. Locally developed simple test kits and other laboratory equipment are also needed. An example is the chlorination test kit developed at the Central Public Health Engineering Research Institute, Nagpur.

Attention should be given to the issue of what parameters really should be measured, and how frequently. A suspicion exists that measurement of many parameters is a make-work operation. In developed countries and in developed areas of developing countries, not enough attention is being given to the measurement of algae going into supplies, to the aesthetic qualities of water such as taste and odour, as well as to bacteriological and chemical parameters. It was suggested that in small systems, it might be realistic to go to measurement of chlorine residual almost to the exclusion of bacteriological sampling. Discussion of this observation failed to produce a consensus.

It should be emphasized that water examination is only a tool, a means to an end, and should not lead to neglect of recurring sanitary surveys, e.g., the construction of a latrine next to a well can be readily identified as poor practice without awaiting the results of a bacteriological test.

The regrouping of small water undertakings to form larger systems can result in better water quality control through access to better staff and surveillance. Evolution of national standards for drinking water, testing methods for various waterworks materials and for water quality, would all be appropriate subjects for the attention of a research institution. Where national standards institutions exist, the research institution dealing

with community water supply should advise the national standards institution on proposed standards for waterworks materials and testing procedures. By close liaison with ministries of health, the research institutions could study existing procedures for inspection of waterworks and surveillance of water quality, and suggest means for their improvement. Where training is involved, they could be of assistance in training government staff.

#### Use of National Resources (agenda item 8)

This topic was introduced by Mr J. Arboledo, Regional Adviser in Water Treatment, Centro Panamericana de Ingenieria Sanitaria y Ciencias del Ambiente, Lima, Peru.

Mr Arboledo decried the too frequent occurrence of over-sophisticated design by foreign or national consultants especially in non-industrialized communities. He maintained that many water treatment plants in the developing countries were designed as copies of installations in the highly industrialized countries and created impossible operating and maintenance situations because of the difficulty in obtaining replacement parts and in training operating personnel. Design should be carefully matched to the local situation and should provide for minimum requirements of mechanical equipment that is not produced locally. He presented an example of an actual design that provided conventional complete treatment with no mechanical equipment except three valves. Mr Arboleda maintained that solutions similar to this are possible in many communities.

#### Discussion

Discussion emphasized the need to seek substitutes for imported materials, including such items as substitutes for anthracite coal as a filter medium, for diatomaceous earth, and for coagulant aids. The stimulation of local production of such items as hand pumps and chloride of lime were cited as examples that serve to reduce import requirements. The use of slow sand filters reduces the requirements for mechanical equipment and specially trained operating personnel. A plea was made that all collaborating institutions be alert for information on new developments in the use of natural resources and provide such information to the International Reference Centre for world-wide dissemination.

#### Research Work in Yugoslavia (agenda item 9.1)

This topic was introduced by Professor Miloje Milojevic, Associate Professor of the Civil Engineering Faculty, Belgrade, Yugoslavia.

Professor Milojevic presented an interesting description by way of background on water supply conditions in Yugoslavia, citing the varied rainfall patterns and groundwater distribution. Increasing use will have to be made of surface water sources with the rapid growth of urban areas, which now include three-quarters of the population. Slightly less than 40 per cent. of the total population is served by piped public water supplies. The per capita consumption varies from less than 10 litres to 500 litres per day. Epidemics of water-borne enteric diseases are a rarity. Emphasis has recently been placed on public water supply development. Hydro-power development had been considered for years after the second World War of primary importance as a basis for economic development. Progress of development, including standard of living and urban growth, has brought about greater attention to water supply needs in the past 10 years. Research activities relating to water supplies are conducted in universities, research institutes, institutes of public health and others. Emphasis has been given to research on groundwater resources, sea water, water impoundments and water treatment. Individual problem cases are receiving special attention by research organizations. There is a large amount of research conducted in co-operation with foreign institutions and in collaboration with multilateral organizations such as WHO, FAO, UNESCO, ECE, etc. These programmes frequently include fellowships for educational travel and

graduate training. Training institutions exist in Yugoslavia for qualifying research personnel in all disciplines for water supply research. Auxiliary personnel are trained in special high schools and vocational schools exist for training in labour skills.

### Discussion

Frequent reports of disease conditions related to water supplies in Yugoslavia have been thoroughly investigated, but a definite relationship could not be confirmed.

### Other items not discussed before (agenda item 9.2)

Mr Martijn, Manager of the International Reference Centre, reported on the responses to a questionnaire that had been circulated to the Conference participants a few days previously. The questions and responses were tabulated as follows:

- A. Give at least three but not more than five research items of great interest for the water supply in your country
1. Studies on water resources, such as:  
Surface water and groundwater;  
Desalinated salt and brackish water and the conjunctive use of the several types of water;  
Artificial groundwater recharge;  
Methods for designing optimum water systems.
  2. Survey of per capita consumption in small communities  
Methods of evaluation.
  3. Education  
Methods of education of small communities to recognize the value of good water and the justification of water rates.
  4. Treatment plants and processes  
Evaluation of existing and new treatment plants, processes and distribution systems.  
Important are: simplification of design  
simple pumps  
use of local materials  
water treatment in disaster circumstances  
unconventional forms of filtration  
re-use of sewage for water supply
  5. Quality control  
Quality control of water from the source to the tap.  
Special topics are: standards  
survival of vibrios  
water quality in wells  
cleaning of pipes  
chemical analysing methods  
water quality in impoundments

nitrate in groundwater  
coagulant aids  
simplified field testing equipment  
protection of water resources.

B. What support do you expect from the IRC with regard to items not yet being carried out?

- a. Documentation of research and development activities and findings.
- b. Assistance in training and education.
- c. Determination of identical research projects being performed in more than one institution, and advancement of proposals for collaboration in such situations.
- d. Evaluation of equipment and research findings.
- e. Assistance in promoting financial support and political acceptance.

C. Is there a national research and development plan for water supply in your country?

This question seemed to be difficult because there is a difference between a research plan and a development plan. Roughly it appears that in 50 per cent. of the countries covered by the questionnaire a research and development programme is available.

D. What sort of service do you expect from the IRC in the field of documentation?

- a. Supply information as to sources of literature.
- b. Supply up-to-date information on research and development.
- c. Publish a periodic digest of research projects as a newsletter.
- d. Provide data and news of achievements by collaborating institutions, for use in promoting support of research and development.

E. What sort of service do you want from the IRC in the field of training?

- a. Distribute announcements and descriptions of training programmes.
- b. Help in organization of training courses.
- c. Assistance in organization of short courses in the country and study trips for local staff.
- d. Assistance in arrangements for exchange of scientific workers and experts as consultants.

F. Are you willing to act as a twin institution?

All of the responding collaborating institutions indicated willingness to serve as a twin institution with some responses specifying certain limiting conditions.

Discussion

Mr J. Lieffering of the IRC reported that it is the intention to produce for regular distribution two kinds of newsletter: one will be designed to inform the collaborating institutions and other research organizations on current activities in the field of water supply research and development. The second will be directed toward public authorities and administrators, with reports on progress in community water supply research and development.

It was requested that collaborating institutions provide to the IRC monthly reports of items suitable for inclusion in these newsletters. Such news items should not be limited to activities of the responding institution, but should include national developments and activities by other organizations. A specific request was made and accepted that the first working day of each calendar month be the target date for transmission of these news items.

The IRC should consider forwarding to collaborating institutions a regular list of the questions asked of them so that interested institutions could call for copies of the replies given.

The discussion then concentrated on the identification of tasks or functions that collaborating institutions might undertake following the Conference. Consensus was achieved on the following tasks:

1. Collaborating institutions should send to the IRC a selection of appropriate documents from their countries including reports of national laboratories and related institutions.
2. Collaborating institutions should provide the IRC with a list of research activities in the field of community water supply with particular emphasis on the use of local materials and simplified designs.
3. Collaborating institutions should provide to the IRC a description of special testing facilities or unique capabilities that could be made available as a service to other laboratories or collaborating institutions, with the objective of developing a system of reference laboratories.
4. Collaborating institutions should advise the CWS Unit of WHO of the names of individuals or laboratory teams that could be made available for service in disaster emergency situations.
5. In those countries which do not have a national plan for research and development in community water supply, collaborating institutions should take the initiative in stimulating and supporting the development of such a plan. These plans, when available, should be provided to the IRC who might be expected to consolidate them into an international master plan for research and development in community water supply.
6. Collaborating institutions should become acquainted with the national community water supply programme, its problems and achievements, and establish a continuing dialogue with the executing agency.
7. Collaborating institutions might examine the possibilities for exchange of scientific workers through a "twin" relationship or other mechanism. It was reported that WHO has limited funds that might be utilized to support this activity. Requests should be submitted to WHO headquarters.
8. Collaborating institutions are advised to initiate some research and development projects designed to contribute directly to the country's community water supply programme.
9. Each collaborating institution should identify for the IRC those programme areas in which the collaborating institution is willing to associate with other institutions on group work projects of mutual interest.
10. Collaborating institutions should prepare annual reports on progress and activities, providing copies to the IRC and other collaborating institutions. In this connexion, it was urged that reports include descriptions of failures or unsuccessful projects with diagnoses of the reasons.
11. Collaborating institutions are advised to develop long-term programme plans with specific one-year plans relative thereto, and to provide the IRC with copies of these documents.

12. Collaborating institutions should exchange newsletters and other periodic publications with other members of the network and should take advantage of every opportunity to visit other collaborating institutions, especially in connexion with attendance at international conferences.
13. The International Reference Centre and WHO should identify specialized consultants who might be made available in various geographical areas for short-term assistance to collaborating institutions. A WHO spokesman explained that provision for short-term consultants in community water supply is included in the programme and budget each year. Requests for such services should be submitted to the appropriate WHO Regional Office.

In response to an appeal for assistance in providing collaborating institutions with technical publications for reference libraries, Mr Bierstein of WHO explained that modest assistance may be available if requests are submitted through Regional Offices.

The availability of bilateral assistance was also suggested by Mr Swisher of the US Agency for International Development. A further suggestion was made that the IRC in its newsletter could appeal for contributions of library collections from retired engineers or from survivors of deceased engineers.

A spokesman for WHO announced that the Organization annually provides modest support for a few water supply research projects and suggested that WHO would welcome proposals, especially from developing countries. Proposals should be submitted to the IRC.

Dr Teodor V. Ghurgjevic, Consultant, "Andrija Stampar" School of Public Health, Zagreb, Yugoslavia, described a historical public health action by the government of Dubrovnik, in the enactment of the first international maritime quarantine regulation. A regulation was adopted by the government of Drbrovnik in 1377 which provided that any travellers from plague-infected regions must purge themselves by a 30-day period in confinement on a designated island or section of the old town (Cavtat).

#### Cholera

At this point, the Conference adjourned to re-convene as an ad hoc committee for discussion of problems related to cholera epidemics.

This discussion produced agreement that all countries should prepare emergency plans for action to be taken in the event of the introduction or resurgence of cholera. Collaborating institutions were urged to stimulate this undertaking, and to arrange for sanitary engineering expertise to provide leadership in planning for preventive measures.

#### Field Trip, 13 October 1970

The field trip of 10 hours took the Conference participants to view several interesting water supply sources, including the emergence of an underground river and traces of ancient roman aqueduct works. Especially interesting were the source, fountains and reservoir of the old water supply system of Dubrovnik, dating back to 1358 A.D.

Concluding Session - Presentation and Review of the Conference Report

The Conference Secretary explained that a printed report would be produced for distribution primarily to the collaborating institutions and the International Reference Centre, also the Conference co-sponsors and other interested organizations. The report would include the substantive content of the draft as approved by the Conference, with selected background information from Conference documents, and appropriate appendices.

The draft report of the Conference proceedings, as submitted by the Rapporteurs, was then studied paragraph by paragraph. Comments and suggestions for changes in presentation and content were adopted by consensus action.

Closing Remarks

Conference participants expressed their unanimous appreciation to the co-sponsoring organizations, citing the conviction of the group that this Conference will prove to be a milestone in furthering the co-ordination and strengthening of the water supply research and development network of collaborating institutions. They strongly urged that provision be made to hold a second conference in 1972.

INTERNATIONAL CONFERENCE ON RESEARCH AND DEVELOPMENT  
IN COMMUNITY WATER SUPPLY

Cavtat, Dubrovnik, Yugoslavia

7 - 14 October, 1970

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MR VILIM CRLENJAK	Secretary to Director Institute of Public Health of Croatia (French language secretary to Conference)
MRS IVKA MANAS	Sanitary Technician, Department of Health Education Institute of Public Health of Croatia (Local secretary to Conference)
MR VIKTOR BELE	Chauffeur, Institute of Public Health of Croatia

From 11 October onwards:

DR TEODOR V. GHURGJEVIC	Consultant, "Andrija Stampar" School of Public Health Rockefellerova 4 <u>Zagreb</u> Yugoslavia
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INTERNATIONAL CONFERENCE ON RESEARCH AND DEVELOPMENT  
IN COMMUNITY WATER SUPPLY

Cavtat, Dubrovnik, Yugoslavia

7 - 14 October, 1970

Provisional Agenda

Note: The Conference will take place in the Conference Hall of Hotel Albatros (where participants will be housed) in Cavtat on the Adriatic Coast, 17km south of Dubrovnik, Yugoslavia.

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7 October 1970 - Wednesday

Registration

Finance and travel arrangements of participants  
(Admin. Officer)

Conference arrangements

- explanation of interpretation and other physical arrangements
- issue of Conference documents

OPENING SESSION

Inaugural address on behalf of the Government of Yugoslavia by His Excellency Dr Nikola Georgievski, President of the Federal Council for Health and Social Policy

on behalf of the Government of the United States of America by The Honourable William Leonhart, US Ambassador to Yugoslavia

on behalf of WHO by Mr C.H. Atkins, Director, Division of Environmental Health

Election of Chairman

Appointment of Rapporteurs (English and French)

Opening Statement on WHO's Research and Development Programme in Community Water Supply, and purpose of meeting - Mr Paul Bierstein

Adoption of Agenda and Conference procedures

WORKING SESSION I

(Names of participants who are expected to introduce the subjects for discussion will be shown subsequently)



Agenda item 1

- 1.1 Rôle of Collaborating Institutions in Developed Countries
- 1.2 Rôle of Collaborating Institutions in Developing Countries

8 October 1970 - Thursday

WORKING SESSION II

Agenda item 2

- 2.1 Identification of Research and Development Needs in Developing countries
- 2.2 Identification of Research and Development Needs in Developed countries

WORKING SESSION III

Agenda item 3

Support to Research Institutions by WHO's Research and Development Programme through IRC

9 October 1970 - Friday

WORKING SESSION IV

Agenda item 4

Needs of Research Institutions

WORKING SESSION V

Agenda item 5

Application of Research and Development

10 October 1970 - Saturday

WORKING SESSION VI

Agenda item 6

Standardization and simplified design

WORKING SESSION VII

Agenda item 7

Quality control

12 October 1970 - Monday

WORKING SESSION VIII

Agenda item 8

Use of National Resources

WORKING SESSION IX

Agenda item 9

9.1 Research work in Yugoslavia

Briefing on field trip

9.2 Other items not discussed before

13 October 1970 - Tuesday

Field trip

14 October 1970 - Wednesday

CONCLUDING SESSION

Presentation of report by rapporteur(s)  
Consideration and adoption

## Discussion Notes

The following notes on various agenda items are submitted as a basis for discussion only. They are not intended as pronouncements or statements of policy; each may be (and, it is hoped, will be) questioned or contradicted. Equally it is not suggested that discussions should in any way be limited to the points raised. The purpose of submitting them to the Conference is merely to provide some ideas on points which might be considered worthy of consideration.

### Item 1

#### 1.1 Rôle of Collaborating Institutions in Developed Countries

Inevitably the chief emphasis of the WHO Research and Development Programme must be on the needs of Developing Countries, where the needs are greater, and the facilities for filling these needs less, than in the more industrialized parts of the world.

It has been shown, however, that the machinery of coordinated approach to common problems, exchange of information, and contact between individual research workers made possible through the International Reference Centre and Collaborating Institutions can be of benefit to developed and developing countries alike, and that, with the growing emphasis upon environmental problems throughout the world, these benefits are likely to increase in the future.

Much work on research in the water supply field is already being carried out in individual countries, and duplication of effort through lack of information on similar work being undertaken elsewhere has occurred in the past. National standards and criteria laid down as a result of these research activities vary from country to country, and it is believed that confusion would be avoided if early and informal exchange of ideas and preliminary findings could be arranged between individuals and institutions engaged upon similar investigations. The WHO International Reference Centre is available as a focal point for such interchange of information.

The establishment of a Literature Scanning and abstracting service, pool of information, facilities for translation and similar activities (which, it is hoped, will be increasingly undertaken by the International Reference Centre) will also strengthen the efforts of Collaborating Institutions in developed and developing countries alike.

As a result it is believed that Collaborating Institutions can become national foci of water research and development information and expertise, and a link between national activities in this field and work being carried out in other countries. Through their own efforts, and through their contacts abroad, they will keep abreast of technical developments and emerging problems, and should become recognized as the repositories of the most up-to-date information of this sort.

With the present day hazard of carriers of epidemic diseases being conveyed half way round the world in a couple of days no country can be completely safe from such diseases as long as they exist anywhere in the world. With the growth of tourism dangers of epidemic introduction equally exist from returning nationals. Collaborating Institutions should play a part in urging Governments that disease knows no frontiers and that national safety may be dependent upon eliminating waterborne epidemics in their homelands.

One way this may be done is support to Research and Development Institutions in other parts of the world by similar Institutions in industrialized countries. Ways in which such support may be given could well arise in discussion at this Conference.

## 1.2 Rôle of Collaborating Institutions in Developing Countries

As a general rule it may be said that the best place to study and solve national problems is within the country concerned.

All over the world there is an increasing activity in water supply construction, urban and rural, as Governments realize more and more the vital rôle of safe water supplies in improving the health and the economic and social well being of their people. International and bilateral financial assistance in this field is growing year by year, and a greater share of national funds is being directed to the same purpose.

Shortages of trained and qualified staffs result in those responsible for planning, design, construction, maintenance and operation of water supplies becoming increasingly overloaded with work. As a consequence the easiest way out has to be chosen, traditional methods are adhered to because of the lack of time and staff to improve and adapt these to meet new conditions. Difficult problems tend to be neglected when equal effort may make a greater or more rapid impact elsewhere.

In Research Institutions and in Universities are concentrated present and future specialists; men qualified and experienced to study and think and who are not bound by the constraints and budgets of their colleagues in the operative departments. It is firmly believed that if these men can devote their skills and ideas to the identification and solution of their country's water problems, to devising methods of improving efficiency, reducing costs, experimenting with new techniques, to adapting methods that have proved successful in other countries to the needs of their own, the result cannot fail to be beneficial to their fellow citizens everywhere.

A further point is that it is from the ranks of University students that the future leadership and senior staff of the national operative departments and ministries will be drawn, and they will carry with them the ideas, approaches to problems, and capacity for logical thought that the solutions of these problems entail, into their future professional careers.

## Item 2

### Identification of Research and Development Needs

#### 2.1 In developing countries

On a global basis, in urban areas of developing countries that are member-states of WHO only about one-third of the people are supplied with water in their houses or courtyard and about an equal number from public standpipes.

In rural areas, less than 10% of the populace are supplied with safe water.

This is the position indicated by the Director General of WHO in his report to the Twentythird World Health Assembly held in May 1970.

The reasons for such a poor state of affairs are many. For the purpose of this Conference, it is necessary to identify those technical problems that await solutions applicable in the conditions prevailing in developing countries. Some of these questions would be capable of study within the country concerned; others might need to be referred elsewhere.

The various agenda items for this meeting are of course inter-related and identification of research needs is not as easy as it might appear at first sight. The plans of the Governments, and the resources available, will have to be taken into consideration in determining research needs rather than consider this question purely from a scientific or technical point of view.

Seldom are technical problems met with in developing countries for which purely technical solutions do not already exist. What is more likely to be the case is that such solutions as found in the developed countries for similar problems are not applicable, either due to the high degree of sophistication involved or due to foreign exchange for the importation of plant and equipment not being available.

The second point which has to be borne in mind is that professional staff engaged in the provision of community water supplies in developing countries must reorient their thinking and be ready to use what might be considered "unconventional" equipment and methods and prescribe standards that are more suited to the reality of the situation. The problem is very real.

In the classical mode of training, the engineering student was seldom faced with the economic problem of making the meagre resources of the country go the longest way, the problem of foreign exchange, the need to use labour intensive techniques, etc. Innovation and improvisation is indeed in some cases frowned upon as a lowering of professional standards. Is it surprising that such an engineer overworked in a Government department prefers administrative ease and seeks designs and specification on standard conservative lines that have proved their value in the past? This is the easy way out, but it results in over-design for the privileged few and nothing at all for great masses of population.

Another aspect to bear in mind is that even professional workers of some standing who know their country well are on their field tours surprised to find that actual problems are rather different from what they thought they were. The importance of contacts with executing departments, local officials and most important with the local people in determining the real needs, cannot be too highly emphasized. Having determined these needs they have to be categorized not only in some order of priority but also subdivided into stages of development that would be related to national resources and plans if these exist.

Methods by which the needs can be identified should be elaborated. This would assist countries which do not as yet have the administrative machinery to identify them.

Where research problems are already known, these, if submitted to the IRC, could be compiled to see which problems are of more general interest, and which of special interest to certain countries only.

## 2.2 In industrialized countries

The problems here would be classified as those that would primarily be of interest to industrialized countries and those that would be of relevance to developing countries as well.

An example of the former would be a comparison of different national standards for new water supply materials and test procedures. Techniques for the establishment of better preventive maintenance systems would be an example of the latter case.

While most industrialized and developed countries have the resources to tackle research and development needs specific to their own countries it would be of immense value to international organizations such as WHO as well as associations such as the IWSA in areas where international action is indicated could be clearly defined. Another aspect of this question is that notwithstanding the fact that developing countries would want to encourage the use of local materials and techniques as much as possible, there would still be a need for importation of certain items (e.g. treatment chemicals, plastic pipes) on which the experience of developed countries, particularly with regard to standards, toxicity, etc. would be of immense value, not only in assessing products that are imported but also in establishing norms for production within the developing countries concerned.

### Item 3

#### Support to Research Institutions by WHO's Research and Development Programme through the IRC

The background document on WHO's Research and Development Programme in Community Water Supply gives the objectives of the programme and some of the methods by which these objectives are sought to be achieved. This document has been prepared by the WHO Secretariat, based on their experience of WHO's assistance to Member States in this field over the last 20 years. However, if the programme is to be effective in dealing with the actual needs and problems of Member States, it is essential, as has been pointed out on the document itself, that Collaborating Institutions should make known their problems and priorities. One of the purposes of this conference is for the participants gathered here to review this document and indicate what changes, if any, need to be incorporated.

Some of these needs have already been given by collaborating institutions in answer to the questionnaire sent to them by the IRC. These will be studied and summarized.

For instance, on the question of exchange of information:

- what type of information is most required?
- abstracts of literature from technical journals?
- results of ongoing field studies in various projects  
which might not have been published?
- translation from literature in other languages?
- would the participants recommend any special system  
of collection and dissemination of such data?
- how best could existing data systems be used?

In all of these, it must be emphasized that communication is a two-way process and the IRC, or for that matter WHO, cannot give out information that they do not have. It is necessary, therefore, for collaborating institutions to realise that the more information that they want from the IRC and WHO, the more information they must be prepared to furnish WHO and the IRC who could, in turn, disseminate such data to the other collaborating institutions. As the field of community water supply is so varied, one must be careful to identify subjects of importance to the majority of participants.

Would the conference consider exchange of information at an informal technical level of value? In what way could the IRC fulfil this?

The IRC's responsibilities, as well as the duties of the collaborating institutions, are also defined in the background document (CWS/70.6). In what respect should this be amended or augmented?

It will be realised by participants that WHO's financial resources for assistance in the field of research are very limited; therefore, it is necessary to ensure that these resources are used for the maximum benefit of Member States. Would the participants have any suggestions on how best these meagre resources could be utilised?

Item 4

Needs of Research Institutions

The needs with regard to staff, staff training, visiting consultants, fellowships, equipment and information have to be identified. Although education and training is very high in the priority of WHO's activities and takes up a good part of its budget, the resources available are still too little compared with the demand.

The needs of research institutions pose special problems in that not only must the research workers possess a high degree of basic professional competence, but would require from time to time acquisition of expertise on topics of special interest. This might involve provision of travel grants for shorter periods to specific institutions, provision of visiting consultant specialists and last but not least, provision for refresher training as nowhere is the need to keep abreast of developments more acute than in the field of research.

The needs of countries which do not yet have institutions specifically devoted to research in the community water supply field merit special attention. In such cases, this task falls on an academic institution, such as a university, whose main function is training. While such research would normally be undertaken by the faculty, it might be necessary to augment the strength of the faculty in order that they would have some leisure time from training activities that could be devoted to research. The general practice is to use students to carry out research projects under the guidance of one or other of the faculty staff. This works to the advantage of the faculty, the student and the country at large, but has certain shortcomings which have to be borne in mind and overcome. The tendency in such a situation would be for students to take up projects that are more amenable to laboratory work and those that can give results within the period of their graduate studies. This has the effect of ignoring subjects of vital importance that can only be tackled by studies of longer duration and often requiring field study by a number of scientific staff. Arrangements by which students could be given credit for working on a part of a long-term project while they are in the university, under the guidance of the faculty, and preferably in association with an executing department, might be considered.

As for equipment for research, the possibilities of fabricating equipment locally for the conduct of field trials and field testing need to be fully explored. There are certain items of testing equipment needed by research institutions in developing countries which may have to be imported from abroad, but the construction of simplified indigenous equipment and instrumentation for routine use of laboratories and waterworks would not only result in better operation of service facilities, but also result in saving of valuable foreign exchange. In special cases where equipment of high sophistication is required, it might be possible, by mutual arrangements, to have the tests carried out in another institution where such facilities are available.

Item 5

Application of Research and Development

The inclusion of the word "development" in both the title of this conference and in the programme of WHO is deliberate. The object of all of the activities of WHO as well as its Member States in this field is the provision of ample safe water conveniently at all times to all the people at a price they can afford. Research results must be quickly applied by departments and agencies responsible for implementation of community water supply projects in order that the public may benefit. It is therefore of great importance that research institutions should have continuing and close liaison with operative ministries or departments and carry out their field trials or pilot projects as much as possible in collaboration with them on actual installations wherever possible, after the preliminary phase. Such a liaison would also enable the operative departments to put forward their problems to the research institutions. A mutual confidence is thus built up. There are other advantages in such collaboration. Research institutions such as universities might have the technical qualified supervisory personnel but lack facilities and funds for carrying out field research. Operative departments on the other hand might have the funds, the equipment, plant and other facilities but may not be able to spare their overworked professional staff for conducting field studies. A linking up of the research institution and the operative agency in such a case would be the obvious solution. Where a new technique is developed a research institution would find it of great advantage to establish field centres where staff of operative agencies can be trained in the new techniques by actual demonstration in their plants.

Item 6

Standardization and simplification of design

Many who can point out the pitfalls of standardization will be ready to concede the tremendous advantages and indeed the necessity of standardization and simplified designs wherever possible, in accelerating countrywide community water supply projects. While a large part of the standardization activity, especially in designs would be undertaken by the executing agencies themselves, it is felt that research institutions could give valuable guidance and assistance to the concerned operating departments in suggesting new methods, equipment and design procedures. In countries where the executive departments are understaffed, the research and development institution may have to carry the main burden of this task.

Item 7

Quality Control

The quality refers of course to quality of the water supplied to the consumer but it applies equally to the quality of material and workmanship involved in the process. Evolution of national standards for drinking water, testing methods for various waterworks materials and testing procedures for water quality - these would be appropriate subjects for a research institution to be engaged in. Where national standards institutions exist, the research institution dealing with community water supply would have to advise the national standards institution on establishing standards for waterworks materials and testing procedures. By close liaison with ministries of health the research institutions could study existing procedures for inspection of waterworks and surveillance of water quality, and suggest means for their improvement. Where training is involved they could be of assistance in training adequate government staff.



Item 8

Use of National Resources

As mentioned in Item No. 2.1, one of the most important tasks of collaborating research institutions would be in developing techniques that can be applied locally, in developing plants that can be fabricated with local materials, in searching, finding or developing new chemicals or other materials that would serve, by import substitution, the function of products that have to be brought from abroad. They would also be concerned with fabrication of simplified instruments and kits locally and of adopting procedures established in developed countries either by modification or simplification so that local personnel can be trained to perform these tasks.

Functions of the International Reference Centre  
for Community Water Supply

1. IRC's task, duties, organization and ultimate goals - These are given in the brochure that has been sent to all participants.
2. Progress of work so far
  - See first annual report that has been sent to all participants.
  - See information on 32 collaborating institutions that has been sent to all participants. A resumé of the suggestions made by the collaborating institutions is attached.
3. Documentation
  - Collection of all relevant information from all available sources, such as collaborating institutions, water supply undertakings, (inter) national organizations, universities, literature, conferences, abstracting-journals, etc.
  - Storage of data
  - Documentation:
    - a. neutral activities in data handling, information to all concerned (newsletter, research findings);
    - b. advisory activities, such as suggestions to collaborating institutions to undertake certain steps. (Meetings of experts, fellowships, twin-institutions, adjusting programmes)
    - c. co-ordinating activities, such as co-ordinate research programmes;
    - d. service to WHO in setting up and carrying out research and development programmes.
4. Co-ordination of Research - See 3 - documentation.
5. Standardization of design - A tentative list of items has been set up by the IRC and sent to all participants (design criteria).
6. Training - Co-operation with training facilities in other countries; interim courses at Delft University.
7. Follow-up
  - After the Dubrovnik meeting, a 5-year programme will be submitted to the Advisory Board and the Government of the Netherlands for approval.
  - The newsletter has been drafted and is awaiting approval.
  - A regular bulletin by IRC, to be sent to governmental VIP's and other decision makers, should, in a mild but persuasive way, convince them of the importance of water supply.

Note: When collaborating and co-ordination is mentioned above, it is evident that these are voluntary activities for each collaborating institution, to be decided upon its size and character. The IRC merely functions as the central data storage bank on community water supply available to all.

Being a collaborating institution, there is a willingness to co-ordinate on a world-wide scale on research and development in the field of community water supply.

Suggestions from the Collaborating Institutions concerning Assistance  
from the IRC to Collaborating Institutions and the Reverse

1. Office de la Recherche Scientifique et Technique Outre-Mer, Paris, France

Collaboration with IRC

This institute believes that a collaboration from the viewpoint of documentation will be very useful.

2. The Water Research Association, Medmenham, England

Assistance from the IRC to Collaborating Institutions

- a. Provide a regular exchange of technical information on community water supply subjects.
- b. Provide information on community water supply research and development on projects either in hand or under consideration.
- c. Establish an international reference system and provide translation services, and abstraction services.
- d. Provide a background information service on the state of community water supply systems in developing countries with a view to more effective and more economic pre-investment surveys.
- e. Sponsor seminars, etc., for the exchange of information and discussion of community water supply problems (exclusive of subjects for International Water Supply Association meetings).
- f. Encourage an interchange of staff in the community water supply field and the formation of bilateral links between technical organizations.

Assistance by Collaborating Institutions

- a. By provision of accumulated research and development knowledge for the furtherance of community water supply projects through contractual studies and exchange of information.
- b. By researching into the most efficient way of developing training programmes applicable to developing countries.
- c. By undertaking research aimed at adapting the technology existing in a developed country to the specific problems in water treatment and distribution which arise as a consequence of the limitations in the social and economic environment of developing countries.

3. Middle East Technical University, Ankara, Turkey

Assistance from the IRC to Collaborating Institutions

- a. Allocating them with a small allowance with which accessories or maintenance of laboratory equipment or needs of research models can be supplied from countries abroad (either through the IRC or by a check and pay system).
- b. Research projects in mind or decided in the meetings of directors of collaborating institutions can be distributed between the institutions and supported by the IRC, so that a more close co-operation is established.
- c. If necessary, specific research consultants work can be asked in connexion with projects stated in (b) and supported by the IRC.
- d. IRC can support specific research projects taken by the collaborating institutions from its own national agencies if subjects of research are agreed upon.

- e. Circulation of information by the IRC (this has been very effective although very limited in number).
- f. IRC can contact governmental agencies to encourage activities and inform them with their national institution as a collaborating institution of the IRC, where many of their community water supply problems can be studied and solved under the support of IRC.

Assistance by Collaborating Institutions

- a. The sanitary engineering laboratory is in a position to work on any research work related to community water supply.
- b. The location of the laboratory in a large campus of 11 000 acres and the presence of a large lake some 20 km from the main campus, presents a special case, because water is supplied to the campus by pumping from its own lake.
- c. The climatic conditions often vary, but are generally moderate with relatively mild winters, warm springs and long autumns. Therefore, comparative studies on the climatic ability of this spot as well can be made.
- d. The campus Meteorology Station run by the Sanitary Engineering Laboratory is also available with its full equipment.
- e. An international level short course can also be offered if a small amount of aid is allocated for such purpose.

4. Consiglio Nazionale delle Ricerche Roma, Italy

No specific suggestions.

5. The University of Naples, Naples, Italy

Assistance from the IRC to Collaborating Institutions

Information about studies and researches carried out by other collaborating institutions, advances in water technology, books published, grants offered, exchanges possibilities, latest water analysis instrumentation, etc.

Assistance by Collaborating Institutions

To give lectures (abroad and at home), training programme for personnel (coming from abroad), pilot plant researches in the field of water treatment, and technical assistance in the field of water works and water technology.

6. Testing and Research Institute of the Netherlands Water Undertakings KIWA Ltd, Netherlands

Assistance by IRC

The IRC was set up with the assistance of KIWA: therefore, KIWA agrees with the programme of the IRC. In our opinion, it is hardly possible at the moment to give a list of subjects in order of priority. This is depending on what the various countries need under given circumstances and, on the other hand, of the possibilities given by the subjects in which the institutions are specialized.

Before setting up a list of priority, it might be useful to await the answers to the questionnaire in order to get a better insight into the possibilities. Important aspects in connexion with the assistance given by the IRC are:

- a. IRC furthers the international co-operation on problems of common interest;
- b. by promoting contacts between the collaborating institutions, duplication of investigation may be avoided, giving a considerable saving of energy;
- c. IRC can take care of regular exchange of information between the collaborating institutions, such as scientific data and results of investigations;
- d. IRC can supply the institutions with abstracts of literature making use of the documentation system set up by KIWA.

#### Assistance by Collaborating Institutions

In our opinion, the most obvious way to assist the IRC programme lies in the collaboration with respect to those subjects in which the institutions are specialized. The institutions will bring together experience and knowledge about special problems, come to an exchange of thoughts between specialists and attack a number of problems in co-operation. A close co-operation will be for the benefit of the drinking water supply in general and yield better possibilities for the assistance to developing countries.

#### 7. University of Newcastle-upon-Tyne, England

##### Functions of IRC

As detailed in the background document, the function of the IRC should be in co-ordinating and promoting the research in the collaborating institutions. It would appear to be reasonable for the WHO Community Water Supply Unit to co-ordinate work on an international scale, and the IRC to do similar duties to those listed on pages 3 and 4 of the background sheet (under the heading WHO Community Water Supply Unit) on a national scale. The internal problems and the international implications of these, if any, could best be dealt with by the same organization and it would be sensible to establish the IRC co-ordinating team within a national research organization such as the Water Research Association. The IRC would thus be at the single co-ordinating centre of activity in the nation and act as an international wing of such a centre.

##### Contribution of this Department

Each collaborating institution should develop a specialized research programme under the guidance of the IRC and based on its existing expertise. This Department could continue and extend the research topics currently under investigation to this end. The post-graduate courses in public health engineering and hydrology offered by this Department can make a significant contribution to training programmes.

#### 8. The University of Aarhus, Aarhus, Denmark

##### Assistance from the IRC to Collaborating Institutions

- a. Provide a regular exchange on community water supply subjects.
- b. Provide information on community water supply research and development on projects either in hand or under consideration.
- c. Establish an international reference system and provide translation services.
- d. Provide a background information service on the state of community water supply systems in developing countries with a view to more effective and more economic pre-investment surveys.
- e. Sponsor seminars, etc., for the exchange of information and discussion of community water supply problems (exclusive of subjects for International Water Supply Association meetings).
- f. Encourage an interchange of staff in the community water supply field and the formation of bilateral links between technical organizations.

Assistance by Collaborating Institutions

- a. Research and training will only be in the field of microbiology and microchemistry.
- b. By provision of accumulated research and development knowledge for the furtherance of community water supply projects through contractual studies and exchange of information.
- c. By researching into the most efficient way of developing training programmes applicable to developing countries.
- d. By undertaking research aimed at adapting the technology existing in a developed country to the specific problems in water treatment and distribution which arise as a consequence of the limitations in the social and economic environment of developing countries.

9. The University of Khartoum, Khartou, Sudan

Assistance by Collaborating Institutions

- a. Provide results of investigations carried out.
- b. Carry out programme of investigation as requested.
- c. Act as a consultant on problems of nature similar to ours.
- d. Act as training centre.
- e. Act as a host for seminars and conferences.
- f. Offer works for postgraduate students in the field of community water supply.

10. The University of Alexandria, Alexandria, UAR

- a. Study of water supply problems in region.
- b. Passing results of its studies to other institutions.
- c. Training the technical staff in the field of water supply.
- d. Giving refresher courses for the engineers working in water supply works.
- e. Participating and initiating seminars and other meetings for studying water supply problems.

11. Hebrew University, Hadassah Medical School, Jerusalem, Israel

Assistance from the IRC

- a. Financial support in the operation of a laboratory and for specific equipment.
- b. Stipends for foreign students.
- c. Information retrieval and bibliographic services.
- d. Support for specific research projects of interest to WHO.

Assistance by Collaborating Institutions

- a. Professional opinions on specific subjects.
- b. Carrying out research on special problems.
- c. Arranging training programmes for visitors from other countries, both in water quality research on projects carried out in the laboratory or in other fields, in co-operation with existing organizations in Israel, and serving as consultants to other institutions.
- d. Organizing special training courses.

12. Bureau of Water Hygiene, Rockville, USA

Assistance from IRC

The primary mission of the IRC should be to serve as a clearing house for international information on community water supply research and development.

Assistance by Collaborating Institutions

Bureau of Water Hygiene assistance will be in providing current information on research and development projects completed by our staff.

13. The University of North Carolina, Chapel Hill, USA

No specific suggestions.

14. The University of Florida, Gainesville, USA

Collaboration with IRC

This institute feels that their largest contribution to the community water supply effort and the IRC would be in the area of education. All qualified applicants will be considered for admission into our graduate training programme, and those accepted can expect unrestricted access to our facilities and the full co-operation of our faculty and staff.

15. Instituto de Engenharia Sanitaria, Rio de Janeiro, Brasil

No specific suggestions.

16. Universidad Central de Venezuela, Caracas, Venezuela

No specific suggestions.

17. National Sanitation Foundation, Ann Arbor, USA

No specific suggestions.

18. University of Science and Technology, Kumasi, Ghana

No specific suggestions.

19. The University of Lagos, Nigeria

Assistance from IRC to Collaborating Institutions

Funds and literature for research into subjects like:

- a. Variation of per capita water consumption with distance of supply source from consumer.
- b. Waste prevention in domestic supplies. Assistance with films and teaching aids in water supply.



20. The Victoria Jubilee Technical Institute, Bombay, India

1. Liaison with financing agencies will help to accelerate the pace of development.
2. Equipment useful in the field and in the laboratory will ensure speedy completion of work and quality control of water being supplied.
3. Fellowships would help individuals and/or institutions to undertake investigative projects in the field of community water supply. In addition, training facilities abroad given to the teaching staff will help strengthen the faculty in imparting the latest information to students.
4. Microfilms of technical publications and availability of reference books will be found to be of great help to research staff and students.
5. Short-term consultants in this field can help to guide projects under development and give an impetus to the research work being conducted at various centres.

Assistance by Collaborating Institutions

We would continue to conduct symposia and seminars in subjects related to community water supply. In addition, we shall continue to help public bodies and neighbouring industries in solving their water and waste treatment problems. Theoretical aspects of the water treatment are always under investigation, verification in our laboratory.

21. Asian Institute of Technology, Bangkok, Thailand

Assistance from IRC

- List and distribute publications available.
- List research projects under way, with details.
- Periodic reports on projects.
- Reviews of state-of-the-art at the commencement of projects.
- Review research needs and accomplishments and finance availability and allocation.

Assistance by Collaborating Institutions

- By carrying out research on community water supply problems in tropical developing countries.
- By developing solutions to problems of supplying cheap potable water which are consistent with the environmental and economic conditions in developing countries.
- To assist in developing meaningful guidelines for planning, design, and utilization of Asia's water and economic resources.
- By providing a centre where visiting scholars and research workers can carry out research.
- By reviewing research proposals and research findings in the light of local conditions and experience.

22. The University of Tokyo, Japan

Assistance from IRC

- a. Upon request, IRC should provide to collaborating institutions information and references on water supply research and development.
- b. Let us know book list of IRC library.

Assistance by Collaborating Institutions

- a. Acceptance of fellows from developing countries.
- b. Research on community water supply engineering.
- c. Consultation advice for community water supply projects of developing countries.

23. The All India Institute of Hygiene and Public Health, Calcutta, India

No specific suggestions.

24. Central Public Health Engineering Research Institute, Nagpur, India

Assistance from IRC to Collaborating Institutions

- a. Facilities for the training of research and other personnel and for their interchange between institutions to broaden experience.
- b. Visits of specialist consultants in specific areas.
- c. Contractual studies on particular problems on which concentrated research is needed, and to arrange field trials of equipment or techniques evolved from laboratory studies.
- d. Circulation of information on research and development carried out by all collaborating institutions and the IRC.

Assistance by Collaborating Institutions

- a. Assist in identification of special problems for tropical and developing countries.
- b. Provide training facilities for developing countries in the region. Short courses can be organized to be suitable to the countries in the region.
- c. Develop an "abstracting" service so that all relevant publications in India are reviewed and abstracted promptly. The abstracts will be sent to the IRC and other collaborating institutions. Gradually, this service could be enlarged to include publications from some neighbouring countries in the region.
- d. Receive personnel from other developing countries for interchange and work on specific problems to broaden experience.
- e. Exchange of literature on research work done in India with other collaborating institutions.
- f. Research into newer methods of water treatment and supply at the community level.

SUGGESTIONS FROM THE COLLABORATING INSTITUTIONS CONCERNING ASSISTANCE FROM THE IRC  
TO COLLABORATING INSTITUTIONS

	<u>in parenthesis: CI's</u>
1. Collaboration on documentation and literature	(1, 11, 19, 20, 22)
2. Exchange of technical information and circulation of information by IRC	(2, 3, 8, 21, 22, 24)
3. Co-ordinate and promote research	(7, 24)
4. Support research projects	(3, 11, 19, 20, 21)
5. Contact research consultants	(3, 20, 24)
6. Render translation services	(2, 8)
7. Sponsor seminars	(2, 8)
8. Exchange of staff, fellowships, etc.	(2, 8, 20, 24)

SUGGESTIONS FROM THE COLLABORATING INSTITUTIONS CONCERNING ASSISTANCE BY THE  
COLLABORATING INSTITUTIONS

1. Carry out research and development	(2, 3, 7, 8, 9, 10, 11, 21, 22, 24)
2. Provide training facilities and organize courses	(2, 3, 7, 8, 9, 10, 11, 14, 24)
3. Act as a consultant	(9, 11, 20, 22)
4. Be a host for seminars	(9, 10, 20)
5. Offer work for research workers, students, etc.	(9, 21, 22, 24)
6. Exchange of literature, documentation	(10, 24)

Documentation and Information

I. Registers (files)

1. Periodicals
2. Abstracting journals
3. Standards
4. Regulations
5. International organizations
6. International agencies
7. National organizations
8. Governmental authorities
9. Governmental agencies
10. Research institutions
11. Universities
12. Educational institutes
13. Local authorities
14. Water undertakings
15. International conferences, congresses, meetings, symposia
16. National conferences, congresses, meetings, symposia
17. Group training courses
18. National reference centres

II. Collections

1. Periodicals
2. Abstracting journals
3. Research reports
4. Programmes of research and annual reports of research institutions
5. Conference proceedings
6. Standards
7. Programmes of study, records, calendars, annual reports of universities
8. Reprints of papers

III. Information Service

Members of IRC and NGIDWS  
as well as librarian, registrar and clerk.

IV. Research Co-ordination

1. Programme of systematic fundamental studies
2. Designation of leading institute for each study
3. Designation of collaborating institutions for each study.
4. Elaboration of searching plan and criteria of development for each study
5. Detailed research co-ordination of each study

V. Elaboration of classification for community water supply problems

Separation of library of NGIDWS

NGIDWS

books  
current year's  
periodicals  
1. librarian

IRC

collections  
1. librarian  
2. registrar  
3. clerk

xerox

Discussion Paper on Research Co-ordination

Research is an essential factor in community water supply development. One of the tasks of the IRC is to stimulate, organize and co-ordinate the research on drinking water supply.

The programme of fundamental studies in the field of community water supply has been elaborated by the IRC. The intention of the IRC is to establish a frame for systematic research. The ultimate aim is to supply all people with safe water in sufficient quantities.

The programme is presented as a basis for the discussions.

PROGRAMME OF SYSTEMATIC FUNDAMENTAL STUDIES ON COMMUNITY WATER SUPPLY

Studies on:

1. Water and environmental hygiene
2. Water consumption in urban areas
3. Water consumption in rural areas
4. Community water supply systems
5. Large scale community water supplies
6. Community water supply small units
7. Water losses in community water supplies
8. Pollution of water supply sources and their protection
9. Ground water resources
10. Artificial recharge of ground water bodies
11. Methods for examination of water
12. Initial preparation of water
13. Mechanical straining in water treatment
14. Coagulation and flocculation in water treatment
15. Sedimentation in water treatment
16. Filtration of water
17. Desalination of water
18. Iron and manganese removal from water
19. Water softening and demineralization
20. Fluoridation and defluoridation of water
21. Treatment of radioactive water
22. Disinfection of water

Studies on design, construction, operation and control of:

23. Surface water intake works
24. Underground water intake works
25. Coagulation and flocculation plants
26. Sedimentation basins
27. Filtration plants
28. Water desalination plants
29. Iron and manganese removal plants
30. Water softening and demineralization plants
31. Water fluoridation and defluoridation plants
32. Water disinfection plants
33. Service reservoirs and water towers
34. Pumping stations
35. Studies on design, construction, maintenance and control of large-scale aqueducts