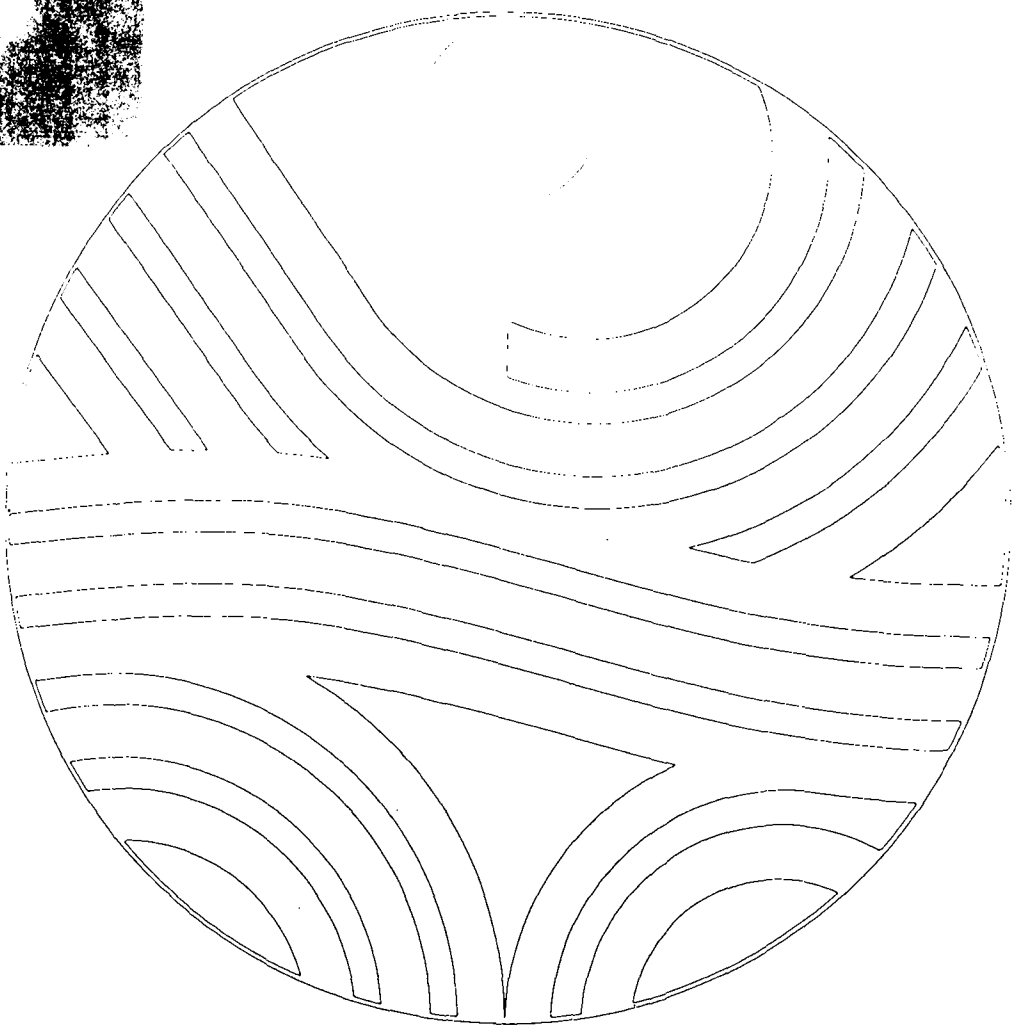
Ground Water in Rural Water Supply

Report on the Workshop held in Lahnstein, Federal Republic of Germany ...983



Technical Documents in Hydrology

International
Hydrological Programme

United Nations Educational,
Scientific and Cultural Organization

Unesco
Paris, 1984

TECHNICAL DOCUMENTS IN HYDROLOGY

UNITED NATIONS EDUCATIONAL,
SCIENTIFIC AND CULTURAL ORGANIZATION

INTERNATIONAL HYDROLOGICAL PROGRAMME

REPORT
ON THE
WORKSHOP
ON
GROUND WATER
IN RURAL WATER SUPPLY

Lahnstein, Federal Republic of Germany
5-8 September 1983

Organized by Unesco
in cooperation with
the National Committee of the
Federal Republic of Germany
for the
International Hydrological Programme

Unesco, Paris, 1984

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PREFACE

Although the total amount of water on earth is generally assumed to have remained virtually constant, the rapid growth of population, together with the extension of irrigated agriculture and industrial development, are stressing the quantity and quality aspects of the natural system. Because of the increasing problems, man has begun to realize that he can no longer follow a "use and discard" philosophy - either with water resources or any other natural resource. As a result, the need for a consistent policy of rational management of water resources has become evident.

Rational water management, however, should be founded upon a thorough understanding of water availability and movement. Thus, as a contribution to the solution of the world's water problems, Unesco, in 1965, began the first world-wide programme of studies of the hydrological cycle -- The International Hydrological Decade (IHD). The research programme was complemented by a major effort in the field of hydrological education and training. The activities undertaken during the Decade proved to be of great interest and value to Member States. By the end of that period a majority of Unesco's Member States had formed IHD National Committees to carry out the relevant national activities and to participate in regional and international co-operation within the IHD programme. The knowledge of the world's water resources had substantially improved. Hydrology became widely recognized as an independent professional option and facilities for the training of hydrologists had been developed.

Conscious of the need to expand upon the efforts initiated during the International Hydrological Decade, and, following the recommendations of Member States, Unesco, in 1975, launched a new long-term intergovernmental programme, the International Hydrological Programme (IHP), to follow the Decade.

Althouth the IHP is basically a scientific and educational programme, Unesco has been aware from the beginning of a need to direct its activities toward the practical solutions of the world's very real water resources problems. Accordingly, and in line with the recommendations of the 1977 United Nations Water Conference, the objectives of the International Hydrological Programme have been gradually expanded in order to cover not only hydrological processes considered in interrelationship with the environment and human activities, but also the scientific aspects of multi-purpose utilization and conservation of water resources to meet the needs of economic and social development. Thus, while maintaining IHP's scientific concept, the objectives have shifted perceptibly towards a multidisciplinary approach to the assessment, planning, and rational management of water resources.

As part of Unesco's contribution to the objectives of the IHP, two publication series are issued: "Studies and Reports in Hydrology" and "Technical Papers in Hydrology". In addition to these publications, and in order to expedite exchange of information, some works are issued in the form of Technical Documents.

SUMMARY

From 5-8 September 1983 a workshop on "Ground Water in Rural Water Supply" was held by Unesco in co-operation with the National Committee of the Federal Republic of Germany for the International Hydrological Programme of Unesco. The objective of the workshop was to give to a group of experts from South East Asia the opportunity to exchange their experience in the field of rural water supply and to discuss related problems. Indonesia, Malaysia and Thailand had sent one representative each from sectors such as administration, technical and sanitation to participate in the workshop. There was also a representative from Burma.

Each country had prepared a national report serving as a basis for the individual expert meetings and discussions. The national reports and the workshops covered the following topics:

1. Assessment and management of water resources

2. Project identification and planning

3. Project implementation: community participation, financing, operation and maintenance

4. Water quality: standards, control and surveillance

5. Institutional structure for related education and training

6. International co-operation and co-ordination of ground-water development in rural water supply.

The results of the workshop should contribute to support these countries in solving their manifold tasks and problems concerning rural water supply. It will also serve to guide in deciding on future specified support. Based on the results of the workshop similar events are designed to be held in other regions of the world during IHP-III.

1. Assessment and management of water resources

The importance of an assessment of ground-water resources for an overall planning of water supply was generally emphasized. Systematic hydrogeological mapping not in particular for rural water supply but for a basic assessment of ground-water resources is in process in all the countries participating. Such a hydrogeological mapping is indispensable to ensure a comprehensive assessment of ground water. As the urgency of implementation of rural water supply cannot wait for a more detailed mapping, around individual villages first priority should be given to the hydrogeological and systematic assessment of springs and wells already used including their water quality. In addition, data concerning the number of inhabitants and sanitation systems (latrines, washing places etc.) are needed. On the basis of such assessments and perhaps additional investigations (geophysical investigations, pumping tests) water supply points can be selected.

Considering the importance of ground water in rural water supply, a central agency for the collection of all ground-water data is required. Such an agency would be responsible for collecting, compiling and evaluating data.

In order to co-ordinate ground-water management the following should be worked out at national levels:

- criteria for water supply installations

- priorities in the implementation of water supply

- defining of individual contributions of the agencies involved.

2. Project identification and planning

The national reports of the participating countries show that there is an abundance of information and basic data. In the light of the existing and still increasing water demand it therefore appears extremely important to accelerate project identification and planning. The advantages of ground-water use should be duly considered.

For the implementation of project identification and planning more trained personnel is needed than is at present available. The goals of planning often exceed available funds. To carry out such manifold tasks it is necessary to make realistic estimates on the basis of natural conditions, technical prerequisites and financial possibilities. Integrated water supply and sanitation plans should be drawn up and supported by governmental activities such as appropriate planning and water legislation.

In view of the numerous projects still to be carried out it appears realistic to carry out the projects planned on the basis of a minimum standard. Only in this way drinking water supply can be guaranteed for all consumers. This means that everything possible is done as far as time and funds are concerned - without implementation of a maximum standard.

The planning should include urban fringe areas. Occasionally there is a possibility of combining rural water supply and the supply of urban fringe areas. Rural water supply projects can often be combined with the development of ground water for irrigation purposes.

3. Project implementation: community participation, financing, operation and maintenance

Community participation is a basic demand to ensure acceptance and proper use and consequently successful operation and maintenance of rural water supply.

To simplify problems of operation and maintenance it appears opportune to select equipment and material in accordance with local conditions (including social aspects). In financial planning should be included adequate maintenance at all levels (national, regional, local). It should include training and costs for future caretakers.

Villages should not receive assistance from external sources without a contribution of their own. Standardization of equipment and material would be of advantage for permanent community participation. Community participation should apply both to the installation of water supply and sanitation including operation and maintenance thereof.

Previous arrangements carried out with the participation of the community in general were identified as having stood the test.

4. Water quality: standards, control and surveillance

Water borne diseases are wide-spread in rural areas of South East Asia. The close interrelation between water quantity and water quality, insufficient removal of excrements and insufficient food hygiene are the main factors for the transfer of water borne diseases.

Shallow ground water can easily be polluted. Since in many cases there are hydraulic contacts between shallow and deeper aquifers, even deeper ground-water aquifers are not completely protected against pollution. In particular where shallow ground water is being used protective measures are therefore needed. Careful design and construction is an essential prerequisite.

To ensure safe water supply the development of rural water supply should be combined with:

- a comprehensive health education and basic sanitation programme
- regular sanitary inspection and central collection and evaluation of water quality data
- improvement of water quality by adequate well construction and use
- improvement of bacteriological investigations

5. Institutional structure for related education and training

Institutionalized training programmes are existing only partly in the region. Educational and training programmes are often carried out in different agencies without any prior co-ordination. The importance of educating and training personnel at all levels and in all topics mentioned was generally emphasized.

Information on scholarships financed by other states often does not reach interested institutes. The system of information on possibilities of education and training could be improved.

A scholarship offering training in the native country is considered to be valuable. In the case of training programmes it should, in principle, be examined whether the trainer can be sent to the trainees. Local conditions may thus be more easily included in the training programme.

Priority should be given to education and training as well as to the exchange of information in the field of rural water supply. To improve the exchange of information UN and other organizations could organize more workshops, round-table discussions, seminars and courses. The establishment of regional training centres for direct training on site is recommended. Support by UN organizations to this effect is indispensable.

The education and training of maintenance staff (e.g. caretakers, mechanics) employed regionally and in individual villages should not be neglected.

6. International co-operation and co-ordination of ground-water development in rural water supply

Operational activities financially supported by international organizations are limited in the field of rural water supply in the five countries mentioned. This is due to the relatively high per capita income of the majority of these countries as well as to mostly relatively rich water resources.

Contributions may be made by the ESCAP and within the scope of the Programme for Technical Co-operation among Developing Countries, as for instance, transfer of technology, standardization of equipment in the field of water, strategy and planning, joint training programmes and information exchange.

Dissemination of technical papers, handbooks etc. covering topics relating to rural water supply should be improved. However, often such information material does not reach the professionals which make use of it.

In co-operation with experts from abroad guidelines for the planning, implementation and operation of rural water supply should be drawn up for the executive agencies and translated into the respective national languages.

Workshops, round-table discussions and seminars for all working levels would be valuable for the exchange of information. Now as before there is a substantial need for it. Unesco and WHO were particularly invited to organize such activities.

I. INTRODUCTION

A. General subject

Organized by Unesco in co-operation with the National Committee of the Federal Republic of Germany for the International Hydrological Programme, the Workshop was held in Lahnstein (near Koblenz) from September 5 to 8, 1983.

B. Objectives

Clean drinking water in sufficient amount is a fundamental prerequisite for all development and quality of life. In rural areas in many developing countries there is often a serious problem of adequate year-round supply of water in both quantity and quality.

In areas with water shortage ground water commonly plays a very important part in providing an adequate drinking water supply. Thus, great efforts have been made in many countries to develop and utilize the ground-water resources for the rural water supply. There are here, however, different starting points and approaches to solutions, as far as technology and organization are concerned.

The aim of the Workshop was to bring together a selected group of specialists from developing countries who were responsibly concerned with the administrative, technical and sanitary aspects of rural water supply. The Workshop was to provide a forum for exchanging experiences, discussing problems and difficulties in implementation, and for documenting these and resulting recommendations for consideration by other countries. The results of this Workshop will be used by Unesco to support the efforts of developing countries in solving the multi-dimensional problem of an appropriate programme of rural water supply. It will also serve to guide Unesco in the consideration and design of future workshops on this subject.

C. Framework

The Workshop was included as a project in the second phase of the International Hydrological Programme. As regards its objectives, the Workshop was in accordance with the programme of the United Nations Water Conference at Mar del Plata and was presented as a contribution to the International Decade for Drinking Water Supply and Sanitation.

The Workshop followed directly after the International Symposium on "Ground Water in Water Resources Planning" (August 28 to September 3, 1983, Koblenz, Federal Republic of Germany).

D. Participation in the Workshop

Participation in the Workshop was by personal invitation only. The official working language was English. The circle of participants was restricted to the South-eastern-Asiatic region. In addition to a number of international experts, Representatives (decision-makers, senior experts) from each of five countries (Burma, Indonesia, Malaysia, Philippines, Thailand) were invited to take part in the Workshop (at the last minute the secretariat was informed that it would not be possible for the representatives from the Philippines to attend). The experts from each country were expected to be decision-makers in their country and to be capable of representing at least one of the following special fields:

1. Administration

   1.1 Legal fundamentals
   1.2 Organizational fundamentals
   1.3 Fundamentals for planning and technology
   1.4 Finances (tariff system)
   1.5 Public relations (education)

2. Water resources

   2.1 Planning — Geological fundamentals, survey of natural conditions, registration of needs and demands (area planning), coverage of demand (balancing), management, regeneration
   2.2 Construction: Technology (well construction, water lifting techniques, distribution or water treatment)
   2.3 Control of aquifers by observation wells
   2.4 Maintenance
   2.5 Ground-water protection

3. Sanitation

   3.1 Water born diseases
   3.2 Hygiene
   3.3 Surveillance of drinking water quality
   3.4 Standards

The Annex to this report provides the names and addresses of the Workshop participants.

E. Country Reports

For each country, and within the general theme of what the country is doing about the use of ground water in rural water supply, the participants were requested to prepare national reports on the following subjects:

1. Assessment and management of water resources
2. Project identification and planning
3. Project implementation: community participation, financing, operation and maintenance
4. Water quality: standards, control and surveillance
5. Institutional structure for related education and training
6. International co-operation and co-ordination of ground-water development in rural water supply.

The report was to include descriptions of problems encountered, solutions arrived at (or, perhaps, the lack of satisfactory solutions), and the approach that would be taken were the situation to be developing at this time (using the advantage of hindsight). Those reports are not reproduced in this document, but are available for review at Unesco Headquarters.

F. Arrangement of the Workshop programme

Using the experiences presented in the country reports a series of round-table discussions were held. Rapporteurs made preliminary presentations on each of the subjects of the Country Reports (see Section III).

During these sessions the experiences of the other invited international experts were also solicited. It was the objective of these sessions to produce a document that would be of value to other countries in the region, and would also serve Unesco in planning for other activities, including other regional workshops if it were felt to be desirable. The discussions are not summarized; however, the recommendations of the participants are given in Section II.

II. PRESENTATIONS BY THE RAPPORTEURS

GROUND WATER IN RURAL WATER SUPPLY

Unesco-Workshop, 5 to 8 September 1983
Lahnstein, Federal Republic of Germany

Report by J.F. Mock, Rapporteur

A. ASSESSMENT AND MANAGEMENT OF WATER RESOURCES

Country reports are presented from:

- Burma, Socialist Republic of the Union of
  (Irrigation Department)
- Indonesia
  (Coordinating Committee for Research on Water Resources,
  Indonesian Institute of Science)
- Malaysia
- Philippines
  (National Water Resources Council, Bureau of Mines and
  Geo-Sciences, Bureau of Health and Medical Services)
- Thailand
  (Ground Water Supply Project in Rural Thailand)

These monsoon climate countries of South East Asia are characterized by little variation of temperatures and a more or less uneven distribution and a wide range of annual total precipitation (less than 750 and up to more than 5000 mm/a). Dry zones prevail particularly in the rain shadows of mountain ranges. Other areas obtain precipitation from both of the monsoon sysrems and have their dryest months during the inter-monsoon periods.

All of the countries still have a high proportion of rural population (60 to 80%) which is scattered over the country in X x 10^4 villages and hamlets. Therefore, the provision of safe water is an enormous task and of particular importance since the climate favours a number of water related diseases.

The people obtain their water from various sources, which may be classified here in an approximate order of health hazard (and also approximately by increasing cost):

- water holes and ponds (dug or dredged)
- tanks and small reservoirs
- slow moving rivers, irrigation and drainage canals
- accessible open rain water cisterns
- open dug wells with hand-lifted containers

- large lakes and reservoirs
- mountain streams
- covered rain water collectors
- covered dug wells with pumps
- captated springs
- infiltration galleries, shallow or deep wells with hand pumps or motor pumps
- artesian wells
- piped water systems with constant pressure and water treatment.

The proportion of rural population which is served by a safe water supply ranges between 10 and 50%. The above list of sources indicates the importance of ground-water use for this task. All the countries have made great efforts to utilize available ground-water resources and continue to do so.

The information on the state of rural water supply, assessment and management of ground water and future programmes is somewhat differently presented and, therefore, may not be directly comparable. Moreover, information cannot be complete on such a complex subject in such short papers.

This report should not repeat details of the country reports, which have been presented by the representatives. But it may point out some subjects for discussion, further clarification and exchange of information. The following suggested list of subjects is open to be amended during the course of discussion:

It apppears that classical techniques of ground water assessment and exploration are well known and applied in all the countries. However, there may be substantial differences in the degree of mechanization.

Most reports do not mention figures and methods of estimation of ground-water potential, ground-water recharge and safe yield. The approaches may be discussed.

The basis of demand forecast and respective figures are lacking in some reports. Which methods are used? (Exponential increase according to past experience, slow down of increments, signs of saturation, limitations of resources, past over-estimations).

Are there artificial ground-water recharge facilities? Which methods are used?

How is data collection organized (case by case, systematic, by basin, by political boundary, each agency on its own, central inventory or register etc.)?

Are there observation networks, topographic survey of wells, observation of ground-water levels?

How is access to the data possible? (Data bank, publications).

Are there appraisals or evaluations of existing information? (Mapping, regional studies, basin studies etc.).

Are there systematic surveys? (Test holes, pumping tests, geophysical methods).

Various agencies, more or less independent, are engaged in ground-water exploitation. How effective is the coordinating Agency?

What are the legal provisions (scattered laws concerning water, comprehensive water law, expected development)?

Management of ground-water resources becomes necessary, after a certain level of exploitation is reached. Are there areas where the ground water-resources are managed? Which are the management tools?

Table A.1: Groundwater in Rural Water Supply (Summary)

Burma	Indonesia	Malaysia	Philippines	Thailand
Area, Characteristics				
678 000 km^2	2 000 000 km^2	330 000 km^2	300 000 km^2	514 000 km^2
forested mountains	13 000 islands		7 100 islands	highlands, plains
fertile valleys + delta	6 000 inhabited		1 000 inhabited	plateaus
Population Year: total-urban-rural (mio)-growth rate (%/a)				
1980: 36-12-24-2.3 %	1982: 154-34-120	1980: 14-5-9	1980: 48-15-33-2.6 %	1980: 47-8-39-2.3 %
	1990: 182-55-127	40 000 villages	39 000 villages	54 000 villages
Sources of Water Supply Safe Supply of Rural Population (Year: %)				
dW-dug well, tW-tube well, SW-shallow well, DW-deep well, PWS-piped water system, HP-hand pump, MP-motor pump, HR-hydraulic ram, S-spring, IG-infiltration gallery, RWC-rain water cistern				
unsafe: rivers, lakes, tanks (reservoirs), ponds (dredged), water holes to dug wells				
1980: 16 %	1983: 30 %; 1990: 60 %	1980: 44 %; 1990: 83 %	1980: 47 %; 1990: 75 %	1978: 24 %
Past Accomplishments				
1953-82: 9360 tW for 5.7 mio by (1)	1976 survey of 67 mio people's water sources:	up to 1976 GW little developed, Later considerable Federal contribution	1980: rural pop.suppl.: 20 % DW; 16 % S; 11 % PWS	1951-65:1400 tW by(1)+(1300 dW by (7)
1978-82: tW for 500 schools and hospitals by (2)	47 % shallow, 21 % deep GW 10 % S, 10 % PWS	1981: 66 tW by (1)		1966-80: 18000 tW by (1
	1978-82: 12400 SW+HP, 2000 DW			1980: 110000 installations existing + 20000 private wells
Programmes				
1982-86: 3200 tW for 2.6 mio	1983-89: 10000 dW	1981-85:250 tW in Kedah and Perlis (most important project)	1982-2000: Rural Water supply and Sanitation Master Plan	1982-86:29000 tW by (1)to(5)
290 tW equipped with MP	130000 SW+HP; 112000 DW+HP; 4600 S; 2000 PWS;			10000 tW by privates;
1710 tW rehabilitated	800 IG;5800 artesian		SW 1,5;2;4" (12 m)	2500 MP; 5700 SW, 840 !
900 new tW with HP or MP	102000 RWC		DW 2" (24 m) 1.5;5;6" (60 m)	Master Plan up to 1991 in prep.,
7000 2"tW; 35 PWS by (1)				water for 5 mio people, year
1983: tW irrigation of 8100 ha by (3)				5000 wells/a
1982-86: tW for 250 schools or health centres by (2)	5 year plans, 4th 1983-89	5 year plans 1981-86		5 year plans 5th:1981-8
4 year plans; 3th:1982-86				
Water Demand (WD), Water Utilization (WU)				
	1990 WD: Irrig.137·10^{-6}	2000 WD rural:10^{9}m^3/a	WD assumption:	1980 WU: 132·10^{6}m^3/a
	Ind.0.5·10^9, Dom.6.6·10^6	16 % of it from GW	30,60,75.100 l/ca·d	(HP 61·10^6,MP 71·10^{6}m/a

Table A.2: Groundwater in Rural Water Supply (Summary)

Burma	Indonesia	Malaysia	Philippines	Thailand
Organization in Approximate Order of Involvement, Coordinating Agencies				
(1) Rural Water Supply Div.	Mines + Energy Dep.	Geolog.Survey Dep.	Rural Waterworks Dev.Corp.	Dep.Mineral Resources
(2) Envir.Sanitation Dep.	Public Works Dep.	Public Work Dep.	Metrop.Waterworks and Sewerage Systems	Dep.of Health
(3) Irrigation Dep.	Health Dep.	Drainage+Irrig.Dep.	Local Water Utilities Adm.	Dep.Local Admin.
(4) Housing Dep.	Agriculture Dep.	Ministry of Health	Min.of Public Works + Highways	Dep.Public Works
(5) Construction Corp.	Transmigration Dep.		Min.of Local Government	Of.Accel.Rural Devel.
(6) Garrison Eng.			Min.of Health	Central Security Comma
(7) Railway Corp.			Meteor.Adm. (PAGASA)	Dep.Community Dev.
(8) Geolog.Survey+Expl.Dep.		Min.of National and Rural Development	Bureau of Mines + Geo-Science	Dep.Public Welfare
(9) Rangoon City Dev.Dep.		Economic Planning Unit, National Development and Planning Committee	Nat.Water Resources Council	Nat.Econ + Social Dev. Board
(10)	Coord.Committee for Research on Water Resources			Budget. Bureau
(11) Central State Councils				
Foreign Aid				
A UNICEF (drilling rigs)	UNDP (hydr.engineering)	1950's UNTAA	1955 US-AID	UNICEF
B UNDP (data bank)	WHO (rural water supply)	1974-77 German Hydrogeological Mission	WHO-IBRD } masterplan	UNDP (data bank)
C WHO	UNESCO	1979 Japan Internat. Cooperation Agency	UNDP }	IBRD
D Bilateral assistance	UNICEF	1981 ADB	1981-90 IDWSSD	1981-90 IDWSSD
E and financing	Bilateral financing		Bilateral financing	Bilateral financing
			FAO (well drilling training)	
Legislation				
1930,1941 Underground Water Act;"Water Officer" (permit,concellation and record of wells)	1974 Water Resources Law (inventory, planning, development, utilization, admin. pollution)	Little effective for GW-extraction + pollution: 1974 Geological Surv. Act, Water Enactment, Envivm.Quality Act, Local Government Act, (Revisions under way)	1980: Executive Order No 577 (Responsibilities of agencies)	Ground water law
(close coordination and cooperation because of People's Councils)	1982 Government Act No 22 (Min.of Mines and Energic responsible for GW-management)			

Table A.3: Groundwater in Rural Water Supply (Summary)

Burma	Indonesia	Malaysia	Philippines	Thailand
Assessment, Main Aquifers in Order of Importance				
Alluv.: piedmon's, fans, river valleys (clay, sit- subartesian) delta (saline) Pleistocene (Irrawaddian): loose sandstones + conglomerates, clay + silt confined Oligocene-Miocene (Peguan): poor yield + quality Highlands + Mountains: mainly poor, best in limestone, fractures, faults, weathered Coastal plane: poor, shallow	Alluv.: intermontane basins along rivers, coastal Quaternary volcanics: in lower and mid flanks Karstic limestone Tertiary if fissured or weathered Igneous metamorphic little yielding, fissures GW recharge: 1-25·10^9 m^3/d high 40 %, med 20 % (P-E) Water potency: 700·10^9 m^3/a high 70 % med 40 % (P-E)	Alluv.: delta, river valleys coast, wells 25-100 m^3/h Karst: up to 65 m^3/h Sedimentary + volcanics: of limited potential Granitic: only in fractures Sarawak: best GW in sandstones, Alluv. much clay	Alluv.: river valleys, coastal (SW<20 m, slope 1-3 %, El<50 m MSL) Sediments: 90 % with aquifers (DW>20 m, slope up to 10 %, El>50 m)	Alluv.: upper river valleys (good); coastal + delta (saline) Pleistocene: terraces (fair) Tertiary-Triassic: various massive rock, GW in fracturezones and in carbonates Igneous, metamorphic: poor, only in fissure
Site Selection Criteria, Priorities				
scarcity of water, close to users, sanitary views, hydrogeology, pumping costs	shortage of water and prevalence of water born diseases. Priority of water use: drinking water - agriculture-industry	GW development when no piped water or fair surface water	priority according to community commitment, need, development level, costs	priority based on neec improvement of existing, new GW devel; PWS
Investigation, Monitoring, Inventory, Management				
(1): GW studies, water supply projects + programs (3): tW-projects, studies feasibility (4): water supply for housing industry Aquifer grading in pilot wells	(1): data bank, hydrogeological mapping, evaluation of GW potential (1,2,3,5): monitoring # inventory + management in the advanced development projects	(1): GW study, locate exploit, utilization inventory, data bank (2-4): GW development in their field of responsibility also private activity	data collection by (1;10;9;5 etc) (10): inventory, sampling, maps, by 1983 70 % reconnaissance survey (11): coordination: Automated Water Information System 1981 Rapid Assessment 73 Vol. 1982 Geo-resistivity study Task force-Integrated water supply program 1980-2000	integrated information system, in preparatio (1 to 8 independent agencies + private drill and maintain wells and keep records) National Programe for Village Water Supply
Problems				
	GW-assessment of the area to be covered rapidly is too large for the skilled manpower available	no major physical problems yet, some land subsidence, sea water intrusion, GW-pollution, ineffective legislation	poor data base, decline of GW level, salt water intrusion, difficult transport (water samples, desinfectants)	10 % of country underlain by saline water overexploitation, rapid, declining GW, replacement of pumps, lack of procedure standards

GROUND WATER
IN RURAL WATER SUPPLY

Unesco-Workshop, 5 to 8 September 1983
Lahnstein, Federal Republic of Germany

Report by H. Eylers, Rapporteur

B. PROJECT IDENTIFICATION AND PLANNING

Before delivering an overview about substantial elements, whether congruent or individual, of principles and procedures in project identification and planning as defined by the country reports, it seems - as an introduction - to be necessary to recall some elementary aspects of Country Decade Programmes, as formulated in the latest WHO "Review and Perspective" of June 1983.

WHO states that a new impetus is noticeable "to consider investments in the sector more prominently in terms of health than in terms of financial return". This is in accordance with the basic ideas of the 1977 Habitat declaration and the 1977 Mar del Plata Resolution. Up to now, the main activities undertaken by the developing countries taking part in the decade program as well as those countries which are not partners in the "program", but go their own way in their attempts to realize the Decade targets - and both are represented in this workshop - concentrate on identification and planning in a logical sequence of steps and implementation. These efforts start with strategy or policy formulation, of sectoral and sub-sectoral programming, and of schemes for investment, finance, materials and human resources development.

Both phases - identification and planning - are the basic framework for defined, concrete and detailed project work, taking into consideration priorities, opportunities and constraints in a realistic view.

The WHO Review as well as the detailed descriptions in our 5 country reports make clear that these steps may be more complex and time consuming than the detailed design and implementation work. So we have to consider the progress in Decade results within the first phase which is typical for integrated programs of this kind. Identification needs policies, sector reviews and strategies formulation, coordination between agencies and governmental institutions as well as a "compromise potential" of all parties concerned.

The Decade approach to planning includes, quoted from the WHO report:

- improved sanitation hand in hand with the provision of safe water;
- priority for the underserved rural and urban population;
- designing replicable, self-reliant and self-sustaining programmes;
- use of socially relevant systems applying low-cost technology;

- association of the community in planning, implementation, and more particularly in operation and maintenance;

- close links of programmes with those in other sectors;

- implementation of drinking water and sanitation programmes as part of primary health care activities.

On the other hand, the key to realize the goals obviously are an understanding of a basic needs approach as well as primary health care, which can be defined by a number of essential elements such as (e.g.) health education and prevention, proper nutrition, basic sanitation or control of endemic diseases.

The comparison of the five countries participating in this workshop on the basis of the WHO - "Status of Decade Plan Preparation" gives an impression of the fact that despite a lot of similar basic conditions (climatical, hydrological, geological, population increase) these countries are in individual phases of realisation of the Decade targets, so that an exchange of views and of experiences, attempts to adopt or adapt solutions and procedures of neighbouring countries may be a very important result of this workshop:

Country	Plan		1990 target pop. served %			
	complete	draft stage	water		sanitation	
			urban	rural	urban	rural
Burma	x		50	50	70	50
Indonesia	x		74	60	59	40
Malaysia		x	100	83	100	66
Philippines		x	100	100*	n.a.	95
Thailand		x	70	95	70	50

(*C.R.:75)

Further details given by WHO allow an overview on the planning activities of these 5 countries since 1975 within the WHO cooperative program:

Burma:
1979 Decade Preparation Assistance (WHO/GTZ)
1981 Decade Planning Support (WHO/GTZ)
1982 First Decade Workshop and Planning Support (WHO),
Study on Manpower Development (WHO/GTZ),
Evaluation Guideline trial (WHO)

Indonesia:	1975	Sector Study (WHO/WB)
	1979	Decade Preparation Assistance (WHO/GTZ)
		Project Formulation (WHO/GTZ)
	1981	First Decade Planning and Preparation Workshop (WHO/GTZ)
	1982	Regional Sector Study (WHO/WB)
		Second Decade Planning Workshop and Planning Formulation (WHO)
		Organizational Review of Rural Program (WHO/GTZ)
Malaysia:	1976	Urban Sewerage Study (WHO/WB)
	1978	Rapid Assessment (WHO/WB)
Philippines:	1976	Sector Study (WHO/WB)
	1978	Rapid Assessment (WHO/WB)
	1981	Water and Sanitation Sector Study (WHO/WB)
Thailand:	1976	Sector Study (WHO/WB)
	1979	Decade Preparation Assistance (WHO/GTZ)
	1981	Decade Planning Workshop (WHO/GTZ)
		Decade Planning Preparation (WHO)
		Study on Water Quality Control (WHO/GTZ)
		Health Education and Public Information Project (WHO)
		Training and Health Education Advice (WHO/WB)
		Water Quality Control (WHO)
		Decade Planning Workshop (WHO/GTZ)
	1982	Decade Planning Support (WHO)
		Studies on Institutional Aspects and Information System (WHO)
		Waste Disposal (WHO/GTZ)

To give these informations in advance seemed to me very useful before undertaking the attempt to summarize briefly the essentials of the five country reports as concerns project identification and planning. The reports give quite a lot of information on these subjects, and I tried to compare under the headlines Administration, Legislation, Policy and Development Plans, Basic Data (Resources, Demand, Population), Standards, Sanitation, Manpower which may deliver some guidance for the workshop discussions.

Administration

In all five countries there are a lot of organizations - Ministries, Corporations and Agencies - involved in the water supply sector, but following quite different lay-outs. Either there is a sophisticated, hierarchical system down and up the line from e.g. Geological Survey Dept. to village headmen and district engineers in a mutual process of participation (Malaysia) or a kind of "double headed" system with a Ministry responsible for policy formulation, programme planning and standards development on top and a logic system of organizations from

the national (framework policies and plans), to metropolitan, local and rural (institution building) corporations level (Philippines), or a couple of organizations in the water and sewage sectors with historically grown background and competences which have "to share the cake" from their points of view. It should be discussed whether it is possible to identify an optimal administrative solution out of the different concepts given in the country reports, and whether such solution is also dependent on the political (central or federal) governmental structure.

Legislation

There are not many detailed informations in the reports about legislation referring to the water sector. In one country there is no effective legislation for the control of groundwater extraction and utilization, and the competences between federal and state governments are not well defined. As a consequence there are problems to apply relevant governmental acts on the different levels. In another case there are specific decrees referring to the different organizations and their competences. Or there is a "Water Resources Law" which sets the basic competence and responsibility for the overall water policy, or an "Underground Water Act" of 1930 is mentioned. It seems necessary to draw more information from the workshop discussion to define more clearly the role of legislation, its concept and basic contents, for delivering an effective legal structure to enable a nationwide policy in the water sector combining sectoral, resource-orientated, ecological and institutional elements. Also relevant legislation is a very important prerequisite for planning and implementation procedures.

Water Policy and Development Plans

All five countries have obviously strengthened their efforts coherent with the decade planning program, as has become clear in the introductory remarks. All countries, in different intensity, cooperate with WHO, partly long before the Mar del Plata Declaration, and additionally in joint programs financed by World Bank or GTZ. So they adopted the targets of the Decade as a national water supply and sanitation program target and are setting their priorities in improvement of rural water supply and, partly, of sanitation.

On a general level, the water supply and sanitation implementation follows national development plans in 4-year- or 5-year planning periods. The results are - or will be in the near future - so-called "National Water Supply Projects", partly long before the start of the Decade (e.g. Thailand 1964) or "Rural Sanitation and Water Supply Master plan", which define policies, guidelines and also selection criteria for relevant project activities, or "Master Action Plan" (Malaysia).

Thus, in all cases the strategies follow a similar planning concept from defining general demands, identification of resources, investigation of adapted solutions and setting of priorities following relevant selection criteria, so e.g. in Burma in a certain hierarchy: scarcity of safe water - low water quality - untreated water with acceptable standards as a priority sequence typical for Burma. Also there have been introduced regional criteria (Indonesia) depending on the ground-water potency of a region, where "potency" means the quantity which can be supplied to the users. The Indonesian report describes a type of strategy which could be a good example for others looking for a concept of their own.

- Improvement of water quality and quantity
- guiding assistance from the Government
- applied technology for the local communities
- standardizations (of financing, production, equipment, spare parts)

and in certain steps:

- development of institutions and manpower
- guidance (information, education, R&D)
- basic data collection
- establishment of regulations
- technology: simple, economica, mutual, acceptable, using local material and stimulating local production

and setting priorities (Philippines), e.g.

- community commitment and capacity
- community needs
- community development level and potentials
- capital cost.

A concept to plan from an overlooking level of view in direction to individual, well or at least better defined projects seems to be accepted by all.

Basic Data

Quality and quantity of basic data concerning ground water potencies are available in different qualities, partly - generally prepared by the national Geological Survey Departments - relatively well defined and based on regional exploration programs. But it is well known that normally the data information available is not adequate for integrated planning and has to be improved. On the other hand, as has been remarked in general from the country reports, a lot of work and data collection has already been done in most of the countries.
The problem for all of them will be to manage the increase of demand whilst the populations increase by 2,3 to 2,7% annually, so that the time at which the decade goal may be reached for the rural masses is very uncertain - but rather long, for sure!

Different origins, types and quantities as well as quality of resources are another information package for the identification and planning process. The monsoon type climate plays a dominating role in our five countries.
Estimates or guesses of the demand are not mentioned in every report. There are existing figures of the World Bank,

Type of Water Supply	Typical Water Consumption (lit./capita-day)	Range (lit/capita-day)
Communal water point (e.g.village well, public standpost)		
- at considerable distance (>1.000m)	7	5-10
- at medium distance (500 - 1.000 m)	12	10-15
Village well walking dist. > 250m	20	15-25
Communal standpipe walking dist. < 250m	30	20-50
Yard connection (tap placed in house-yard)	40	20-80

which are not adopted by every country, which undertook their own guesses. What is not being mentioned at all is a hint on tariff systems and problems and their influence on planning concepts and resources availability. For this, additional remarks of the country repporteurs should be welcome.

Another point which has to be paid attention to is the cost problem referring to certain water supply and sanitation structures. Some are mentioned in the WHO "review", but we - from our experience - doubt whether these cost figures are worthwhile for other countries and partners.

Regarding these data as planning basis, establishment of data measuring and collecting networks are mentioned in the reports as absolute future necessities.

Sanitation and Manpower are referred to only in three of the five reports - sanitation as an integral part of the Decade program, manpower as the human resources development problems with which nearly all 3rd world countries find themselves confronted. It would be interesting to learn something more about envisaged training programs, training levels, trainers' training and - if relevant - "brain drain" problems be it inside or outside the country. Interesting details are given in the Philippines report.

Standards

In nearly all cases follow, directly or in an improved and adapted quantity, the WHO drinking water standards of 1958 and 1963, but also - as e.g. is mentioned in the Philippines Report - revised by using U.S. Public Health Standards and their improvement by local experience to define national standards which are suitable to health and water resources conditions, which have been formulated locally and which led to "National Standards of Drinking Water" (Philippines, 1978). Also this seems to be a major point for discussion regarding the importance of standards as well for the cost situation as for the health and welfare of the people.

This short summary may show that there are a lot of identical problems, conditions and possible solutions out of the country reports, but also that there are individual processes. On the other hand, there are the donor organizations which are sometimes working with their traditional, industrial countries oriented basic data, which are by no means acceptable if we want to succeed with water supply and sanitation assessment within a reasonable time for the urban and the rural population. The time needed to fulfill the demands of the people will - looking at the human, the material and the financial resources - anyhow last longer than the International Decade.

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Unesco-Workshop, 5 to 8 September 1983
Lahnstein, Federal Republic of Germany

Report by Joseph Freedman, Rapporteur

C. PROJECT IMPLEMENTATION: COMMUNITY PARTICIPATION, FINANCING, OPERATION AND MAINTENANCE

Participation in decision making to have a water system - initiate a request

Participation in selection of type of system (planning)

Participation in construction

Materials, Labor, Funds

Participation in O & M

Level of expertise
Training of operators
Collection of fees to pay O & M

Outside support from government - national, local

Technical
Financial
Advice/Training

Non-Governmental Organization to promote

Community organization
Operation and maintenance

Formation of water user's committee

Cooperative/association
Group responsible for community participation

- Role of government organization and means to develop community participation.

- Traditional organizations and sociological factors.

Questions

Why is community participation important?

How can community participation be developed?

What are the forms of community participation?

Financing

Financing of rural water supply systems is done by the government with its own funds and with external assistance. In some countries a contribution to capital investment from the villagers of funds or labor, materials amounting from a minor contribution to about 10% is accomplished.

The government contribution is generally a grant. However in some countries a combination of loans and grants is utilized. It is not expected that the revenues and fees collected from rural water supplies can repay the original investment - that is the systems must be subsidized to varying extents.

Funds are also obtained from international lending and bilateral agencies at varying rates of interest, terms and conditions. These loans do not finance the total cost of the project but generally the cost of foreign goods and services, training, and health education; with the balance financed from local sources. The loans for rural water supply are repaid by the national government; the funds are passed on to the executing agency that may invest them through grants and subsidized loans.

Operation and Maintenance

Operation and maintenance is a problem and must be given more attention; and better methods of achieving improvement must be sought.

The difficulties in ensuring good operation and maintenance are due to the great numbers of individual systems and their scattered locations.

This means that a degree of decentralized responsibility must be sought, and the local villagers benefitting from the systems must assume as much of the local functions they can for operating and maintaining the systems. Varying degrees of technical assistance and physical assistance for major repairs will be necessary from the national and regional agencies responsible for the project. This is necessary because in most cases the fees collected from the users will only be sufficient for routine operation and maintenance. The World Bank policy is to have as an objective the collection of fees and charges at the village level sufficient to pay at least local operation and maintenance.

To simplify the problems of operation and maintenance the design of the facilities is simplified, mechanical and energy consuming systems are built only as a second priority, materials and equipment standardized. An addition local operators must be trained.

Provision must be included in the planning and budgeting for financing adequate operation and maintenance.

World Bank Policies for Rural Water Supply

The World Bank has been developing a policy on rural water supply that takes into consideration the institutional, technical and financial aspects. Important elements are also community participation and health education.

1. Institutional Aspects

In order to plan, develop, and carry out a project for the installation and operation of numerous water supply systems in scattered locations, efficient and capable institutions at a national, regional, and village level are required. Frequently many institutions at all levels are involved, and coordination is required. The Bank seeks to work within the existing framework of institutions; assisting the government to strengthen the institutions, clarifying their functions and responsibilities, improving arrangements for coordination in order to derive better results and efficient project implementation. Thus many projects include technical assistance that may take several forms - training, advisers, consultants and so forth. In short the institutions are carefully evaluated as to their capability and functions.

2. Technical Aspects

The proposed design standards, criteria, and the implications for operation and maintenance by the villagers and the responsible institutions are reviewed. Attention is given to the proposed plan for construction and subsequent operation. The technology must be acceptable to the users, and represent a least cost solution.

3. Financial Aspects

It is a basic part of the policy that the villagers will be expected to contribute to the initial construction of the system. This contribution may take the form of cash, labor, materials or land and services. In many cases a contribution of 10-20% has been achieved.

The second contribution expected from the villagers is a payment of fees and charges sufficient to meet the costs of local operation and maintenance.

On a national level, there should be funding for continuing support to the villagers for operation and maintenance (technically, financially, and administratively).

The Bank accepts that loans for such projects are to be repaid by the central government. In most projects the villagers are expected to pay at least local operation and maintenance and an initial contribution to the construction.

Summary

Bank financing for a rural water supply project can be based on the following:

a) Adequate institutional arrangement and capabilities;

b) Technical adequacy which is demonstrated through; the design of a sample of typical water systems with cost estimates for construction and operation; a sample that will permit about one year's construction; suitable design criteria and standards; selection criteria; implementation schedule; provisions for community participation, health education and training, arrangements and estimates for operation

and maintenance; basic information about the size and location of the villages; and identification of potential water sources for at least the first year's construction program;

c) Financial clearly defined policies for the system of grants and loans to the village systems; the type and amount of the village contributions to construction; the payment or contribution of the villagers toward operation and maintenance; and the provision of funds for operation and maintenance support to the villagers by the central government;

d) The project represents a phase of a national program and could be followed by a sequence of projects.

The Bank funds are used to finance foreign goods and services (direct and indirect), technical assistance and consultants, training and in certain cases a portion of local costs. The balance of the project cost is financed from national sources. The national sources could also be supplemented by funds provided by third parties such as the UNDP and bilateral organizations.

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Report by Richard Helmer, Rapporteur

D. WATER QUALITY: STANDARDS, CONTROL, SURVEILLANCE

Improvement of water services requires that there be a concern for water quality as well as for water quantity at the earliest possible stage of national programme development. Not only is a certain minimum amount of water required to sustain life, but the ready availability of good quality water is essential to limit the transmission of some thirty-five bacterial, viral, protozoal or helminthic diseases. A comprehensive summary of the major ones associated with water is provided in table D.1.

Assuring that water quality is, and continues to be, satisfactory requires that water quality surveillance and control is a component of any national health programme. Control implies that regular and routine surveys be undertaken to provide for a systematic series of observations concerning water quality in order to ensure that minimal quality standards are consistently being achieved. An effective surveillance programme depends on the existence of national regulatory standards of water quality and codes of practice. These, in turn, depend on appropriate national legislation and the establishment of a surveillance unit or agency within government. Such a programme must be suited to local conditions, taking account of the types and sizes of water supply systems, technologies used and available, economic realities and health conditions in the country and the level of surveillance that could be feasible.

Country reports on groundwater in rural water supply have been prepared for five countries: Burma, Indonesia, Malaysia, Philippines and Thailand. Their common features concerning water quality and related issues are summarized in the following.

The prevalence of communicable diseases closely associated with inadequate water quality throughout South-East Asia is demonstrated by various health statistics. Gastro-enteritis and diarrhoeal diseases are shown as the most common diseases in Burma and the Philippines. Similar situations can be expected in the rural areas of Indonesia and Thailand as well. Although there are other factors such as contaminated food and improper excreta disposal habits, much of the above health problems can be attributed to contaminated drinking water.

Most of the water resources utilized for domestic supply are surface waters (flowing or stagnant), rain water cisterns, springs, open dug wells (shallow groundwater) or deep aquifers. Access to safe drinking water is limited to an estimated 16% in Burma, 25% in Indonesia and 47% in the Philippines. The remainder of the rural population is not adequately protected from the endemic threat of contaminated supplies. Groundwater supplies are, in this respect, often not any more safe or better protected than surface waters due to the shallowness of the aquifer or due to the mode of exploitation (dug wells). Predominance of shallow groundwaters and large numbers of open dug wells are reported from most of the five countries.

Table D.1

HEALTH IMPACT

UNICEF estimates that about 15 million children below the age of 5 die in the developing countries every year. The absence of safe water and sanitation plays a major part in this tragedy. If everyone had access to safe drinking water and sanitation, infant mortality could be cut by as much as 50 per cent world-wide.

According to the World Health Organization (WHO), approximately 80 per cent of all sickness and disease can be attributed to inadequate water or sanitation. For example:

- Diarrhoea directly kills six million children in developing countries every year, and contributes to the death of up to 18 million people.
- Trachoma affects some 500 million people at any given time, often causing blindness.
- Parasitic worms infect nearly one half of the entire population of the developing countries, often with very serious consequences. For example, 200 million people in 70 countries suffer the debilitating effects of schistosomiasis.
- Malaria yearly kills one million children below the age of two in Africa, South of the Sahara, alone.

Diseases related to water and sanitation (or lack of them) may be grouped into five general categories:

Water-borne Diseases
spread by drinking or washing hands, food or utensils in contaminated water, which acts as a passive vehicle for the infecting agent.

Water-washed Diseases
spread by poor personal hygiene and insufficient water for washing. Lack of proper facilities for human waste disposal is another contributing factor.

Water-based Diseases
transmitted by a vector which spends a part of its life cycle in water. Contact with water thus infected conveys the disease-causing parasite through the skin or mouth.

Diseases with Water-related Vectors
contracted through infection-carrying insects which breed in water and bite near it, especially when it is stagnant.

Fecal Disposal Diseases
caused by organisms that breed in excreta when sanitation is defective.

These diseases exact a high toll in human life and suffering. Figures for Africa, Asia and Latin America (1977-78) show:

	Infection	Infections thousands /year	Deaths thousands /year	Average no. of days lost per case	Relative disability *
WATER-BORNE DISEASES	Amebiasis	400,000	30	7-10	3
	Diarrhoeas	3-5,000,000	5-10,000	3-5	2
	Polio	80,000	10-20	3,000+	2
	Typhoid	1,000	25	14-28	2
WATER-WASHED DISEASES	Ascariasis (roundworm)	800,000-1,000,000	20	7-10	3
	Leprosy	12,000	Very low	500-3,000	2-3
	Trichuriasis (whipworm)	500,000	Low	7-10	3
WATER-BASED DISEASES	Schistosomiasis (bilharzia)	200,000	500-1000	600-1000	3-4
DISEASES WITH WATER-RELATED VECTORS	African trypanosomiasis (sleeping sickness)	1,000	5	150	1
	Malaria	800,000	1,200	3-5	2
	Onchocerciasis (river blindness)	30,000	20-50	3,000	1-2
FECAL DISPOSAL DISEASES	Hookworm	7-9,000,000	50-60	100	4

Source: after Julia A. Walsh and Kenneth S. Warren, Selective Primary Health Care: An Interim Strategy for Disease Control in Developing Countries, The New England Journal of Medicine, vol 301, no 18, November 1, 1979, p 967.

*** 1 means the sufferer is bedridden; 2 able to function to some extent; 3 able to work; 4 experiences minor effects.**

As concerns water quality aspects, a difference in principle has to be made between the physico-chemical quality of the water and its microbiological properties. Chemical quality of groundwaters is primarily determined by the geological properties of the aquifer and secondly influenced by pollution that percolated from the top soil or infiltrated from polluted rivers and ponds. The quality of the groundwater is, in general, reported as being generally good. Problems are indicated in Indonesia and Malaysia with iron and manganese levels which are well beyond tolerable limits in certain areas. If these waters are distributed through piped houseconnexions, treatment for removal of iron seems inevitable. Salinity problems are reported from shallow coastal aquifers (Indonesia, Thailand) which may also occur in similar locations of the other countries.

No data are reported on the actual levels of bacteriological contamination of the groundwater supplies. The high rate of gastro-intestinal and diarrhoeal diseases indicates, however, that considerable counts of total and also fecal coliforms can be expected if bacteriological tests were carried out. A study with over 200 samples in one of the countries revealed that 3/4 of all supplies showed excessive total coliform counts and 1/2 was unsatisfactory in terms of fecal coliforms. Particularly in the rural situation as described above this represents a typical picture.

Chlorination as an effective means to inactivate most pathogens is applied in groundwater supplies in Malaysia if the yield is more than 5.5 m^3/hr.

For the emergency disinfection of contaminated groundwater supplies, instructions and simple hypochlorinators are provided by the responsible health agencies in the Philippines. Otherwise nothing is reported on the use of chlorine disinfectants in the other reports.

Standards for drinking water quality were adopted by all countries of the region, mostly based on the WHO International Standards for Drinking Water Quality. For the purpose of groundwaters, sometimes only physico-chemical parameters are included in the standards (Ground Water Act, Thailand). In general, the legislative basis for the achievement of adequate drinking water quality has been provided already. Most countries are now in the process to improve and expand the necessary surveillance services and to step up enforcement of the standards.

Whereas it is relatively easy to provide regular surveillance of drinking water quality at the source and within the distribution system of the major cities and urban agglomerations, there are considerable difficulties to provide similar services in the rural areas. Large distances between villages and scattered populations pose enormous logistic and transportation problems. Considerable efforts have been made by most of the countries in the region. There are centralized schemes such as in Burma where the National Health Laboratory in Rangoon performes all required chemical and bacteriological analysis. A rather decentralized scheme has been established in the Philippines where 12 regional water analysis laboratories perform bacteriological and physico-chemical analysis, and an additional 23 provincial water analysis laboratories undertake bacteriological tests only. The other countries follow the more central (Thailand) or the more regionalized (Indonesia) approach.

Recognition and identification of drinking water contamination is the first step to achieve the goal of "safe" supplies. To this end regular sanitary survey or inspection is necessary to pinpoint technical defects, potential fecal contamination and other sources of potential water quality impairment. Such services are described in the Philippines report and certainly conducted in a similar fashion in the other countries. In addition, it is recognized in all reports that protection of water supply sources is an essential step towards health protection which must be accompanied by environmental sanitation programmes to become effective. Proper disposal of human excreta and wastes eliminates immediately a major potential source of contamination. Also, food hygiene and personal hygiene in relation to water use are inevitable. Relevant programmes are mentioned in the reports on Burma, Indonesia and Thailand. The importance of health education campaigns including water supply, sanitation and food hygiene is also described and emphasized in most reports.

The role Ministries of Health are playing is an essential one when it concerns the quality of drinking water. Comprehensive primary health care programmes include water supply and sanitation components in all countries of the region. National standards for drinking water quality have been issued and surveillance programmes were organized through central, provincial and district laboratories. Particularly the bacteriological testing of drinking water samples is often being undertaken by hospital laboratories.

Technical projects such as well drilling and latrine construction are usually undertaken either in collaboration with other national agencies or regional (provincial, state) bodies. In particular, water supply and sanitation of health centres, schools, etc. is undertaken by health authorities (Burma). Also, the surveillance findings and health statistics provide for a long-term means to measure the success of water supply and sanitation efforts undertaken by the country as a whole.

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Report by P. Buske, Rapporteur

E. INSTITUTIONAL STRUCTURE FOR RELATED EDUCATION AND TRAINING

Country reports are presented from:

- Burma, Socialist Republic of the Union of
  (Irrigation Department)

- Indonesia
  (Coordinating Committee for Research on Water Resources, Indonesian Institute of Science)

- Malaysia

- Philippines
  (National Water Resources Council, Bureau of Mines and Geo-Sciences, Bureau of Health and Medical Services)

- Thailand
  (Ground Water Supply Project in Rural Thailand)

These country papers contain a lot of information on the present situation of rural water supply from the groundwater, about several aspects of the management of groundwater resources and about the sanitation and hygiene situation. Compared with the mostly very comprehensive and precise description of the hydrogeological and technical aspects that of what is going on in the field of education and training is rather little.

In the Burma Report this complex has been left out, only the agencies dealing with groundwater in general are indicated:

- Rural Water Supply Division (Ministry of Agriculture and Forests)
- Irrigation Department (Ministry of Agriculture and Forests)
- Housing Department (Ministry of Construction)
- Construction Corporation (Ministry of Construction)
- Environmental Sanitation Department (Ministry of Health)
- Garrison Engineers (Ministry of Defence).

The training activities of these agencies are not mentioned.

The Indonesian Report also points out 6 institutions working in the groundwater management:

- Department of Public Works
- Department of Mines and Energy
- Department of Interior and Local Government
- Department of Health
- Department of Transmigration
- Indonesian Institute of Sciences.

After this is accentuated the need of on-the-job training, the fact that currently a number of university departments have included in their curricula courses on groundwater and water resources development and the statement that most of the water resources development projects in Indonesia have substantial training components both in the form of fellowships abroad and on-the-job training.

In the Malaysia Report is stated that in the existing institutional structure there is no programme for education and training of manpower in the field of groundwater investigation and development. At the university level some basic courses leading to a bachelor's degree in some related fields are available. At the professional level officers are trained both overseas and at home on-the-job. The National IHP Committee is attempting to organize training courses on hydrological topics. Finally is stated that there is an urgent need of training of manpower and therefore the training institutes have to be restructured.

The Philippines Report indicates more than 7 agencies involved in water supply development:

- National Water Resources Council
- Metropolitan Waterworks and Sewerage Systems
- Local Water Utilities Administration
- Rural Waterworks Development Corporation
- Ministry of Public Works and Highways
- Ministry of Local Government
- Ministry of Health
- "Other agencies".

All government agencies already have their own independent large-scale programme to develop trained manpower. The programme consists of orientation seminars, professional, technical and scientific development programmes, supervisory development programmes and on-the-job training. For the future it is proposed that to come to more effectiveness the programmes should be coordinated and synchronized. Detailed proposals are given.

In Thailand rural water supply is provided by six government agencies:

- Department of Mineral Resources (Ministry of Industry)
- Accelerated Rural Development Office (Ministry of Interior)
- Department of Health (Ministry of Public Health)
- Department of Public Works (Ministry of Interior)
- Department of Local Administration (Ministry of Interior)
- Department of Community Development (Ministry of Interior)

The Department of Health has a sanitation programme which includes training components. The Thai Government has directed the relevant authorities to formulate a national strategy plan for the development of rural water supply orientated at the Decade's goals which shall also give a review of manpower requirements, an assessment of presently available manpower and recommendations for suitable training programmes.

This summary of the country papers shows that in only one of the countries an institutionalized training programme is existing. The other countries make efforts with different intensity to plan and implement education and training programmes. The importance of education and training of manpower for the attempt to attain the targets of the Decade is accepted in all the countries.

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Unesco-Workshop, 5 to 8 September 1983
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Report by R. Dijon, Rapporteur

F. INTERNATIONAL COOPERATION AND COORDINATION OF GROUND-WATER DEVELOPMENT IN RURAL WATER SUPPLY

Within the framework of the International Water Supply and Sanitation Decade, one of the outcomes of the Mar del Plata Conference, the agencies of the United Nations family have developed programmes and projects.

- The UNDP is the focal point of the IWSSD, especially as regards the coordination of cooperation programmes: UN, bilateral and others.

- Several UN organizations are involved in field projects as executing agencies of UNDP. WHO comes first, then the United Nations Department for Technical Cooperation.

- UNICEF has a large scale programme for well-drilling and pump installation together with sanitation and health care in areas where young mothers and children are affected by waterborne deseases, or where water supplies are not secured in sufficient quantities.

- The World Bank is testing a great number of hand pumps around the world with the purpose to develop a study, versatile, unexpensive, simple pump which could be manufactured in most developing countries.

- The IHP of Unesco assists the Decade in promoting a better knowledge and handling of water resources.

Most UN agencies involved in water resources activities have their own programmes for specific projects (especially WHO), consultant services, publications, seminars, symposia and training activities.

Coordination of the programmes is secured at three levels:

- in the countries themselves at the level of the UNDP office which also arranges to avoid overlapping with bilateral programmes

- within the coordinating committee of the Decade which meets every year in a different UN water agency, and

- within the framework of the "ACC subcommittee" which has been established long ago to coordinate water resources activities within the UN system.

In the country papers submitted to the workshop not much is said of the International Cooperation in rural water supply and related fields for the following reasons:

- most of the UNDP assistance is provided to the so-called "Least Developed Countries". Out of the 5 countries invited to the workshop, only Burma is considered to fit this category.

- the countries, big and large, are rainy and humid countries and water supplies are not too much of a problem as compared to arid and semi-arid areas

Be that as it may, an overview of activities in ground water and rural water supply is provided here:

Operational Activities - Country Projects

Burma
- A UNDP/UN project (74-039) "Water Management and Project Development" has organized a water resources data bank (mainly surface water)
- A major UNICEF project involving about 30 rigs is operating in the central "dry zone"
- A World Bank project is operating to study the feasibility of irrigation by means of ground-water development. This project allows for a detailed knowledge of ground water resources
- A UNDP/UN project (BUR-80-014) has been prepared and may be approved within a year or so for the exploration of ground water in selected areas - especially hard rock areas - and the preparation of ground-water resource map to sewe on a basis for the planning of the programme of the IWSSD

Indonesia
- UNDP/UN project 70-527 "Institute of Hydraulic Engineering 1970-81" dealt with ground-water resources on a limited scale
- UNDP/WHO projects 73-010 rural water supply for East Java and 78-052 rural water supply are to be mentioned

Malaysia
- A United Nations (Technical assistance) Hydrogeologist was assigned to Malaysia in the late 1950's. Most water resources activities involving the UN system have been in the field of surface water. (Water management, Hydrology, etc.). No activities in rural water supply could be identified.

Philippines
- UNDP/FAO project 70-531 "Improvement of Irrigation Facilities through Ground Water Development 1970-77" had a limited impact as a result of the energy crisis. The government decided to phase out irrigation projects operating on pumping stations consuming expensive oil products. A number of ground water professionals were trained through this project and were transferred to projects dealing with community water supply,

  Through UNDP/UN project "Assistance to the National Water Resources Commission" (1974-81) a limited amount of consultancy in ground water was provided; a specialized government agency for rural water supply the "Rural Waterworks Development Corporation" (RWDC) was developed,

- The World Bank provides financing to a major rural water supply project. It assisted, together with WHO, in preparing the "rapid assessment of water supply sources" in 27 volumes,

- Under the (now defunct) WHO/World Bank Cooperative Programme two water supply and sanitation studies were undertaken, and

- A Master Plan for rural water supply and sanitation is being carried out with the assistance of the World Bank, WHO, UNDP, and other organizations.

Thailand - No major project of the UN system in the field of ground water/ rural water supply was found. The activities of the various government agencies involved have been coordinated for several years in an office located within the Ministry of Health which was strengthened by two international experts: a water engineer and an hydrogeologist

It is to be noted also that WHO is financing under its regular programme several sanitary engineers that have been sent to the five countries mentioned, on a permanent basis.

"Non Operational Activities"

1) Publications

A number of UN publications on the subject of rural water supply and ground water should be mentioned. Some are listed here:

Unesco (IHP)

"Ground-Water Contamination and Protection"
"Hydrology of Hard Rocks"
"Ground-Water Studies"
"Ground-Water Models"
"Surface-Water and Ground-Water Interaction"

United Nations

"Ground-Water in the Pacific (Insular Asia) - 1983"
"Ground-Water in (Continental Asia) - 1984"
"National Resources Forum (quarterly review)

Unicef

"On the Waterfront" (periodical)

UN/World Bank

Reports on the hand pumps project etc.

2) Consultant services

Provided by WHO, ESCAP (one hydrogeologist based in Bangkok), the UN Mineral Center in Bandung (one hydrologist). UN Headquarters, New York. Department of Technical Cooperation for Development (3 hydrogeologists, one drilling engineer, one data bank/modelling specialist).

3) Symposia/Seminars

At the country level several meetings were organized by WHO with the assistance of bilateral organizations such as GTZ (West Germany). As far as the United Nations are concerned the following two meetings should be mentioned:

- Interregional seminar on rural water supply held in Uppsala (Sweden), October 1980, attended by participants of 23 developing countries including Burma, Indonesia, Thailand

- Symposium on Technical Cooperation among developing countries in Ground Water Exploration and Development held in Zagreb (Yugoslavia), in April 1983

4) Training

Fellowships are available from UNDP. Numerous special courses, schools and training programmes are sponsored by Unesco/IHP.

Conclusion

Due to the limited means of the United Nations system - especially UNDP and the fact that the most of the South East Asia countries who participate in the workshop have a relatively high GNP, the involvements of the UN system in operational prospects will remain limited. However, a valuable contribution can be provided especially under ESCAP and within the framework of the Programme for Technical Cooperation among Developing Countries, in various fields such as institutional and legislative matters, transfer of technology, standardization of equipment, water policies and planning, cooperative training programmes and exchange of information. It would be desirable in the future to organize subregional or regional workshops/seminars as cooperative ventures of UN organizations under the umbrella of Regional Economic Commissions as to avoid overlapping and unnecessary expenses.

III. RECOMMENDATIONS OF THE PARTICIPANTS

1. In the light of the data existing and the imbalance of this information, central collection of the data needed for rural water supply schemes is recommended. The responsible agency should be capable of collecting, compiling and evaluating the data.

2. It is recommended that national coordinating agencies be established with authority to:

   - determine the criteria for water supply installations,
   - set priorities of requests for implementation, and
   - define contributions of the agencies involved.

3. In view of the existing and still increasing demand it is recommended project identification and planning be accelerated to cope with the established national goals of rural water supply. The advantages of ground water should be duly considered.

4. It is recommended that rural water supply projects near urban centres consider taking care of the urban fringes. Rural water supply projects may also be usefully combined with ground water development for irrigation.

5. It is recommended that the design of water supply systems and the selection of materials and equipment be accomplished in accordance with the capabilities of the village or the operating institution.

6. It is recommended that donor organizations and national agencies agree upon a consistent policy for community participation in rural water supply, on arrangements for operation and management and on contributions for those purposes. Standardization of equipment and materials is also needed in this regard.

7. In order to obtain the full benefits of a rural water supply program scheme it is recommended that:

   a) the program be accompanied by a comprehensive health education and basic sanitation program

   b) sanitary inspection of the system should be carried out regularly

   c) permanent improvement of the water quality be achieved by adequate well construction and use, and

   d) bacteriological analysis facilities be improved.

8. Since the need for training and exchange of information in the field of rural water supply is high it is recommended that the UN and other agencies organize more workshops, round-table discussions, seminars and short courses.

   It is further recommended that more of this training be carried out regionally and that for this purpose the creation of a regional training center be considered. External support by the UN organizations would be appropriate.

9. It is recommended that at the village and district level training of people involved with rural water supply (e.g. caretakers, mechanics and extension workers) be given particular attention.

10. It is recommended that Unesco prepare a list of publications available in the field of rural water supply. The information should be widely disseminated. It is further recommended that information manuals or modules be developed concerning project planning, implementation and operation of rural water supply schemes at the working level.

11. It is recommended that this regional workshop on the general topic of ground water in rural water supply be followed up by a series of related seminars on specific subjects concerning the region. The subjects might include: ground-water data banks, planning requirements for preparation of project documents and well construction.

ANNEX

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