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fifth annual report

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WORLD HEALTH ORGANIZATION
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FIFTH ANNUAL REPORT

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1. OBJECTIVES AND OPERATIONAL PROCEDURES

1.1. Introduction

The IRC occupies itself with coordinating activities in the field of water supply on an international level, and in particular with alleviation of water-famine in developing countries, where 1,300 million people (1/3 of the world population) have to do without safe and adequate water supply.

The IRC operates as a special department of the Government Institute for Water Supply in the Netherlands which up to the present moment during its 60 years' existence together with the water organizations, has succeeded in raising the percentage of connections to the public system of watermains in the Netherlands to 99%, thus gaining considerable experience in the entire field of activities connected with water supply. This experience met with considerable interest abroad, in particular in the World Health Organization. The loyal position taken up by the Netherlands in the group of countries active in the field of development cooperation was another reason why an invitation by the WHO was extended to the Institute to participate in the relief of water-famine. This invitation ultimately led to the designation of the IRC.

Since, in 1968, the first relevant agreement was signed by the Netherlands Government and the WHO, 1973 was a significant year for the IRC: it celebrated its fifth anniversary, together with the 60th anniversary of the parent Institute.

Not one but both parents of the celebrating IRC commemorated a special event in 1973: the WHO celebrated its 25th anniversary. During those 25 years of existence, many new and brilliant ideas led to a considerable number of activities, all directed to WHO's objective: "the attainment by all people of the highest possible level of health". One of those ideas was the establishment of systems of International Reference Centres in respect of a considerable number of public health issues, in some cases in cooperation with Collaborating Institutions. The IRC for Community Water Supply (IRC/CWS) forms an example.

At the occasion of the Centre's anniversary the present annual report deals in some detail with general background information and way of operation.



School children in Bolivia enjoy their first drink of clean safe water from the first well every dug in El Espino, a little village in the low, hot Chaco country, south of the city of Santa Cruz. (UNICEF photo by D. Maugurian).

1.2 Objectives

The driving force behind the long-standing activities of the Government Institute for Water Supply has been the conviction that one of the basic conditions to achieve a high level of public health and environmental hygiene is the supply of an adequate quantity of safe water to population and industry. The same conviction also motivates WHO's involvement in water supply matters.

In 1959, after a resolution to this effect had been adopted by the twelfth World Health Assembly, the WHO took the initiative to start the WHO Community Water Supply Programme. The objective is to assist governments, in developing countries particularly (but not exclusively) to provide more and better quality water to as many people as possible as quickly as practicable, in a convenient manner and at a price which they can afford.

Within this programme a sub-programme was developed: "the Research and Development Programme", aimed at engaging the assistance of research, teaching and other institutions in the solution of practical problems related to the development and improvement of water supplies in those countries where lack of funds and shortage of trained staff form ever-growing obstacles.

Since its establishment, the WHO has booked many results and more are to follow. A recent study shows that enormous effort will have to be made if the U.N. objectives of the second development decade concerning water supplies are to be achieved. The objective is to supply all urban dwellers with safe water, 60% by means of house connections and 40% by some provision on public standpipes (e.g. on markets). Rural population should have reasonable access to safe water. Only 25% of the world's rural population will be receiving this in the remaining 7 years. The costs of the entire undertaking have been estimated at US\$13 to US\$15 thousand million. The scope of this task is almost beyond comprehension.

However, the problems that will have to be tackled are not of a technical nature only. One has to deal with shortcomings in other fields, such as:

- lack of financial means and in many cases of a suitable organization for a fair distribution of available funds;
- lack of trained personnel;

- inappropriate administrative structure, and often an outmoded legal framework;
- inadequate use of local materials.

And this far from exhausts the problems.

Two phases can be distinguished in solving water supply problems. In a first phase of preparation, existing technologies are tested, methods applied in industrialized countries are adapted to the situation in the developing countries and personnel is trained to maintain the water supply system, once it has been established.

In the second phase, a planning system is drawn up for the water supply, to be followed by the construction of pumping and purification plants and distribution networks.

The first phase forms the basis of the second.

The second phase aims at the solution of problems in a particular situation. The first phase is of a more general nature and should be carried out rather in international cooperation than by incidental approach. Initiating this first phase is one of the tasks of IRC, which it carries out in close cooperation with the World Health Organization.

Another task worthy of attention at an international level is coordination of the considerable research and development activities carried out in the field of drinking water supply in the industrialized countries. Linked with this are exchange of information and transfer thereof to developing countries. There is every reason to see this task in a wider light than in relation to drinking water alone. The exploration of the sources and the relationship with other sanitary provisions deserve of being treated in a wider perspective.

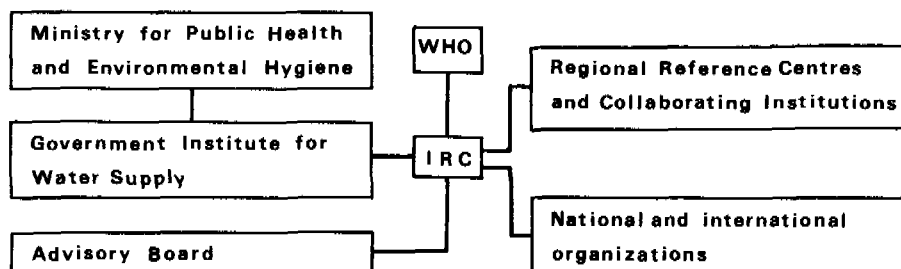
Projected against the background described above and within the framework of the relevant WHO-programme, the general objective of IRC is to stimulate and coordinate activities aimed at development and improvement of water supply systems, both in industrialized and in developing countries. IRC operates as a nexus of the network of regional and national centres, established in both categories of countries. Its role is to inventarize, in conjunction with the WHO, the existing problems in the field of drinking water supply and to establish and coordinate research and development projects against the background of these various problems. Another role is to build up a data bank and a system of information concerning existing knowledge and information,

which will be obtained from and transferred to subdivisions of the network and elsewhere. Besides this collection and transfer of knowledge, the training aspect forms an important part of the entire task-package.

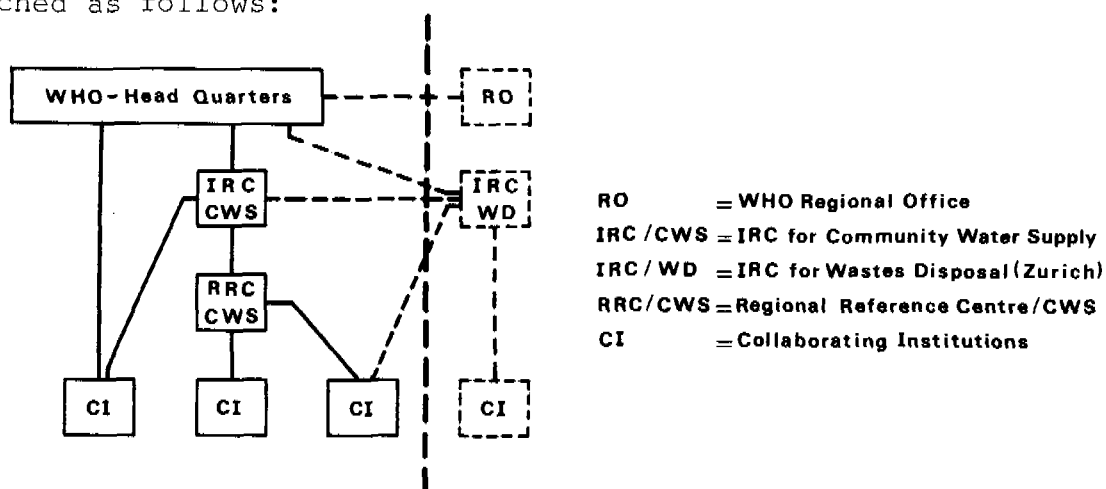
(A more extensive list of objectives and tasks is given in annex 2). In addition to these activities, which are directly connected with the programme of the World Health Organization, an increasing number of IRC activities are directed to related fields of interest both on a national and an international level. To mention some: the reception of visitors from abroad to the Netherlands, activities concerning a project on re-use of water, and a liaison with the International Referral System of the United Nations Environment Programme. These aspects are described in more detail in chapter 2.

1.3 Organization and communication

Those liaisons with organizations and institutions of which the IRC, to a certain extent, forms a part and/or receives financial or technical scientific input are outlined in the following diagram:



The structure of the international network for water supply can be sketched as follows:



Some institutions in the network for water supply also collaborate with the International Reference Centre for Wastes Disposal (Zürich).

The Ministry for Public Health and Environmental Hygiene provides the IRC with funds and (indirectly via the Government Institute for Water Supply) with technical and practical aid; the Director of the Government Institute functions also as Director of the IRC. Good use is made of the know-how, skill and activities of the technical-scientific departments and the accounts and personnel departments of the Government Institute, while the facilities of the Government Institute are frequently called upon.

Discussions are now under way concerning a greater operation freedom and flexibility for the IRC.

The World Health Organization provides the IRC with some financial support. In addition, funds are received from time to time from the WHO budget for special activities.

IRC collaborates closely with the Community Water Supply and Sanitation United, Division of Environmental Health, World Health Organization. There are additional contacts with other Units and with some Regional Offices.

In addition to financial aid, IRC also receives scientific and informative support and cooperation from the organization.

The Advisory Board of IRC has a consultative function and consists of representatives of bodies and institutions to which IRC is connected directly or indirectly.

Representatives of the following bodies are members of the Board:

- a. The World Health Organization;
- b. The Ministry for Public Health and Environmental Hygiene;
- c. The Netherlands Waterworks Association VEWIN;
- d. The Testing and Research Institute of the Netherlands Waterundertakings KIWA Ltd.;
- e. The Technological University Delft, Chair for Civil Sanitary Engineering;
- f. International Courses in Hydraulic and Sanitary Engineering;
- g. The Research Institute for Public Health Engineering TNO;
- h. The National Institute for Public Health.

Professor W.F.J.M. Krul serves as an adviser to this Board. The directors of the Regional Reference Centres and of Collaborating Institutions outside the Netherlands are also invited to participate in the Advisory Board meetings in order to attune recommendations to im-

mediate needs, especially in developing countries. The meetings are usually planned in such a way that at least some of these representatives are able to participate.

In addition to IRC, the network embraces at present two WHO Regional Reference Centres, whose duties are similar to those of IRC, but on a regional scale:

- Central Public Health Engineering Research Institute (CPHERI) at Nagpur, India;
- Pan American Centre for Sanitary Engineering and Environmental Sciences (CEPIS) at Lima, Peru.

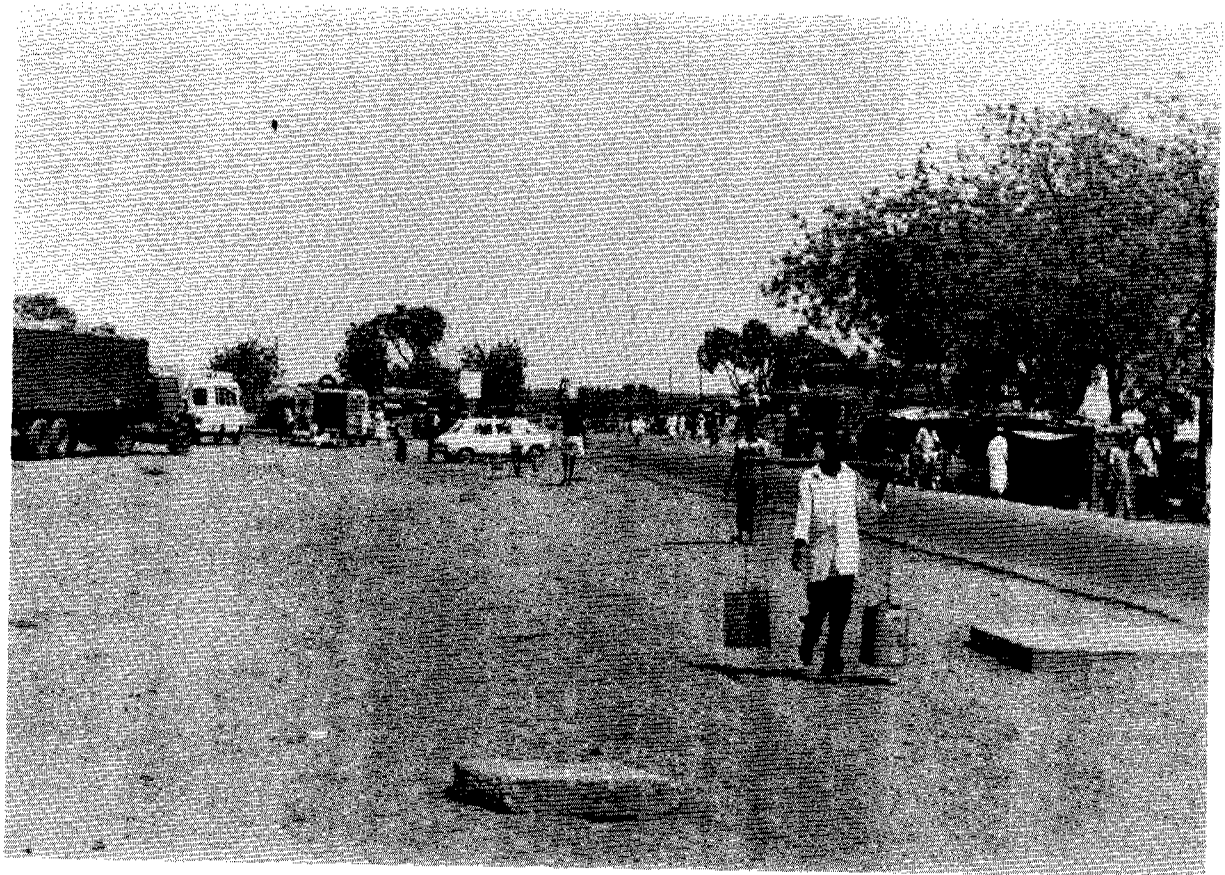
The 31 "Collaborating Institutions" in the network can be defined as institutions engaged on research and development in community water supply; they are prepared to and have the facilities for research, training and exchange of information, and have contact with and recourse to organizations active in the relevant field in their own country. The network of Collaborating Institutions is formed by research institutes, universities and departments of government bodies and regional and international organizations.

A list of Regional Centres and Collaborating Institutions is included as annex 2; a world map, showing the geographical distribution, is attached as annex 3.

This distribution is now as follows:

Region	Developing countries	Industrialized countries	Total
North America		4	4
Latin America	3		3
Europe		11	11
Middle East	5		5
Africa	4		4
Far East	3	1	4
Total	15	16	31

IRC maintains more or less intensive contacts with a large number of other bodies and organizations. There is active collaboration with several U.N. agencies, the International Water Supply Association in London, the World Council of Churches in Geneva, the Comité Inter-



Fetching the water, a daily concern, Niamey, Niger.

Africain d'Etudes Hydrauliques at Ouagadougou (Upper Volta) and many other internationally and nationally orientated organizations, bodies and industries at an ad-hoc basis.

Within the Netherlands, too, contacts and collaborating relationships are being expanded continuously for example with the International Technical Assistance Department of the Ministry for Foreign Affairs, the Delft Hydraulics Laboratory, the Royal Tropical Institute, several Universities and various waterworks companies.

With a view to exchange of information, contacts have been made with hundreds of organizations, institutions and individuals, such as organizations within the U.N. framework, WHO consultants and padres in the field, national associations of research workers, government departments and technical agencies. The Newsletter, published in three languages and circulated in over 5000 copies, is an important medium. In addition, extensive correspondence takes place, while personal visits to foreign contacts are a more or less regular item on the agenda. Meetings, and visits from foreign contacts to the Netherlands, also contribute to good communication, one of the most vital conditions for a properly operating IRC and of immense importance to an up-to-date performance of the parent institute.

1.4 Personnel, budget and operating procedures

Initially, those tasks of the Government Institute that could be seen as IRC functions, were carried out in part-time work by staff members of the Institute. As it soon became obvious that this was not an efficient way of working, special staff assisted by personnel from the Institute, was engaged or appointed for specific IRC duties.

The views of the WHO changed too. On the one side, it became clear that the problems to which this IRC was devoting itself were of quite a different nature than those on which the other, already existing IRC's were working. On the other side, it appeared that the initiative had opened up possibilities to bridge the gap between ready knowledge and the application of that knowledge in the form of development and improvement of water supplies.

A major part of IRC duties concern the convening of meetings of experts, the development of applied research activities, the writing of digests and the setting up of training programmes. The know-how of

the Government Institute can now, better than before, be utilized by IRC workers who can carry out their coordinating and organizing activities on this firm basis.

Another important function of IRC is the formulation and preparation of the above mentioned programmes in the form of projects, together with the mobilization of funds to finance them. The actual implementation of the projects will not be undertaken by IRC. In most cases, IRC will carry out the preparatory activities required for realization of the projects, the specific-know-how acquired by IRC during the preparatory activities and the scientific know-how of the parent Institute. of a more general nature will be put to good use. IRC is further entrusted with the transfer of acquired knowledge, and the incorporation of this new information in other projects and programmes. In some cases IRC will also have to act as project leader, certainly in those cases where the execution of the project is effectuated within the network. Establishing and maintaining both verbal and written contacts will always remain an important aspect of IRC duties.

Meanwhile it has become obvious that the above mentioned activities (i.e. those that fall outside the scope of the actual projects) will have to be carried out by a basic staff who can build up specific knowledge and experience. This staff specializes into four directions: management, scientific-technical personnel (project leaders), personnel charged with a section information, and administrative personnel.

An analysis of the tasks has shown that irrespective the number of projects being executed (the assistance being paid out of the project funds), this basic staff will have to number at least 10: two in a general managerial function, three project leaders, two officers responsible for the exchange of information, and three administrative assistants. It should be possible to temporarily enlarge this team with foreign officers.

Part-time staff to assist in the preparation or development of large projects can be paid out of the funds set aside for overheads. New projects can be developed in periods when no projects financed by other organizations are in hand.

It need not be emphasized that, in view of the complex problems of water supply, in the developing countries especially, a great many of these problems will have to go unsolved for the time being. Gradual awakening to the fact that ever bigger funds will have to be invested in water supply projects (as voiced in the recommendations of the

Stockholm Conference) will further stimulate the release of project funds. It may, therefore, be concluded that an IRC with a limited number of staff and relatively limited funds should be able to generate considerable activity in the field of water supply. Or: small investments may yield large profits since they will mobilize sizeable funds for projects. An incidental increase of the permanent staff may be attained by calling in the (temporary) help of officers employed by institutions operating within the network, or by delegating specific tasks within this network. In fact, the growth of the Centre consists of growing efficiency and collaboration within the network. It will also be clear that expansion of the project package will at the same time release more funds, out of which temporary staff expansion can be financed.

In 1973 IRC still worked with a permanent staff of four: a manager, 2 project engineers and a secretary. The Centre also frequently called upon the services of the staff of the Government Institute, both in the technical-scientific and administrative departments.

The funds received for IRC activities can be classified as (1) funds for the operation of IRC itself, (2) contributions of a material or personal nature from the network for specific tasks and studies to be carried out by IRC within the framework of the operation, and (3) funds intended to finance projects.

At the time of writing the operation of IRC itself is financed out of the budget provided for that purpose by the Ministry for Public Health and Environmental Hygiene to the Government Institute for Drinking Water Supply. For 1973 IRC received these funds for activities within the framework of the Government Institute. The sum of US\$200,000.- allocated for the year 1974 has been provided to meet the IRC expenditure. In conformance with the agreement mentioned earlier, the WHO gives an annual grant of US\$10,000.- as a small contribution towards the operation costs of IRC. The WHO would also investigate whether this WHO grant might be enlarged out of funds that may be made available by the UN Environment Fund.

Meanwhile, the British Water Research Association (one of the Collaborating Institutions) is considering to grant a contribution for specific IRC operations. A sum of £5,000.- for 1974 has been mentioned. In addition, services of an expert might be expected. Also other institutions and organizations have offered their assistance to IRC, whether of a material or personal nature.

Projects to be prepared and developed by IRC may be financed out of various funds. In three cases already, the WHO allotted funds to IRC: for research on the suitability of iodine and iodine compounds as disinfectants for small water supplies and for the two meetings in 1973.

In addition, the IRC has now contacts on the financing of projects with the International Technical Assistance Department of the Ministry for Foreign Affairs, with the World Bank and with the African Development Bank.

First contacts by visits and/or correspondence were laid with some organizations with a view to obtaining funds for specific activity programmes, viz. the United Nations Environment Programme, including the International Referral System in Nairobi; the international charity organization OXFAM, Oxford; the Battelle Organization, Washington; the International Development Research Centre, Ottawa and the Overseas Development Administration of the British Ministry for Foreign Affairs, London.



WHO photo

2. 1973 REPORT

2.1 Introduction

The event that in the 5-year period had a major effect on IRC activities was the meeting of directors of the Collaborating Institutions of the IRC, together with representatives of various internationally and regionally operating organizations. Not only were programmes drawn up for activities to be expanded in future, but arrangements were also made concerning a further consolidation of the network of Collaborating Institutions and expansion of the potential possibilities of IRC itself. This last item was discussed in the above mentioned meeting, as well as in the following meeting of the Advisory Board of IRC, the conclusion being that the establishment of an IRC foundation would greatly increase IRC's operational potential.

Another meeting also had considerable influence on IRC activities in 1973. Under auspices of the WHO, a meeting of a consultant group was organized which resulted in two important publications, which were distributed by the WHO on a world-wide basis (see 2.2.2)

In addition to these events further activities of a varying nature can be reported, such as development of a number of projects to be financed by organizations at home and abroad, intensive correspondence dealing with enquiries, the circulation of a monthly Newsletter and a number of other publications by IRC and its staff members, and the further establishment of a library and documentation system.

An important aspect, somewhat neglected due to both internal and external reasons, is the further development and improvement of the network of Regional Centres and Collaborating Institutions. This international network, with IRC as coordinating and inspiring centre, has shown in the past year that it can occupy a front-rank position in the battle against drinking water problems.

The year 1973 was marked by building-up activities. The building-up of a more efficient organization, of a staff better capable of dealing with the tasks within the budget and the building-up of a stronger network. Likewise were the following tasks still in the building-up stage: project development, optimum supply of information, and the establishment of contact concerning both subject of study and the possibilities of the financing of such studies.

One glance at the first five years of IRC activities shows that - in spite of its slow development in this period - it has gained a position of growing importance and has given an impulse to an international approach of problems in the field of water supply.

2.2. Meetings

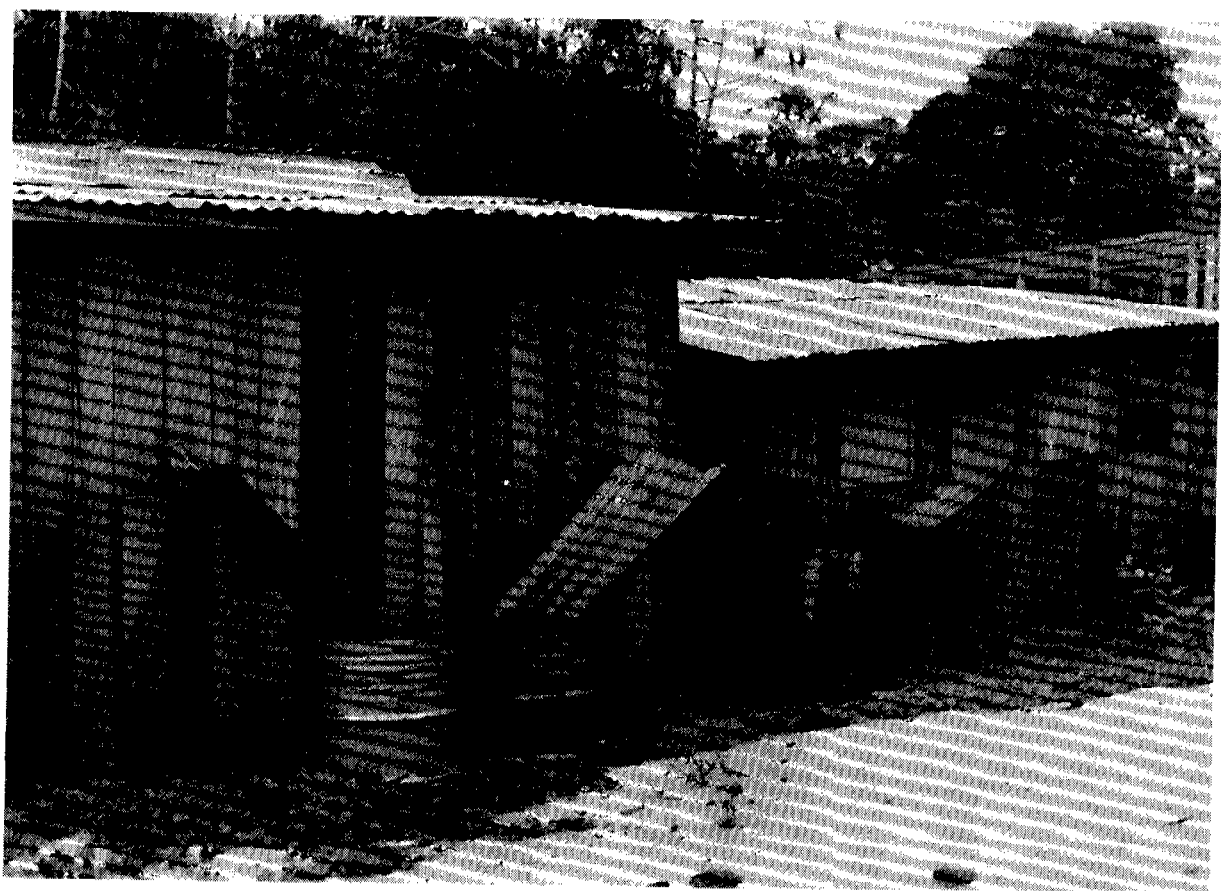
2.2.1 The "Bilthoven meeting"

The IRC convened a meeting of directors of Collaborating Institutions and representatives of organizations in the field of internationally-orientated programmes for water supply, held at the National Institute for Public Health at Bilthoven from 9-13 April, 1973. 36 delegates from both industrialized and developing countries took part in the discussions. The purpose of the meeting was to review the activities of the network, to discuss organizational aspects with a view to improving operational results and to agree upon a programme of specific activities concerning research and development, training, and exchange and transfer of information.

Against the background of the activities carried out so far by IRC and the Collaborating Institutions, it was emphasized that both the Netherlands Government and the WHO ought to consider increasing their grants to IRC in order to safeguard the continuation of these activities. Collaborating Institutions should also consider this aspect and delegate staff to assist in the activities mentioned earlier. It was agreed that IRC, in collaboration with the WHO, was to define the functions of the Collaborating Institutions, which would be of good use when new institutions were to be invited in the network; this work would include definition of the function of national centres, routine activities and a number of specific tasks. Collaborating Institutions would appoint a member of their staff to act as a liaison officer.

The general opinion was that initiatives should be taken by IRC. However, Collaborating Institutions were to give as much support as possible to IRC activities, IRC reporting annually on this collaboration. It was suggested that the network be reviewed regularly, and that Collaborating Institutions that did not live up to the arrangements would be requested to withdraw.

The network would be further expanded both by means of establishing new institutions in countries not yet represented and by intensifying



Roof catchment in Mibreville, Gabon.

contacts between the Collaborating Institutions and other institutions and executive institutes in the home country. The WHO would initiate the establishment of more regional centres.

A plenary discussion on problems and needs in industrialized and developing countries resulted in general agreement on the nature of present and future research and development programmes. Specific proposals for future activities were discussed by working groups. 29 of these proposals receiving priority.

Six projects were considered as being most urgent, viz.:

- health aspects of the re-use of water;
- health aspects of trace elements in water;
- slow sand filtration in developing countries;
- transfer and adaptation of existing simple and safe techniques to developing countries;
- studies on the impact of community water supply;
- development and implementation of systematic training programmes in developing countries.

It was agreed that IRC was to take the initiative to develop these programmes first, in collaboration with the WHO and Collaborating Institutions.

IRC Bulletin no. 5 reports on the meeting. To support discussions on organizational matters in the Bilthoven meeting, the manager prepared a background paper under the title "Functioning of the International Network for Community Water Supply".

Appreciation was expressed on the hospitality, the goodwill and the cooperation extended to this meeting by the National Institute for Public Health.

Immediately after the Bilthoven meeting, the annual meeting of the Advisory Board was held. Besides the representatives of the Ministry for Public Health and Environmental Hygiene and the KIWA, all foreign guests attended. Discussions centred chiefly on the future of IRC.

2.2.2 The "Toxicity meeting"

Within the framework of a WHO project, IRC convened a meeting of a Consultant Group from February 8-12. In this meeting, held in the KIWA office, the health aspects of the use of polyelectrolytes in the treatment of water and of plastic pipes for distribution networks were discussed and recommendations made. 17 Specialists from both industrial-

ized and developing countries took part in the discussion, which led to the two technical IRC publications "Health aspects relating to the use of uPVC pipes for community water supply" and "Health aspects relating to the use of polyelectrolytes in water treatment for community water supply".

The first paper, based on a background paper by C.H.J. Elzenga (KIWA) and on discussions at various meetings, gives a survey of unplasticized PVC-pipes with regard to water-soluble toxic substances. The recommendations include the stipulation that national standards for such pipes would also give the maximum allowances of water-soluble toxic substances. The use of toxic substances in production of pipes should, for that matter, be restricted to the utmost limit. In view of experiences it is to be expected that unplasticized pipes stabilized with lead, that meet the ISO Draft International Standards, will release only minimum quantities of lead. The paper also draws attention to the lack of toxicological data on organo-tin compounds used in the U.S. in particular as stabilizers. The use of cadmium compounds in the production of PVC-pipes for the transportation of drinking water must be considered undesirable.

The second paper deals with the problems concerning the use of polyelectrolytes. It is based on a background paper drawn up by drs. H.J. Boorsma and ir. J. Hrubec (IRC) and also on discussions at the meetings. It contains the statement that polyelectrolytes may only be used in the purification of water for community water supply after careful inspection for any toxic risk. It is desirable to use polyelectrolytes as far as possible on the basis of non-toxic materials. Synthetic polyelectrolytes should only be used if adequate facilities for testing are available. It is recommended that health authorities collaborate on a national level in order to stimulate the drawing up of quality standards and test procedures. Of utmost importance, too, is proper supervision in purification plants. The present use of polyacrylamide is based on limited toxicological data and further studies will be needed to establish an admissible daily dose of monomer residue. Manufacturers of polyelectrolytes should inform users as well as possible on chemical composition and toxicity of their products and give clear instructions for use and storage.

Both papers are obtainable on request from the IRC. It is also worthy to mention that the hospitality, goodwill and cooperation extended by the KIWA management and their staff contributed to the success of the meeting.

2.2.3 Planned meeting for representatives of technical agencies

Preparatory talks were held with Mr. H.R. Shipman, Water Supply Adviser at the World Bank in Washington, on a meeting of representatives of European technical agencies operating in developing countries in the field of water supply and relevant matters. The programme should include transfer and exchange of knowledge concerning corrected designs, information on working with organizations in the U.N. family and discussion of problems that may arise when working in developing countries.

2.3 Organizational activities

2.3.1 The IRC

A great deal of time and thought was spent in 1973 on the effectuation of a properly-operating, reasonably-staffed and reasonably-financed IRC. Various discussions were held at the Netherlands Ministries for Public Health and Environmental Hygiene, Foreign Affairs and Finances. These discussions were in fact centred on the desired increase of operational freedom and flexibility since the present staff and budget does not allow for the obligation undertaken being fulfilled in a reasonable manner.

Establishment of e.g. a foundation would lead to support from outside and a more efficient use of the available funds, in particular in the personnel sector. Relevant discussions are now in progress.

2.3.2 The WHO and the networks of Centres and Institutions

Considerable attention was also paid to perfecting collaboration with the WHO and improving the organization and communication within the network of the Regional Centres and Collaborating Institutions. Several discussions were held with the WHO. In January Head Quarters were visited in order to discuss problems connected with the two meetings to be organized by IRC.

In March the manager was invited to attend a meeting of the WHO Regional Advisers in Environmental Health.

Subjects of the discussions were the research and development programmes concerning water supply and wastes disposal.

In December, talks were held in Geneva on projects in hand, collaboration within the framework of the United Nations Environment Programme, matters of organization concerning IRC and expansion of the network against the background of clearly-defined tasks.

WHO-officials paid counter-visits in February, April and October to attend, amongst other events, the IRC meetings.

Various institutes have meanwhile delegated special issues concerning the network to one officer, with a view to improving communication within the network. Some other measures on this point concerned the exchange of information. For example, a start was made to provide special services to Collaborating Institutions in the form of supplying information on issues resorting under those institutions, the supply of news for the Newsletter was better organized, and preparatory work was carried out in the documentation sector.

Few of the planned visits to Collaborating Institutions, which were to take place every 3 years, could be realized in 1973 on account of limited time and means. The manager paid a visit to the Water Research Association at Marlow, Britain, in March, which gave an impression of the laboratories and other facilities there, while forms of collaboration and IRC-meetings were discussed with the Director and various members of the staff. In September, one of the regional meetings of the WRA at Windon was attended.

A number of visits are now being prepared for 1974 in order to fill the gap and to perfect project preparation.

As to expansion of the network, 9 prominent institutions and organizations in various countries have applied to IRC for incorporation in the network of Collaborating Institutions.

2.4 Projects and studies

2.4.1 Introduction

The organizational set-up within IRC, the increasingly distinct role

played by the Centre within the network of Regional Centres and Collaborating Institutions as well as the Bilthoven meeting in April, have led to the emphasis being laid on project development, project guidance and project coordination in the planning of IRC activities.

After a fairly slow start needed for inventarization of requirements, building-up of a network of contacts and exploration of possible channels for collaboration both in the operational and financial sector, some degree of consolidation was achieved in this respect in 1973. In addition to the completion of communicative and routine tasks, a number of projects are now in a more or less advanced stage of preparation.

Discussions are on the way with a number of organizations that may provide funds. In the first instance this will be the WHO, which in its turn has contact with the United Nations Environment Programme in Nairobi on the financing of, for example, IRC projects. IRC is now actually discussing this point with various other organizations.

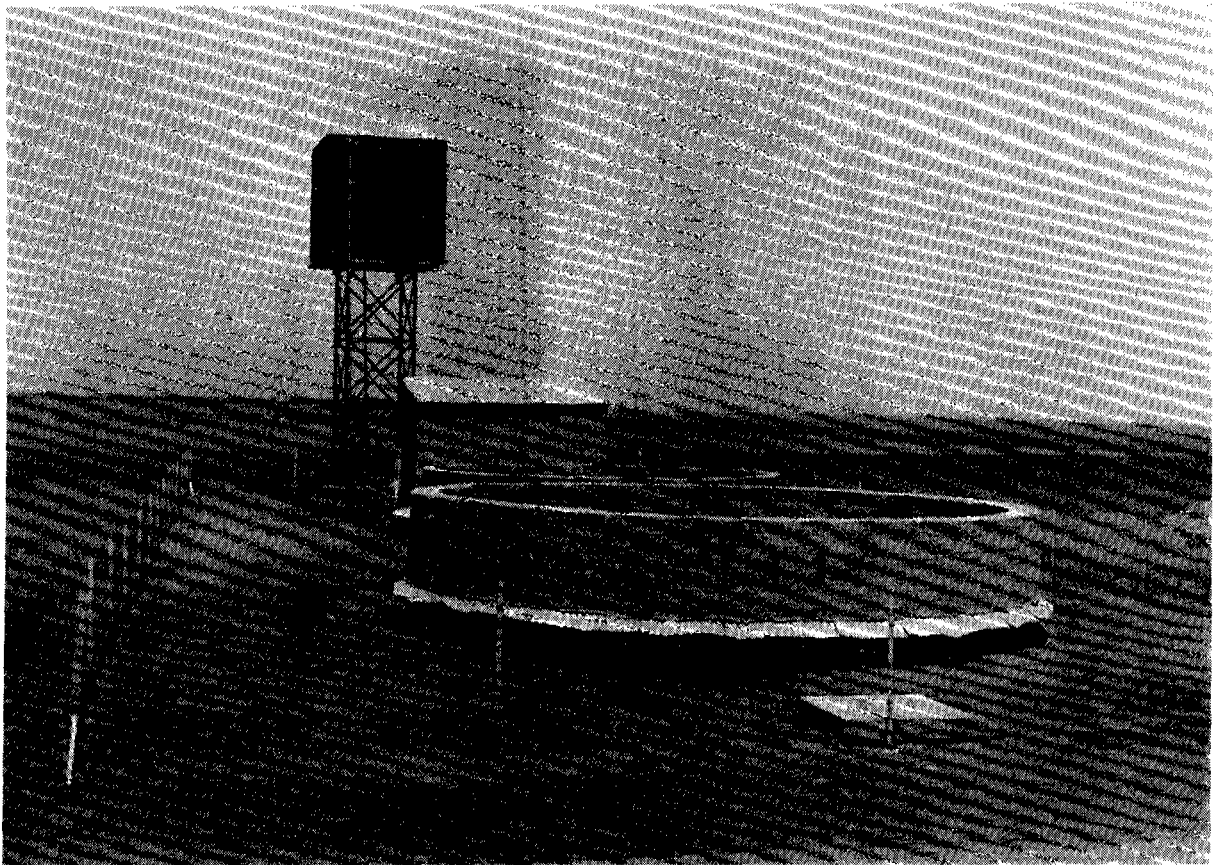
2.4.2 Slow sand filtration in developing countries

The slow sand filter is generally seen as a practical method for obtaining safe drinking water. A project proposal on this issue received the highest priority in the Bilthoven meeting.

Basic work has already been carried out by Professor L. Huisman of the Technological University Delft in collaboration with the WHO.

The objective of the project is as follows:

1. to develop a process for the preparation of drinking water by adaptation of the slow sand filter to the local situation in developing countries;
2. to carry out studies on the pre-treatment of water in tropical and sub-tropical countries and on the use of alternative filtering materials, as well as a simple procedure for the removal of mud blankets;
3. to set up designing standards for slow sand filters in developing countries on the basis of present knowledge and to gain experience with experimental filters installed at selected sites;
4. to encourage the use of slow sand filters by making a manual available, and by the organization of seminars, training courses and demonstrations at a regional level.



Water treatment system in Gezira project, Sudan.

The International Technical Assistance Department of the Netherlands Ministry for Foreign Affairs is in principle prepared to finance this project. Cooperation will be extended by the Chemical-Biological Department of the Government Institute and Collaborating Institutions in Ghana, India and Turkey and possibly other institutions. A number of prominent scientists in the field of filtration have shown an interest and declared themselves willing to cooperate. Various international organizations promised to support the project in an operational sense. The duration of the project is 3 years; it is to commence in the second half of 1974. The needed budget has been estimated at US\$600,000.-

2.4.3 Re-use of water

Another project that received high priority at the Bilthoven meeting concerned the health aspects in respect to the re-use of water. On account of water shortage, the principle of re-use of water or production of drinking water from waste water is applied in several parts of the world, whether or not intentionally. As a result, many studies are being undertaken, not only on technological methodology to achieve the safest and most agreeable results, as possible, but also on the long-term effect of the consumption of such water on health. In order to avoid overlapping of activities and open the way to general application of the findings of these studies, coordination and, if possible, integration of the studies is desirable. In cooperation with the Chemical-Biological Department of the Government Institute, IRC has taken the initiative to prepare coordinating activities in this field. Collaboration is invited from institutions not only in the Netherlands, but also in Australia, Britain, Israel, Japan, the United States and South Africa.

Activities to be undertaken progressively during a period of approx. 4 years will, if possible, include:

- discussion of a coordinated programme in a working group of representatives from the above mentioned countries;
- implementation of a coordinated programme with interim reports and regular meetings;
- organization of a meeting of experts to discuss results and to prepare further activities;
- organization of a congress for transfer and exchange of know-how and information.

The activities have been planned to commence in the second half of 1974 when the availability of funds will also be discussed.

2.4.4 Simple technologies

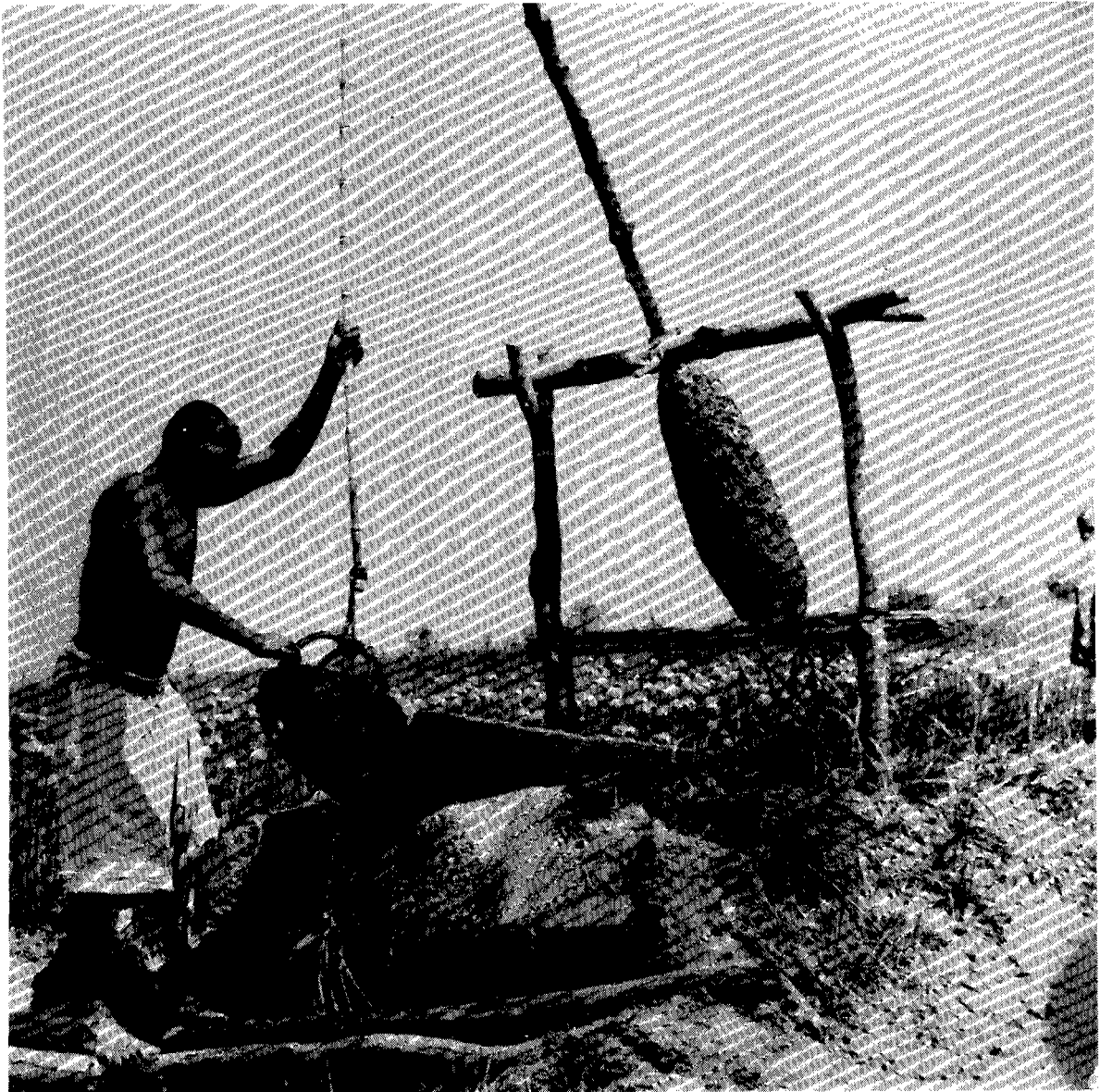
The use of simple technologies using locally available materials has for some time now occupied the imagination of planners and students of water supply systems. So far, however, the number of concrete and generally applicable systems developed in this field has been rather small.

Identification of successful, simple, low-cost technologies applied in industrialized and developing countries, and evaluation of the practicability of such technologies, in particular in rural areas, form a project in itself, in which a number of sub-projects have been designed and already partly developed.

In the course of the year the publication "The purification of water on a small scale" was completed in French and English. It is a revision of an earlier publication by R.N. Clark in the bulletin of the World Health Organization, discussing a few simple systems for the preparation of drinking water by individuals in remote areas.

A start has been made with the evaluation of apparatus in present use. In collaboration with Professor E.W. Mood of Yale University, New Haven, Connecticut (USA) and the Water Purification Department of the Wageningen Agricultural University, a system of chlorine dosing is now being tested, special apparatus having been supplied by an American firm. Through the intermediary of IRC the Wageningen University received a provision grant of US\$700.- for this project. If results are favourable, they will be published by the Agricultural College and/or Yale University, while IRC will use the findings for a later publication on the apparatus for the dosing of chlorine. IRC also took over from Professor Mood the coordination of evaluation carried out in other parts of the world under the auspices of the WHO.

Again within the framework of the transfer of knowledge about simple technologies IRC set up a sub-project concerning the use of apparatus and chemical substances for disinfection of small drinking water supply systems. This project, the draft of which IRC had had in hand for some time already, has now been submitted to the WHO for financing. It is intended to set up a reference system and a catalogue concerning available apparatus, to develop chemical substances and to



WHO photo

draw up manuals, recommendations and criteria concerning choice and application of the various existing procedures and systems in developing countries. The KIWA has, in principle, promised their cooperation.

Collaboration on a permanent basis is being developed with Professor G.W. Reid of Oklahoma University in respect of collecting and transferring existing knowledge in the field of simple technologies. In this project, financed by the US Agency for International Development, the emphasis is placed on the exchange of information.

In the field of existing information and literature concerning the issues mentioned in this chapter IRC has contacts with many institutions and individuals. In March during a visit to the Intermediate Technology Development Group in London, arrangements were made with regard to certain forms of collaboration and exchange of information. As soon as more manpower has become available the above mentioned activities, in the form of sub-projects, will be integrated in one project.

Ir. Tjiook wrote a background paper on this subject for the Bilthoven meeting under the title "An integrated programme of development and promotion of appropriate technology in community water supply".

2.4.5 Methods for examining the quality of drinking water

From various quarters IRC received urgent requests to lend publicity to simple methods for examining the quality of drinking water, both in and outside the laboratory. The Water Research Association (Britain) offered to collaborate with IRC and the Central Public Health Engineering Research Institute at Nagpur (India) in drawing up a manual based on a WHO publication concerning physical and chemical examination of water. The University of Nairobi requested IRC to publish a memorandum on bacteriological tests drawn up by them. At IRC's request the University at Aarhus (Denmark) promised their cooperation. Contacts have been established with various research workers who are working in particular on field techniques.

All these studies can be very well combined and collected in one publication. IRC has submitted a proposal to the WHO for the financing of the relatively small costs involved in this project (approx. US\$4,000.-).

In this connection could also be mentioned a request received from CIPHERI, Nagpur, India, for assistance in respect of the testing by other institutions of membrane filters developed by CIPHERI and an equivalent of the "McConkey broth". Various institutions and companies have already promised their assistance.

2.4.6 Water pollution index

Concerning the study initiated in 1971 in respect of the setting up of a water pollution index as a general criterion for the potential degree of pollution of a river, extensive information was received from institutions all over the world that had been approached on this matter. This enabled Ir. B.C.J. Zoeteman to devote an IRC technical paper to this subject under the title "The potential pollution index as a tool for river water quality management".

The author was afforded the opportunity to introduce this paper at the First World Congress on Water Resources held in Chicago, September 1973. The subject appeared to receive much interest. In the paper a river water quality model is presented based on the above mentioned index, which is the ratio of the average Gross National Product in the drainage area and of the discharge of the river.

The relation between the index and the actual quality of the water is deduced from data obtained on 160 rivers all over the world.

A classification of the rivers based on the index is given, while trends in pollution are discussed. From these figures, the original level of pollution of a river can be computed and prognoses can be given on the degree of pollution that is to be expected. Against this background a separate chapter has been devoted to the pollution of the Rhine.

2.4.7 Miscellaneous subjects

The IRC has a number of other subjects in hand to which some attention has been paid and concerning which some contacts have been established. Further development, however, had to be put off because of lack of manpower.

To mention some:

- coagulant aids obtained from materials locally available in developing countries;
- "fixed bed chlorination;

- hand pumps;
- the impact of community water supply;
- "packaged plants";
- simplified filtration systems.

2.5 Training

2.5.1 Introduction

A subject receiving high priority on every list of problems to be tackled in developing countries is training. It is also one of the needs that are the most difficult to adequately cope with.

One of the tasks of the IRC is related to this subject. In 1973 some activities were devoted to training and it is intended to devote further thought to this problem in 1974.

In the future, besides the routine activities concerning training, the tasks in this sector will have to be set up in the form of projects. Contacts about financing such projects have been established with the African Development Bank at Abidjan and the World Bank in Washington. The Netherlands Ministry for Foreign Affairs, too, has shown an interest in this issue.

2.5.2 "Twinning"

One project, initially set up in collaboration with the technical bureau IWACO, Rotterdam, the Water Company Zeeland, Goes, and the Société Nationale de Distribution d'Eau, Brazzaville, was that of collaboration between a water supply utility in a developing country and one in the Netherlands concerning training problems and related problems of exploitation.

On the basis of this experience, IRC introduced the system of "twinning" that incorporates the above mentioned collaboration, which is attracting growing interest both in the Netherlands and in the developing countries.

The questionnaire, sent out by IRC to several of its contacts on this matter, elicited a fair amount of positive response. It is intended to further develop this form of collaboration in development, by participation of Dutch waterundertakings.



Village children in Ban Som, Thailand, sampling the filtered water prior to carrying it to their homes.

2.5.3 Educational programmes for foreign visitors

Partly as an executive unit within the framework of the tasks of the parent Institute and partly in pursuance of the agreement with the WHO, IRC organizes educational programmes for foreign visitors wishing to augment their knowledge and experience in the Netherlands. Various research workers, WHO fellows and students from abroad availed themselves of this opportunity in 1973. Special mention can be made of an educational excursion organized by the IRC in June for a group of 21 post-academic students and 2 lecturers of the Sanitary Engineering Centre in Rabat, Morocco. The group was most cordially received by various institutes, water works and authorities in charge of purification works for waste water.

2.5.4 IWSA Standing Committee for Education and Training

As a member of the Standing Committee for Education and Training of Water Works Personnel of the International Water Supply Association, IRC participated in the committee meeting held at Tadley (Britain) in July.

The discussions concerned the revision of an earlier drawn up "Glossary of Terms", relating to training activities, and the result of a questionnaire on the present state of affairs in the training of water works personnel in the various member countries of the IWSA. Preparations were made for the 1974 committee meeting in Brighton, agreement being reached on the committee's responsibility for three contributions to these issues, viz.:

- manual for the development of systematic training programmes in developing countries;
- training of sanitary engineers;
- training of sanitary technicians.

The first subject arises from a project proposal submitted in the IRC meeting at Bilthoven and will serve as a basis for the IRC project discussed below.

2.5.5 Project concerning training programmes

To plan a project to be initiated, if possible in 1974, a preliminary programme concerning the development and implementation of systematic training programmes in developing countries was drawn up. Meanwhile,

collaboration for the completion of the project has already been promised to the Water Supply Industry Training Board in Britain (to which organization a prolonged visit was paid in March) and the Water Research Association, also in Britain.

Within the framework of this project an inventarization will first be made of the needs and of the existing facilities in some three, still to be selected, countries, while for each country, in collaboration with its representatives, a special programme will be drawn up.

The preparation of training manuals and other aids is to precede the actual training programme. It is intended then to recrute, if possible, a group of experts from the region concerned, to train future instructors in the countries selected, who in their turn will pass on, in their own language, their newly acquired skill and knowledge to water works personnel, therewith perhaps assisted by the group of experts. Follow-up of the training, evaluation of the results and publicity on the undertaking will form an important chapter in the project.

2.5.6 Conference "Environmental health engineering in hot climates countries"

Also within the framework of training was the participation in a conference on the above mentioned subjects, of representatives of British technical bureaus and overseas observers organized by the University of Loughborough, England, in September. Drs. van Damme presented a paper under the title "Needs and problems in water supply in developing countries" to the conference. On the same occasion also a short course on the same subject was followed.

2.5.7 Miscellaneous activities

On the request of the Free University in Amsterdam, in an attempt to evoke interest for problems in developing countries, the manager held a lecture for staff and students of the Hydrological Section of the Institute of Earth Sciences, in February.

Several articles were published with the same objective in journals and newspapers in the Netherlands.



Well near Ouagadougou, Upper Volta.

2.6 Information and documentation

2.6.1 Introduction

Besides the coordination of and aid to projects to be carried out within the network, plus organizing and initiating training programmes, IRC is also entrusted with the establishment of a pool of information; functioning as a "letter-box" for organizations, institutions and individuals in need for information, and taking the initiative in providing and exchanging know-how and information within and outside the network.

In the establishment of a documentation system annex data bank as a means to carrying out the above mentioned tasks, the function of the IRC is unique in the sense that the emphasis is laid on unpublished and hardly accessible or obtainable material. Great attention is paid to the problems of water supply in developing countries.

2.6.2 Dissemination and exchange of information

The dissemination and exchange of information is effectuated by various means:

Newsletter

In 1973, too, the Newsletter was an important contact medium in which information on new developments in the field of water supply, research findings, interesting publications, congresses and symposia, news about the IRC, Collaborating Institutions and other organizations are presented.

Several foreign periodicals referred to articles published in the Newsletter, quoting parts or even the entire Newsletter.

The information is chiefly taken from contributions from Regional Centres and Collaborating Institutions, and from periodicals. Incidental contributions were made by IRC staff members. The acquisition of information for the Newsletter from Regional Centres and Collaborating Institutions was formalised by periodically circulating questionnaires to be followed by reminders if no response was forthcoming.

This year the Newsletter appeared in Spanish for the first time, as "Noticiero". The translation and the distribution in Latin America was undertaken by the Pan American Center for Sanitary Engineering

and Environmental Sciences (CEPIS, one of the IRC Regional Centres), Lima, Peru.

The English circulation of the Newsletter has reached 2600 copies, the French 2300, while the Spanish edition numbers 2000.

For the Bilthoven meeting, Ir. Tjiook prepared a background paper "Two years IRC Newsletter, a retrospect".

Technical Papers Series and Bulletin Series

In the first series, research findings, reports and technical-scientific meetings and final reports on projects are published. The various 1973 publications are named with the relevant subjects in previous sections and in the list of publications.

The Bulletin series report on current research and training programmes undertaken by collaborating and other institutions and organizations, describing institutional facilities and reporting on meetings concerning general subjects of research. Besides the Bulletin on the Bilthoven meeting, a survey was given of current research programmes undertaken by 15 Collaborating Institutions, classified according to subject, entitled "Community Water Supply Research 1973".

Manpower permitting, it is intended to follow up this activity by displaying initiatives concerning the exchange of information between the individual Collaborating Institutions. It is worthy of mention that, as from early 1973, a more convenient format and a more striking lay-out were chosen for the technical paper and the bulletin.

Requests for information

Here again, an important activity was the Centre's correspondence with other organizations concerning the exchange of information and its dealing with requests for information received from numerous bodies and individuals. A total of 1220 mailings were received and 625 sent out.

The main subjects of enquiry were:

- problems regarding rural water supply systems;
- hand pumps;
- disinfection of water;
- the connection between nitrate-containing water and the incidence of cancer;
- the connection between the quality of water and cardiovascular disease.

Inquiries regarding rural water supply systems were made by Professor I. Burton, who was carrying out a study on this subject for the International Development Research Centre, Ottawa at the request of the OECD.

Through the intermediary of IRC Professor Burton received comprehensive information from the Collaborating Institutions. Within the framework of this collaboration, the IRC participated in a seminar held in Lausanne in May to discuss quality standards, research needs and organizational improvements concerning the setting up of rural water supply and sanitation systems in developing countries.

In the year covered by the report a beginning was made with the formalisation of the supply of information by requesting the inquirer to state the purpose of the inquiry and to give a list of available literature.

Circulation of publications

IRC undertook circulation of the following publications, prepared by other organizations:

1. G. Berg, "Viruses in waste, renovated and other waters", U.S. Environmental Protection Agency.
2. F.E. McJunkin, C.S. Pineo, "The Role of Plastic Pipe in Community Water Supply", U.S. Agency for International Development.
3. C.D. Spangler, "Simplified Laboratory Procedures for physical and chemical examination of waters", World Bank.
4. Water Research Association, Technical Inquiry Report no. 248A "Technique for Laboratory coagulation tests".
5. World Health Organization, "Reuse of Effluents: Methods of waste water treatment and health safeguards", WHO Technical Report Series no. 517.
6. World Health Organization, "Report of the Meeting of Directors of Institutions Collaborating with the IRC for Wastes Disposal", WHO document.
7. World Health Organization, "The WHO Programme in Basic Sanitary Services: Community Water Supply and Wastes Disposal: The Advancement and Transfer of Knowledge and Methods", WHO document.

International Referral System (IRS)

In December, IRC and the International Referral System of the United Nations Environment Programme discussed in Geneva, the possibilities of collaboration. The IRS displayed considerable interest in IRC's

activities and asked whether the IRC would be prepared in principle to collaborate with the IRS programme as "national focal point" in the Netherlands for environmental issues. After the UNEP meeting in Nairobi in March this request would be submitted via the official channels. Simultaneously a function of international "focal point" of water supply issues might be arranged.

2.6.3 Documentation and library

Documentation system

As a basis for a documentation system annex data bank a thesaurus was developed and practically completed in the past year. This thesaurus is also based on the OECD Macro Thesaurus, compiled in collaboration with a large number of international and regional organizations. Optimum coordination with the SALIWA (Cooperation Literature Documentation Water Utilities) system is pursued.

After ample discussion of existing systems in 1973 apparatus was purchased as an auxiliary on which a documentation system will be developed. IRC will derive great benefit from this system when studying literature concerning special projects, rendering informative service within the network and dealing with requests for information.

A small-scale start was made with summarizing relevant publications available in the IRC library that had not been abstracted elsewhere. It is intended to do this regularly and to circulate such digests outside the network too, in order to achieve better dissemination of existing knowledge.

Library

A start was made with indexing the numerous books, publications and reports received during the past years. As soon as the documentation system is operating, the scientific contents of the library will be transferred to this system, for which preparations have already been initiated. An index system for publications and reports received was set up.



Bits of rock fly up as pneumatic drill bores more than 100 feet deep through solid rock (India; UNICEF photo by J. Blacomb).

VISITORS

<u>Country/Name</u>	<u>Organization</u>	<u>Subject</u>	<u>Days</u>
<u>Australia</u>			
Mr. J.D. Lang Mr. I.G. Mitchell Mr. W.N. Sloan	State Rivers & Water Supply Commission, Victoria	Re-use of waste water	1
<u>Cameroon (North)</u>			
Mr. F.A.H.C. Polamn	Missionary	Advice on rural water supply	1/2
<u>Denmark</u>			
Dr. Maurike	WHO Regional Office for Europe, Copenhagen	General information on IRC	1/2
<u>Federal Republic of Germany</u>			
Mr. H. Hübner	Dokumentation Zentrale Wasser, Düsseldorf	Documentation system	1/2
Dr. K.E. Schickhardt	Deutsche Verein für Gas- und Wasserfach- männern, Frankfurt	1) Collaborating Institution in W. Germany 2) Rural water supply 3) Contributions to IRC	1
Mr. A. Supan	Preussag, Hannover	Plastic pipes	1/2
<u>France</u>			
Dr. M. Proctor	OECD, Paris	1) Information on meeting toxicity in February 2) Micro-pollution	1/4
Dr. R. McLennan	International Agency for Research on Cancer, Lyon	Information on nitrate content in drinking water	1/2
<u>Hungary</u>			
Dr. Ferenc Dolánsky Dr. Eng. István- Illes	NWA Water Resources Centre, Budapest	Information on qua- lity of rain water in the Netherlands.	1/2
Mr. Sarlós Miklós	District Water Authority, Győr	Introduction to IRC Information on water pollution	1
<u>Indonesia</u>			
Dr. W.L. Reyes	Institute of Tech- nology, Bandung	Contact between IRC and University of Bandung	1/2

<u>Country/Name</u>	<u>Organization</u>	<u>Subject</u>	<u>Days</u>
<u>Iran</u>			
Mr. R. Valdes-Pinilla	WHO/UN Teheran Sewage Project, Teheran	Re-use of waste water	2
<u>Malaysia</u>			
Mr. Theng Heng Low	Public Works Department, Kuala Lumpur	Training Advice on drinking water problems	1
<u>Morocco</u>			
Dr. A. Günter Mr. U. Mörgeli with 21 students	Centre International de Génie Sanitaire, Rabat	Field trip to the Netherlands for training purposes	9
<u>Switzerland</u>			
Dr. R.C. Ballance	WHO, Geneva	Follow-up of Bilthoven meeting	6
Mr. L.A. Orihuela	WHO, Geneva	1) Status IRC 2) Results UNEP-meetings 3) Activities and projects of IRC	1
<u>Tanzania</u>			
Mr. Mwanga	World Broadcasting Training Centre.	Interview	1/2
<u>Thailand</u>			
Mr. S. Dharnikarak	Chulalongkorn University, Bangkok	Introduction to IRC	1/2
<u>United Kingdom</u>			
Mr. F.J. Machon	Water Research Association, Medmenham, Marlow	1) Activities and projects of IRC 2) Documentation 3) Symposium for consultants 4) Cooperation in project on quality management	1
Dr. R.F. Packham	Water Research Association, Medmenham, Marlow	Continuation of meeting on toxicity	2
Mr. B. Rydz	Water Resources Board, Reading	Introduction to IRC	1/2

<u>Country/Name</u>	<u>Organization</u>	<u>Subject</u>	<u>Days</u>
<u>U.S.A.</u>			
Mr. S.L. Diesch	University of Minnesota, St. Paul	Information on IRC Pollution by fertilizers	1/2
Mr. H.R. Shipman	International Bank for Reconstruction & Development, Washington	1) Symposium for consultants 2) New methods in designing water supplies for projects of the World Bank 3) Several IRC projects	
Dr. W.M. Turner	Hydrotechnics, Albuquerque, N.M.	Measurement of temperature fluctuations in geohydrology	1/2
Prof. W.E. Mood	Yale University, New Haven, Connecticut	Testing of chlorinators	2
<u>Zaire</u>			
Mr. I.B. Mizamou	Société National de Distribution d'Eau, Brazzaville	Study visit	1/2



WHO photo

WHO REGIONAL REFERENCE CENTRES AND COLLABORATING INSTITUTIONS
FOR COMMUNITY WATER SUPPLY
(as at 31 December, 1974)

Regional Reference Centres

Central Public Health Engineering Research Institute
Nehru Marg
Nagpur-440020
India

Pan American Center for Sanitary Engineering and
Environmental Sciences (CEPIS)
Avenida Salaverry 722, Casilla Postal 4337
Lima
Peru

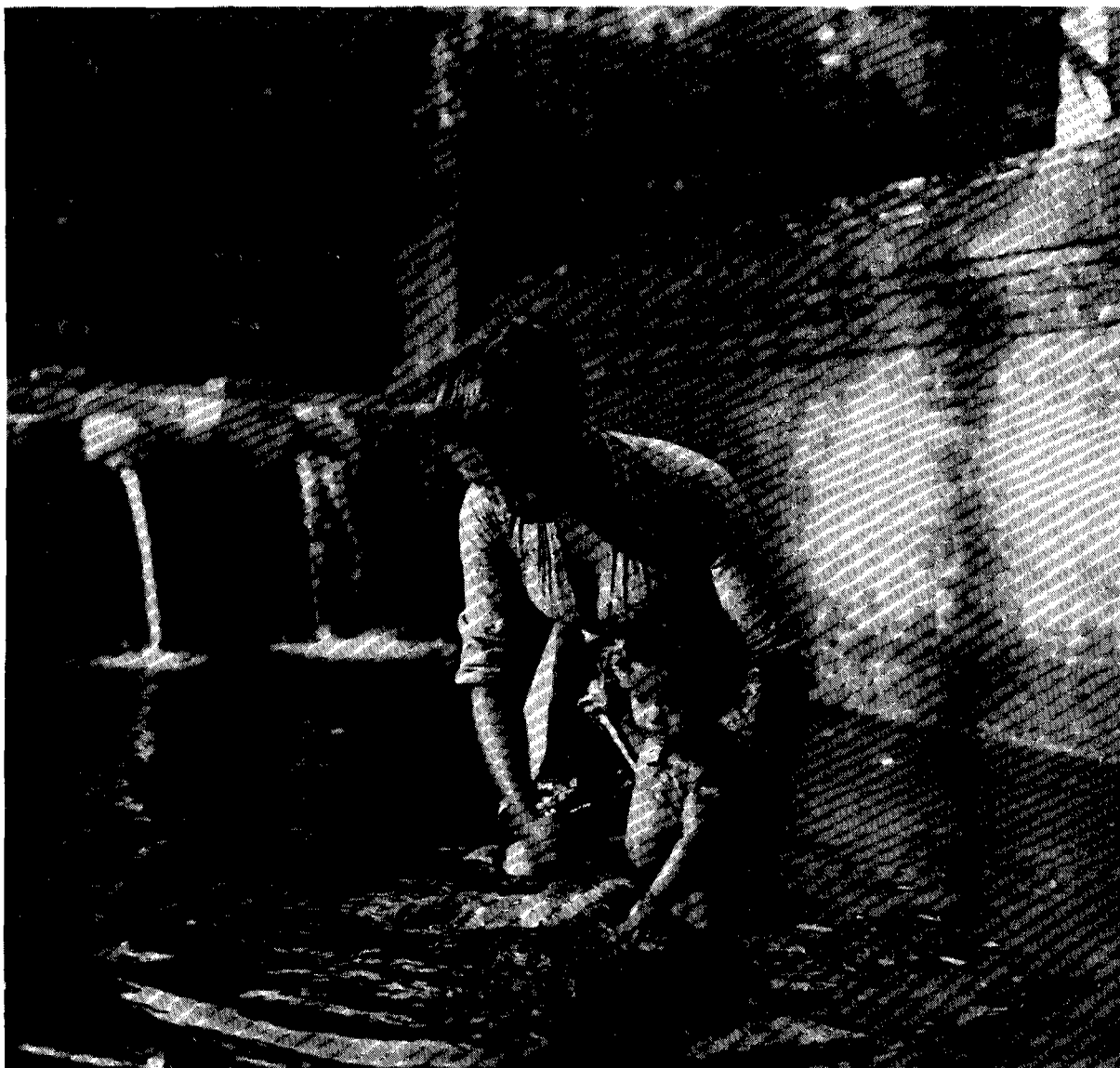
Collaborating Institutions

1. Institut d'Hygiene et d'Epidémiologie
14, rue Juliette Wytsman
1050 Brussels
Belgium
2. Instituto de Engenharia Sanitaria SURSAN/IES
Rua Fonseca Teles 121 - 15^o and
Caixa Postal 23011 - ZC 08
Rio de Janeiro - GB
Brazil
3. Centre of General and Environmental Hygiene
Institute of Hygiene and Epidemiology
Srobárova 48
100 42 Prague-10
Czechoslovakia
4. Institute of Hygiene
University of Aarhus
Universitetsparken
8000 Aarhus-C
Denmark
5. Sanitary Engineering Department
Faculty of Engineering
University of Alexandria
Alexandria
Egypt
6. Office de la Recherche scientifique et
technique Outre-Mer
Section d'Hydrology
24, Rue Bayard
Paris 8e
France
7. Department of Civil Engineering
Faculty of Engineering
University of Science & Technology
Kumasi
Ghana

8. Victoria Jubilee Technical Institute
Matunga
Bombay-19
India
9. All-India Institute of Hygiene and Public Health
110, Chittaranjan Avenue
Calcutta-12
India
10. Institute of Hydro-Sciences and Water Resources
Technology
University of Teheran
64, Ghadessi St. North Blv. Elizabeth
Teheran
Iran
11. Environmental Health Laboratory
Hebrew University - Hadassah Medical School
P.O. Box 1172
Jerusalem
Israel
12. Centro Studi e Ricerche d'Ingegneria Sanitaria
University of Naples
Piazzale Tecchio
80125 Naples
Italy
13. Istituto di Ricerca sulle Acque
Consiglio Nazionale delle Ricerche
Via Reno 1
Irsa
Rome
Italy
14. Department of Sanitary Engineering
Faculty of Engineering
University of Tokyo
Tokyo
Japan
15. Department of Civil Engineering
University of Nairobi
P.O. Box 30197
Nairobi
Kenya
16. Faculty of Engineering & Architecture and
School of Public Health
American University of Beirut
Beirut
Lebanon
17. Testing and Research Institute of the
Netherlands Waterundertakings KIWA Ltd.
P.O. Box 70
Rijswijk 2109
the Netherlands
18. Faculty of Engineering
University of Lagos
Lagos
Nigeria

19. Departamento Académico de Saneamiento
Universidad Nacional de Ingeniería
Avenida Tupac Amaru s/n
Apartado 1301
Lima
Peru
20. Battelle Geneva Research Centre
7, Route de Drize
1227 Carouge
Geneva
Switzerland
21. Faculty of Engineering & Architecture
University of Khartoum
P.O. Box 487
Khartoum
Sudan
22. Division of Environmental Engineering
Asian Institute of Technology
P.O. Box 2754
Bangkok
Thailand
23. Environmental Engineering Department
Middle East Technical University
Ankara
Turkey
24. The Water Research Association
Ferry Lane, Medmenham
Marlow, Bucks. SL7 2HD
United Kingdom
25. Department of Civil Engineering
University of Newcastle upon Tyne
Claremont Road
Newcastle upon Tyne, NE1 7RU
United Kingdom
26. Department of Environmental Engineering
College of Engineering
University of Florida
Gainesville, Florida 32601
U.S.A.
27. Division of Water Hygiene
Water Quality Office
Environmental Protection Agency
5600 Fishers Lane
Rockville, Maryland 20852
U.S.A.
28. National Sanitation Foundation
NSF Building
Ann Arbor, Michigan 48105
U.S.A.

29. Department of Environmental Sciences and
Engineering
School of Public Health
The University of North Carolina at Chapel Hill
Box 630
Chapel Hill, North Carolina 27514
U.S.A.
30. Academy of Community Services
(K.D. Pamfilov Academy of Community Services)
Volokolamskoe Sosse 116
Moscow D-373
U.S.S.R.
31. Department of Sanitary Engineering
Faculty of Engineering
Central University of Venezuela
Caracas
Venezuela



Tampaksiring, Bali, a mother bathes her daughter daily in
springfed public pool (UNICEF photo by J. Ling).

THE INTERNATIONAL NETWORK FOR COMMUNITY WATER SUPPLY AND W.H.O. OFFICES

