INTERNATIONAL WATER SUPPLY ASSOCIATION

ASSOCIATION INTERNATIONALE DES DISTRIBUTIONS D'EAU

Seminar on Developing Countries

Séminaire sur les Pays en voie de Développement

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1 Queen Anne's Gate,
London
SW1H 9BT

Telephone
01-222 8111

Elizabeth Brazendale

with Compliments

Notes on the seminar on developing countries which was held at the Kyoto International Conference Centre, Kyoto, Japan, on 6-7 October 1978, following the Twelfth IWSA Congress

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Present:

Austria

Mr. H. Herzog, Wasserleitungsverband der Triestingtal und Südbahngemeinden Bad Vöslau

Belgium

Mr. J. Bascour, Societe Nationale des Distributions d'Eau, Brussels
Mr. J. J. Bogaerts, Eternit, Kapelle-op-den-Bosch
Mr. N. Bollars, SODEMECA S.A. Liege
Mr. F. Cauwenbergh, Eternit, Kapelle-op-den-Bosch
Mr. M. Chalet, Cie Intercommunale des Eaux Bruxelles, Brussels
Mr. R. Germonpre, Societe National des Distributions d'Eau, Brussels
Mr. M. Janvier, SODEMECA S.A. Liege
Mr. S. Libert, Societe National des Distributions d'Eau, Brussels
Mr. M. Roger, Societe National des Distributions d'Eau, Brussels
Mr. M. Snel, Societe National des Distributions d'Eau, Brussels

Botswana

Mr. C. J. Lang, Water Utilities Corporation, Gabonne

Brazil

Mr. T. M. Fernandes, Porto Alegre
Mr. P. Ferreira, Sao Paulo

Canada

Mr. N. Filiatrault, Desjardins & Sauriol & Associates, Laval, Quebec

Denmark

Mr. A. Johnsen, Neilsen & Rauschenberger, Virum
Mr. O. Krogh, Vandkvaliteitsinstituttet, Hørsholm
Mr. L. Larsen, National Agency of Environmental Protection, Copenhagen
Mr. J. Ploug, Copenhagen
Mr. K. Rauschenberger, Neilsen & Rauschenberger, Virum
Mr. E. Rørdam, National Agency of Environmental Protection, Copenhagen
Mr. L. Winther, Vowiconsult, Virum

Egypt

Mr. B. M. Mabrouk, Zagazig University, Cairo

Finland

Mr. M. Tikka, Soilwater Consultants, Hensinki

France

Mr. M. Cardosi, Societe des Eau & Assainissement, Rueil Malmaison
Mr. P. Descroix, KICH, Paris
Mr. R. Faure, Societe des Eaux de Marseille, Marseille
Mr. C. Gomella, SETUDE, Paris
Mr. P. Guy, SAFEGE, Nanterre
Mr. L. Potie, Societe des Eaux de Marseille, Marseille
Mr. Y. Richard, Degremont, Paris
Mr. B. de Vulpillieres, SAFEGE, Nanterre

Federal Republic of Germany

Mr. H. B. J. Braun, G.K.W. Consulting Engineers, Mannheim
Mr. W. H. Frank, Dortmunderwerke, Dortmund
Mr. G. Hoke, Hamburger Wasserwerke, Hamburg
Mr. P. Krista, G.K.W. Consulting Engineers, Mannheim

Great Britain

Mr. S. G. Barrett, Newcastle & Gateshead Water Company, Newcastle upon Tyne
Mr. R. Y. Bromell, Severn Trent Water Authority, Birmingham
Mr. R. J. Clark, National Water Council, London
Mr. W. D. Hughes, National Water Council, Training Division
Mr. J. Lamont, South Staffordshire Waterworks Company, Birmingham
Mr. R. G. Mander, Mander, Raikes & Marshall, Bristol
Mr. R. Orman, Kent Meters Limited, Luton
Mr. R. J. C. Philips, Binnie & Partners, London
Mr. E. C. Reed, Thames Water Authority, London
Mr. A. S. Robertson, Northumbrian Water Authority, Newcastle upon Tyne
Mr. T. A. Stoten, Kent Meters Limited, Luton
Mr. B. Thorpe, Southern Water Authority, Worthing
Mr. A. C. Twort, Binnie & Partners, London
Mr. E. W. Watson, National Water Council, Training Division
Dr. E. Windle Taylor, Chairman, Committee on Water Quality and Treatment, IWSA, London

Hungary

Mr. K. Becker, Budapest Water Works

India

Mr. A. Doshi, The Indian Hume Pipe Co. Ltd., Bombay
Mr. S. T. Khare, Urban Development and Public Health Dept., Bombay
Mr. C. E. S. Rao, The Hindustan Construction Co. Ltd., Bombay

Indonesia

Mr. Dachlan Mohammad, Indonesian Water Supply Association, Jakarta
Mr. S. Darmawan, Cipta Karya, Ministry of Public Works, Jakarta
Mr. Hariyono, Indonesian Water Supply Association, Jakarta
Mr. I. Nazir, Project Manager Jakarta, Jakarta
Mr. S Pandjaitan, IWSA Jakarta
Mr. A. Sasmitadihardja,
Mr. Supraptono, Cirebon Water Supply, Cirebon

Israel

Mr. E Dubinsky, Tahal Consulting Engineers Limited, Tel Aviv

Italy

Mr. M. Calini, Conteuro SA, Vaglio Serra

Ivory Coast

Mr. S. Diallo, Abidjan

Japan

Mr. T. Magara. Institute of Public Health, Yokohama
Mr. D. Sugito

Korea

Mr. Pan-Gil Hong, Seoul

Malaysia

Mr. M. B. Ahmad, Public Works Department, Kuantan
Mr. Boon Teik Chan, Public Works Department, Kuala Lumpur
Mr. Sing Khang Lai, Public Works Department, Kuantan
Mr. Yow Ching Lee, Penang Water Authority, Penang
Mr. Cheng Win Pui, George Kent (Malaysia) Limited, Petaling Jaya, Selangor
Mr. Nicholas Ting Pek Hua, Kuching Water Board, Sarawak

Morocco

Mr. Van Berenfeld, Rabat
Mr. A. Guessous, SAEM, Rabat
Mr. M. Iraqi, Ste Nouvelle de Conduites d'Eau, Rabat
Mr. O. Laraqui, Ste Nouvelle de Conduites d'Eau, Rabat
Mr. M. Mansouri, Ste Nouvelle de Conduites d'Eau, Rabat

Netherlands

Mr. P. H. Begemann, Amsterdam Water Supply, Amsterdam
Mr. J. Haijkens (WHO, IRC) Amsterdam
Mr. J. W. P. Mulder, Wessem Sand Supply, Wessem
Mr. C. Vaillant, International Institute for Hydraulic and Environmental Engineering
Mr. C. van der Veen, Amsterdam Water Supply, Amsterdam
Mr. B. C. J. Zoeteman, National Institute of Water Supply, Leidschendam

Nigeria

Mr. L. Are, Ogun Oshun River Basin Development Authority, Abeokuta
Mr. S. J. Cotterell, Scott Wilson Kirkpatrick Ptns. Ibadan
Mr. L. T. Dompke, Rivers State Utilities Board, Port Harcourt
Mr. A. Magaji, Kaduna State Water Board, Kaduna
Mr. G. O. Ogunsola, Ogun State Water Corporation, Abeokuta
Mr. E. A. Ojo, Water Corporation of Oyo State, Ibadan
Mr. M. E. Okaisabor, Okaisabor Associates, Benin City
Mr. Souza-Okpofabri, Ministry of Works and Housing, Port Harcourt

Philippines

Mr. S. J. Ernosto, Cagayan de Oro City
Mr. F. C. Go, WHO, Manila
Mr. T. Heinsoo, James M. Montgomery (Consulting Engineers) Quezon City
Mr. R. Howard, Metcalf & Eddy International Inc., Manila
Mr. A. T. Mangawang, Ministry of Local Government & Community Development, Luzon

Portugal

Mr. L. Cunha, Laboratorio Nacional de Engenharia Civil, Lisbon
Mr. F. Megre, Laboratorio Nacional de Engenharia Civil, Lisbon

Seychelles

Mr. P. Loizeau, Minister of Works and Port, Unity House

South Africa

Mr. O. O. Hart, Water Research Commission, Pretoria
Mr. R. J. Laburn, Rand Water Board, Johannesburg

Sweden

Mr. B. Hawerman, VAV, Stockholm
Mr. S. Johansson, VIAK, Gothenburg
Mr. E. Jonsson, VBB, Stockholm
Mr. B. Lundberg, VBB, Stockholm
Mr. Wetterhall, Ministry of Agriculture, Stockholm

Sierre Leone

Mr. A. R. E. Browne, Guma Valley Water Company, Freetown

Switzerland

Mr. R. Michel, Cie. General pour l'Industrie Geneva

Syria

Mr. M. R. Mourtada, Water Supply Company, Damascus

Taiwan

Mr. Chien-Hshium Chang, Taiwan
Mr. Lien-Chuan Chen, Taiwan
Mr. Min-Ching Chen, Taiwan
Mr. Chiang-Pi Hsiao, Taiwan
Mr. Jan-Lang Hsu, Taiwan
Mr. Ming-Chang Hsu, Taiwan
Mr. Teng-Yung Lai, Taiwan
Mr. Tsu-Ching Shih, Taiwan
Mr. Kai-Wen Shyu, Taiwan

Thailand

Mrs. C. Dhamasiri, Metropolitan Water Works, Bangkok
Mr. K. Supkit Uilakkarn, Metropolitan Water Works Authority, Bangkok
Mr. R. Thavat, Metropolitan Water Works Authority, Bangkok

Tunisia

Mr. A. Frih, SONEDE, Montfleury, Tunis
Mr. M. B. Aicha, SONEDE, Montfleury, Tunis
Mr. F. Ouali, SONEDE, Montfleury, Tunis

United States of America

Mr. W. W Aultman, Montgomery Consulting Engineers, San Gabriel
Mr. H. W. Barker, World Bank, Washington
Mrs. A. Merryfield, Corvallis, Oregon
Mr. W. H. Richardson, Chicago
Mr. H. R. Shipman, Consultant, Chevy Chase
Mr. A. H. Stevenson, Greenwich, U.S.A.
Mr. A. F. Thiys, (B.I.R.D.) World Bank, Washington
Mr. L. C. Wierson, Hill International, Portland

Friday 6 October 1978

Introduction

1. Professor T. Ishibashi (Japan) President IWSA, opened the meeting and welcomed the 135 delegates from 35 countries. The Association, he said, was now developing its role in the service of water supply world-wide and with the launching of the UN Water Decade in 1980, it wanted to assist and co-operate with the international agencies and member countries in the development programme. This seminar would provide an excellent opportunity to exchange information and recount experiences, to look at the needs in developing countries and possibly help determine where the Association could best direct its efforts.

Pollution and Protection of Water Sources

2. Mr. C. Gomella (France) Chairman, said that his committee was concerned with the protection of resources. The problems of such protection were of primary importance to all those engaged in the water supply industry, and could not be separated from those of pollution.

Problems may differ from country to country, but moves must be made very early to protect not only the quantity but also the quality of water resources. He said that dilution of pollutants was not enough, as the examples of the Rhine, the Rhone and Lake Baikal had shown.

Briefly, three types of pollution could be distinguished, according to their source:

: Pollution from the conurbations, particularly the largest;

: Pollution from farming;

: Pollution from industry, which was the most dangerous.

The flow of pollution was found to be directly connected with economic growth: pollution and development go hand in hand. And it was easier to tackle the problems posed by pollution at the outset rather than to cure them after they had occurred.

Among the papers presented at this Congress, Mr. Gomella said that those most useful to participants' countries as regards protection of resources were:-

: The introduction by the Chairman, Prof. Ishibashi, at the opening session;

: The reports presented at the meeting of our standing Committee;

: General Report No. 1;

: The speeches at the Discussion Group on Management of River Basins;

: General Report No. 2;

: Special subjects Nos 2 and 6;

: The session on desalination.

Before opening a discussion which he hoped would be fruitful, Mr. Gomella suggested that the reports of Messrs. Becker, Descroix and Haijkens were heard.

3. Mr. K. Becker, (Hungary) Water Engineer presented a paper on his experience with a large investment programme in Tanzania. Very often funds were not available. Enthusiasm was not enough. Many different methods and principles were being applied simultaneously. Any breakdown could be met satisfactorily. He recounted

his experiences regarding two large schemes started in 1974. The design had not taken into account any form of standardisation in either of these two projects. He said that twelve different types of gate valves had been used in pipes of varying diameters and in addition two different types of purification plants had been installed, with the result that it was necessary to carry an excessive number of spare parts, and operators needed to know two different installations inside out.

Referring to overseas manpower, Mr. Becker stated that at times the personnel were not right for the job. They were short of qualified personnel.

If personnel were the right types they would, nevertheless, leave normally after a two or three year contract, and there would be a vacuum. Although a good job may have been done the operators did not know how to follow up with organisation, even after a period of job training. Qualified staff training was of the utmost importance and members of the IWSA could assist in this field.

4. Mr. Gomella said that the problems to which Mr. Becker had referred might seem of secondary importance and not directly connected with pollution; but they had major repercussions on the construction of pollution control projects. He said that two guidelines should be remembered:-

   a) Simple means should be sought requiring the least possible imports. For instance, primary treatment systems should be installed first and extended at a later stage;

   b) It was most important to build up a team of qualified personnel from the start.

5. Dr. P. Descroix (France) said that he had hoped to have a report from Dr. Eylers (Germany) on the Federal Republic's work on water supplies in developing countries. Germany had set up a commercial form of organisation for co-operative projects, and they would certainly have full details of this at the Berlin meeting in 1981.

Dr. Tchatchev had provided them with an interesting report on the legislation concerning monitoring and control of water pollution, particularly by industry, in Bulgaria. The line followed was conventional and comprehensive.

In 1963 The Ministry of Public Health had been made responsible by law for publishing the necessary standards and regulations. This law prohibited any discharge of municipal or industrial effluent into watercourses, lakes, or the sea, without permission from the Committee for the Protection of the Natural Environment. No Drainage improvement schemes for a commune, or proposals for the erection of a factory, could be approved unless provision was made for effluent treatment.

In 1964, a decree had provided for classification of waterways into four categories:-

I Drinking Water, food industries, swimming pools

II Watering places for cattle, sport, fish breeding

III Irrigation and industry

IV No special requirement

The dumping of synthetic radioactive substances was prohibited.

In 1976, a table of maximum acceptable concentrations for each of these waterway categories had been published.

In 1975, a decree had provided for the creation of a national network to monitor the state of the natural environment. Analyses of pollutants were made once a month. This network was operated on a co-operative basis by the various Ministries concerned: Environment, Public Health, Hydrology and Meteorology, Public Works, Agriculture and the Academy of Science.

This was, therefore, a complete and efficient set of laws which could be offered as a model to all countries faced with problems of urban and industrial pollution of the natural environment.

6. Mr. Gomella said that Regulations from other countries should not be taken over as they stood; they should be analysed and then adapted to meet one's own country's requirements. He pointed out in particular the important work which had been carried out in this respect by the Commission of the European Communities.

7. Mr. J. Haijkens (WHO, IRC, Netherlands) read his paper. (See Appendix 1)

8. Mr. Gomella thanked Mr. Haijkens, for this most interesting paper which covered both pollution standards and an outline of very specific solutions. He said that there might be thought to be some contradiction between the requirement he had mentioned at the start of the meeting and Mr. Haijkens' position on standards. In fact this was only an apparent contradiction; the purpose was the same, the difference being in the stages of achievement. The final objective must be strict standards; the stages might on the other hand differ in length and stringency. This was also true of the developed countries. In France, for instance, the quality objectives for rivers were not the same for all rivers at a given moment, although the same objective was ultimately aimed at.

The specific solutions proposed by Mr. Haijkens could no doubt be used as a basis for their discussions.

9. Mr. B. C. J. Zoeteman (National Institute for Water Supply, Netherlands), presented a paper. (See Appendix 2)

10. Mr. Gomella thanked Mr. Zoeteman for his report, which mingled a little philosophy with a lot of science, and emphasised two points: Prevention was better than cure; and that the highly relevant model of evolution of a European-type river might be applicable elsewhere, but not always.

11. Mr. S. T. Khare (India), referred to his experience in India. In 1970 there was only one State with appropriate legislation but by 1974 legislation was passed by all States, and effluent standards for industry were laid down. Habitations however, posed a more dangerous problem for the environment - of 100 habitations investigated 30 increased river pollution down stream. Sewage treatment was difficult and sewage should, if possible, be disposed of on the land as a fertiliser, to increase crop fertility. The streams in India should be classified A, B, C, D, etc., which would help in determining the best sources for water supply. As people in India had decided that water was a priority, the above classification gave an excellent lead to the politicians. It was important to have a simple and cheap method available to control industrial effluent. Mr. Khare mentioned further problems at times of flooding during the monsoons.

12. Mr. E. C. Reed (Great Britain) referred to Mr. Zoeteman's comments and stressed that a proper diagnosis of water quality was essential, apart from the sensory method: cholera, typhoid, etc., were not matters which could be determined by smell.

13. Mr. Gomella thanked Mr. Reed for clarifying these two major types of pollution: pollution with consequences for health, which involved infectious or parasitic diseases; this was a highly dangerous form with very rapid effects; a more insidious physico-chemical form of pollution, upon which Mr. Zoeteman had previously laid stress. The problems of parasitism were not much in evidence in the developed countries, but were of considerable importance in the tropics. However, there were fears in Europe at the moment of their reappearance as a result of heating of the river by power stations.

14. Mr. A. Guessous (Morocco) said that water resources were more plentiful in Morocco than in some neighbouring countries. At the start they had mainly tapped springs, but currently were making increasing use of surface water.

But as soon as there were large areas of impounded water, the problems of eutrophication would have to be faced in summer, with the disappearance of a proportion of the dissolved oxygen. In winter, on the other hand, the dams would not raise any special problem.

A second point concerned their groundwater levels. Because of increasingly intensive use of fertilisers, the quality sometimes deteriorated. He said that there were problems with nitrates in particular.

Water Quality and Treatment

15. Dr. E. Windle Taylor (Great Britain) chaired the second session on water quality and treatment and briefly introduced the following items:-

1. Water quality requirements of developing countries in relation to WHO guidelines.
2. Relevant papers on water quality and treatment presented at the Kyoto Congress.
3. In Amsterdam in 1976 a paper was presented by A. Lencastre on basic criteria for small capacity treatment plants as exemplified in their application in Mozambique.
4. The merits of slow sand filtration for use in developing countries.
5. Means of disinfection of water in rural communities.

16. Mr. C. J. Lang (Botswana) discussed, with particular regard to rural water supplies, the required standards for water quality. Compliance with these standards, he said, depended on the experience of the staff of the water supply authority in the developing country. You could usually make residual chlorine tests, but more often bacteriological tests were desirable; priority should be given to chlorine tests.

17. Mr. Chan Boon Teik (Malaysia), questioned the relativity of quality standards. He asked whether they would deter people from using water when it was readily available if the required standards were not met.

18. Dr. Windle Taylor said that colour and smell in many cases can be a parameter as well.

19. Mr. H. R. Shipman (USA) said that there had been criticism of WHO quality standards. He had been taught that laboratory quality standards should be tools; too much emphasis should not be put on them. Often the WHO standards were too high. But one could not place too much credence on samples from remote rural areas.

20. Dr. Windle Taylor recommended slow sand filters. He said that London had had them for over 150 years. WHO/IRC The Hague (Holland) had a series of pilot plants planned in various countries.

21. Mr. Haijkens confirmed this and specified that five years ago pilot plants had been introduced in six developing countries. A year ago the next stage had been put into operation. In eight countries large-scale plants would be built to cover the full field of operation and maintenance and there would be provision for training personnel.

The programme is available from the IRC for anyone who would like a copy.

22. Mr. Eric Reed (Great Britain) stated that slow sand filters were the best single method of purification - simple to construct and easy to clean. Polythene covering over slow sand filters had proved a deterrent against algal growth and did not influence the quality of the final product. He showed two slides demonstrating the cleaning of a slow sand filter.

23. Mr. C. Vaillant (IIHEE Netherlands) also supported the efficiency of slow sand filters. He showed slides of more sophisticated plants where something had gone wrong with either the dosing or the settling part of the plant. He pointed out that the argument of "too much area required" was not valid. Reservoirs and domestic facilities each took more square meters per capita than a slow sand filter.

24. Mr. Van der Veen (Netherlands) asked what measures should be taken during times of high turbidity of the water.

25. Dr. Windle Taylor replied that settling tanks could be utilised. Furthermore, he went on to discuss disinfection with either chlorine gas of hypochlorite. The disadvantages of the latter product were that in six months time the strength of hypochlorite is reduced by half. Duplication of plant required further expenditure. The production of chlorine by means of electrolysis of brine was very common for smaller production units.

26. Mr. A. R. E. Brown (Sierra Leone) stated that in his experience electrolysis had not been successful.

27. Dr. Windle Taylor also mentioned ozone as an oxidising agent, but said that it was less suitable for use in developing countries.

28. Mr. C. E. S. Rao (India) drew attention to the loss of head in slow sand filtration and the high turbidity in monsoon periods.

Distribution

29. Mr. R. Laburn (South Africa) Chairman, reported that of the 20 various sessions of the current Kyoto Congress, 10 had been devoted more or less to water distribution, and no wonder since the greatest expenditure for all water companies and water organisations was on pipelines. The developing countries should learn from the mistakes the developed countries had made. The rate of development varied greatly. In some areas it was at the rate of 2-10 per cent per annum. In the Rand Water Board area it had increased at the rate of 6 per cent per annum for the last 75 years. (See Appendix 3)

30. Mr. A. Thiys (B.I.R.D. World Bank) said that in areas of urban explosion the rate of increase had doubled in ten years.

31. Mr. Laburn, continued by stating some facts about the Rand Water Board. The assessment of future requirements would always be difficult. Statistical information was important as well as surveys of consumption versus temperature.

The number of domestic supply points was also important. Pipelines which would be subject to soil conditions might also require cathodic protection. Preferably pipelines should be buried in order to avoid being damaged by ploughing machinery. If possible ring mains should be in common use, and emergency power should be available. Peak demand should be catered for. He said that it was important to influence legislation so that pipes could be laid without delay. In South Africa only seven days notice was necessary. Every country should treat water as a high priority and authorities must be convinced that water was the most essential commodity.

32. Mr. M. E. Okaisabor (Nigeria) said that there were problems attached to laying pipes in urban areas, mainly due to other underground traffic. He even had trouble crossing the road to make house connections. In his country water came last on the list of priorities.

33. Mr. K. Diallo (Ivory Coast) said that with regard to growth rates, when basic data over a long period were available these were easy to calculate. On the other hand, in villages supplied by rivers, or villages with explosive growth, for instance as a result of the creation of an industry, it was much more difficult. The same applied to estimating the size of investments. In the Ivory Coast, the mean growth rate was 3%. but with extremes of up to 10 or 15%.

In the case of reservoirs, if no accurate growth rate was available, if there was no town planning, and no topographical constraints existed, the problem of location became a serious one. He asked what experts thought of this aspect? If there was a town plan, it would often conflict with other systems; telephones, drainage, various cables ... agreement was possible, but difficult. In new streets standby conduits were normally provided, in order to ensure that in future it would not be necessary to remove the surface when applications for connection were made.

34. Mr. Van der Veen (Netherlands) also took part in the discussion. One of the points made was that it was important to have a good working relationship between employers of the Water Supply Company, and personnel in telecommunications, the Public Works Department and the Sewage Department, so that matters could be properly co-ordinated.

35. Mr. Thiys in answer to Mr. Khare's question about estimating demand and the extent of investment, said that surveys showed that the greatest savings were in fact made by correctly calculating the year of commissioning. An error of two years in the operational date four years in advance represented 25% of the cost of the project. On the other hand, saturation after 15 years instead of 10 represented an error of only 10%.

There was, moreover, a very close correlation between sales of water and number of connections. It was thus very important to make a proper assessment of the rate at which these connections would be provided.

Water Meters and Water Metering

36. Mr. H. R. Shipman (USA) Chairman, commenced with the following comments:

1. He would like to leave production meters outside the discussion, although he stressed the need for calibration once a year. Production meters were a must, as it was not wise to calculate production by multiplying the pump capacity by working hours.
2. Very few countries did not have residential meters; there were questionnaires which bore this out.
3. A valid question was: What does one do if meters do not work?
4. Intermittent supply and intermittent pressure gave rise to problems with meters; as air passed through the meters it was recorded as water.
5. Meters were generally intended to reduce wastage and by so doing postponed investment.

Another valid question was: if world bank loans were granted with the proviso that supply was metered, did one install meters during intermittent supply or did one wait until production capacity had been increased.

37. Mr. San Juan Ernosto (Phillippines) strongly supported speedy installation of meters. In his experience installation of meters had stopped intermittent water supply.

38. Mr. Ben Aicha (SONEDE Tunisia) said he did not agree with the Chairman. The 'intermittent pressure' factor should be momentary only; it was not an objective for a supplier. Production meters were not in fact particularly useful. They were generally fitted in places lacking in sufficiently skilled personnel. Moreover, breakdowns were frequent. It was better to use simpler systems: venturis, monitoring of electricity consumption. What was important was to monitor the major consumers, industries, hotels, etc. In Tunisia 3% of users represented 40% of consumption. In the case of domestic users, they were invoiced quarterly, reading one third of the number each month.

He said that they had gone quite a long way with the use of meter reading, distinguishing between types of user: domestic, industrial, government. This provided statistics on which reliable medium-term estimates of demand could be made. It was difficult to see why the advisability or otherwise of installing meters should be linked with climate. The psychological advantage of meters was most important in the fight against waste.

He was of the opinion that water supply companies were duty bound to deliver water at all times at a reasonable pressure.

39. Mr. Shipman reminded the audience that 85 per cent of all requests to the World Bank for loans were from areas where intermittent supply was a reality. He praised SONEDE for the great improvement in water supply in Tunisia over the last 10 years. He mentioned the social/cultural aspect of metering in areas where metering was normal. Thefts of meters as well as damage to meters took place. Meters could also be bypassed and some countries had abandonnedmeters altogether because of vandalism. Education programmes should include teaching on the advantages of meters and respect for them. In Latin America, populations of less than 2,000 were not metered while in larger areas 100 per cent were metered.

40. Mr. A. Thiys (World Bank) stated that he was a pro-'meterman', except probably for smaller areas. He was of the opinion that one could not start a water decade plan without insisting on meters as they were the only means of charging a social tariff.

Tourist industries could be charged with higher tariffs than normal. He realised that vandalism occurred, but thought that it could be overcome, and that the extra cost involved would be worth it. The only chance of increasing the water rates at times was to tackle the better class people who consumed more water. This could only be done if meters were installed. Intermittent supply would increase the consumption of water, as large quantities of water are wasted when the new supply came on.

41. Mr. Shipman was of the opinion that the social tariff could be worked out on a different basis; for example, on the area of the house, number of bathrooms, size of garden, etc. In developing countries especially there were doubts about metering.

42. Mr. Chan (Malaysia) said that meter readers could be bribed.

43. Mr. Van der Veen (Netherlands) said that with regard to tariffs, metering could be advantageous to a water supply company at times of high consumption and disadvantageous during times of decreased consumption. The need for meters depended on the social habits of people, climatological conditions and countries. Industries should always be metered.

44. According to Mr. E. Johnson (USA) a flat rate was highly discriminating, particularly against a small family, for instance. He stated that water supply companies should operate as economically viable institutions. Welfare costs should be paid for by the welfare institutions.

45. Mr. Lee (Malaysia) told the meeting how a computer could help the company. Billing losses were reduced from 23 per cent to 8 per cent. The computer also registered if a meter was not read in three months. The computer also identified high and low consumption, and in times of drought one could warn high consumers to reduce consumption.

46. Mr. Browne (Sierre Leone) called attention to the areas where 60 per cent of the population were served by means of standpipes. Where does the money come from he asked? He suggested a flat rate charge.

47. Mr. Ben Aicha (Tunisia) said that in the case of intermittent pressure, they invoiced pro-rata, on the basis of the four preceding years. To guard against readings by guesswork, they had a regular rotation of readers.

48. Dr. Descroix recalled that to prevent guesswork readings, one method used some years ago had been to supply the reader with a book which did not give the previous readings. He was thus forced to go and record the true figure.

Education and Training

49. Mr. B. Thorpe (Great Britain) Chairman, stressed the importance of this subject to all countries, both those producing the services and for the people receiving the services. Payment for services given should form part of the education programme. He wanted people to know what is expected from the Standing Committee on Education and Training. Some activities were: attention to rural water supply, which was the subject of a congress session; plans for a library; survey of training facilities in the various countries; and a glossary of terms to help everybody understand subjects under discussion. (See Appendix 4)

50. Mr. W. D. Hughes (Great Britain) presented his paper (See Appendix 5)

51. Mr. A. Sasmitadihardja (Indonesia) informed those present on the situation in Indonesia. At national level there were training courses run by the Ministry of Health for rural areas, and the Ministry of Public Works for urban areas. The latter is more or less permanent and deals with maintenance and operation of treatment plants plus planning and design of new installations. At provincial level there was schooling in the principal towns. In conjunction with Japanese authorities a programme for training had been planned in 1973. On the job training was preferable, but it was difficult to find trainees despite an adequate budget.

52. Mr. A. Guessous (Morocco) said that he came from a country which one could call underdeveloped or developing according to whether one was a pessimist or an optimist - he was a physicist, and a teacher for 15 years, when he had been in charge of a college for training secondary and primary school teachers. For some years now he said he had been directing a Moroccan engineering consultancy which had been in existence for 30 years. On Monday, at the meeting of the Education and Training Committee, he reported that forms of training experience had been offered which existed in Germany and Japan. These were probably not of interest to countries such as Morocco. This morning "bamboo pipes" and "slow filters" etc., had been mentioned; these did not meet their needs either. The treatment station which Mr. Guessous had mentioned was currently treating 4 m3/sec and would be treating 14 m3/sec in the final phase.

He said that Morocco was faced with galloping population expansion. Mr. Guessous stated that IWSA should endeavour to learn more about the water supply and training organisations existing in countries such as Morocco, and make them better known. He suggested that, between now and the Paris Congress, 4 or 5 reports should describe the actual situation in such countries. For his part, he was prepared to draw up the report for Morocco.

53. Dr. B. M. A. Mabrouk (Egypt) suggested that IWSA should help the Egyptian Water Authorities by putting forward plans for an education programme.

54. Mr. Ben Aicha (Tunisia) said that enthusiasm was required first of all. Any foreman directing his team did 'on the job' training. He advised against questionnaires: the men needing them most could not always read and write. A pragmatic approach was needed: to identify where things were going less well, train on the spot, train in small groups, give young graduates experience by including them in, for instance, teams of consulting engineers. Some ideas for the future: co-operation between developing countries, triangular co-operation (developed country, partially developed country and country just starting), links between water supply services in a developed and in an underdeveloped country.

55. Mr. L.Potie (France) gave a brief description of a training organisation set up two years ago by France with the help of UNEPK known as CEFIGRE, this body had first been introduced in February 1977 at the Mar del Plata Conference. It was managed by a Board consisting of government representatives from several countries. It was financed by UNEP, France, and public and private bodies using the Centre, and its purpose was to provide training for management in the following fields:-

: Mastery of technical matters connected with the quality and quantity of water resources

: Mastery of associated legislative and institutional matters

: Ability to follow up the implementation of selected schemes and to monitor results.

There was also a Documentation Centre and a Research Centre.

CEFIGRE had organised many seminars for engineers and administrative officials in the water supply sector. These seminars had included a theoretical part, provided by international experts, and practical training periods with existing water supply concerns. The centre was located at a pleasant site near Nice, in France. Additional information and practical details in brochures were available to participants.

56. Mr. E. Watson (Great Britain) then presented his paper

General Discussion - Open Forum

Standing Committee Chairmen formed the Panel:

Professor Ishibashi opened the discussion

57. Mr. R. Mourtada (Syria) stressed the important points in his memorandum on the problems encountered in developing countries in the field of drinking water and sanitation, which was available to participants. He said he was going to tackle a subject which differed from those which had been dealt with by people attending this seminar.

First of all he reminded delegates that recommendation C.12 in the Habitat Report of the United Nations Conference on Human Settlements held in Vancouver (Canada) in 1976 stated that:

a) In the less developed countries almost two-thirds of the population did not have reasonable access to safe and ample water supplies and means of waste disposal, and that:

b) Safe water supplies and hygienic waste disposal should receive priority with a view to enacting measurable qualitative and quantitative targets serving all the population by a certain date; targets should be established by all nations and should be considered by the forthcoming United Nations Conference on water.

In the resolution, adopted after the Water Conference held in February 1977 at Mar del Plata (Argentina) to discuss all problems connected with water, i.e. hydraulic resources of water systems, desert creation, etc., the United Nations had appealed to all countries, during the general international extension of the water system between 1980 and 1990, to implement plans for a 100% drinking water supply to the whole population, with a mains service for towns. (See Appendix 6)

58. In response to this appeal, a similar resolution was adopted by WHO at its 13th general meeting in 1977. The President of IWSA, Professor Ishibashi had also announced the following important event in his opening speech at the inaugural session of the IWSA Congress:

"For its part, the International Water Supply Association adopted at its general meeting two days ago a resolution which substantially declared that:

"The International Water Supply Association unreservedly supports the proposals for generalisation of the water supply system proposed by the UN and by WHO. The members of the Association will approach their Governments requesting implementation of the resolution, while co-operating fully with Government programmes. The industrialised countries must provide positive co-operation in the implementation of major plans on an international scale through technical co-operation, provision of information and training of the technicians needed by the developing countries."

59. Mr. Mourtada said that developing countries had, of course, only one desire - to see this aim achieved. They could therefore see that all those concerned were agreed on the achievement of this purpose which concerned humanity as a whole, and were willing to collaborate in finding the right answers to these countries' problems.

Since the Mar del Plata recommendations were only resolutions, which allow the Governments of the developing countries a free choice of the right ways to implement them, he suggested that the delegates of WHO and IBRD at this Congress were best placed to tell us, 20 months after the appearance of these recommendations, how many of the developing countries had taken the necessary steps to implement them. He personally believed that few countries had done so, and then only those possessing the technical and material facilities to adopt a sound methodology, and had given priority to the resolution of these problems even before the Mar del Plata Conference.

The problems of the developing countries, whether financial, technical, social or organisational, were highly complex and required a sound methodology and long hard work, plus financial resources, to solve them.

In view of what had been said, in his view, a dynamo or a catalyst to accelerate reactions was needed, before a satisfactory result could be achieved. Addressing the Chairman, Professor Ishibashi, he said he was aware that the IWSA:-

1) was an international organisation of great worth in the field of drinking water

2) which combined a large number of water suppliers throughout the world

3) having concerned itself for some years with the problems of developing countries

could play a very important part in this field with a view to maximum implementation of the Mar del Plata recommendations.

Briefly, he proposed that:

A. The IWSA should approach:

1. The international organisations concerned, such as WHO, IBRD, etc.
2. The developing countries or organisations capable of representing them,
3. and the industrialised countries.

He suggested the setting up of a Standing Committee whose job would be to find the best way of implementing the recommendations of the Mar del Plata Conference in the field of drinking water and sanitation, particularly as regards the developing countries. This Committee would include representatives of the organisations mentioned and would be responsible for determining the obligations of each, and a rational relationship between them. The Committee would propose a programme, the purpose of which would be to expedite the implementation of these recommendations to the maximum possible extent.

The results of this Committee's work would be submitted every two years to the developing countries' seminar to be held at the IWSA Congress, where they would be discussed, amended if necessary and subsequently approved, so that every representative of an organisation could take responsibility for approaching that organisation requesting implementation of the resolutions.

B. A triangular form of co-operation between the least and most experienced water supply services in the developing countries and the water supply services of industrialised countries (i.e. a twinning arrangement). Such collaboration might lead to improved project design and more efficient operation.

C. Finally, that the Governments and peoples of the developing countries would have to make a major effort, particularly for the financing of projects, the organisation of water supply services, training and instruction of personnel and everything necessary for optimum operation of drinking water projects.

These were proposals which could not be studied in detail in the time available to us, and he therefore urged those attending this seminar and subsequently the IWSA Standing Committee to take the appropriate decisions in this connection.

60. Mr. Diallo (Ivory Coast) fully endorsed the remarks of the delegates from Morocco and Tunisia. He said it was their ambition in the Ivory Coast to make available to the whole population water which was sufficient in terms of both quantity and quality. If they had the opportunity one day of hosting an IWSA Congress, as he sincerely hoped would be the case, they would show how far this objective had been achieved in the Ivory Coast. Currently, they were contemplating setting up a regional organisation in conjunction with the water supply services of neighbouring countries, which would provide for meetings and an exchange of information.

He said that the main problems they had to face were:-

: conflict with other users (energy, irrigation, etc) over the sharing of resources; sometimes this forced them to devise integrated programmes for the use of these resources;

: shortage of reliable basic statistics;

: availability of sufficient water resources;

: financing and above all maintenance of new installations.

On the last point, he recalled, in conclusion, the remark made a little while ago by Mr. Hughes, which he fully endorsed: "It is well-trained people who produce good supplies".

Saturday 7 October the meeting was reconvened at 9.00 am by Mr. C. Van der Veen who invited Mr. S. T. Khare (India) to take the chair.

Case Study 1

61. Mr. Aziz Sasmitadihardja (Indonesia) presented his paper on "Pollution and Protection of Water Sources" with regard to Surabaya, East Java and its environs, (See Appendix 7) He said that 50 per cent of the population had access to safe drinking water. He then showed some slides. There were three main consumers of water in the province of Surabaya:-

1. Industry
2. Agriculture
3. Human beings

Both industry and human being were also pollutors. Following Mr. Aziz's
62. presentation Mr. Yow Ching Lee (Penang) spoke on the 'Appropriate Technological Applications to the Penang Works'. Improvements to existing water purification installations had been made by using common sense and locally available materials. He showed some slides giving an impression of the situation and solutions. (See article in 'Aqua' 1 1979)

63. Mr. L. S. Rao (India) spoke on the 'Assessment and Control of leakages in the Distribution System'. This paper had been prepared by Mr. V. Raman (see Aqua 4/78).

64. Mr. Lee Yow Ching (Malaysia) asked for attention to be given to another type of leak; pilfering. He said that it was relatively simple to tap water from an air relieving valve, and two slides were shown to prove this point. After questions, Mr. Lee confirmed that the appropriate technology was applied to existing plants, and as a result production had been increased. In new plants new techniques and sophisticated equipment were included.

65. Mr. Shipman (USA) stated that the water hyacinth shown on Mr. Aziz's slides was a good source for the take-up of nutrients from water, and reduced the B.O.D. figures although these plants had to be removed occasionally because at times they presented problems.

66. Mr. Aziz Sasmitadihardja confirmed Mr. Shipman's contributions and mentioned studies of an Institute in Bandung in this respect. Clogging-up of the rivers was indeed a problem.

67. Mr. A. C. Twort (Great Britain) congratulated Mr. Lee Yow Ching on the work done at Penang. He considered that Penang Water Authority must be a happy undertaking to work for and he was not surprised that economies had been achieved as these were the result of engaging the enthusiasm of engineering staff.

With respect to the baffled chemical mixing channels successful at Penang, this illustrated the different conditions affecting water treatment in the tropics as compared with water treatment in cold climates. Temperature of the water was an important factor. He did not think simple baffling would achieve proper mixing of chemicals in a cold water; and had become convinced that the application of energy for mixing was essential in cold climates.

He suggested Mr. Lee and staff should consider what could be done about contact tanks. Their performance could be very bad in practice. At best they might be 33% efficient. It was irritating to think that, of the capital spent on constructing such tanks, two-thirds was thrown away.

With reference to Mr. Raman's paper presented by Mr. Rao, Mr. Twort confirmed from his own experience with intermittent supplies at Instanbul that much unaccounted-for water arose from the over-flowing of storage vessels or cisterns. During Ramadan householders had their evening meal at night, and would breakfast again about 4.30 am before dawn. Graphs of consumption in a typical area showed that the night-time consumption was less during this night-time activity, than when people were asleep all night. The consumption graphs fully supported the idea that the main cause of excess consumption outside Ramadan was overflowing of storage vessels whilst householders were asleep.

68. Mr. Van der Veen asked Mr. Rao to comment on the follow-up of Mr. Raman's paper. Mr. Rao stated that in Bombay there was a permanent leakage control system in the form of a special unit.

69. Mr. Khare stated that there should really be a similar system in all other cities in order to fight leakage problems. He called on the World Bank to pay attention to this point as well as to national training programmes.

70. Mr. Chan (Malaysia) referred to slow sand filters. He said that raw water these days was different from the raw water in the past. Pre-treatment was necessary he maintained and praised the tube-settler as the perfect implement for purification.

71. Mr. Shipman (USA) underlined Mr. Khare's point in training and said that national and provincial training institutes should have preference over single units.

72. The Chairman summed up the papers as follows:

1. River basin water should be used for drinking water supply and legislation should make this possible.

2. Mr. Lee had given clear insight into low-cost solutions to effect good operation and increase the production of plants. He could foresee a valuable exchange of ideas between India and Malaysia.

3. Leak detection should be put into practice. In built-up areas metering could help as a control measure, but in rural areas different methods were required.

73. Mr. Yasumoto Magara (Japan) presented his paper on "bilateral Co-operation in Training". Training in Japan is undertaken at training schools, run by the central government. The following training facilities were available.

(a) Laboratory facilities

(b) Field practice

(c) Audio visual teaching aids

(d) Text books

By-laws, the design of water treatment plants and evaluation of treatment processes were also subjects for training courses. (See Appendix 8)

74. Mr. Daisaku Sugito (Japan) spoke on his paper entitled 'Eastern Asia Water Supply Association'. (See Appendix 9)

75. Mr. Katsunobu Takenaka (Japan) introduced the paper on the 'Water Supply System of Liberia (West Africa) (Appendix 10)

76. Mrs. Champit Dhamasari (Thailand) gave a resume of the discussion held in Bangkok in 1977. She said that a small scale conference was much better than a large one as more time could be spent on detailed discussion of common problems. She hoped, however, that further progress would be made by the next conference in Taipei.

77. Mr. Panjaitan (Indonesia) asked how the regional conference in Taipei was associated with the IWSA.

78. Mr. Aziz Sasmitadihardja (Indonesia) stressed the importance of educational training being given to recipients in their own countries.

79. Mr. Frank Go (Phillippines) WHO presented his paper on 'Co-operative action for the Water Decade' (Appendix 11) and also stated that at a meeting in Geneva next month, donor countries would be asked to set targets and goals for the next year(s).

80. Mr. A. Thiys (World Bank, Washington) reported that the World Bank's capital would be doubled and that it would be possible to lend one billion US dollars per year by 1990.

So far developing countries had been financing 80 to 85 per cent of their investments, and should continue to do so. Planning took time and feasibility studies should be ready for 1980. From the moment a project was conceived until it was built, a period of 10 to 12 years would elapse. Most projects would, therefore, not be finished by the end of the decade.

Mr. Thiys stressed the point that water authorities should be created and/or strengthened and to make a success of this one has to be sure that plans once realised, would be properly operated and maintained. On finance, Mr. Thiys said that water rates should be increased in time to ensure their own financing. In Tunisia financing arrangements were as follows: 40 per cent by the water company, 40 per cent by the Tunisian Government, and 20 per cent by international agencies.

81. In the discussion Mr. Browne (Sierre Leone) asked Mr. Thiys' opinion regarding:-

(a) the time taken to approve projects. In his experience, Mr. Browne said that this took a long time and wondered how it could be shortened.

(b) If 80 per cent had to be financed by the country concerned, this seemed to be impossible for rural water supply areas.

82. In reply Mr. Thiys stated that rural and urban supply should not be separated and that towns and industries should pay for rural development. As for the approval of projects, this should take about nine months, and should not, therefore necessarily hold up the projects.

83. Mr. Go stressed that water supply in rural areas should be a basic service. Many Governments believed this and in many cases it was provided as a social service.

84. Mr. Chan (Malaysia) raised the point that not many people knew about the decade. He asked for guidelines from the international agencies as to the form in which plans should be submitted. He also asked if there was a model to enable approval to be obtained in a relatively short period.

85. Mr. Aziz Sasmitadihardja (Indonesia) supported Mr. Chan's plea: He also wanted to know if models were available showing how the approval procedure could be shortened.

86. Mr. Rao (India) stated that the Indian Water Works Association had guidelines, and anybody who was interested would be welcome to see them.

87. Mr. Okaisabor (Nigeria) said that he was sceptical about the water decade. He emphasised the importance of training with the assistance of the IWSA. He also wondered if twinning was sufficient.

88. Mr. Thiys informed the audience that standard procedures had been worked out for rural water supply. Complex situations in urban communities needed careful study before appraisal was given. As for training, the water authorities themselves should look into this aspect. The bigger the water authority, the easier it was for them to release personnel for training in rural supply companies.

89. Mr. Go said that political decisions on the subject of water supply should be taken now, but if the decade finished in 1995 instead of 1990, it would not matter.

90. Mr. Van der Veen (Netherlands) delivered his paper on "What Contribution the IWSA can make and how this contribution is to be organised". He said that the IWSA should not duplicate efforts but should give assistance to international agencies, and should help to achieve concrete results. It was essential that each development was carried out by the people themselves. The means of assistance and co-operation were several:

(a) The IWSA would continue to offer a platform for communications. This was essential, and had been done successfully in the past. The programme of IWSA Congresses had been increased: they were now held every two years rather than every three.

(b) Activities should be regionalised. There were three types of regional activities:-

1. Regional conferences - dealing with general subjects.
2. Specialised conferences - on special subjects.
3. Seminars - the main emphasis being on exchange of knowledge.

He said that a regional conference on Africa would shortly be organised.

(c) The quarterly magazine "Aqua" was an important vehicle for communication. Efforts had been made and would continue to be made to increase the area of circulation.

(d) It was hoped to introduce a regular publication of scientific and technical papers.

(e) Increase in membership was important; more people should know about the IWSA, and its expertise available from members of specialist standing committees.

(f) Assistance in organising water supply authorities.

(g) To draw the attention of various Governments and water supply organisations to the Decade.

The committee on Co-operation in Development was now working. Members were representatives from all continents and international agencies (WHO and WB).

Co-operation between water supply authorities in various parts of the world (twinning), would be an important activity. Support from the World Bank for an action programme would be sought soon. The main item for the IWSA Congress in Paris in 1980 would have to be the Decade.

91. Professor Ishibashi (President of the IWSA) closed the seminar. He said that this was the first seminar conducted by the IWSA. He hoped that in addition to seminars a special session of the IWSA Congress would be attributed to the developing countries. He thanked the speakers and the secretariat.

Vendredi, 6 Octobre 1978

Introduction

1. Le Professeur Ishibashi (Japon), Président de l'AIDE, ouvre la réunion et souhaite la bienvenue aux 135 délégués des 35 pays presents. L'Association, declare-t-il, développe à l'heure actuelle le rôle qu'elle joue à l'échelon mondial dans la distribution des eaux, et, dans le cadre du lancement, en 1980, de la Décennie de l'Eau organisée par les Nations Unies, elle souhaite aider et coopérer avec les organisations internationales et les pays membres dans le cadre du programme de développement. Ce séminaire constitue une excellente occasion d'échanger des informations et de faire état d'expériences, d'étudier les besoins des pays en voie de développement, et peut-être même de permettre de definir les meilleures orientations possibles des efforts de l'Association.

2. Pollution et Protection des Ressources en Eau

M. C. Gomella (France). Notre Comité s'occupe de la protection de la ressource. Les problèmes concernant cette protection sont d'une importance primordiale pour tous ceux qui sont engagés dans l'industrie de l'eau; ces problèmes ne peuvent être séparés de ceux relevant de la pollution.

Suivant les pays, les problèmes peuvent différer. Toutefois, il faut se préoccuper très tôt de protéger les ressources en eau, non seulement en quantité, mais également en qualité.

La dilution des produits polluants ne suffit pas, comme l'ont montré les exemples du Rhin, du Rhône ou du Lac Baikal.

Sommairement, on peut distinguer trois sortes de sources de pollution en fonction de leur origine:

- pollution en provenance des agglomérations et, notamment, les plus grandes;
- pollution en provenance de l'agriculture;
- pollution en provenance des industries, qui est la plus dangereuse.

On constate que les flux de pollution sont directement liés à l'essor économique: la pollution et le développement vont de pair. Or, il est plus facile de s'attaquer aux problèmes posés par la pollution dès le départ plutôt que de guérir après coup.

Parmi les communications presentées à ce Congrès, les plus utiles pour vos pays en ce qui concerne la protection des ressources sont:

- l'exposé introductif du Président Ishibashi lors de la séance inaugurale,
- les exposés presentés lors de la session de notre Comité permanent,
- le rapport général no. 1,
- les interventions lors du Groupe de Discussion Gestion des Bassins Fluviaux,
- le rapport général no. 2,
- les sujets spéciaux no. 2 et no. 6,
- la session sur le dessalement.

Avant d'engager une discussion que nous espérons fructueuse, je vous propose d'écouter des exposés de MM. Becker, Descroix et Haijkens.

3. M. Becker, Ingénieur des Eaux, Budapest (Hongrie), présente un document sur l'expérience qu'il a acquise dans le cadre d'un vaste programme d'investissement en Tanzanie. Il est fréquent que les crédits ne soient pas disponibles. L'enthousiasme ne suffit pas. Des méthodes et des principes aussi nombreux que divers sont appliqués simultanément. Il est possible de faire face à toute panne éventuelle. Il fait état de son expérience quant à deux plans importants démarrés en 1974. Les études n'ont tenu compte d'aucune forme de standardisation dans l'un ou dans l'autre de ces projects. Il raconte que douze types de vannes ont été utilisés sur des canalisations de diamètres variables, et que, de plus, deux différents types d'installation de purification ont été installés, le résultat étant qu'il est nécessaire de disposer d'un volume excessif de pièces de rechange, et que le personnel d'exploitation doit connaître à fond deux installations différentes.

Se référant à la main'd'oeuvre étrangère, M. Becker déclare qu'a certains moments, le personnel ne convient pas à la fonction qu'il doit accomplir. On manque de personnel qualifié. Si le personnel avait la qualification voulue, ce personnel s'en irait malgré tout à la fin d'un contrat de deux ou trois ans, et il laisserait donc un vide. Bien qu'il soit possible que le travail fait ait été de bonne qualité, le personnel d'exploitation ne sait pas s'organiser, même après une periode de formation. La formation d'un personnel qualifié est d'une importance vitale et les membres de l'AIDE peuvent jouer un rôle dans ce domaine.

4. M. Gomella

M. Becker est Ingénieur au Service des Eaux de Budapest. Les problèmes qu'il a évoqués peuvent vous paraître d'importance secondaire et sans lien direct avec la pollution; ils ont pourtant des conséquences importantes dans la construction des ouvrages contre la pollution. Retenons-en deux directives:

a) il faut rechercher des moyens simples et nécessitant le moins d'importation possible. Par exemple, commencez par installer des ouvrages de traitement primaire, et ce n'est qu'ultérieurement que vous les etendrez;

b) il est extrêmement important de développer dès le départ des moyens en personnel qualifié.

5. Dr. Descroix (France)

Nous avions espéré avoir un exposé par le Dr. Eylers (Allemagne) sur l'action de la République Fédérale en matière d'alimentation en eau dans les pays en développement. L'Allemagne a créé un organisme de forme commerciale pour les actions de coopération. Nous aurons certainement des détails complets sur ce sujet lors des réunions à Berlin en 1981.

Le Dr. Tzatchev nous a remis un intéressant rapport sur la législation relative à la surveillance et au contrôle de la pollution des eaux, notamment par l'industrie, en Bulgarie. La filière suivie est classique et complète.

1963 - Une loi confie au Ministère de la Santé Publique le soin de publier les normes et règlements nécessaires. Elle interdit tout rejet d'eaux usées municipales ou industrielles dans les cours d'eau, les lacs et la mer, sans une autorisation du Comité de protection de l'environnement naturel.

Les projets d'assainissement d'une commune ou de creation d'une usine ne peuvent etre approuves que si l'épuration des eaux usées est prévue.

1964 - Un décret prévoit le classement des cours d'eau en quatre catégories:

I Eau potable, industries alimentaires, piscines

II Abreuvoirs, sports, pisciculture

III Irrigation et industrie

IV Pas d'exigence particulière

Le déversement de substances radioactives artificielles est interdit.

1976 - Un tableau des concentrations limites admises a, dans chacune de ces catégories de cours d'eau, été publié.

1975 - Un décret prévoit la création d'un réseau national d'observation sur l'état de l'environnement naturel. Les analyses des substances polluantes sont réalisées une fois par mois. L'exploitation de ce réseau est assurée par coopération entre les divers Ministères intéressés : Environnement, Santé Publique, Services de l'Hydrologie et de la Météorologie, Travaux Publics, Agriculture et Académie des Sciences.

Il s'agit donc là d'une législation complète et efficace qui peut être donnée en modèle à tous les pays où se posent des problèmes de pollution des milieux naturels par les villes et par l'industrie.

6. M. Gomella (France)

Il ne faut pas, bien sûr, reprendre tels quels les règlements existant dans d'autres pays, mais les analyser puis les adapter à son propre pays. En particulier, je vous signale l'important travail effectué à ce sujet par la Commission des Communautés Européennes.

7. M. J. Haijkens (OMS, CRI, Pays-Bas) lit son document (Annexe 1)

8. M. Gomella

Merci M. Haijkens de cette communication particulièrement intéressante et qui aborde deux aspects:

- les normes de pollution,
- des esquisses de solutions très concrètes.

On pourrait penser qu'il y a une contradiction entre les exigences dont j'ai parlé en début de réunion et votre position sur les normes. En fait, cette contradiction n'est qu'apparente : l'objectif est le même; ce qui diffère, ce sont les étapes pour y arriver. L'objectif final doit être des normes rigoureuses; les étapes, par contre, seront plus ou moins longues et plus ou moins sévères. Ceci existe aussi dans les pays développés. En France, par exemple, les objectifs de qualité pour les rivières ne sont pas les mêmes pour toutes à un instant donné, bien qu'à terme on vise le même objectif.

Les solutions concrètes proposées par M. Haijkens peuvent sans doute permettre d'ouvrir nos discussions.

9. M. B.C.J. Zoeteman (Institut National de la Distribution des Eaux, Pays-Bas) presente son document (Annexe 2). Il insiste sur la nécessite de disposer de normes internationales portant sur la qualité des eaux de surface, divisées en trois catégories.

1. Niveaux élevés de bactéries pathogènes
2. 1. Plus eutrification et epuisement de l'oxygène dus au déversement de déchets domestiques,
3. 2. Plus croissance des volumes de métaux lourds toxiques et de micro-polluants organiques.

Il souhaiterait que les pays en voie de développement n'acceptent, pour l'approvisionnement en eau potable, que les catégories 1 et 2, et qu'ils organisent leurs industries de telle manière que les eaux de catégorie 3 ne soient pas employées pour la distribution d'eau potable. Il pense de plus que les gens doivent faire meilleur usage de leurs sens pour résoudre les problèmes qui se posent en laboratoire.

10. M. Gomella

Merci M. Zoeteman de votre intervention qui mêle un peu de philosophie à beaucoup de science. Je souligne deux aspects:

- il vaut mieux prévenir que guérir;
- le modèle très pertinent d'évolution d'une rivière de type européen peut être applicable ailleurs, mais pas toujours.

11. M. Khare (Inde) parle de son expérience aux Indes. En 1970, un seul des Etats disposait d'une législation appropriée. Dès 1974 toutefois, la législation était adoptée par tous les Etats, et on a mis au point des normes relatives aux effluents industriels. L'habitat individuel pose cependant un problème plus dangereux pour l'environnement : sur 100 habitations étudiées, 30 augmentent la pollution des fleuves en aval. Le traitement des eaux d'égout est difficile, et, si possible, il faudrait éliminer les eaux usées à terre en les utilisant comme engrais, de manière à accroître la fertilité des terres cultivables. Aux Indes, les écoulements doivent être classés en catégories A, B, C, D etc., ce qui devrait permettre de déterminer plus précisément les meilleures sources d'alimentation en eau. Etant donné que, dans ce pays, le peuple a décidé que l'eau constituait une priorité, la classification ci-dessus forme une excellente base de travail pour les politiques. Il est important de disposer d'une méthodes simple et bon marché pour contrôler les effluents industriels. M. Khare fait état d'autres problèmes qui se presentent au moment des crues, pendant les moussons.

12. M. Reed (Grande-Bretagne) rappelle les commentaires de M. Zoeteman et fait remarquer qu'hormis la méthode sensorielle, un bon diagnostic de la qualité de l'eau est chose essentielle : le choléra, la typhoide, etc., ne sont pas discernables par l'odeur.

13. M. Gomella

Merci M. Redan de clarifier ces deux grands types de pollution:

- une pollution entraînant des conséquences sanitaires avec maladies infectueuses ou parasitaires; cette pollution est très dangereuse et ses effets sont très rapides;

- une pollution plus insidieuse, de type physico-chimique, sur laquelle.

M. Zoeteman a mis l'accent précédemment. Les problèmes de parasitisme sont peu apparents dans les pays développés; ils sont, par contre, très importants en zone tropicale. Toutefois, en Europe actuellement, on craint qu'ils n'apparaissent à la suite du réchauffement des rivières du aux centrales énergétiques.

M. Abdelmalek Guessous (Maroc) présente son document.
(Annexe)

14. M. Guessous (Maroc) Au Maroc, les ressources en eau sont plus abondantes que dans un certain nombre de pays qui nous entourent. Au début, on a surtout fait

appel au captage de sources, mais actuellement on s'adresse de plus en plus aux eaux de surface. Or, dès que nous avons des retenues d'eau importantes, nous devons faire face à des problèmes d'eutrophication en été avec disparition d'une partie de l'oxygène dissous. Par contre, en hiver, nos retenues ne posent pas de problème particulier.

Un deuxieme point concerne nos nappes aquifères. Du fait d'une utilisation de plus en plus intensive des engrais, leur qualité se détériore parfois. En particulier, nous avons des problèmes avec les nitrates.

Qualité et Traitement des Eaux

15. Le Dt. E. Windle Taylor (Grande-Bretagne) préside la deuxième séance sur la qualité et le traitement des eaux. Il prononce une brève introduction sur les points suivants:

1. Les besoins des pays en voie de développement en matière de qualité de l'eau, compte tenu des directives de l'OMS.

2. Documents pertinents sur la qualité de l'eau et sur son traitement, présentés au Congrès de Kyoto.

3. En 1976, à Amsterdam, un document a été présenté par A. Lencastre, à propos des critères de base relatifs à des installations de traitement de faible capacité, telles que l'on en a des exemples au Mozambique.

4. Les avantages de la filtration lente sur sable et son application dans les pays en voie de développement.

5. Les moyens de désinfection de l'eau dans les communautés rurales.

16. M. C.J. Lang (Botswana) traite de la norme qui est nécessaire quant à la qualité de l'eau en particulier sur le plan de la distribution des eaux en milieu rural. La conformité à ces normes dépend de l'expérience du personnel du service des eaux en question dans le dit pays en voie de développement. On peut normalement procéder à des analyses de chlore résiduel, mais par contre, on ne peut que rarement faire des analyses bactériologiques. A son avis, bien que les analyses bactériologiques soient souhaitables, la priorité doit être donnée aux analyses de chlore.

17. M. Chan Boon Teik (Malaisie) met en cause la relativité des normes de qualité. Il demande si elles parviendraient à empêcher les gens d'utiliser une eau disponible et ayant subi des analyses pour que l'on sache si elle satisfait aux normes de qualité requises.

18. Le Dt. Windle Taylor déclare que la couleur et l'odeur peuvent elles aussi constituer un paramètre dans de nombreux cas.

19. M. Shipment (Etats-Unies) signale que l'on a émis des critiques à propos des normes de qualité de l'OMS. On lui a quant à lui enseigné que les normes de qualité des laboratoires doivent être considerées comme des outils, et que l'on ne doit pas leur accorder une trop grande importance. Les normes de l'OMS sont souvent trop élevées. D'un autre côté, on ne peut accorder un trop grand crédit à des échantillons prélevés dans des régions rurales éloignées.

20. Le Dt. Windle Taylor recommande la méthode des filtres lents. Il signale que Londres en utilise depuis plus de 150 ans. L'OMS/IRC à La Haye (Pays-Bas) a prévu une série d'usines pilotes dans divers pays.

21. M. Haijkens confirme cet état de choses et précise que voici cinq ans, on a mis en place des usines pilotes dans six pays en voie de développement. L'étape suivante est entrée dans sa phase concrète voici un an. Des usines à grande échelle seront construites dans huit pays de manière à couvrir la totalité du domaine de l'exploitation et de la maintenance; on a de plus prévu la formation du personnel.

Toute personne souhaitant obtenir un exemplaire du programme en question peut s'adresser à cet effet à l'IRC.

22. M. Eric Reed (Grande-Bretagne) déclare que la meilleure méthode individuelle de purification est celle des filtres lents sur sable. Ces filtres sont simples à construire et faciles à entretenir. Il s'est avéré qu'une couverture en polyéthylène montée sur les filtres lents permettait de combattre la croissance des algues tout en n'influant pas sur la qualité du produit final. Il présente deux diapositives qui illustrent le nettoyage d'un filtre lent.

23. M. C. Vaillant (Pays-Bas) constate lui aussi l'efficacité des filtres lents. Il présente des diapositives qui illustrent des installations plus complexes dans lesquelles un dispositif était tombé en panne soit sur le plan du dosage, soit dans la partie sédimentation de l'installation. Il fait remarquer que l'argument selon lequel "la surface nécessaire est trop importante" n'est pas valable. Les réservoirs et les installations domestiques occupent chacun une surface plus importante par tête que ne le fait un filtre lent.

24. M. Van der Veen (Pays-Bas) demande quelles sont les mesures qui doivent être pendant les périodes de forte turbidité de l'eau. Le Dt. Windle Taylor répond que des réservoirs de sédimentation peuvent être utilisés dans de tels cas. Il continue en parlant de la désinfection soit au gaz de chlore soit à l'hypochlorite. Le désavantage de ce dernier produit est que dans un délai de six mois, la puissance de l'hypochlorite se réduit de moitié. Le doublement de l'installation nécessite un complément d'investissement. La production de chlore par électrolyse de la saumure est chose courante dans les petites usines.

26. M. A.R.E. Browne (Sierra Leone) déclare que, d'après son expérience, la méthode de l'électrolyse n'a pas réussi.

27. Le Dt Windle Taylor parle aussi de l'ozone, agent d'oxydation, mais il ajoute qu'il est moins bien adapté à l'emploi dans les pays en voie de développement.

28. M. C.E.S. Rao (Inde) attire l'attention sur la perte de pression de refoulement dans la filtration lente sur sable ainsi que sur la forte turbidité qui se produit pendant les périodes de mousson.

Distribution

29. M. R. Laburn (Afrique du Sud) rapporte que sur les 20 séances distinctes du Congrès de Kyoto qui se déroulenten ce moment même, 10 ont été plus ou moins consacrées à la distribution des eaux, et que ceci n'est pas étonnant puisque les frais les plus lourds que subissent les compagnies et les services des eaux sont dus aux canalisations. Les pays en voie de développement devraient tirer enseignement des erreurs commises par les pays développés. Le taux de développement varie largement. Dans certaines régions, il est de 2 à 10 pour cent l'an. Dans la zone régie par le Rand Water Board, le taux de croissance a été de 6 pour cent l'an pendant ces 75 dernières années. (Annexe 3)

30. M. Thijs (Banque Mondiale) déclare que dans les régions d'explosion urbaine, le taux de croissance a doublé en dix ans.

31. Le Président continue en énoncant des faits sur le Rand Water Board. L'appréciation des besoins futurs sera toujours difficile. L'information statistique est importante, de même que les études de consommation par rapport à la température. Le nombre de points d'alimentation domestique est aussi un aspect important. Les canalisations pouvant subir des conditions qui se présentent dans le sol risquent de nécessiter une protection cathodique. Il est préférable que les canalisations soient enterrées pour éviter une détérioration par les machines agricoles. Dans la mesure du possible, il faut utiliser le plus souvent possible des canalisations de ceinture, et une source d'énergie de secours doit être disponsible. Il est aussi nécessaire de répondre aux pointes de demande. Il déclare par ailleurs qu'il est important d'influer sur la législation, de telle sorte que l'on puisse poser des canalisations sans retard aucun. En Afrique du Sud, un préavis de sept jours suffit. Tous les pays doivent considérer l'eau comme une haute priorité, et les autorités doivent être convaincues que l'eau est le plus important des services.

32. M. Okaisabor (Nigeria) déclare que la pose des canalisations en zones urbaines pose des problèmes, problèmes surtout dus aux autres services souterrains. Il a même, quant à lui, eu des difficultés dans la traversée de routes pour le branchement de résidences privées. Dans son pays, l'eau est la lanterne rouge des priorités.

Messieurs Khare (Inde), Diallo Sodeci (Côte d'Ivoire) et Van der Veen (Pays-Bas) prennent part au débat. L'un des points que l'on fait ressortir est qu'il est important d'avoir de bonnes relations de travail entre employeurs de la Société de Distribution des Eaux, et le personnel des télécommunications, du Ministère des travaux publics et du service des égouts, de telle manière que les questions puissent être bien coordonnées.

33. M. Diallo (Côte d'Ivoire) Vois avez parlé surtout de taux de croissance. Lorsqu'on a des donnees de base sur une longue durée, ils sont faciles à déterminer. Par contre, dans les villages alimentés par les rivières ou les villages "explosifs", à la suite par exemple d'une implantation industrielle, c'est beaucoup plus difficile. Il en est de même quant à l'horizon de dimensionnement des investissements.

En Côte d'Ivoire, le taux moyens de croissance est de 3%, mais avec des extrèmes atteignant 10 à 15%.

Pour les réservoirs, si on n'a pas de taux de croissance bien précis, s'il n'y a pas de plans d'urbanisme et s'il n'y a pas de contrainte topographique, le probleme d'implantation devient sérieux. Que pensent les experts de cet aspect?

S'il y a un plan d'urbanisme, nous avons souvent des conflits avec les autres réseaux, téléphonique, assainissement, câbles divers, ...; la concertation est possible mais difficile. Dans les rues nouvelles nous prévoyons habituellement des fourreaux en attente, pour éviter dans l'avenir d'avoir à démollir le revêtement lors des demandes de branchements.

35. M. Thiys (Banque Mondiale) Concernant la question de M. Khare sur l'estimation de la demande et les horizons, les études montrent que les plus grandes économies sont en fait obtenues en évaluant bien l'année exacte de mise en service. Deux ans d'erreur sur la mise en service quatre ans à l'avance représentent 25% due coût du projet. Par contre, une saturation obtenue au bout de 15 ans au lieu de 10 ans ne représente qu'une erreur de 10%.

Signalons par ailleurs la correlation très précise entre les ventes d'eau et le nombre de branchements. Il est par conséquent très important de bien apprécier le rythme de construction de ces branchements.

Compteurs et Comptage

36. M. Shipman fait alors les remarques suivantes:

1. Il souhaiterait écarter du débat les compteurs de production, ce bien qu'il souligne la nécessité de procéder à un étalonnage une fois par an. Les compteurs de production sont un besoin absolu, car il est dangereux de calculer la production en multipliant le débit des pompes par le nombre d'heures de travail.

2. Rares sont les pays qui ne disposent pas de compteurs installés chez les consommateurs; il existe des questionnaires qui font ressortir ce point.

3. La question à poser est la suivante : que fait-on si les compteurs ne marchent pas?

4. Une alimentation intermittente, de même qu'une pression intermittente, donnent lieu à des problèmes sur les compteurs; l'air qui passe dans les compteurs est en effet enregistré comme de l'eau.

5. En général, le but des compteurs est de réduire le gaspillage, et, ce faisant, de retarder les investissements.

Une question valable qui se pose est que si les prêts de la Banque Mondiale sont accordés sous réserve que l'alimentation fasse l'objet d'un comptage, est-ce que l'on installe des compteurs pendant les fournitures intermittentes ou attend'on jusqu'à ce que la capacité de production ait augmenté?

37. M. San Juan Ernosto (Phillippines) est tres favorable à l'installation rapide de compteurs. Suivant son expérience, l'installation de compteurs a fait cesser la distribution intermittente des eaux.

38. M. Ben Aicha (Tunisie - SONEDE) Je ne suis pas d'accord avec M. le President. L'aspect pression intermittente ne devrait être que très momentané : ce n'est pas un but pour un distributeur.

Pour les compteurs à la production, ce n'est en effet pas très utile. Ils sont généralement installés en des lieux où il n'y a pas un personnel suffisament compétent. De plus, il y a souvent des pannes. Il est meilleur d'utiliser des systèmes plus simples : venturi, suivi de la consommation électrique.

Ce qui est important, c'est de suivre les gros consommateurs : industries, hôtels, etc. En Tunisie, 3% des consommateurs representent 40% de la consommation.

Pour les abonnés domestiques, nous effectuons une facturation trimestrielle avec relevé du tiers des abonnés chaque mois.

Nous avons développé assez loin l'exploitation des relevés de comptage en distinguant les différents types de consommateurs : domestiques, industriels, administration. Ceci nous permet de disposer de statistiques permettant des prévisions fidèles à moyen terme de la demande.

On ne voit pas bien la raison de lier au climat l'opportunité de mettre en place ou non des compteurs. L'intérêt psychologique du compteur est très important pour la lutte contre le gaspillage.

39. M. Shipman rappelle à l'assemblée que 85 pour cent de l'ensemble des demandes de prêts adressées à la Banque Mondiale émanent de régions dans lesquelles la distribution intermittente est une réalité. Il loue la SONEDE pour la grande amélioration intervenue en Tunisie en matière de distribution des eaux ces dix

dernières années. Il mentionne l'aspect socio-culturel du comptage dans les régions où le comptage est chose normale. Des vols de compteurs, ainsi que du vandalisme, ont lieu. Il est par ailleurs possible de bypasser les compteurs et certains pays ont abandonné leur usage du fait même du vandalisme. Les programmes d'éducation doivent englober l'enseignement des avantages des compteurs, ainsi que le fait qu'ils doivent être respectés. En Amérique Latine, les comptages n'ont pas lieu lorsque la population est inférieure à 2000 personnes, tandis que, dans les régions à densité plus forte, le comptage est généralisé à 100%.

40. M. Thiys (Banque Mondiale) déclare être favorable au comptage, à l'exception peut-être des petites régions. Il est d'avis que l'on ne peut démarrer un plan décannal de distribution des eaux sans insister sur le comptage, car c'est là le seul moyen d'appliquer un tarif social.

Les industries touristiques peuvent faire l'objet d'une facturation tarifaire plus élevée que la norme. Il est conscient du vandalisme, mais il pense que ce problème peut être résolu et que les frais supplémentaires que cela impliquerait seraient payants. La seule chance d'accroître les tarifs des eaux de temps à autre est de s'attaquer aux classes sociales élevées, qui consomment un volume d'eau plus important. Ceci ne peut se faire que si des compteurs sont installés. La distribution intermittente augmente la consommation d'eau, car de grosses quantités sont gaspillées au moment de l'arrivage de chaque nouvelle distribution.

41. Mr. Shipman est d'avis que le tarif social pourrait être mis au point sur d'autres bases; par exemple, en fonction de la surface de la maison, du nombre de salles de bains, de la taille du jardin, etc. Dans les pays en voie de développement en particulier, la question du comptage fait l'objet de doutes.

42. M. Chan (Malaisie) déclare que le personnel chargé de la relève des compteurs peut être corrompu. En ce qui concerne les tarifs, M. Van der Veen dit que, pour une compagnie des eaux, le comptage pourrait être avantageux à des moments de forte consommation, et désavantageux aux époques de consommation moindre. La nécessité des compteurs depend des habitudes sociales de la population, des conditions climatiques et des pays. Les usines doivent toujours faire l'objet d'un comptage.

43. Suivant M. E. Johnson (Etats-Unis), le taux uniforme est très discriminateur, surtout, par exemple, dans le cas d'une petite famille. Il pense que les compagnies de distribution des eaux devraient être des organismes économiquement viables. Les frais des avantages sociaux doivent être assumés par les organismes d'assistance sociale.

44. M. Lee (Malaisie) décrit à la réunion la manière dont un ordinateur peut aider la compagnie. Les pertes au niveau facturation se trouvent réduites et passent de 23 à 8%. L'ordinateur indique par ailleurs si un compteur n'a pas été lu en trois mois. L'ordinateur identifie en outre les consommations élevées et les consommations faibles, et, en période de sécheresse, on peut avertir les gros utilisateurs de réduire la consommation.

45. M. Brown (Sierra Leone) appelle l'attention sur les régions où 60% de la population est desservie par des tubes piézométriques. Il se demande d'où vient l'argent? Il propose une tarification uniforme.

46. M. Ben Aicha (Tunisie) En cas de pression intermittente, nous utilisons une facturation au prorata calculée sur la base des quatre années précédentes.

Pour pallier la "relève au café", nous avons une rotation systématique des releveurs.

47. M. Descroix Pour empêcher la "relève au café", il y avait un moyen employé il y a quelques années : le carnet fourni au releveur n'indiquait pas la valeur des relevés précédents. De ce fait, il était obligé d'aller relever la vraie valeur.

La séance sur l'Education et la Formation est présidée par M. B. Thorpe (Grande-Bretagne)

48. M. Thorpe insiste sur l'importance que présente cette question pour tous les pays, tant pour ceux qui rendent le service que pour la population qui en bénéficie. Le paiement des services rendus doit faire partie du programme d'éducation. Il veut que les gens sachent ce que l'on attend du Comité Permanent pour l'Education et la Formation. Certaines de ses activites sont : l'etude de la distribution des eaux en zones rurales, qui fait l'objet d'une séance au congrès; la création d'une bibliothèque ; l'étude d'installations de formation dans les divers pays; ainsi qu'un glossaire de vocables permettant à tous de comprendre les sujets débattus. (Annexe 4)

49. M. Hughes (Grande-Bretagne) présente son document (Annexe 5)

50. M. Aziz Sasmitadihardja (Indonésie) informe les personnes présentes de la situation en Indonésie. Au niveau national, il existe des cours de formation dont le Ministère de la Santé est chargé dans les régions rurales, et qui sont gérés par le Ministère des Travaux Publics dans les zones urbaines.

Ces derniers sont plus ou moins permanents, et ils traitent de la maintenance et de l'exploitation des usines de traitement, auxquelles s'ajoutent la planification et l'étude de nouvelles installations. Au niveau provincial, la formation a lieu dans les principales villes. Un programme de formation a été prévu en 1973 en collaboration avec les autorités japonaises. La formation sur le terrain est préférable, mais il est difficile de trouver des élèves en dépit d'un budget adéquat.

51. M. Guessous (Maroc) Je suis citoyen d'un pays que vous appelez sous-développé ou en développement selon que vous êtes pessimiste ou optimiste. Je suis physicien; j'ai été professeur pendant 15 ans, puis j'ai dirigé une école chargée de former les professeurs du secondaire et du primaire. Depuis quelques années, je dirige une Société marocaine d'Ingénieurs-Conseils qui existe depuis 30 ans. Lundi, à la session du Comité Education et Formation, on nous a proposé des expériences de formation existant en Allemagne et au Japon. Ce n'est probablement pas des expériences intéressantes pour des pays comme les notres. Ce matin, on nous a parlé "tuyau de bambou" "filtres lents" cela non plus ne correspond pas à nos besoins. La station de traitement dont je parlais tout à l'heure traite actuellement 4 m3/s et traitera 14 m3/s en phase finale.

Nous sommes confrontés à des démographies galopantes. L'AIDE devrait essayer de mieux connaître et mieux faire connaître les institutions de distribution d'eau et de formation existant dans quelques pays comme les nôtres. Je suggère que d'ici le Congrès de Paris, 4 ou 5 rapports présentent la situation concrète dans de tells pays. Pour ma part, je suis prêt à préparer celui concernant le Maroc.

52. Le Dt Mabrouk (Egypte) suggère que l'AIDE appuie la Direction Egyptienne des Eaux en proposant des plans pour un programme d'éducation.

53. M. Ben Aicha (Tunisie) Effectivement, il fait d'abord de l'enthousiasme. Tout agent de maitrise dirigeant son équipe fait de la "formation sur le tas".

Attention aux questionnaires : les agents pour lesquels il serait le plus nécessaire ne savent pas toujours lire et écrire. En fait, il faut être pragmatique : identifier ce qui va le moins bien, faire de la formation sur le tas, faire de la formation par petits groupes, assurer l'initiation des jeunes diplômés en les intégrant par exemple dans des équipes d'Ingénieurs-Conseils. Pour le futur, quelques idées : coopération entre pays en voie de développement, coopération triangulaire (pays développé, moyennement développé et en démarrage), jumelage entre Services des Eaux d'un pays développé et d'un pays sous-développée.

54. M. Potie (France) Je voudrais vous présenter rapidement un organisme de formation créé il y a deux ans par la France avec l'aide du PNUE : le CEFIGRE. Cet organisme a été présente en fevrier 1977 à la Conférence de Mar del Plata.

Il est géré par un Conseil d'Administration forme de délégués publics de plusieurs pays.

Son financement est assuré par le PNUE, la France et des organismes publics et privés utilisant ce Centre.

Son objectif est de fournir une formation à des cadres dirigeants dans les domaines suivants:

- maîtrise des problèmes techniques liés à la qualité et la quantité des ressources en eau,
- maitrîse des problèmes législatifs et institutionnels associés,
- aptitude à suivre l'exécution des solutions retenues et à contrôler les resultats acquis.

C'est en outre un Centre de Documentation et un Centre de Recherches.

Le CEFIGRE organise de nombreux séminaires pour les ingénieurs et cadres administratifs du secteur de l'eau. Ces séminaires comprennent une partie théorique assurée par des experts internationaux, ainsi que des stages pratiques auprès de distributeurs d'eau existants.

Il est localisé dans un site agréable à proximité de la ville de Nice en France. Vous trouverez un certain nombre de compléments et de détails pratiques dans les brochures situées à l'entrée de la salle.

55. M. Watson (Grande-Bretagne) présente alors son document.

56. M. Rida Mourtada (Syrie) lit son document. Il presse l'AIDE de jouer le rôle de catalyseur dans la mise en oeuvre de la Décennie de l'Eau. Il est favorable à la creation d'un Comité de l'AIDE chargé de proposer un programme, ainsi que de présenter des projets bi ou tripartites. (Annexe 6)

57. Le Professeur Ishibashi clôture la réunion, et invite toutes les personnes présentes à une réception organisée par les Comités Nationaux du Japon, de la France, des Pays-Bas, ainsi que par le Comité pour la formation du Conseil National des Eaux (Grande-Bretagne).

Discussion générale

58. M. Mourtada (Syrie) Permettez-moi de mettre en relief les points importants de mon mémorandum sur les problèmes rencontrés dans les pays en voie de développement dans le domaine de l'eau potable et de l'assainissement, memorandum qui se trouve dans cette salle à la disposition de Messieurs les participants a ce séminaire. (Annexe 6)

Je vais donc aborder un sujet différent de ceux qui ont été abordés par Messieurs les participants à ce seminaire.

Je me permets tout d'abord de rappeler que la recommandation (C.12) du rapport d'Habitat de la Conférence des Nations Unies sur les établissements humains, qui s'est tenue à Vancouver (Canada) en 1976, énonce que:

a) Dans les pays peu développés, près des deux tiers de la population ne sont pas convenablement desservis par un système salubre et abondant d'installations sanitaires et d'évacuation des déchets et que:

b) Il convient de donner la priorité à l'alimentation en eau salubre et à l'évacuation sanitaire des déchets, en vue d'atteindre à une date donnée des objectifs qualitatifs et quantitatifs mesurables au profit de la population toute entière ; des objectifs devraient être fixés par tous les pays et être examinés par la prochaine Conférence des Nations Unies sur l'eau.

Dans la résolution qu'elle a adoptée à l'issue de la Conférence des Eaux tenue en février 1977 a Mar del Plata (Argentine) pour délibérer sur tous les problèmes relatifs à l'Eau, à savoir ceux des ressources hydrauliques des systèmes des eaux, de la désertification, etc... l'Organisation des Nations Unies a fait appel "à tous les pays, pendant la Généralisation Internationale du Système des Eaux entre 1980 et 1990, de mettre en oeuvre des plans d'approvisionnement à 100% en eau potable de l'ensemble de la population et par conduites, pour les villes."

Répondant à cet appel, O.M.S. a, dans sa 13ème assemblée générale tenue en 1977, adopté une résolution analogue.

D'autre part, M. le Président Ishibashi de l'AIDE a annoncé dans son discours à la séance d'ouverture du Congrès de l'AIDE l'évènement important suivant:

"Pour sa part, l'Association Internationale des Distributions d'Eau a également adopté dans son assemblée générale d'avant-hier une resolution déclarant en substance:

"L'Association Internationale des Distributions d'Eau donne un soutien sans réserve aux plans de généralisation du système des eaux prévus par I'O.N.S. et par O.M.S. Les membres de l'Association entameront des démarches auprès de leur Gouvernement respectif demandant la mise en oeuvre de la résolution tout en coopérant entièrement aux programmes gouvernementaux".

Les pays industrialisés doivent coopérer positivement à la mise en oeuvre de plan grandiose d'échelle internationale à travers la coopération technique, la fourniture des renseignements et la formation des techniciens requis par les pays en voie de développement".

Il va de soi que les pays en voie de développement n'ont qu'un désir : c'est de voir ce but se réaliser.

M. le Président, nous voyons donc que tous les intéressés sont d'accord pour la réalisation de ce but qui préoccupe l'humanité, et veulent bien collaborer à trouver des solutions convenables aux problèmes de ces pays.

Vu que les recommandations de Mar del Plata ne sont que des voeux qui laissent aux Gouvernements des pays en voie de développement le libre choix des méthodes convenables pour les réaliser, je peux dire que Messieurs les délégués de l'O.M.S. et de la BIRD à ce Congrès sont les mieux placés pour nous dire, 20 mois après la parution de ces recommandations, combien de pays en voie de développement ont pris les mesures nécessaires pour mettre en exécution

lesdites recommandations. Personnellement, je crois que peu de pays l'ont fait, et seulement, les pays qui possèdent des possibilités techniques et matérielles pour suivre une méthodologie saine et avaient donné une priorité à la résolution de ces problèmes, même avant la conférence de Mar del Plata.

En effet, les problèmes des pays en développement, qu'ils soient financiers, techniques, sociaux ou d'organisation, sont des problèmes très complexes qui exigent une méthodologie bien etudiée, un travail ardent et long, ainsi que des moyens financiers pour arriver à les résoudre.

M. le President, vu ce qui est dit, à mon avis, pour arriver à un résultat satisfaisant, il y a nécessité qu'il y ait une dynamo ou un catalyseur pour activer les réactions.

M. le Président, et ici je m'adresse à M. le Président Ishibashi, je suis conscient que l'AIDE:

1. en tant qu'organisation internationale de grande valeur dans le domaine de l'eau potable,

2. groupant un grand nombre de distributeurs d'eau du monde,

3. s'étant mise, depuis plusieurs années, à s'occuper des problèmes des pays en voie de développement,

peut jouer un rôle très important dans ce domaine pour réaliser le maximum des recommandations de Mar del Plata.

Pour être bref, je propose:

A. que l'AIDE fasse des démarches auprès:

   1. des organisations internationales intéressées comme l'O.M.S., la BIRD, etc....

   2. les pays en développement ou les organisations pouvant les représenter,

   3. et les pays industrialisés,

   pour la création d'un Comité permanent qui aura la tâche de trouver le meilleur moyen pour l'exécution des recommandations de la Conférence de Mar del Plata dans le domaine de l'eau potable et de l'assainissement, surtout en ce qui concerne les pays en voie de développement.

   Ce Comité groupera des représentants des organisations citées et sera chargé de déterminer les obligations de chacune d'elles, ainsi que les relations rationnelles qu'elles doivent avoir entre elles. Ce Comité proposera un programme qui a pour but d'activer autant que possible l'exécution de ces recommandations.

   Les résultats des travaux de ce Comité seront soumis tous les deux ans au séminaire des pays en développement qui se tient au sein des congrès de l'AIDE, où ils seront discutés, modifiés si c'est nécessaire, et par la suite approuvés afin que chaque représentant d'une organisation prenne à sa charge d'entamer des démarches auprès de celle-ci demandant la mise en oeuvre des resolutions.

B. une collaboration triangulaire entre les Services des Eaux les moins expérimentés et ceux les plus expérimentés dans les pays en développement et les Service des Eaux dans les pays industrialises (autrement dit, faire un jumelage entre ces services). Cette collaboration peut conduire à des projets et à une meilleure exploitation.

C. Je ne nie pas enfin que les Gouvernements et les peuples des pays en voie de développement doivent faire un grand effort, surtout pour le financement des projets, l'organisation des services des eaux, la formation et l'entrainement du personnel, et tout ce qui est nécessaire pour une exploitation optimum des projets de l'eau potable.

M. le Président, ce sont des propositions que le temps dont nous disposons ne permet pas d'étudier en détail. Donc, je laisse à Messieurs les participants à ce seminaire et par suite au Comité permanent de l'AIDE, de prendre les décisions convenables en ce qui les concerne.

59. M. Diallo (Côte d'Ivoire) Je souscris pleinement à ce qui a été dit précédemment par les délégués du Maroc et de la Tunisie.

Notre ambition en Côte d'Ivoire est de mettre à la disposition de la totalité de la population de l'eau en quantité et qualité satisfaisante. Si nous avions la chance d'accueillir un jour un Congrès de l'AIDE, ce que je souhaite vivement, nous pourrions vous montrer l'état d'avancement dans notre pays de cet objectif.

Actuellement, nous envisageons avec des Distributeurs d'eau de pays voisins de mettre en place une organisation régionale permettant les rencontres entre nous, ainsi que l'échange d'informations.

Je suis moi-même Ingénieur à la Société Nationale des Eaux de la Côte d'Ivoire, la SODECI, chargée de la gestion de l'ensemble des systèmes de distribution d'eau du pays.

Les principaux problèmes auxquels nous sommes confrontés sont les suivants:

- conflits avec les autres utilisateurs (énergie, irrigation, ...) pour la répartition des ressources; cela nous impose parfois de prévoir des programmes intégrés d'utilisation de ces ressources;

- manque de statistiques de base fiables;

- disponibilité de ressources en eau suffisante;

- financement et surtout maintenance des installations nouvelles.

Concernant ce dernier point, je rappellerai en terminant ce qu'a dit tout à l'heure M. Hughes et auquel je souscris pleinement : "ce sont des gens bien formés qui forment de bonnes distributions".

La réunion est reconvoquée à 9 heures le samedi 9 Octobre par M. Van der Veen, qui invite M. T.S. Khare (Inde) à en assurer la presidence.

Cas d'étude No. 1

60. M. Aziz Sasmitadihardja (Indonésie) présente son document sur "la pollution et la protection des sources". qui a trait à Surabaya a l'est de Java et a ses environs (voir le document en question) (Annexe 7) Il declare que 50% de la population a accès à une eau potable ne présentant aucun danger. Il présente ensuite des diapositives. Il y a trois principaux consommateurs d'eau dans la province de Surabaya:

1. L'industrie
2. L'agriculture
3. L'être humain

61. L'industrie comme l'être humain sont par ailleurs les pollueurs. A la suite de la présentation de M. Aziz, M. Yow Ching Lee (Penang) parle des "Applications technologiques appropriées aux usines due Penang". En utilisant le bon sens et des matériaux existant sur place, on a pu améliorer des installations existantes de purification des eaux. Il presente quelques diapositives donnant une impression de la situation et des solutions apportées. (Aqua No. 1, 1979)

62. M. L. S. Rao (Inde) parle de "L'appréciation et de l'élimination des fuites sur le réseau de distribution". Ce document a été préparé par M. V. Raman (Voir Aqua 4/78).

63. Au cours du débat, M. Chang (Malaisie) demande que l'on étudie aussi un autre type du fuite, à savoir celles dues au chapardage. Il dit qu'il est relativement simple de prélever de l'eau au niveau d'un clapet d'évacuation d'air, et deux diapositives sont présentées pour demontrer cet état de choses. Après quelques questions, M. Lee confirme que des techniques appropriées ont été appliquées à des usines existantes, et qu-en conséquence, leur production a augmenté. Des techniques nouvelles et des matériels complexes sont utilisés dans les nouvelles usines.

64. M. Shipman (Etats-Unies) déclare que la jacinthe aquatique que l'on a vue sur les diapositives de M. Aziz, constitue une bonne source de prélèvement de produits nutritifs dans l'eau, et qu'elle réduit le volume de la DBO, ce bien qu'il soit nécessaire d'enlever ces plantes de temps à autre. Cette nécessité est absolue, et elle pose parfois des problèmes.

65. M. Aziz confirme les dires de M. Shipman, et parle d'études effectuées par un institut de Bandung sur cette question. L'obstruction des fleuves constitue effectivement un problème.

66. M. Twort (Grande-Bretagne) dit que le mélange instantané (sans ajout d'énergie à l'eau) est valable pour les eaux chaudes. Dans le cas des eaux froides, un apport d'énergie est nécessaire. A son avis, le matérial de contrôle et de commande devient trop complexe. En ce qui concerne les debats précédents sur la fourniture intermittente des eaux, il relate une expérience intéressante faite en Turquie pendant le Ramadan. On a démontré que les statistiques de consommation d'eau étaient plus fortes dans le cas d'une alimentation intermittente que dans celui d'une alimentation constante. La nuit, les réservoirs débordent pendant que les gens dorment.

67. M. Van der Veen demande à M. Rao des commentaires sur le suivi du document de M. Raman. M. Rao déclare qu'à Bombay, il existe un dispositif permanent de contrôle des fuites. Ce dispositif est constitue par un service spécial.

68. M. Khare déclare qu'il devrait y avoir un système semblable dans toutes les grandes villes de manière à résoudre le problème des fuites. Il demande à la Banque Mondiale de considérer ce point de même que les programmes nationaux de formation.

69. M. Chan (Malaisie) parle des filtres lents. Il signale qu'à l'heure actuelle, l'eau brute est différente de ce qu'elle était par le passe. Il soutient qu'un pré-traitement est nécessaire, et loue le sédimenteur tubulaire qui constitue un dispositif parfait pour la purification.

70. M. Shipman (Etats-Unies) souligne l'argument que M. Khare a avancé en matière de formation, et dit que les instituts de formation nationaux et provinciaux doivent être preferés aux unités uniques.

71. Le Président résume les documents de la manière suivante:

1. L'eau des bassins des fleuves doit être utilisée pour la distribution des eaux potables, et la législation doit faire en sorte que ceci soit possible.

2. M. Lee a permis d'avoir une vision claire des solutions bon marché pour l'exploitation et l'accroissement de la production des usines. On peut prévoir un précieux échange d'informations entre l'Inde et la Malaisie.

3. La détection des fuites doit entrer dans la pratique. Dans les régions construites, le comptage peut être précieux à titre de mesure de contrôle, tandis que d'autres méthodes sont nécessaires dans les régions rurales.

72. M. Yasumoto Magara (Japon) présente son document sur "La coopération bilaterale en matière de formation". Au Japon, la formation est donnée dans des écoles de formation qui dependent du gouvernement central. Les équipements de formation suivants sont disponibles:

(a) Installations de laboratoires

(b) Pratique sur le terrain

(c) Matériels audio-visuels d'enseignement

(d) Livres

Les règlements municipaux, l'étude des usines de traitement des eaux et l'évaluation des procédés de traitement font aussi l'objet de cours de formation. (voir Annexe 8)

73. M. Daisaku Sugito (Japon) fait un discours sur son étude intitulée "L'Association des Distributeurs d'Eau de l'Asie de l'Est". (Annexe 9)

74. M. Katsunobu Takenaka (Japon) présente le document sur "Le réseau de distribution des eaux du Libéria (Afrique de l'Ouest)" (Annexe 10)

75. et Mme Champit Dhamasari (Thailande) donne un résumé du débat qui a eu lieu à Bangkok en 1977. Elle déclare qu'une conférence à petite échelle est bien plus bénéfique qu'une grande car on y consacre plus de temps à la discussion approfondie des problèmes communs. Le manque d'argent n'est pas le seul obstacle; parmi les autres problèmes, se comptent l'absence de législation et de personnel. Il y a aussi des problèmes politiques. Elle espère toutefois que l'on pourra progresser avant la prochaine conférence qui doit se tenir à Taipeh.

76. M. Panjaitan (Indonésie) demande les rapports qu'il y a entre la conférence régionale de Taipeh et l'AIDE.

77. M. Aziz Sasmitadihardja (Indonesie) insiste sur l'importance de la formation éducative donnée aux bénéficiaires dans leurs propres pays.

78. M. Frank Go (Philippines)(OMS) présente son document sur "L'action coopérative en vue de la Décennie de l'Eau"(Annexe 11) et déclare en outre qu'à une réunion qui se tiendra à Genève le mois prochain, il sera demande aux donateurs de fixer des objectifs pour l'année ou pour les années suivantes.

79. M. A. Thiys (Banque Mondiale, Washington) rapporte que le capital de la Banque Mondiale sera doublé et qu'il sera possible de prêter un milliard de dollars US par an dès 1990. Jusqu'à présent, les pays en voie de développement ont finance de 80 à 85% de leurs investissements, et ils devront continuer de la sorte. La planification prend du temps, et les études de factibilité doivent

être prêtes dès 1980. Entre le moment où on conçoit un projet, et la fin de sa construction, une période de 10 à 12 ans s'écoule. Par conséquent, la plupart des projets ne seront pas terminés à la fin de la décennie.

M. Thiys fait remarquer que des directions des eaux doivent être créées et/ou renforcées. Pour réussir, il est nécessaire de s'assurer qu'une fois les plans réalisés, l'exploitation et l'entretien se feront correctement. Sur le plan financier, M. Thiys déclare que les tarifs des eaux doivent être augmentés à temps pour que ces services s'autofinancent. En Tunisie, les dispositions financières sont les suivantes : 40% par la compagnie des eaux, 40% par le Gouvernement Tunisien, et 20% par les organismes internationaux.

80. Au cours du débat, M. Brown (Sierra Leone) demande à M. Thiys son opinion sur:

(a) le temps que prend l'approbation des projets. Suivant son expérience, M. Brown dit que ceci prend beaucoup de temps et il se demande comment on pourrait raccourcir ce délai.

(b) Si 80% doivent être finances par le pays en question, la chose devient impossible pour la distribution des eaux en régions rurales.

81. M. Thiys répond que les distributions rurales et urbaines ne doivent pas être séparées, et que les villes et l'industrie doivent payer le développement rural. En ce qui concerne l'approbation des projets, le délai doit être de l'ordre de neuf mois, et il ne doit pas nécessairement retarder les projets.

82. M. Go fait remarquer que la distribution des eaux dans les régions rurales doit constituer un service de base. Nombre de gouvernements en sont persuadés, et dans de nombreaux cas, la distribution est un service social.

83. M. Chan (Malaisie) Pense que peu de gens sont au courant de la Décennie de l'Eau. Il demande que les organismes internationaux donnent des directives sur la forme sous laquelle les plans doivent être soumis. Il demande aussi s'il existe un modèle qui permette d'obtenir une approbation dans un délai relativement court.

84. M. Aziz (Indonésie) soutient la demand de M. Chan. Il veut aussi savoir si l'on dispose de modèles montrant comment la procédure d'approbation pourrait être raccourcie.

85. M. Rao (Inde) déclare que l'Association indienne des usines d'eau dispose de directives, et que quiconque s'y intéresse peut volontiers en prendre connaissance.

86. M. Okaisaber (Nigeria) dit qu'il éprouve des doutes à propos de la Décennie de l'Eau. Il insiste sur l'importance de la formation avec l'assistance de l'AIDE. Il se demande aussi si le jumelage suffit.

87. M. Thiys informe l'assemblée que des procédures normalisées ont été mises au point pour les programmes de distribution des eaux en zones rurales. Les situations complexes qui se présentent dans les communautés urbaines nécessitent une étude attentive avant qu'une appréciation puisse être donnée. En ce qui concerne la formation, les services des eaux eux-mêmes doivent s'occuper de cet aspect. Plus la taille du service des eaux est important, plus il lui est facile de libérer du personnel de formation pour les compagnies de distribution rurale.

88. Mr. Go dit que les décisions politiques doivent être prises dès maintenant à propos de la distribution des eaux; toutefois, si la décennie se termine en 1995 et non en 1990, cela n'a aucune importance.

89. M. Van der Veen (Pays-Bas) présente son document sur "la contribution de l'AIDE, et comment cette contribution doit être organisée. Il déclare que les efforts de l"AIDE ne doivent pas faire doublon, qu'elle doit appuyer les organismes internationaux et qu'elle doit soutenir l'aboutissement de résultats concrets. Il est essentiel que chaque développement soit réalisé par les gens eux-mêmes. Les moyens d'aide et de coopération sont multiples:

(a) L'AIDE continuera à constituer une plate-forme de communication. Cet aspect est essentiel et a bien réussi par le passé. Le programme des congrès de l'AIDE a été étoffé: ces congrès se tiennent en effet tous les deux ans et non plus tous les trois ans.

(b) Les activités doivent être régionalisées. Il existe trois types d'activités régionales:

1. Les conférences régionales, qui traitent de sujets generaux,

2. les conférences spécialisées, qui traitent de sujets spécifiques,

3. et les séminaires, où l'accent est surtout mis sur l'échange de connaissances.

Il déclare aussi qu'une conférence régionale sur l'Afrique sera organisée à bref délai.

(c) La revue trimestrielle "Aqua" est un important vecteur de communication. On a fait des efforts, et on continuera à en faire, pour en accroître la diffusion.

(d) On espère pouvoir créer une publication régulière de documents scientifiques et techniques.

(e) Il est important que le nombre de membres augment; il faut que l'AIDE soit plus largement connue, de même que la haute qualification qu'elle met à disposition par le biais des membres des comités.

(f) Appui dans le cadre de l'organisation de services de distribution des eaux.

(g) Attirer l'attention de divers gouvernements et d'organismes de distribution des eaux sur la Décennie de l'Eau.

Le comité pour la Coopération en matière de Développement s'est mis au travail. Ses membres représentent tous les continents et toutes les organisations internationales (OMS et BM). La coopération entre les services de distribution des eaux dans diverses parties du monde (jumelage) sera une activité importante. On demandera très bientôt le soutien de la Banque Mondiale pour un programme d'action. Le thème principal du Congrès de l'AIDE qui se tiendra à Paris en 1980 devra être la Décennie.

90. Le Professeur Ishibashi (Président de l'AIDE) clôture le séminaire. Il signale que c'est là le premier séminaire qui ait été dirigé par l'AIDE. Il espère qu-hormis les séminaires, une séance spéciale du Congrès de l'AIDE sera consacrée aux pays en voie de développement. Il remercie les orateurs et le secrétariat.

Pollution and Protection of Water Sources

J. Haijkens (WHO, IRC, Netherlands)

J. Haijkens said there was probably time only to touch upon a few of the numerous problems and questions that could be raised in connection with pollution and protection of water sources, but he hoped to stimulate discussion on some of them.

In the industrialised world it was only after a long period of neglect in the pursuit of material and economic development, that environmental conservation, including the protection of water resources, had become a primary topic of discussion and concern at all levels of society. Now many people realised that pollution of essential water sources had sometimes gone too far, threatening the health of men and the environment.

Also, it had been experienced in many of these situations that it was very difficult to turn the clock back to try to rehabilitate natural waters. Nevertheless, discharge standards were becoming more and more stringent, requiring substantial financial offers for treatment from population and industries.

It would be a serious mistake, however, if the same stringent standards were to be applied in those situations in developing countries wherever increasing demands of the citizens for better consumer goods and industrial products speeded up industrial development. In those situations it would make no sense for developing countries to jump steps ahead in implementing very stringent standards that could not be complied with without resulting in outright closures of industries. On the other hand serious pollution of important water resources should be prevented as far as possible.

It was probably a matter of choosing the balance between the much needed industrial development and conservation of water resources and he thought this could well be the first point for discussion, taking into account of course that not all surface waters were potentially water resources and that differences in biological conditions in tropical water required flexible discharge standards.

Apart from pollution from industrial effluents, many developing countries experienced a problem with strong organic wastes which arose from tropical agricultural crops, e.g. palm oil and rubber production.

At the moment a new attitude was emerging in some developing countries towards wastewater treatment, or better usage, which was promising and which might help overcome the financial drawbacks of wastewater treatment. The nutrients in waste water were being seen as a resource which could be utilised either as a source of food for selected fish in ponds, or for the growth of algae used as cattle food.

Another situation he referred to was the water source for domestic use in rural areas in developing countries. Water supplies for rural areas, that is in places where houses were grouped in small numbers or were scattered about, served a small number of people and the danger of widespread outbreaks was therefore relatively small. Nevertheless, pollution of a water source could mean, and in many places does, a serious health hazard to the local population. He mentioned a number of causes for this kind of pollution, firstly there was the natural consistency of ground water, which made it sometimes less fit or unfit for human consumption (fluoride, nitrate). Secondly, the problem of contamination of groundwater because of disposal of human excreta, wastewater and sometimes oil in the ground nearby water sources.

Thirdly there was the pollution of wells because of primitive ways of fetching water (dirty buckets) or, when it concerned a rainwater catchment, contamination of the catchment surface (roof) after a long dry period.

Looking at surface water sources (such as brooks, rivers and ponds) he had been amazed to see in many places people standing next to each other washing their laundry and their bicycle, and cleaning their teeth, while just around the corner or even sometimes at the same place others were relieving their sanitary needs.

He said that the solution to prevent these problems was of course, first of all, health education for everybody, including school teaching programmes. From a more technical point of view it was important to cover wells and provide them with at least a handpump, to make technically sound springcaptations, to provide public sanitary systems, such as latrines away from the water source or in general to separate the various types of water uses. Proper maintenance, supervision of sanitary conditions by Sanitary Inspectors of Health Controllers (who in turn required proper training to that end) and a regular examination of the quality of the water was important.

Mr. Haijkens then spoke briefly on water pollution during transport. In many rural situations people carried water home in buckets, vessels, containers, etc., or obtained water from a water vendor. He pointed out that originally clean water was often polluted during transport and/or during later storage at home. Here, at least, education of the consumers in the importance of cleaning buckets before fetching water and covering them during storage could be of great help.

Another problem was the intermitent piped supply of water in many situations. Such an arrangement would often allow groundwater, which is sometimes mixed with wastewater, to infiltrate in the water pipes. He supposed it was superfluous to elucidate the dangers of this.

In conclusion, Mr. Haijkens stressed that the protection of water resources should be an integral part of a water resources management system.

Surface water was used for many purposes. It was easily contaminated by the disposal of wastewater, sewerage, industrial and agricultural wastes and by various other human activities. Therefore it was necessary to urge the developing countries to establish adequate legislation for the control of industrial and agricultural wastes and to further appropriate technologies for the treatment of wastewater.

Groundwater was a major drinking water source all over the world. Therefore particular attention should be paid to the protection of groundwater as a drinking water source. Aquifers should be protected against improper use, for purposes other than drinking water, and against pollution.

He finally asked two questions:-

- What discharge standards should be applied in d.c.'s in different situations?

- What experiences could be reported on treatment of organic wastes from agriculture, algae production etc., or perhaps in general, what innovative, appropriate solutions had been developed to treat wastewater and/or to prevent pollution of water sources in rural areas?

Appendix 2

Quality Aspects of Water Sources

B. C. J. Zoeteman, (National Institute for Water Supply, Voorburg, Netherlands)

1. Introduction

The quality of surface water is decreasing step by step concurrently with the increasing development of a human settlement. In general a number of phases can be recognised in the development of pollution in a river basin and a philosophy on what approach can be envisaged in development countries, towards reduction and prevention of pollution of water sources, will be discussed.

Finally a different subject will also be touched upon, i.e. the use of a simple technique to measure the quality of water sources under field conditions.

2. Trends in the deterioration of River Water Quality

In 1973 a study was published by the WHO International Reference Centre which related the economic activity within a river basin with the quality of the river water. (WHO, IRC - 1973).

This study was based on more than 100 rivers in the world and showed that increasing levels of human activity, expressed as GNP* related to the drainage area divided by the yearly average flow of the river, is related to the concentration of most water contaminants.

However, certain phases can be recognised as follows. Firstly, rivers only show increasing levels of pathogenic bacteria without much sign of chemical contamination. Secondly, problems of eutrofication and problems of oxygen depletion will start to become evident in the surface waters, due to the discharge of increasing quantities of domestic waste consisting of biodegradable organic compounds, nitrogen and phosphorous containing substances.

Finally a third phase becomes apparent, characterised by increasing amounts of toxic heavy metals (Hg, Zn a.o.) and organic micropollutants such as oil constituents (DDT, Dieldrinn, Lindane, etc.) basic chemicals and others.

What to do if a development from category 1 water till category 3 water is to be expected in a certain drainage area? What can be learned from the experiences gained with river basins such as the Rhine, the Thames, and the Mississippi?

3. Possible approaches to reduce or prevent health hazards related to increasing pollution of surface waters

Generally water to be used for potable supply water should be given as much time as possible from the moment it has been contaminated till the moment of abstraction for potable water treatment. Time kills bacteria and reduces reactive agents if the water is properly stored. Therefore groundwater is in general to be preferred to surface water.

Surface water can be protected to some degree, but never sufficiently, against pollution by micro-organism and nutrients by trying to prevent wastewater being directly discharged into the surface water and where possible by means of lagooning, treatment passage of the wastewaters through the ground. However, eutrofication problems will inevitably manifest themselves in category 2 water sources.

*GNP = Gross National Product (US dollar)

Additional provisions, such as nutrient removal by harvesting algae or higher plants as well as by dredging nutrient-rich sludge in lakes and reservoirs, should be considered. Problems as to the use of category 3 sources are very complex and partially still unknown. Even advanced treatment systems including ozonisation and activated carbon treatment can only partially cope with pollutants present in category 3 type of water sources. Here seems to be a point where it is very advisable to try to prevent the development of industrially contaminated sources, which have to be used for potable supply. It seems to be cheaper to construct new plants which meet strict environmental standards, than first starting to pollute the rivers and then having to reorganise industrial processes, as had to be done in all industrialised countries.

An optimal approach to overcome the problems of pollution of water sources in developing countries could therefore be to accept category 1 or 2 pollution of sources, but to prevent the introduction of category 3 water sources. This would necessitate a central planning of where industrial complexes should be concentrated, but on the other hand it would need a worldwide structure which requires any new industrial activity to meet minimum environmental standards in order to prevent industries choosing those countries which are the least strict in environmental protection.

4. Rapid water quality control using (sensory) assessment methods

Of course the primary purpose of water quality control should be the application of (micro)biological techniques to verify bacteriological, virocidal and cyclicidal safety of the drinking water. However, additional methods can be very useful in the field, at remote locations, to detect chemical and general contamination of water sources, including groundwaters as well as surfacewaters. Why should we not use more often the always available sensitive instruments we have got by means of our senses to assess the quality of water sources, to detect changes in water quality due to accidental or progressive pollution. Water colour and turbidity, as registered by our eyes, tell already much about the quality of a water resource, but this is even more true for the senses of taste and smell.

The human being is able to taste most salts in concentrations between 100-1000 mg/l. and to smell some organic contaminants at levels in water as 0.01 microgramm/l. In fact no, or very few, compounds are presently known which can cause acute death after drinking 2 litres of water, containing the chemical, without smelling its presence (Zoeteman, 1978). The sense of smell provides a reliable first screening system for water pollution cases due to chemical pollutants and often indicates general contamination of sources of insufficient treatment of supplied drinking water.

Of course human beings differ in odour sensivities from individual to individual. But this can be overcome by taking our sense of smell more seriously, that means by applying large numbers of persons to assess the taste and odour of the water and by using a statistically reliable methodology. More details on these points are published elsewhere (Zoeteman, 1978).

Finally, it should be stressed that the principle that water which has an offensive taste or smell for a certain group of consumers is to be regarded as too much contaminated or insufficiently treated is correct. The reverse does not apply. However, water which is tasteless or odourless should of course never be blindly accepted to be safe.

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Water Distribution

Mr. R. J. Laburn (Rand Water Board, Johannesburg)

Introduction

Of the several aspects of water supply the distribution of water to each individual consumer's property or dwelling calls for great expenditure of capital and usually constitutes the major item of capital expenditure of a water supply authority or company.

It is presumed that the obtaining of water supplies and treatment thereof, and prevention of pollution, etc., is not to be considered in this paper. Distribution of water is taken to mean receiving water of adequate quality and in sufficient quantity at one or a few points and delivering it, also in quantities and of an acceptable quality that meets the needs of the consumer, to where it is required.

Probably every developing country is faced with the problem of supplying water to a population that is increasing rapidly, to a population living in varying degrees of comfort or sophistication and it is necessary to realise that whilst certain water supplies are required on a part with those in well established urban centres in the world, other water supplies, if for no other reason than financial, may have to be made available on a lower standard or less convenient systems, but no less safe, secure or healthy.

Accordingly, considerable care must be taken in the planning and execution of distribution systems. Where there are financial restraints, as is usually the case, a differentiation may have to be made between the provision of assured water of satisfactory quality at supply points within reasonable distance from the point of use, and the ultimate target of having adequate water of safe and suitable quality at several points within each dwelling or building. Included in this ultimate target is that the water should be at adequate pressure and be 'on tap' at all times.

In either case, or in all cases, the source of water, its quality and its reliability of supply must be beyond any doubt or even such that the water supply gives rise to uncertainty or insecurity. Without water man soon perishes - it is his most essential and vital requirement. There should be a confidence in the water supply, a service that the population need not have to worry about.

Economies can always be effected, but there should be no risk factor attaching to water supply.

It would be far better, if funds were limited, to have one stand pipe for four or more families on a completely assured, if limited, basis, than to have water laid on to every household and a system wherein quality and/or quantity were not assured.

The basic provision may often be the first step in supplying reticulated water to areas having relatively large populations and where populations and per capita consumption are increasing rapidly. Without adequate good quality water supplies not only squalor but disease and death lurk close by.

The distribution of water

Included in this broad subject or responsibility are -

a) Meeting the demand and economics of supply
b) Pipelines
c) Pumping plant (in certain cases only)
d) Peak demands
e) Storage reservoirs
f) Metering
g) Maintenance of the distribution system
h) Emergency provision
i) Household connections - prevention of reverse flow
j) Types of consumers - human, industrial .. parks .. gardens .. dual supplies
k) Financing

a) Meeting the demand and economic considerations

In developing countries it can be expected that the increase in demand will rise and continue to rise until the town or region under consideration has reached full development and a high standard of living, and until the population ceases to increase, after which time the demand will continue to increase but at a reduced tempo.

Extensions to distribution systems often take two or more years so that the estimated water requirements must be known well in advance. It is the experience of the author, in supplying a region wherein water is supplied in bulk to some 50 local authorities and 1,000 other consumers of whose total water demand continues to increase at about 6 per cent per annum after 75 years of supply, that estimates of future demand should be studied every two years or more frequently. If bulk supplies are made to large consumers they are required to state their estimated future requirements for the ensuing 2, 5 and 10 years. These estimates are analysed, adjusted and used as a basis for forward planning. It is essential to know the total required demand but it is equally important to know the demands in the particular regions and areas within the whole area of supply. If water under different heads is supplied the separate demands in each pressure zone must also be known.

Having obtained estimates, and it is assumed that the question of limiting the supplies for economic or supply reasons is not to be considered here, it is important to determine which is the best manner in which development is to take place. This covers not only physical location of pipelines, pump houses, reservoirs and the reticulation system, but also the timing of implementation of the development.

Provision for the future depends upon optimum engineering solutions, availability of capital as well as the rate of increase in demand. The greater the rate of increase in demand the more difficult it is to provide far into the future : on the other hand, provision for too short a period in the future can result in costly, uneconomical additional implementation within a few years.

There is no hard and fast rule because the fundamental variables in the equation vary with each project. However, bearing in mind that schemes take a year or more to implement, after decision to proceed, it is doubtful whether comprehensive schemes for development should be for less than the estimate for demands 10 years hence.

In new developing regions it is frequently the case that the actual consumptions exceed the demands ahead of when estimated.

b) Pipelines

As mentioned in a) above, the decision as to the size of capacity of a scheme or pipelines, whether it is a pumping supply pipeline or a gravity supply pipeline, requires careful consideration.

Pipelines and distribution of water are synonymous and their cost constitutes a major item in the total cost of supplying water.

The pipeline must be designed to be able to withstand all foreseeable internal and external forces that may be imposed upon it and certain of these conditions or forces preclude certain types of pipe.

Internal forces comprise working pressure of the water, water hammer effects, corrosion by water of the interior surface of the pipe wall.

External forces or factors include those due to unstable ground conditions, superimposed loads (heavy traffic), corrosion due to soils, ground water and pollutants.

Experience has shown that where large diameter pipes are required operating under high pressures, certain types of pipe should not be used.

It is probably world wide practice to bury water supply pipelines to a depth of at least 0.6 m except where unusual conditions preclude so doing. Apart from aesthetics and practicability in built up areas, buried pipes are far less subject to vandalism and malicious damage. Temperature variations in ground are far less than on the surface so that usually joint movement is minimised if pipes are located below the surface.

In built up industrialised areas, particularly where railways operate by d.c. current, the control of stray electric current is important so that perforations of steel pipe particularly can be minimised.

c) Pumping Plant

Pressurising water so that it is available at the consumer's draw-off point at a reasonable working head (approximately 35 metres) is achieved by centrifugal pumps driven by electric motors or by gas or steam turbines or diesel engines. Electric motor driven machines require little maintenance and are usually less expensive than those driven by gas or steam turbines or by diesel engines. However, charges and tariffs for electric current often make it uneconomical to operate pumps at variable outputs. Turbines powered by gas, steam or oil are preferred for variable pump outputs but require regular and expensive maintenance compared with electric motors.

For reliability and continuity of supply careful consideration should always be given to having an alternative source of energy, if only for a portion of the nominal output of the whole plant.

The use of booster pumps either stationary, semi-portable or fully portable, can be most effective in achieving or increasing the desired through-put of a pipeline system. Often this is a low capital cost solution and has the added benefit that the equipment can be employed elsewhere when no longer required or when more urgently needed elsewhere. Noise abatement from booster pumps in built-up areas is a problem.

Water distribution systems should be designed so that duplicate or ring mains supply large or important areas.

d) Peak demands

The distribution system must be able to meet all reasonable demands, including peak demands that are generally unavoidable. Hourly, daily and seasonal peaks occur and the system must be able to meet these peaks.

This is accomplished in several ways: by intermittent use of booster pumps, by storage or service reservoirs, or by the imposition of restrictions on the use of water for certain purposes such as watering of gardens, parks, etc. during high demand periods.

To be able to meet all peaks that, depending on climatic and other factors, can reach 3, 4 or more times the average daily or weekly demand, can be expensive capital-wise which in turn affects the cost or price of water.

It is considered that consumers should be consulted as to whether they are prepared to pay higher tariffs for unrestricted draw-off and use of water or whether restrictive use at consequential lower unit cost is preferred. Another solution, though not easy to enforce, is the imposition of a differential tariff for water whereby the unit rate increases perhaps exponentially with quantity in excess of a predetermined reasonable peak draw-off.

e) Service or storage reservoirs

Service reservoirs, preferably covered and secured against ingress of insects, vermin and humans, are provided at strategic or conveniently high points within or close to the area to be supplied. The function of these reservoirs is to supply water in the event of expected high peak demands in excess of the maximum capacity of the distribution or reticulation system of pipelines and pumps, or in the event of temporary disruption in supply following plant or pipeline failure.

The recommended capacity of these reservoirs relative to normal quantities supplied in the region or area varies with circumstances. Some of these circumstances depend upon the type of consumer whether domestic or industrial, the reliability of power supply and plant, and on pipelines as well as the number of pipelines serving the region. Climate, the nature and intensity of peak demands, variations in demand, efficiency of maintenance of the supply system etc., are also important factors. It can be assumed that generally between one and three days storage in the reservoir would be adequate in meeting most short term peak demands as well as short term plant and pipeline breakdowns.

Care must be taken to ensure that water in the storage reservoir is not stagnant as otherwise, quality, taste and odour problems can arise. Water should circulate through the reservoir wherever possible.

f) Metering

g) Maintenance of distribution system

Sound routine maintenance of valves, meters and appurtenances, and pipelines reduces emergencies and breakdowns as does planned maintenance of plant and machinery. However, no matter how excellent the maintenance, no water supply system is without its faults and plant and pipeline breakdowns must be expected.

It is imperative that plant and pipeline failures are attended to immediately and long experience has shown that a versatile mobile breakdown crew must be available or on call at all times. This crew must have equipment and personnel readily available to commence repair work and restore the supply as soon as possible. Time is the essence in such circumstances and the water supply authority's office or workshop telephone must be manned 24 hours a day.

h) Emergency provision

As fully discussed in General Report No. 2 at this Congress, emergencies, whether man-made or due to natural phenomena, do occur. The effects of certain of these can be reduced to mere temporary inconvenience to consumers whilst others, such as severe natural phenomena (earthquakes, floods, droughts, freezing, etc.) and man-made emergencies such as prolonged plant failure, severe pollution of supplies or war, can give rise to the most serious water shortages. In these cases, to avoid disaster emergency supplies albeit of very limited quantity are essential. There is a tendency in new distribution systems in developing regions or countries to give insufficient attention to ensuring that emergency provision is made. This can or should be met by having an alternative supply available and capable of supplying at least the minimum quantity necessary to sustain life until normal supplies are restored.

i) Household connections

j) Types of consumers and dual systems

Normally one supply system conveying water of acceptable quality is employed to meet the demands of all types of consumer - human, industrial, gardens, parks. Where potable supplies are limited and supplies of poorer quality are readily available or where the cost of converting the raw water into an acceptable potable standard is high, or very high, dual supply systems are often an economic solution. Water of a quality lower than potable standard can be used for toilet flushing, gardens and parks but great care must be taken, however, to ensure that such lower quality water is not consumed by humans.

k) Financing of water distributions systems

Because capital expenditure on distribution systems is a major factor in water costs, particular attention should be given to finance charges, the expenditure on developing and maintaining the system, and the recovery of expenditure by means of tariff charges or a tax system. Considerations such as expected life of plant, pumps, buildings and pipelines must be conservatively assessed and the finances required for their replacement within the periods so estimated must be allowed for in any tariff system.

A time old sliding scale tariff system whereby the tariff decreased with increased consumption is now no longer as common as it used to be. Whilst increased sales are to be encouraged to earn revenue to defray capital and operating expenses, water is becoming increasingly scarce and a reverse type of sliding scale whereby the unit tariff rate increases with increased consumption should be carefully considered, so that further capital expenditure in expanding the distribution system can be delayed or deferred.

Appendix 4

Education and Training

Chairman - B. Thorpe

Introduction

A session on Training and Education is important to all of us whatever our country's state of development may be and it is certainly necessary for me, having only been appointed this week, I am in need of a great deal of education and training.

Our special concern today however is those countries lagging behind and in those countries it may be necessary not only to train those who will be providing and maintaining water supplies, but also to educate and train those who will hopefully be using the services provided. They will in many cases be accustomed to using unsafe sources and cannot readily see the need for a safe alternative, and certainly cannot see the need to pay for it.

Something like three quarters of the world's rural population and getting on for a quarter of the world's urban population do not have easy access to safe water.

What can the education and training committee of the Association do to help? - That is the purpose of our discussion, and those of us concerned with the committee's work are anxious to have your views and suggestions. What we are doing at present:-

(a) Our session at this Congress held on Monday October 3rd included an excellent papers by Jan Haijkens (Netherlands) and Robin Turrell (Great Britain) on Rural Water Projects in Developing Countries. Already we are thinking of our special session in Paris in 1980 which happens to coincide with the start of the 1980-1990 United Nations International Water Decade with its objective of providing safe water and sanitation for everyone by 1990.

We need your help to decide how that Paris session can best serve your needs. More immediately, we have a Regional Conference in Singapore - there is to be a session on training - How Ought it to be Organised?

(b) Between now and the Paris Congress we are going ahead with the work on which a start has already been made, namely:-

(i) To provide a Training Reference library of specially designed training materials (where is it - how can access to it be obtained).

(ii) To provide a Directory of Training Facilities (where are they - Who provides them - how can contact be made)

(iii) We have already produced a Glossary of terms in English, French, and Spanish so that as far as possible we all understand what we are talking about. At our meeting on Wednesday we accepted a generous offer to produce an Arabic version - we should like to extend into other languages.

(iv) What other tasks can be undertake which will be of value, and which are within our capacity to do well.

Appendix 5

Education and Training

Opening Speaker - W. D. Hughes

Chairman, Ladies and Gentlemen,

Having agreed to our Chairman's request that I should attempt to review what I have heard throughout the Congress and its implications to education and training, I then realised what a strange task I had taken on. It is strange for two opposite reasons, firstly because the words education and training have been little used during the Congress, and secondly because good training is the cornerstone to success in our business, particularly if we are genuinely concerned to further the spread of efficient and economic water supplies in developing countries.

I have therefore collected together a few impressions and comments which will hopefully stimulate our discussions. In the absence of facilities to show the slides that I had prepared for overhead projection, may I suggest that you might find it helpful to follow the list of headings in your programme because I shall offer my comments generally attached to those headings.

There has been over the years countless and endless discussions between educators and trainers on the distinction between 'education' and 'training'. I choose to use for the purpose of my comments at this seminar the simple distinction that 'education' is that process applied to people to understand the work of others so that they may relate it to their own work and life, and 'training' is that process applied to people to equip them to carry out a job. May I further suggest to you that training can take on any disguise and occur in any place. However, it is quite easy to distinguish three types of training, that carried out formally by a recognised instructor, that delivered, normally informally by a person's manager or supervisor, and that which is self-delivered through the searching and experience of the worker himself. All these types have their place, and in my comments I am sure that in your varying situations you would choose different training methods to solve roughly the same problem.

Let me begin then, at last, to mount my comments from what I have heard, read and observed during these last few days.

Firstly, I should like to elaborate a little on a few levels of concern in the operation of the water industry in our different countries.

Government

Except for those of us who come from very small island countries, within our territories we experience sometimes a wide variation in climate, availability of water, vegetation, soil conditions and many other factors. Therefore the arrangements for capturing and delivering water can be complex. It has been suggested during the Congress that national water plans should be the goal in every country and that the smallest areas for water distribution system organisation can only be based on catchments. It was further suggested that in some cases international plans should be the target.

I suggest to you, therefore, with my tongue only partly in my cheek, that Governments are in many cases in need of a water education programme, so that the place of water, its political and economic significance, and cost, are clearly seen. It is unlikely in this education programme that leading water experts will play anything other than a very significant role.

Community

The second large education exercise which frequently reveals itself and which was mentioned several times in the Congress is that of the community. We were shown at least one example of where a small community was intimately involved in the organisation and construction of its own water supply with outside help. However, frequently centuries of tradition and consequent cultural and social patterns have to be adjusted so that not only is a water supply installed but also maintained and not misused and abused.

Our session on public relations demonstrated many of the techniques and devices available in so-called "developed countries" and it was interesting to see how relatively recently these steps have been taken.

Staff

I had intended to single out the various levels of staff for individual comments, but have concluded that that would take too much time. The urgent need in developing countries is for competent people trained in the varying skills. The manual operators are easily trained in their simple tasks, but they have to be organised and monitored by good supervisors who know the work and can lead their men.

Technicians able to install and maintain are of prime importance and the professionals necessary to direct their work are so frequently not available. As was commented in this room this morning, it is not uncommon for expatriates either not to want to do the job for which they are employed, or not to be allowed to carry out their duties because the organisational, technical and political climate in the area does not so permit.

At the top of this staff pyramid is the manager, the jack of all trades in a way, whose previous experience may well have to be urgently and rapidly adapted to conditions which he may well not have met before.

There is a continuing training programme for our industry in the technicalities of the job and in the management and supervision of the work. A programme of training can be self-perpetuating for staff if organised, maintained and motivated correctly, but a very significant first step has to be taken at an appropriate level otherwise training is left to the enthusiasm of a local and often isolated, but dedicated person.

May I now move on to the second group of headings which cover areas of concern.

Firstly Finance, a subject about which we have heard a lot directly and indirectly during this Congress. At one extreme we have heard of reduction in revenue through water loss and the happy delay of capital works consequent upon loss reduction. At the other extreme, we have considered economies in waterworks operation. Further from time to time, questions have been raised about the financing of projects. To me then there is a considerable continuous programme of both education at Government and community level because someone has to pay the bill, and of training of staff.

A legal system to allow actions to be taken to provide water is essential, and as we have seen on several occasions this week, to prevent other actions such as pollution and wrongful abstraction is essential. At a different level bye-laws to ensure correct installation and to minimise abuse are needed. An education and training programme to assist in the devising of a legal framework, and to ensure standard interpretations and application has been called for more than once this week.

A large part of this week's discussion has concerned water resources, and economies of use, re-cycling and desalination were a few of the topics raised. The management of the water cycle following the establishment of a reasonably thorough development of a region or country's resources is quite essential, and training is vital at research, survey, planning, development, operational and management levels, to obtain an acceptable degree of service. The development of water resources was described as having managerial, technical, social and cultural implications.

Our next heading is the Human Resource. I believe that I do not need to develop this theme at this point, but would claim that the whole of this session is about that human resource.

Installation and Maintenance can I believe go together. One speaker this week reminded us that the best installation in the world will always need maintenance, without which it will soon become the best non-used installation in the world.

Those of us who have been fortunate enough to work in, and to visit several overseas countries, will be familiar with the sight and story of well-conceived installations being unused, through lack of trained manpower. We also heard considerable discussion on the renovation, renewal and replacement of mains and equipment, a topic again full of training implications.

Finally in my comment about areas of concern, I should mention health and safety considerations. Some of the so-called developed countries are now vigorously turning their attention to massive training programmes in this field. Our concern is not only for the health and safety of the work force, but also for that of the community at large and for property.

If we now assume that with the spread of water supplies to more communities we also see a rapidly increasing growth in demand for education, we must inspect some of the problems.

What is the cost of training? The question has been asked this week, but no answer or even guide has emerged. We must not be mislead into thinking that training in workshops and classrooms is the only cost. May I remind you that training takes place in many places and at best is indistinguishable from doing work.

However, against the cost of training set even a subjective guess at the cost of not training. The cost chain goes through the cost of unmaintained plant right to the cost of failing water supply.

Who are these trainers that I keep mentioning, and how do we train them. I could offer my list of characteristics, skills, and backgrounds needed to compile a good training man, but I believe that the picture I might be painting might be that of a good manager.

The training of trainers as a heading I think takes me quickly on to assistance obtainable from other sources. No matter how good a training organisation is, it must always draw from practitioners in the skills of the industry. Developing countries may also have to draw upon other countries for training expertise. I believe that assistance must be carefully judged and a careful balance struck.

The final problem that I believe in indirect ways I have heard highlighted this week is that of standards and simplicity. Training should be simple. Installations should be capable of simple operation and maintenance, automatic where possible, and standardisation across regions, countries and international boundaries would assist the spread of training.

The last section needs to be brief and perhaps aims to sound a few warning notes:-

Use the education system to spread a feel for our industry and an appreciation of the commodity.

Use local vocational centres and adapt where necessary to train in many of the simple skills.

Use local colleges and universities as far as they are able to assist, but beware of too much theory and not enough practical training.

Encourage on-job training and as a start establish a group of mobile on-site training experts who may begin a process of systematic training where formal fixed facilities are not available.

However, finally, Chairman, I take my concluding phrase from a speaker in the main hall on Tuesday who summed it up very well for us. He said:-

"Good vocational training creates good installations".

MEMORANDUM ON THE PROBLEMS ENCOUNTERED IN "COMMUNITY WATER SUPPLY AND SANITATION IN THE DEVELOPING COUNTRIES

by: Engineer Rida Murtada
Chairman of the Board and President Director General
for the General Establishment of Damascus Water Supply
(Syria)

This Document was submitted to the United Nations Water Conference (Mar del Plata, March 1978) and discussed following which many recommendations were made.

Introduction

There is no doubt that the Document contains significant information which can assist in determining the depth and the breadth of the problem existing in developing countries characterised by the lack of good projects for potable water and sanitation, particularly in rural areas. Also the report presents very important recommendations regarding the significance of safe potable water in upgrading life style of developing nations.

Also the Document presents vital statistics concerned with water supply and sanitation services and people served in one way or another in 1975, as well as the average costs of these services in urban and rural areas between 1970 to 1975. Further more statistics were presented on the national and foreign participation in financing these probjects in 1970 to 1975. On the basis of this data the cost of the services was calculated for 1976 and 1990. By 1990 the HABITAT conference recommended that the targets specified for the services and their costs must be met.

Further, the referenced report suggests alternative solutions and options for achieving the targets which I believe will be one of the stages for the happiness of humanity.

Also it was recommended that programmes adopted must be more serious and reflect the concerned government commitment to develop the water supply and sanitation sector. On the financing side the report studied this matter and made very important recommendations.

Administratively, the Document expressed the problem that some ideas come from persons trained in the industrialised countries and encouraged from persons who do not understand the local conditions of the developing countries.

Further, the Document emphasised the significance of the manpower constraints which can often set limits on the goals or targets that can be achieved. From past experience the Document indicates that many water institutions are suffering from the inefficiency of its operations, due to the improper institutional arrangements and the lack of proper control.

The Document discussed properly the difficulty concerning the plight of low income urban dwellers, in particular, squatters whose existence is often not recognised by the public authorities which are frequently unwilling to legitimise their occupation of urabn land by providing even the most basic services.

In the area of community participation the report discussed the need for a national movement to explain the objectives, criteria and methods of implementation of the community water supply and sanitation programmes.

The Document calls for directing policies with global collaboration when such resources, development of alternative strategies, the preparation of cost/benefit reports and the establishment of training of personnel.

Also the Document discussed the coordination of external inputs, particularly in promoting groups that can monitor progress and problems and serve as trouble shooter and catalyst for accelerating programme delivery at country level by the agencies concerned.

The Document discusses the programme country principle and foreign aid policies. Also it emphasises the need for manpower development and developing the production of needed materials locally for community water supply and sanitation programme for reducing the developing countries' dependency on external sources. The report analyses information transfer and the quantity of external assistance for helping developing countires in enhancing its real resources for increasing their participation in financing water supply and sanitation projects.

The Document highlights a plan of action for achieving the global targets and states the action to be taken by developing countries in short term as well as the medium and long term.

Finally the Document explains actions to be taken by donor countries from the specialised United Nations Agencies and other external donors. The report emphasised the need for speedy action by the United Nations Agencies and the financing agencies such as the World Bank and the Regional Banks to assist developing countries in the preparation of the prospected external financing for projects and providing these countries with long term loans at reduced rates for well prepared community water supply and sanitation projects.

All these subjects studied in the report are of vital importance. There is no doubt that they have been included after deep study of problems existing in developing countries for a long time.

As a native of one of the developing countries and as an official of an important institution responsible for maintaining potable water and as I have been working for 25 years dealing with potable water problems and sanitation, I would like to make some propositions in this seminar, hoping that they will help to clarify my point of view.

In the first place, I would like to state some remarks incorporated in Shipman's report of 1966 as follows: "One of the basic premises in the thinking of many developing economists can be foreseen in the faulty belief that municipalities' investments are unproductive. This error is found also in the various calculations of important benefits resulted from investment in industry and agriculture if it is compared with the very small benefits realised by housing or municipalities projects. In most of these cases these calculations take into account only the direct revenues and production (or profits) and that can be measured easily and realised by industrial and agricultural benefits and disregarded generally, the indirect important benefits realised by municipality investments in the following fields are:

A - vast and fact utilisation of labour force

B - the formation of new labour force due to construction works

C - opening local avenues for producing consumption industries and construction materials from local sources

D - developing civilisation which provides the population with progress possibilities and removes traditional routine in agriculture and establishes areas of advancement in the fields of education, arts, science and technical works. This last point of great sifnificance makes the following a principle: "the social and economic prosperity necessitates the existence of municipality areas which contain lively centres for culture, education, science and technology".

Let us come back to the justification of the project, the concerned authorities in planning must not be satisfied, in deciding in the project just by the mere expression that some have need of it. Every country that consists of large or small population concentrations demands new water supply or expansion of the existing networks and every concentration must be convinced that its needs are of great importance. If the Government and its water institutions want to prepare its programmes for supplying water on a correct basis, it must start from the principle that the user of the services must carry the burden of paying the outlays. If the concentration knows that the Government is ready to help provided that it must cover the cost of such a service then acceptance to do so proves a true need.

The above could be used as 'operational method' for justifying the projects otherwise amy questions will be asked in other areas and these may be very difficult to answer. This action does not eliminate the possibility of taking other factors into consideration such as general health, fire protection, tourism etc. which will ehop to justify the project and which are difficulty to quantify in value when the members of the concentration accept the values of using water.

The Problem of Potable Water in Developing Countries

This problem is unique in developing countries but the solution may differ from one country to another by nature. Nevertheless, there are generalisations applicable to these countries. It is a mistake to divide the problem for each area separately in the same country

in order to study it and yet to study the problem on a national level and evaluate the abilities requires a study of the financial matters. The problems of developing countries can be divided into the following problems:

- Financial
- Technical
- Organisational
- Social.

The Financial Problems

The financing of projects is carried out as follows:

- Local loans (State or Municipalities)
- Foreign loans (World Bank and other International Institutions)
- Self-financing

This last method is the safest way because frequently, institutions fail to reply loans due to the deficit caused by the following factors:

- the incorrect study of the project is technically due to the errors in the study or the failure to recognise the far away future needs. This necessitates a restudy of the project or the failure to expand it due to the increased need which influences the project efficiency
- the increase in investment costs over the natural limit
- the incorrect estimation of the project costs (the project starts with a million and ends with millions)
- the incorrect estimation of water costs and selling it below cost
- the size of the administrative staff is beyond the needs which results in an increase in outlay
- the great discrepancy between the water produced and the water utilised on the basis of bills due to the following reasons:
    - the infiltration of water in the systems
    - some departments or municipalities do not pay the bills
    - the difficulty of meter reading due to the fact that they are out of order or the readers do not do the job properly. In addition, sometimes it is very difficult to collect from defaulters and as the interest on loans is now higher than 7% this does not help matters.

Technical Problems

- the unavailability of technical people at a required standard for the desing, implementation and investment

- the unavailability of data used to estimate the demand correctly
- the unavailability of hydrological studies for water resources
- the unavailability of long range planning and studying of probjects in the short term and then only superficially
- the unavailability of the required expertise of manpower implementing the projects
- the failure to utilise the sophisticated methods used in advanced countries such as the mechanical control of operations
- the inability to produce equipment and the required materials for water projects which necessitates importing them and maintaining unavailable spare parts

Organisational Problems

- the unavailability of regulations concerned with potable water
- the unavailability of organisational relations between the various administrative departments responsible for making decisions concerned with water projects (public works, municipality, army, internal affairs)
- the unavailability of the required expertise serving the responsible officials on directing public institutions.

Social Problems

- the difficulty in estimating the number of population and their growth rate due to the great migration from the rural areas towards urban areas
- the failure of users to obey the regulations issued by the water establishments as far as the carelessness in consuming water and the safety of water connexions and meters is concerned.

We present our recommendations as above, hoping that they will interest the participants of the seminar.

I do believe that the recommendations adopted in the Habitat conference in Vancouver, namely that 1990 shall be the year when one hundred per cent of the world population shall have acccess to adequate quantities of safe water supply is timely, despite the fact that it may have set up a very ambitious target when one considers the current rate of progress achieved in this sector by a large number of the developing countries. I do believe therefore that the document submitted to the United Nations Conference in Argentina contains a realistic appraisal of the situation in the developing countries and it contains constructive proposals which should contribute substantially towards meeting the adopted targets. I must emphasise that unless we develop a strong collaborative effort between all the parties concerned at the international, national and indeed the local levels, our aim of achieving the desired target will be in vain. To this end the following is proposed:

1. International agencies should do all possible to increase their assistance for the sector, including the provision of lending agencies of preferential or concessional interest and long term loans. Also international agencies should seek increased assistance for the developed countries and wherever possible, experts from developing countries should be utilised in order to benefit from their experience under similar conditions.

2. Individual governments of the developing countries concerned should mobilise expediently their manpower resources and available expertise for long term planning and selection of priorities and should develop feasibility studies for implementation of priority schemes within one year following the 1977 water conference. In this connection it is important that due attention is given to the problems of waste disposal created by the availability of additional water supply. This is a long neglected aspect of the human environment which has not been given the proper priority by the people and their government.

3. It is imperative that the communities themselves are made to appreciate that they must participate actively both materially and physically in the campaign towards achieving the 1990 targets. The governments should act on the necessary legislation which makes it possible for the local communities and individual users to obtain low interest long term loans so that the ultimate goal of self sufficiency can be achieved. At the same time the people concerned must be convinced that community water supply is a necessary xommodity which must be purchased like any other commodity. In this connection we have, in Damascus (2,000,000 inhabitants) a highly successful experiment where the local inhabitants have paid in advance for the cost of a water supply system which is yet to be built. This was accomplished through the establishment of a cooperative society which later became a public authority. This has active local participation and has been accomplished despite the difficult financial situation of a large proportion of the inhabitants. Local participation in paying for the cost of water supply in Damascus has been a reality for many years when water is metered in a larger proportion of the city. Those who use the meter pay a monthly tariff. It is with this encouraging situation that we are able to undertake a larger expansion programme with loans from several external sources including IBRD.

Pollution and Protection of Water Resources

by: A. Aziz Sasmitadihardja (Indonesia)

ABSTRACT

This paper outlines a typical problem existing in developing countries where water pollution is in its early stage due to population increase and industrial growth.

Sewerage systems are ideal to curb water pollution, however, financial resources are usually limited to construct these facilities. Temporary measures can be taken to solve such problems. These measures will only be successful if cooperation exists between the responsible agencies and the private sector.

INTRODUCTION

Since 1969, the Government of Indonesia has been embarking upon very heavy programmes of development, known as Pelita I, which is the First Five Years Development Plan. At present we are busy completing the Second Five Year Development Plan. Among the activities undertaken, irrigation and community water supplies have been given such priorities that these have entailed great efforts in the development of water resources.

Indonesia, being an archipelago, has limited water resources, especially in the narrow islands, such as Java, where annual river flows are observed to have high fluctuations. Whilst available water resources will not increase in the years of socio-economic development to come, the conflicts of interest in the utilization of such resources will occur at an increasing rate. Therefore, there should be a coordinated effort in protecting these water resources and in rationalizing the utilization of water. In most cases these objectives are difficult to achieve due to the fact that almost every agency, even local government, satisfy their own interests primarily.

Besides these conflicts of interest among water users, water resources are also endangered by pollution. Siltation is one form of river pollution which poses difficulties in the operation of municipal water treatment plants. This is especially true during flood periods when some water treatment plants must close down their operation, as suspended solids exceed 4000ppm.

This pysical pollution is largely attributed to land development activities, forest exploitation, natural erosion and volcanic debris. On the other hand, during dry weather flow, surface waters are polluted by liquid and solid wastes of domestic origin, as sanitary sewerage systems are non existent in Indonesia. Also coming into prominence during recent years is the problem of pollution of rivers where disposal of wastes without treatment by industries are continuing until the waste assimilation capacity of the receiving waters is exhausted. Only then, various authorities will be alarmed. Nevertheless, the following describes a case in Surabaya City, East Java, where our Government faces such problems and how efforts are being made to solve them.

BACKGROUND INFORMATION WITH RESPECT TO SURABAYA CASE

- Historically Surabaya-City and its vicinity enjoyed an important role in water management, being the first region in Java to implement in 1936 the rules of the General Water Statutes.

- Surabaya municipality is the second largest town in Indonesia, after Jakarta, the Capital of the Republic. At present Surabaya has a population of about 2.2 million.

- The towns around Surabaya-City such as : Gresik - Bangkalan - Mojokerto - Surabaya - Sidoarjo and Lamongan will be developed as a socio economic entity.

- As a port city situated in the northern tributary of the Brantas River, Surabaya-City has to face difficulties in obtaining water resources to satisfy domestic and industrial demands, while conflicts of interests among water users exist due to the fact that Surabaya has to flush its rivers and canals periodically and also because water is still needed to irrigate the existing 2400 hectares of ricefields.

- Early industrial activities have already taken place, entailing pollution problems.

- To a certain extent, upstream dams and reservoirs were built to control floods and volcanic debris. Positive results have been achieved through the construction of these facilities so that the

existing irrigation systems could be provided with sufficient water during drought, thus increasing rice production, flushing water could be made available at any time, diluting certain pollution incidents and hydropower generation.

WATER SOURCES VERSUS POTENTIAL POLLUTION HAZARDS WITHIN THE AREA

Only about 45 percent of Surabaya's present population is served by the municipal water supply system, through direct connections and public taps. This system is supplied from two basic sources, eighty percent from the Surabaya River and the balance is collected from a group of springs in the mountains, south of the city.

Thus more than half the people in the city rely on small shallow dug wells or other untreated surface water sources. Many such wells are of marginal salinity and subject to pollution by human wastes.

In 1976 an International consulting engineering firm investigated thirty eight existing wells, the results of which are as follows :

Coliform organisms were identified in thirty seven percent of these wells. The average coliform density was 530 colonies per 100 ml. and the maximum was 3000 per 100 ml.

The wells with positive coliform samples had an average of 640 mg/l. chlorides. Thirty percent of these wells had levels exceeding present Ministry of Health permissible limits (600 mg/l) while 87 percent exceeded desirable limits (200 mg/l). These results tend to confirm a major risk to users of such wells, if present inadequate waste water practice continues. Fortunately, in practice many people are boiling the water before consumption.

Deep aquifers are not exploited as these are too saline for domestic or industrial purposes. Observation in the past indicated chlorides of 400 to 8000 mg/l. Successful well drilling was achieved in areas 60 km. from Surabaya. Yields are in the vicinity of 20 to 90 lps per borehole.

With regard to spring-water, this provides a basically

attractive public water supply source because it requires only a minimum of treatment. Limitations are in reliability and quantity as they exhibit marked reduction in yield during dry seasons.

The existing Ngagel Treatment Plant in Surabaya has its intake structures on the Surabaya River, near the South edge of the city. The Surabaya River, together with Porong River, are tributaries of the Brantas River which is 320 km. long.

Upstream, the Brantas River flows through cities such as Malang (pop. : ± 50.000) Kediri (pop. : + 200.000) and Mojokerto (pop: ± 70.000) hence it is already polluted by untreated municipal waste waters from those cities. Recently, about 19 industries have developed upstream of the Ngagel Treatment Plant resulting in some chemical pollution. The Surabaya River has a gross hydraulic capacity of about 400 m3/sec. with dry weather flow as low as 5 m3/sec.

With these characteristics, at present there are two fundamental problems with particular concern in the Surabaya water supply system :

a) anticipated shortage of water during drought
b) pollution by industrial wastes discharged into the river.

Serious fish kills in the river occured in 1971, 1973, 1974 and 1976. In 1975 and 1977 the Water Treatment Plant was shut down due to the same cause.

Investigations have been made to find out the true causes, also whether these toxic substances could endanger human life. Unfortunately the results of these investigations were not clear and conclusions could not be made.

STEPS TAKEN TO PROTECT WATER SOURCES IN EAST JAVA

The existing Water Law deals with control of the use of water resources. Basically it provides a system of water use permits. As mentioned earlier in this paper, these rules are applicable to the Brantas River, and at present the Municipality of Surabaya has only the right to withdraw 3 m3/sec. Thus several industries along Surabaya River were fortunate to have water use permits and withdraw water from this river. These licenced withdrawals total approximately 1,7 m3/second.

The Government has ceased, for the time being, issuing new permits as a precaution to protect the Brantas River from increased industrial pollution and to protect other water users. Even the Municipality was not able to obtain an extension of their present permit in oder to increase treatment plant capacity.

Effective controls of industrial wastewaters in Surabaya are lacking at present. Thus, there is a need for intermediate improvements in industrial wastewaters management. One endeavour is the concentration of industries in one large area such as the Industrial Estate at Rungkut. Such an area and other new industrial estate developments along the coastline shall be required to sewer their premises and in addition to provide some form of adequate treatment and disposal of their waste water. The industries are required by the East Java Provincial Government to comply with the effluent standard as set in the Provincial Verdict No. 43 of May 23, 1978.

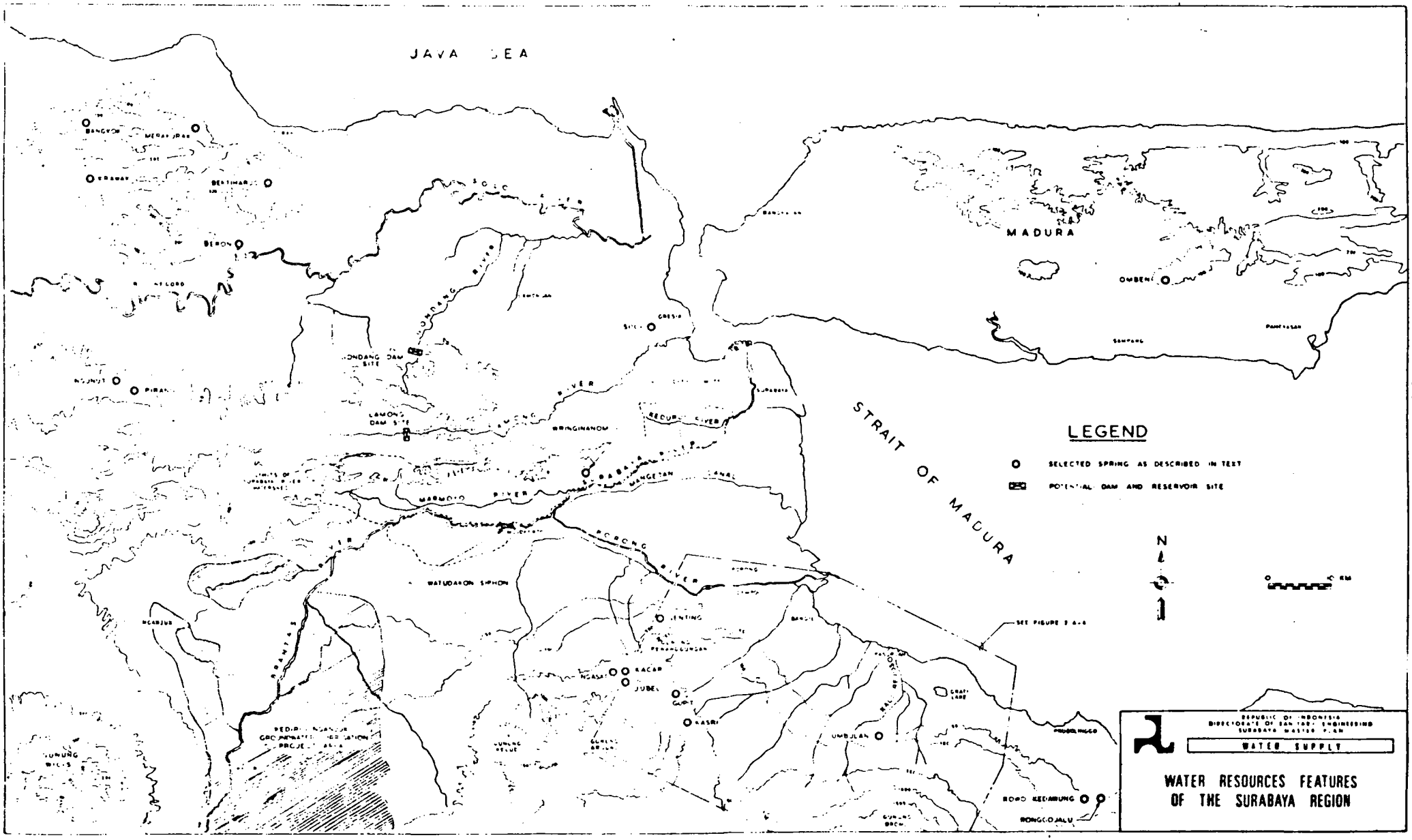
Meanwhile, the existing municipal water treatment plant should be alleviated from receiving all toxic industrial waste materials. Therefore, the existing industries are required to dispose of their toxic materials either on site or by means of closed containers on trucks and carry these to predetermined sites.

A requirement of this nature would call for monitoring of receiving waters. The Government, therefore, has selected 27 points along the Brantas River to monitor water quality.

CONCLUSION

Water Pollution has been, and will continue to be, an environmental problem as a consequence of increase of population, industrialization and development in general.

The Government of Indonesia is very much aware that any scheme of development could be disastrous without his awareness, therefore from now on success in developing water resources will have to depend upon the success of protecting the environment.



CAMP DRESSER & MCKEE INTERNATIONAL INC
CONSULTING ENGINEERS 1978

FIGURE 2.4 – 3

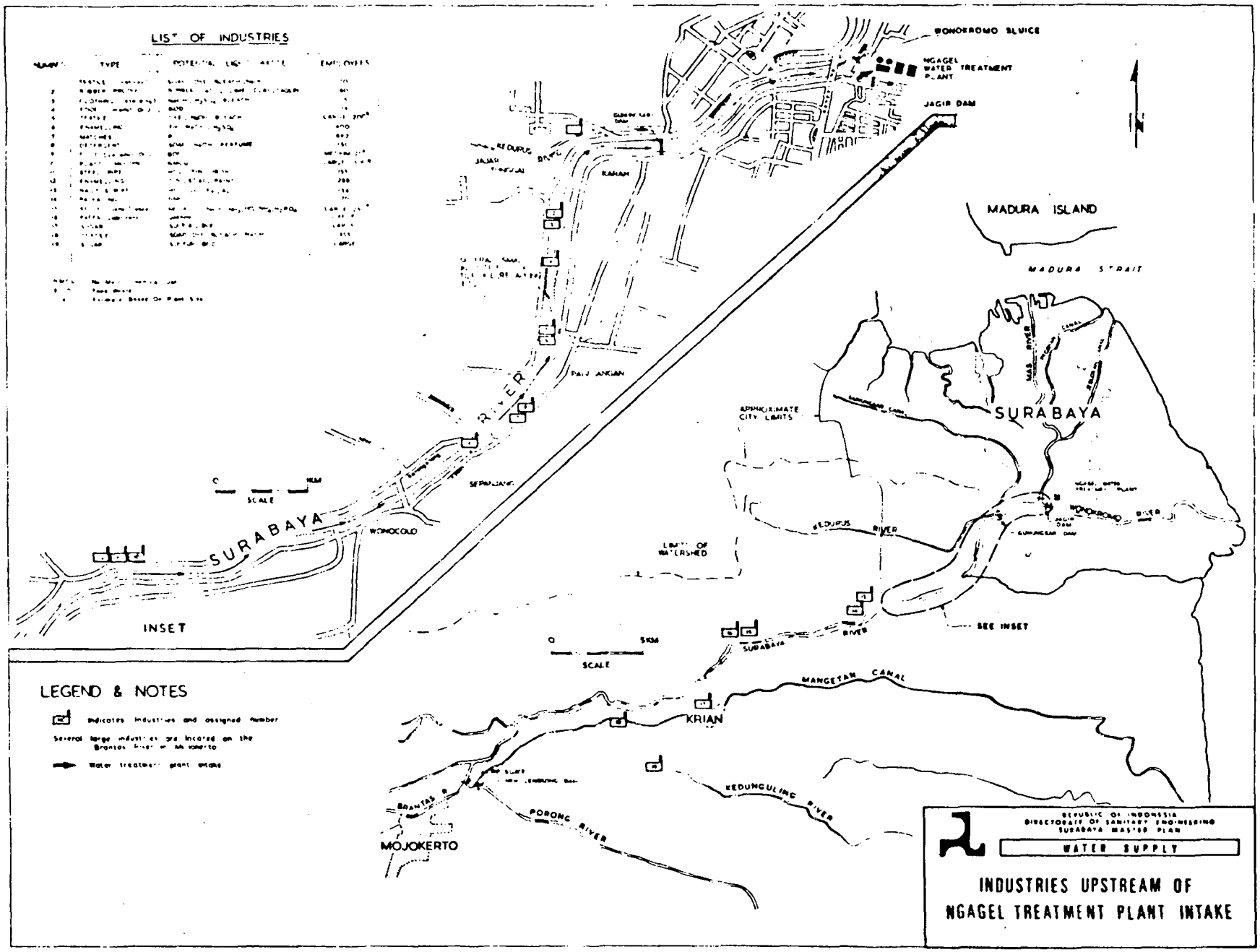


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FIGURE 2.5-1

Case Study on Training

Yasumoto Magara - Institute of Public Health,
Ministry of Health and Welfare, Japan

In 1970 the Indonesian Government announced the establishment of a waterworks training programme to fulfill the demands of water works engineers in order to develop public water supply systems in the country.

In 1972 the Japanese Government said that it would co-operate with this programme, and asked the Indonesian Government if they would receive a feasibility study team who would be responsible for collecting information on the status of waterworks activities and manpower in Indonesia, and to make recommendations for a training project.

The Indonesian Government welcomed this study team and discussions commenced in March 1973. The team recommended a training project, the principal aim of which was to up-grade senior engineers who would then be able to contribute to the training programme in their country in the future. A draft of the programme was then produced by the team. The recommendations were accepted by both governments, and it was agreed to put the training project into action as a technical co-operation project under the Colombo Plan. The training course commenced in August 1973, after the Indonesian Government hurredly constructed a training centre.

The Japanese Government asked the Institute of Public Health, which has responsibility for education and research, to draw up a detailed programme for the course. The IPH also said that they could provide a team of lecturers and advice on training aids.

One of the problems was providing enough lecturers for the course. Although there were many Japanese lecturers, there were few who could lecture in English, and even if there were, they would be occupied full-time with their everyday work. It was therefore difficult to persuade their employers to release such people as lecturers for three months.

This problem was, however, overcome and the course on waterworks engineering started in August 1973. The curriculum for this course consisted of the following subjects: planning, work quality, water resources, water treatment, distribution and service, pump and power supply, instrumentation and administration. Most of the participants were civil engineers with a university education. Their average age was early 30's.

In addition to providing lecturers, the Japanese Government supplied teaching aids including laboratory instruments, equipment for field practice, audio-visual aids and textbooks specially edited for the course.

Evaluating this 1973 course, the following points were made:-

(i) the period of the course was too long

(ii) parts of the course were too difficult for participants to understand

Training courses for 1974 and 1975 were therefore rearranged according to different professional fields, i.e. design of water treatment plant and design of distribution systems. There was a conference on 'Evaluation systems of Water Treatment Plant' and two seminars on 'Administration, Legislation and Management of Water Works' and 'Legislation, Bye-Laws and Ordinances of Local Water Supply'.

In 1974 and 1975 accent was on the practical aspects: practical exercises on plant operation and pipe works, and design exercises on a model village of 50,000 to 100,000 population. With regard to the latter, participants were asked to design, with the help of a map of the area, the necessary works for such a city, so that after completing the course they would be capable of preparing a design fit for government acceptance.

The Indonesian Government officers attending the seminar were anxious to establish an administrative and legal system for water works, and to this end, the presentation made based on Japanese experience was of value to participants.

Although Japanese participation in this project was for only three years, it has been very successful. The Indonesian Government now organises practical training courses and the engineers have attained a relatively high level of expertise.

There is, however, still room to improve several aspects of water supply, for example, maintenance of treatment plant, rationalisation of the distribution networks, and development of consumer relations. These are subjects for future projects.

Mr. Magara thanked the Indonesian Government for inviting their help, and expressed his gratitude to the JWWA and the Japanese International Cooperation Agency and all other bodies who had supported this project.

Case Study : Eastern Asia Water Supply Association

Mr. Daisaku Sugito (Japan)

Last October the Eastern Asia Water Supply Association held its first conference in Bangkok, Thailand. Eight countries were invited from Eastern Asia, namely the Philippines, Indonesia, Japan, Korea, Malaysia, Thailand, Taiwan and Singapore. In addition there were guests from the USA, France, Denmark and ESCAP. The total number of participants was about 180.

Reports from eight countries were presented. The constitution of the Association was discussed, and also the aims and the venue for the next conference.

It is always useful to have opportunities for exchanging information in order to develop present technology and administration, because we have many similar problems regarding water supply systems. In 1959 the Regional Office of the Western Pacific (WHO) made the proposal that there should be regular meetings in the Western Pacific, but unfortunately at that time, not everyone agreed.

Since then, at the 11th IWSA Congress in Amsterdam, the proposal was discussed further, and it was decided that regional problems should be discussed regionally and international problems should be solved by the international body.

The JWWA supported this proposal and the need to form an organisation in the Western Pacific. The first regional conference took place in Bangkok (which is in the centre of the area) under the joint sponsorship of JWWA and TWWA.

The aim of the conference was to establish an international body concerned with water supply systems and to improve the knowledge on public water supplies - technically, legally and administratively.

The following points were agreed:-

(1) To establish a regional body concerned with public water supply, for domestic, agricultural and industrial purposes, without religious or political restrictions.

(2) To collaborate, and exchange information on research, methods of supply, statistics and matters of common interest.

(3) To develop a better understanding between people engaged in public water supply throughout Eastern Asia.

The discussion on the Constitution of the Association can be summarised as follows:

(1) The name of the organisation shall be the Eastern Asia Water Supply Association (EAWSA)

(2) The objectives of the Association shall be in accordance with those of IWSA

(3) The membership will be similar to that of IWSA, namely Corporate, Associate, Individual and Honorary Members.

(4) Detailed discussion of the constitution was held to determine the methods of selection of President, the function of the General Assembly and Executive Board.

(5) The location of the Secretariat would be subject to approval of the JWWA's Board Meeting.

(6) The General Assembly and related conference shall be partially self-financed, and the conference fee shall be kept as low as possible.

The constitution, as detailed above, gives a brief idea of the final draft, which will be prepared with the help of JWWA. The final draft will be presented at the next conference so that delegates can inform their countries and gain approval of it. Further discussion on the constitution will take place at the next conference after which it is hoped that approval will be given.

The second conference will be held in Taipei in 1979 and the one after that, in Tokyo, 1981. Special subjects will be presented at these conferences, followed by exchange of information between member countries.

In order to promote the necessity for clean and plentiful water supply in Eastern Asia, finance and expertise are needed to develop water resources and control pollution, and from now on it is believed that bilateral and multilateral cooperation will further this task.

Water Supply System in Liberia, West Africa

by K. Takenaka (Japan)

1. General Information

The Republic of Liberia, with a land area of 111,370 square kilometers, has a population of 1.5 million (1974 census). About 30% of the population lives in urban areas with 70% living in the rural areas. The annual growth rate is about 3.4%, but some urban areas are growing at twice this rate. Communities with more than 5,000 people are classified as urban.

The capital city of Monrovia has a population over 200,000 with four cities having population between 20,000 to 100,000. More than 100 communities have population from 5,000 to 20,000. About 288 communities have population from 500 to 5,000, while more than 39 areas have below 500 people.

2. Present levels and quality of service

About 25% of the population has access to water from public systems of which the principal sources are surface water and groundwater. This service is provided to the capital city of Monrovia, where about 64% of the population is served, nearly all by private connections, at an average per capita consumption of about 200 litres per day, and public standposts at an average per capita consumption of 75 litres per day.

The rest of the population having access to water from public systems is concentrated in four cities, with two or more cities to have access by the end of this year and by the first quarter of next year respectively. There are plans to provide public water supply systems to three more cities by 1981.

About 80% of the population in these cities will be served by public standposts at an average per capita consumption of 40 litres per day, while 20% will be served by private connections, at an average per capita consumption of 200 litres per day.

However, the population without public water supply systems is about a million. The continuity of the public water supply systems is on a 24 hour basis with substantial amount of unaccounted for water, especially in the city of Monrovia. WHO water quality standards are maintained in all the public systems.

The public sewerage system is confined to the city of Monrovia, where about 20% of the population is served. The rest of the people use septic tanks, pit privies and other facilities. The need for sanitation services is justified on health grounds by the high prevalence of gastro-intestinal and parasitic diseases, especially in the rural areas.

3. Institutions involved in the sector

The Liberia Water and Sewer Corporation (LWSC) has the main responsibility in the sector. Other agencies concerned are the Ministry of Health, the Ministry of Education, the Ministry of Lands and Mines, and Ministry of Agriculture, the Ministry of Local Government, USAID and CARE.

In the past, there was no coordination between these agencies; however, strong steps have been taken to see that proper coordination and planning exists between the agencies in the sector.

The LWSC is charged by an Act of the National Legislature to provide water supply and sewerage disposal systems in the country. The Ministry of Health supplies

water to hospitals and clinics, the Ministry of Education to schools, the Ministry of Agriculture for agricultural purposes, while the Ministry of Local Government, USAID and CARE serve the rural population with water supply.

4. Policy and Planning Aspects

A. Basic Data

The National Socio-Economic Development Plan covers the period from 1976 to 1980. In this period, some medium term plans were completed to provide public water supply to more cities. The long term plans intended to assess the country's water resources and to ensure a realistic water supply for the country.

Unfortunately, most of the investment in this sector comes from foreign institutions with the rest met locally. It is anticipated that during the WHO decade programme, more investment will come from institutions to provide safe water supply and sanitation facilities for all by the year 1990.

L I B E R I A

1. General Information

Area	111,370 km^2
Total population	1,500,000 (1974)
Urban population	450,000 (30%)
Rural population	1,050,000 (70%)
Annual growth rate	3.4% (geometric)
Definition of urban	5,000 or more
Breakdown of communities by size above 100,000	1
from 20,000 to 100,000	4
from 5,000 to 20,000	100
from 500 to 5,000	288
below 500	39
GNP per person US $	404
Income distribution	Uneven

2. Present levels and quality of service

For water: Principal sources (surface, and groundwater). Surface sources reliable, while groundwater sources unreliable during the dry season.

Population served by standposts	89,807
Population served by private connections	37,451
Total population without public service	1,372,742
Typical per capita consumptions: private connections	200 litres/day
public standposts	75 litres/day
Continuity of service	24 hours daily
Unaccounted for water	34%
Water quality standards	WHO standards
The extent to which public systems serve horticultural, agricultural or industrial users	None

For excreta disposal:

Population connected to sewerage systems	5,500
Population connected to septic tanks	448,167
Population connected to pit privies or other facilities	990,833

The urban "fringe" population problem, as related to the provision of water supply and sanitation services is unwholesome and unhealthy.

3. Institutions involved in the sector

The Liberia Water and Sewer Corporation (LWSC) has the main responsibility in the sector. Other agencies concerned are the Ministry of Health, the Ministry of Local Government, the Ministry of Lands and Mines, USAID, CARE, the Ministry of Education, and the Ministry of Agriculture.

There is no coordination between these agencies especially in the rural areas where the other agencies apart from the LWSC dig wells here and there.

4. Policy and Planning Aspects

A. Basic Data

1. 1976 - 1980

2. Medium-term and long term plans in the water supply and sanitation sector.

3. 32%

4. 68%

5. Act passed by the National Legislature and approved February 1976.

6. Very little

URBAN WATER SUPPLY SUB-SECTOR

	1974-1976		1978-1980
	Planned	Actual	Planned
New Construction Work			
Inputs (in US$ 000)			
Total cost	1,000	1,000	15,839
External assistance	750	750	10,864
Government loans	-	-	-
Government grants	250	250	5,215
Funds generated within sub-sector, through tariffs and other charges	6,008	4,272	4,656
Estimated community participation in kind and cash	NONE	NONE	NONE
Outputs			
Number of projects	4	4	10
Number of additional people served (000) by size of community 5,000-20,000	18	18	38
Studies			
Inputs (in US$ 000)			
Total cost	500	500	240
External assistance	500	500	220
Inputs			
Estimated value of resulting projects (in US$ 000)			15,000
Others (identify)			
Inputs in US$ 000			
Total cost			
External assistance			
Total inputs for sub-sector (in US$ 000)			
Total cost	1,500	1,500	16,079
External assistance	1,250	1,250	11,084

RURAL WATER SUPPLY SUB-SECTOR

	1974-1976		1978-1980
	Planned	Actual	Planned
New Construction Work			
Inputs (in US$ 000)			
Total cost	8,000	8,000	3,000
External assistance	8,000	8,000	2,000
Government loans			
Government grants			600
Funds generated within sub-sector, through tariffs and other charges	31	24	
Estimated community participation in kind and cash	NONE	NONE	NONE
Outputs			
Number of projects	3	3	2
Number of additional people served (000) by size of community 500-5,000	20	20	29
Studies			
Inputs (in US$ 000)			
Total cost			400
External assistance			400
Outputs			
Estimated value of resulting projects (in US$ 000)			3,000
Others (identify)			
Inputs in US$ 000			
Total cost			
External assistance			
Total inputs for sub-sector (in US$ 000)			
Total cost	8,000	8,000	3,000
External assistance	8,000	8,000	2,400

Appendix 11

Co-operative Action for the Water Decade

Frank C. Go - Regional Adviser in Environmental Health, Western Pacific Regional Office, World Health Organisation

I am pleased to have this opportunity to tell you about activities which have been initiated by WHO to provide intensified technical co-operation to national Governments to prepare and implement water supply and sanitation development programmes during the period 1980-1990 which as most of you already know, has been designated by the United Nations as the International Drinking Water Supply and Sanitation Development Decade.

The Water Decade was proposed by the United Nations Water Conference held at Mar del Plata, Argentina, in March 1977. The Conference adopted an Action Plan to implement recommendation C.12 of Habitat: United Nations Conference on Human Settlements. Habitat had recommended that "safe water supply and hygienic waste disposal should receive priority (from governments and international agencies) with a view to achieving measurable qualitative and quantitative targets for serving all the population by a certain date. The United Nations General Assembly subsequently approved at its Thirty-Second regular session the recommendations of the Water Conference.

The main target of the Water Decade is to provide water and sanitation for all people by 1990. To attain this target, all United Nations organisations are expected to extend co-ordinated assistance to countries upon request, as well as to intensify their co-operation with the ongoing work of WHO related to the monitoring of community water supply and sanitation needs.

A review of data from global surveys on the situation in developing countries shows that even excluding China, about 1200 to 1350 million people lacked adequate water supply and sanitation services in 1975. The vast majority of these people are the disadvantaged rural dwellers. Service coverage for the urban population was about 75% but the prevailing range for the rural areas was below 25%. Although it is difficult to estimate with any precision the scale of investment needed to attain the Decade goals, the required level is far beyond the current or potential capacity of many developing countries. Consequently, emphasis was placed by the Water Conference on the need to develop additional financial resources to be provided from bilateral and multilateral programmes.

WHO has estimated that the developing countries made a total investment of US$ 15.1 billion during the period 1971-1975 or an average annual rate of US$ 3.02 billion. It has also been estimated that even a minimum programme to implement the Decade goals would require a total investment of US$ 60 to US$ 100 billion or an annual rate of US$ 6 to US$ 10 billion. These estimates do not include the facilities needed to meet the growing demands of industry. More specifically, it has been estimated that the current rate of investment must be increased, as indicated below, in order to be able to attain the Decade goals:

	Required increase in annual investment
Urban water supply	1.2 times
Urban sewerage disposal	2.1 times
Rural water supply	3.9 times
Rural excreta disposal	4 times

Following the Water Conference, the World Health Assembly adopted Resolution WHA30.33 emphatically urging Member States to appraise the status of their drinking water and sanitation services and to develop accelerated programmes for the Water Decade. It further requested WHO to provide all necessary technical co-operation to Member States in these activities and to take immediate steps to make a rapid assessment of ongoing national programmes and the extent to which they could usefully be expanded to meet the objectives of the Water Decade.

During the past 12 months, WHO has collaborated with the World Bank and Member States to carry out the Rapid Assessment Exercise. The specific objectives of these country by country studies were to evaluate:

- the countries' preparedness to proceed with accelerated sector development;
- the constraints which are likely to hamper such development;
- the actions required in the preparation during 1978 - 1980 of national plans for the 1981 - 1990 Decade programme to be reviewed in 1980 by an appropriate mechanism of ECOSOC;
- the need for international co-operation in preparing development plans for the Decade.

WHO has either collaborated or is collaborating with over 100 Member States in the "rapid assessment" task and we expect to have all national reports completed by December 1978. The bulk of this work is being accomplished under the WHO/ World Bank Co-operative Programme.

To provide a focal point for the co-ordination of the Decade programme, WHO has established a unit at its headquarters for Global Promotion and Co-operation for Water Supply and Sanitation (GWS). The unit will monitor progress of implementation of the Decade programme and maintain continuing liaison at the technical level with bilaterals, development banks, and United Nations agencies involved in the Water Decade. In addition, WHO in collaboration with its International Reference Centre for Community Water Supply (IRC) in the Netherlands, currently is in the process of redefining the functions and composition of the existing global network of Collaborating Centres for Community Water Supply and Sanitation. The aim of this exercise is to make the network more responsive to needs and better able to provide technical co-operation to national governments in the developing regions during the Decade, through an improved system for the generation and exchange of technological information and experiences. The IRC will be responsible for the planning, co-ordination and implementation of the network activities. It is hoped that these global mechanisms of WHO will provide the basis for a more cohesive framework for international co-operation.

In the Western Pacific Region, WHO is establishing this year a Western Pacific Regional Centre for Pomotion of Environmental Planning and Applied Studies (PEPAS). The Centre will be located in the campus of the University Pertanian Malaysia, near Kuala Lumpur. Although the thrust of the programme envisioned for PEPAS will deal with the broader field of environmental planning, it is expected that the Centre will also provide a base for supporting more intensified WHO technical co-operation work in manpower training and policy and technical studies, in support of national activities for the Water Decade. Lastly, the Centre is expected to serve as a mechanism to facilitate technical co-operation between WHO Member States in the Region.

WHO has also agreed to service the multi-agency Steering Committee (i.e. composed of representatives from the United Nations, UNDP, UNICEF, ILO, FAO, World Bank and WHO) which has been established to synchronise co-operative international actions for the Water Decade.

Other major activities which have been undertaken by WHO to promote increased support for the Decade are:

(1) a study on "Water Supply and Sanitation Components of Primary Health Care" due for presentation to the WHO/UNICEF Joint Committee on Health Policy in 1979;

(2) several agreements with FAO on the basis and procedures for co-operative action in rural water supply and water control activities;

(3) co-sponsoring with the Asian Development Bank in 1977 of a Working Group on Pre-investment Planning for Water Supply and Sewerage Development;

(4) preparation of an in-depth study in co-operation with other members of the United Nations system of the implications of Water Conference Resolution II on community water supply, and the launching of the Water Decade.

Are the goals of the Water Decade attainable? On this point the report "Community Water Supply and Sanitation - Strategies for Development" prepared by WHO and the World Bank for the Water Conference had this to say:

> "The achievement of the Habitat targets will require re-ordering of priorities in favour of the sectors of community water supply and sanitation, and within these sectors in favour of rural populations and the poor in urban fringe areas. The conditions, constraints, financial circumstances and priorities for action vary between and even within regions, but there is clear evidence of an increasing resolve on the part of the governments of all developing countries throughout the world, as well as international and bilateral aid agencies, to effect a radical improvement in access to water supply and sanitation facilities."

Although it seems likely that there will be a substantial increase in allocation of funds to the sector, during the Decade, one fact that has emerged from various studies is that this by itself would not ensure the achievement of the Decade goals. Most developing countries have limited institutional and technical capacity to carry out a greatly increased development programme. WHO technical co-operation programme is thus giving high priority to institutional and manpower development, in addition to the essential activity of national policy development for the Decade.

The rapid assessment studies have shown that few countries have yet taken the step of translating the primary goal of the Decade into specific action programmes. The re-ordering of national priorities in many cases will not be reflected in national budgets until the next cycle of the countries' development plans. The response of governments to the Rapid Assessment Exercise has been encouraging, however, and some governments are beginning to perceive water supply and sanitation services as basic needs and as having higher social and economic values than those reflected from purely financial considerations.

The prospects then for the fulfilment of the objectives of the water decade are at least promising. By the year 1990, less than a generation away, we should be able to meet our target of providing adequate water and sanitation to all the people, if national governments resolve to re-order their priorities. The key to a successful Water Decade is <u>total</u> co-operative action.

The Water Decade provides unprecedented opportunities for international collaboration to achieve a turning point in world health. Further, achievement of the decade targets is essential to ensure the attainment of the bigger WHO's goal of health for all by the year 2000.