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LEGAL AND INSTITUTIONAL FACTORS AFFECTING THE IMPLEMENTATION OF THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE



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Natural Resources/Water Series No. 23

LEGAL AND INSTITUTIONAL FACTORS AFFECTING THE IMPLEMENTATION OF THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE

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FORWARD

As a result of the United Nations Water Conference (held at Mar del Plata, Argentina in March 1977) and the recommendations contained in the Mar del Plata Action Plan, the General Assembly launched the International Drinking Water Supply and Sanitation Decade on 30 November 1980. The Decade, 1981-1990, had as its ultimate goal access to clean drinking-water supply and sanitation services for all people by 1990.

As the Decade draws to a close, it has become evident that the goals of the Decade will not be met, although a large number of people throughout the developing countries have been reached by the programmes of the Decade. While the mobilization of financial resources has been a major constraint to attaining the goals of the Decade, it is widely felt that legal and institutional factors have been equally responsible for the inability of some countries to attain the targets set.

This volume contains analyses of the legal and institutional factors which affected the implementation of Decade programmes in Africa, Asia, and Latin America and the Caribbean. The three parts of this report were prepared by well-known experts in the water resources field. We are indebted to Mr. Nii Boi Ayibotele of the Water Resources Research Institute of Ghana, who prepared the part on Africa; Mr. Akbar Ali Khan of the Bangladesh Public Administration Training Centre, who prepared the part on Asia; and to Mr. Andres Planas of the Water Resources Secretariat of Argentina, who prepared the section on Latin America and the Caribbean.

While constraints in each of the regions are different, there are some common problems faced by countries in all regions; these are summarized in the Introduction.

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GENERAL INTRODUCTION

The International Drinking Water Supply and Sanitation (IDWSS) Decade (1981-1990) is nearing its end. While many people have been helped under its aegis, there are still many whose needs have not yet been satisfied.

The Water Resources Branch of the United Nations Department of Technical Co-operation for Development (UN/DTCD) has been closely involved with the managerial and structural aspects of water supply and sanitation. It has carried out water resources development projects in Africa, Asia and Latin America. The implementation of water projects in various areas of the world has shown that while many constraints to the implementation of the Decade are technical, there are others which are institutional.

Thus, the Department identified a set of key institutional problems, including organizational structures and regulations, managerial practices and legal provisions, and commissioned a group of well-known water experts to discuss regional experiences on the subject. Mr. Nii Boi Ayibotele presents the African experience, Mr. Akbar Ali Khan writes on Asia, and Mr. Andres Planas discusses the problems of Latin America and the Caribbean.

There is a resemblance between the kinds of constraints faced by related areas. While the reader should make allowances for the degree to which each constraint affects the different regions under analysis (the greater limitations being borne by Africa), some of the major findings and recommendations of the experts are as follows:

A. Organizational, managerial and legal constraints

While there are widespread inadequacies in the provision of drinking water supply and sanitation, rural areas and marginal urban groups are particularly affected by the lack of adequate facilities. Moreover, despite the efforts made in pursuance of the objectives of the IDWSS Decade, progress in implementing the ~~Mar del Plata Action Plan resulting from the United Nations Water Conference~~ (Argentina, March 1977) has not been significant, if judged against population increases.

Several substantive factors affect the sector. Some of them are general socio-economic constraints, such as escalating prices of oil, low economic productivity, high interest rates, debt servicing, population growth, and drought and political instability.

In addition, there are constraints which are sector-specific. Developing countries tend to adopt the standards of water supply and sanitation used in more developed areas. Since their economic capability is much lower than that of the models, the uncritical adoption of alien practices may result in overdesign of systems and locking up of scarce capital. A related effect is that a majority of peoples do not benefit from high cost, centrally operated systems. In fact, high connection costs may prevent more widespread use of public systems, since in many cases the average user cannot afford the connection cost.

Most countries face problems of overlapping jurisdictional powers. Often, several ministries are involved in water supply and sanitation activities. In federal countries the problem is even more grave, since fragmentation occurs among several ministries of the central government, as well as among various levels of government.

Economies of scale, political pressures and comparative managerial advantages tend to favour urban areas, requiring complex central networks, to the detriment of rural communities and peri-urban groups.

Water supply and sanitation are basically approached as engineering endeavours. Managerial considerations are usually downgraded, while new construction is favoured. Consequently, agencies tend to favour structural investment to the detriment of operation, maintenance and monitoring. At the same time, excessive reliance on the central government has limited the possibilities and role of local administrations and community participation, while often eliminating the private sector.

Managerial skills are poorly developed. Many countries are unable to formulate alternative options to satisfy water-related needs. They lack basic data and human resources. Therefore, they cannot assess the actual socio-economic costs and benefits of programmes and projects.

Lack of economic data, inadequate cost recovery policies, and water tariffs on a political basis radically affect the financial capabilities of water supply organizations. Thus, agencies tend to rely on subsidies from the government, rather than devise and apply demand management procedures and marginal pricing.

Inadequate user participation and lack of public awareness about the role and importance of water programmes add to the constraints on the water supply and sanitation sector. This is in turn reflected in the sector's inability to address the situation of specially affected groups, such as women and children. Although women carry the water, and are responsible for the family's health and sanitation, they have no participation in planning and programming water supply systems; designs may not be suited to their capabilities; and they often have to satisfy their needs with what little water remains after men's use.

Managerial weaknesses are also reflected in the inability to limit the use of treated water to drinking purposes, to spread water demands away from peak periods, and to prevent the qualitative deterioration of water sources.

The "engineering approach" to water supply and sanitation services gives less emphasis to the role and importance of legal regulations. However, appropriate regulations are essential. A flexible allocation system would permit the transfer of water from irrigation projects to domestic uses, using only a fraction of the capital that would be needed if water were tapped from distant sources and then conveyed to urban centres.

An adequate legal system would also require the assessment of several alternatives, including monitoring, and loss and leak control before commitment to structural solutions, which would probably be more costly. Legal norms on planning would assure that different supply alternatives, with a balance of structural and non-structural measures, be considered. Finally, adequate regulations are essential for cost recovery as well as for enforced protection of water sources.

The sector also suffers from a general inability to translate policy priorities into plans, and plans into functional assignments to be carried out by implementing and executive bodies. While there have been attempts at sectoral planning, planning institutions are often either non-existent or weak; or the planning function is merged within an executive body, therefore limiting its capacity for objective and independent assessment. Another obstacle is the lack of allocation of clear-cut, definite responsibilities among different agencies and levels of government. The ensuing dilution of accountability hampers the provision of services and the protection of water sources.

Curiously, while basic legal definitions may be missing, and serious legal constraints are often found, many countries suffer from outmoded regulations that require the presentation of detailed designs, blueprints and qualified certifications for house supplies and sanitation, appliances and domestic fittings. However, actual control of performance and inspection of construction sites seldom take place, owing to a lack of resources. In addition, quality control on appliances is limited, while sanctions and penalties are seldom enforced.

A related aspect of the lenient application of sanctions and neglected enforcement of controls is that standards of water quality are not usually applied to state agencies and public corporations. This practice hampers environmental efforts, since, as is well known, most developing countries reserve large sectors of their economies for the activities of state-owned entities.

B. More effective water supply and sanitation systems

The provision of water supply and sanitation services requires a judicious balance of technological, organizational, managerial and legal measures. Programmes and projects should be designed according to the economic conditions of the country of implementation. Overdesigned projects and unrealistic water standards should be foregone, while low-cost, multiple-user technologies must be emphasized, promoted, and disseminated.

National policies should be spelled out and embodied in national sectoral planning, produced under the direction of a co-ordinating central body. Implementation agencies should follow the criteria and directives laid down by the sectoral plan.

Planning criteria for programme and project assessment should emphasize the need to consider various alternatives for augmentation of available water supplies. Alternatives should necessarily consider leak and loss monitoring and control as the most desirable measure, to be disregarded only when new structural investments are proven essential.

The organization of water and sanitation agencies should reflect that drinking water supply and sanitation are not purely engineering endeavours, but that they should integrate modern managerial methods. Personnel should be recruited and trained according to this perception.

Sectoral planning and organization of executing agencies must take into account the active participation and support of users. Therefore, agencies should have offices to deal with users and customers. These offices should identify the problems of marginal areas (rural, peri-urban) and special groups (women, children)

and advocate their attention. There is also a need for promotion of community ventures and allowance for private entrepreneurs, if appropriate.

Adequate management of agency-user relationships includes educational campaigns, participation of local people and creation of suitable institutional mechanisms. Available alternatives include mutual companies, neighbourhood associations, co-operative societies and user groups. However, participation should not be approached as just a resource-saving device. Rather, the end result sought is understanding and interaction between the public sector and the community. Thus, it must take place from planning to operation and maintenance.

Operation and improvement are often neglected. These functions can be improved through appropriate monitoring, rehabilitation and special training. Adequate operation, maintenance and rehabilitation will reduce investment needs. However, if the sector is to achieve acceptable levels of financial soundness and self-reliance, tariffs should be based as much as possible on marginal pricing. Allowance for social concerns can be made by using binomial tariff structures. A sound tariff system demands adequate collection, processing, and interpretation of economic data, needs and coverage requirements. National policies might resort to the use of cross-subsidies, transferring resources among profitable and non-profitable areas. In fact, some of the countries that achieved relatively higher standards in the past relied on such a system. However, subsidies from within or outside the sector should be explicit and identified.

Legal rules should be precise, flexible, and objective-oriented. They should satisfy a set of minimal standards including enforcement vis-a-vis public and private users, agencies, and corporations; prescription of basic planning requirements, including consideration of non-structural alternatives, such as reallocation of water rights, leakage and loss; control programmes, and adequate operation, maintenance and rehabilitation; strict enforcement of sanctions and penalties, including those aimed at protection of sources of supply; and adequate collection and updating of tariffs in arrears.

Finally, the three experts concurred that properly designed education campaigns are the most cost-effective alternative for improving drinking water supply and sanitation programmes.

Part One

INSTITUTIONAL ASPECTS OF WATER SUPPLY
AND SANITATION IN AFRICA

INTRODUCTION

In November 1980 the United Nations General Assembly launched the International Drinking Water and Sanitation Decade (1981-1990), following the recommendations of the United Nations Water Conference held in Mar del Plata, Argentina, in 1977. The aim of the Decade was to ensure that by its end, all peoples in the world would have access to safe and adequate drinking water supply and sanitary excreta disposal facilities.

At the time the Decade was launched, the African region was the one where the percentage of populations with access to safe drinking water and sanitary disposal facilities was the lowest. From the results of a survey carried out by WHO (1983), 34 per cent of the African population of 469 million people in 1980 had access to adequate and safe drinking water supply, and 29 per cent had access to proper sanitary excreta disposal facilities. The urban population of 135 million had 66 per cent and 54 per cent of the total with access to safe drinking water supply and sanitary excreta disposal facilities, respectively. Of the rural population of 334 million, only 22 per cent and 20 per cent had access to safe drinking water supply and sanitary excreta disposal facilities, respectively. Table 1 shows the situation in 1980 and 1983. The urban population with safe water supply decreased to 57 per cent by 1983, but the percentage with sanitary excreta disposal facilities rose slightly to 55 per cent. In the case of the rural areas the coverage increased to 29 per cent for drinking water supply by 1983, and for sanitary excreta disposal facilities it decreased to 18 per cent. The comparative figures for other regions are shown in the table.

The performance of the African region in the implementation of the recommendations of the United Nations Water Conference was evaluated at an ECA/UNESCO seminar held in Addis Ababa in 1986 almost 10 years after the conference. The seminar also afforded an opportunity to evaluate the achievements of the targets of the International Drinking Water Supply and Sanitation Decade (IDWSSD) half way through the Decade. The seminar concluded that, in spite of the efforts made by many countries, the progress made in implementing the Mar del Plata Action Plan had not been significant. This assessment applied equally well to the International Drinking Water Supply and Sanitation Decade. Among the major reasons identified as having hampered or retarded progress were: the escalating prices of oil; low performance of the productive sector; high interest rates; high debt servicing; high population growth rates; political instability; and the devastating effects of the drought.

In addition the following constraints were encountered:

- (i) Lack of finance;
- (ii) Manpower shortages at all levels;
- (iii) Institutional weakness, inadequacies of water legislation, high investment costs, problems of cost recovery in water supply projects, inadequate maintenance facilities, lack of continuity in plans and programmes, and lack of training facilities.

Table 1. Service coverage of water supply and sanitation by region, 1980 and 1983

Region	Population (millions)		Water supply				Sanitation			
	1980	1983	No.	%	No.	%	No.	%	No.	%
Africa (Economic Commission for Africa)										
Urban	135	160	89	66	91	57	73	54	88	55
Rural	334	356	73	22	103	29	67	20	64	18
Total	469	516	162	34	194	38	140	29	152	39
Asia and the Pacific (Economic Commission for Asia and the Pacific)										
Urban	428	493	278	65	330	67	175	41	237	48
Rural	1 064	1 109	277	26	488	44	117	11	100	0
Total	1 492	1 602	555	37	818	51	292	29	337	21
Latin America and the Caribbean (Economic Commission for Latin America and the Caribbean)										
Urban	234	254	183	76	212	85	131	56	203	30
Rural	124	126	52	42	62	49	25	20	25	20
Total	358	380	235	66	277	73	156	44	228	60
Western Asia (Economic Commission for Western Asia)										
Urban	27	30	25	94	29	95	21	80	28	93
Rural	21	24	9	41	12	50	4	18	6	25
Total	48	54	34	69	41	76	26	51	34	63
Totals above										
Urban	824	937	575	70	665	71	401	49	556	59
Rural	1 543	1 615	411	27	665	41	213	14	195	12
Total	2 367	2 552	987	42	1 330	52	614	26	751	29

Source: 1980 Report of the Secretary-General concerning the Decade (A/35/367).

This report examines the legal and institutional constraints affecting the implementation of the Decade targets in Africa. It uses the experiences of five countries, namely: Sierra Leone, Ghana, Nigeria, the Sudan and the United Republic of Tanzania. It is expected that the review will reveal common factors from which lessons can be learned to undertake legal and institutional reforms to assist in more effective implementation of the Decade programmes in the region. In doing the review, the other constraints, such as inadequate financial and manpower resources and appropriate technology, cannot be divorced from the legal and institutional inadequacies, and as such must be kept in mind.

The selected countries are all English-speaking and were former colonial countries. Among them is the most populous country in the region (Nigeria, with 96.82 million people), and the country with the largest land area (the Sudan, with 2,506,000 sq km). All have a unitary form of government, except Nigeria, which has a federal form. Sierra Leone and the United Republic of Tanzania are examples of countries that have had stable governments in the region, while Ghana and Nigeria are typical of countries where there have been frequent changes of government. Table 2 gives some socio-economic indicators about the countries. They have high population growth rates, ranging from 2.1 per cent per annum for Sierra Leone, to 3.3 per cent per annum for the United Republic of Tanzania. Life expectancy at birth in the United Republic of Tanzania and Ghana in 1983 was above 50 years, while in Sierra Leone, the Sudan and Nigeria it was below 50 years. Also, the infant mortality rate in 1980 was below 100 per 1,000 live births in the United Republic of Tanzania and Ghana, but about 100 in Sierra Leone, the Sudan and Nigeria.

Table 2. Basic socio-economic indicators in selected African countries

Country	Area x 10 ³ sq km ²	Population		GNP per capita		Life expectancy at birth (years)		Infant mortality rate (aged under 1)	
		x 10 ³ 1983	Average annual growth rate (%), 1973-83	Current US dollars 1983	Real growth rate (%), 1973-83	1970	1983	1970	1980
United Republic of Tanzania	945	20 771	3.3	240	-0.7	45	51	125	97
Ghana	239	12 818	3.1	320	-4.5	53	59	122	97
Sierra Leone	72	3 588	2.1	330	-0.4	34	38	228	198
Sudan	2 506	20 807	3.2	400	2.5	42	48	150	117
Nigeria	924	93 642	2.7	770	-1.1	43	49	140	113

Source: The World Bank Atlas, 1986.

Their GNP in 1983 ranged from \$US 240 in the United Republic of Tanzania to \$US 770 for Nigeria. Over the period 1973 to 1984, there was a deterioration in the real rate of growth in per capita GNP in all the countries, except the Sudan; they are all oil importers, except Nigeria, which is an oil exporter.

Table 3, which shows the degree of urbanization, indicates that settlements in the countries are predominantly rural. Only Nigeria had an appreciable number of cities with population of over 500,000 in 1980. The rest ranged between nil for Sierra Leone to two for Ghana.

Table 3. Urbanization in selected African countries

Country	Population (millions) mid-1984	Urban population		Average annual growth rate (%), 1973-84	Number of cities over 500,000 persons	
		As % of total population 1965	1984		1960	1980
United Republic of Tanzania	21.5	6	14	8.6	0	1
Ghana	12.3	26	39	5.3	0	2
Sierra Leone	3.7	15	24	3.5	0	0
Sudan	21.3	13	21	5.5	0	1
Nigeria	96.5	15	30	5.2	2	9

Source: World Bank Report, 1986.

At the beginning of the Decade a survey conducted by WHO (1983) to determine the state of preparedness of African countries to embark on Decade activities showed that 33 countries responded. Of these, 18 had prepared their national plans by 1983 and 15 were in the process of doing so. In the case of the countries selected for this study, only Ghana and Sierra Leone had prepared plans by 1983.

As at the end of 1985, the percentage of the total population supplied with safe drinking water was only 12 in Sierra Leone; 56.4 in Ghana; 46 in the Sudan; and 48.8 in the United Republic of Tanzania (URT). By the end of the Decade, in 1990, Ghana and the URT hope to supply 85 and 60 per cent, respectively, of their total populations with safe drinking water. The Sudan has changed its targets and now plans to achieve 100 per cent coverage by the year 2000 rather than by 1990.

I. CONSTRAINTS TO DEVELOPMENT OF DRINKING WATER SUPPLY AND SANITATION SYSTEMS

A. Organizational structures and regulations

1. Lack of planning and evaluation standards

The concentration on urban water supplies by Governments in Africa before independence did not put much strain on national resources because the cities were few and far between. But with the African Governments' present commitment to attain the targets of the IDWSS Decade and bring the economic and social benefits of good drinking water and sanitary excreta disposal facilities to their people, the situation has changed and a lot more resources are called for. Unfortunately the resources are not available (ECA, 1986). To utilize the limited resources effectively requires, among other things, that the planning process should be guided by standards that will assist in evaluating programmes and projects so that the ones selected for implementation can be rationally justified.

These standards relate to the quantity of water to be allowed for various uses and the quality of water to be supplied. In the urban areas domestic consumption per capita per day is related to the level of service, ranging from in-house connections to public standposts. Allowances are also made for commercial, municipal and industrial uses. Standards for these uses have usually been adapted from those used in European countries. Because of the higher standards of living, the use of the European standards has led to over-design of systems with consequent locking up of scarce capital. These experiences show that the adopted standards must be revised to accord with standards of living in the African countries.

In Ghana, the standards for project planning based on population size and level of service are shown in table 4.

In the urban areas, the per capita allowance for regional capitals and cities ranges between 100 and 30 litres per day, while for other urban centres the allowance is 50 and 25 litres per capita per day for those served by property connections and standposts, respectively.

In the rural areas, in addition to per capita consumption, it is necessary to take into account the distance of water points from the points of demand, and the adaptability of the type of water point to the technical skill of the populations concerned and to the local customs and way of living. In Sierra Leone the planning standard is to provide a well for every 150-350 people, and the per capita consumption allowed is 60 litres per day. In Ghana the allowance is 20 to 30 litres per capita per day, with one borehole fitted with a handpump for about 300 people. For Nigeria, Okeke (1986) estimates consumption at an average of 24 litres per capita per day, but occasionally it has been known to go as low as 6 litres per capita per day in some places. Though the service targets are not clearly defined, it is generally assumed that one handpump borehole system will be adequate for 500 people, while 20,000 people are provided with a motorized borehole system. For the Sudan, Mohamed and others (1986) state that the average per capita water consumption in rural areas is about 7 litres per day. They see the disparity between this and the WHO standard of 18 to 20 litres per day required for healthy living conditions as the central problem of rural water supply in the Sudan. In the United Republic of Tanzania (URT) the general standard is to provide one well to 250 to 300 people (Simonson, 1986).

Table 4. Water supply levels of service in Ghana

Size of population group	Type of service	Level of service
Less than 100	Dug well	Provided by community self-help
100-200	Dug well	Handpump fitted
200-2,000	Drilled well	Handpump fitted; 300 persons per well
2,000-5,000	Piped supply	95% service by public standpost: 300 persons per standpost
5,000-20,000	Piped supply	90% service by public standpost: 300 persons per standpost
20,000-50,000	Piped supply	85% service by public standpost: 300 persons per standpost
More than 50,000	Piped supply	80% service by public standpost: 300 persons per standpost

Source: Ghana Water and Sewerage Corporation.

The above indicates the range of standards used, and while the WHO standards are useful as a guide for the African region, ECA (1986) pointed out that it is difficult to be too rigid or precise about per capita consumption for the urban and rural water supplies, as the standards adopted in the various countries are reflections of the overall policies for economic and social development which Governments would wish to pursue from time to time.

With regard to standards for drinking water quality, the practice of most African countries is to adopt either the WHO Standards for Drinking Water Supply, or the British, American or European standards. Many have stuck to this, but a few have started making some changes in order to suit national or local conditions. For ground water in particular, high iron, manganese and chloride concentrations beyond the WHO limits occur in all the countries. The URT has an additional problem of excess fluoride concentrations. The tolerable limits for the populations of these countries in respect of the above substances in ground water have to be established to guide planning and development. While the changes are in the areas of physical and chemical quality standards, there has been no compromise with bacteriological standards. The maintenance of bacteriological standards is considered vital in the effort to eradicate the water-borne, water-related and water-associated diseases which form about 80 per cent of illnesses in the region.

Standards for planning in the sanitation subsector are a lot more difficult to come by. While standards for planning drinking water supply have been partly related to the population size of communities and available water resources, the same cannot be said for sanitation. Generally the more urbanized the locality to

be served with drinking water, the more centralized is the system of organization to deliver service, and also the more sophisticated the water supply system. In the case of excreta disposal facilities, it is usual to find in the African region the most basic (indiscriminate defecation) to the very modern (sewer systems) in the same urban area. This state of affairs is mainly due to the cost of building facilities for excreta disposal.

In Ghana, the capital city is one of three urban areas which have public sewerage systems. Residents are expected to connect to the sewer lines passing by their properties, but this is often not done because the people cannot afford the cost of connection. The other systems in use in the city are septic tanks, pit latrines and night soil collection systems. In smaller towns, about 80 per cent of the population use public toilet facilities. Table 5 shows the different disposal facilities used at eight of the regional capitals.

Table 5. Excreta disposal facilities in eight regional capitals in Ghana

Town	Private water closets	Bucket collection systems	Public toilets	Other (indiscriminate)	Source of information
	(percentage of people)				
Accra	30	44	16	10	1982 Consultant Report
Tema	100	-	-	-	- ditto -
Kumasi	40	50	6	4	1970 Consultant Report
Sekondi/ Takoradi	20	27	33	20	1977 House Survey
Cape Coast	20	40	25	15	1976 Consultant Report
Koforidua	12	58	20	10	1977 House Survey
Sunyani	33	30	22	15	- ditto -
Ho	19	70	7	4	District Council

In the rural areas, about 10 per cent of households are estimated to use pit latrines, but by far the largest majority resort to indiscriminate defecation. There is now a programme to introduce the ventilated improved pit (VIP) latrine in both urban and rural areas. In urban areas it is intended to phase out as quickly as possible the night soil bucket collection system, because of the difficulty of recruiting labour, and operating and maintaining vehicles. Definite standards for sanitation are yet to be set.

In the United Republic of Tanzania there is a government policy which requires that one pit latrine per household has to be built at the user's expense; it is also required to be incorporated in any water supply scheme. The VIP latrine is being promoted but, as Balaile (1986) points out, there are problems with costs and social-cultural sensitivities.

2. Proliferation of entities with overlapping functions

The provision of safe and adequate water supply and sanitary excreta disposal facilities has benefits which are felt in the productive and social sectors of the economy. Therefore, the ministries and related agencies in these sectors have an interest in drinking water supply and sanitation. This interest is felt at the national and other levels of political administration be it regional, district or community/village level. The ministries invariably involved are Public Works, Health, Agriculture, Local Government, Rural Development, Social Welfare and Community Development.

Generally at the national levels there is a body charged with responsibility for formulating policies, planning, co-ordinating activities, monitoring and evaluating water supply and sanitation programmes. The responsibility is placed under one lead ministry. The policies are generally implemented through national water boards or corporations in charge of water supply in both urban and rural areas. The water corporations are structured to have branches at the regional and district levels. The district branches are the nearest to the local communities/villages.

In Africa because of the predominantly rural population, with many scattered and sparsely populated communities, the proliferation of agencies with an interest in water and sanitation is considerable, and the interrelationships in their functions are often difficult to discern. The complexity can be appreciated from the fact that Sierra Leone, for instance, with a population of 3.2 million (1980), had 17,360 villages and hamlets of less than 2,000 inhabitants, while the urban population lived in 74 urban communities. Ghana with a population of 12.8 million has over 47,000 communities with less than 5,000 inhabitants. The number of urban communities (5,000 inhabitants or more) is 132.

The urban centres are usually served with piped supplies from centralized systems. Even though they have resource constraints, management of such systems is comparatively easier than for the many scattered rural installations. As such, while the water supply boards are strong in the urban centres, they are weak in the rural areas. It is this weakness that other national institutions, and secondly external agencies, attempt to fill. Unfortunately these other national institutions have neither the manpower nor the financial resources to do effective work. To correct the imbalance, the national water boards are setting up special divisions for rural water supply to deal with the peculiar problems of the rural communities. These organizational changes are illustrated in the selected countries.

(a) Sierra Leone

In Sierra Leone, national responsibility for water supply (urban and rural) until 1974 was assigned to the Public Works Department, under the Ministry of Works (Ayibotele, 1983). In 1974, a Ministry of Energy and Power was created, and water supply functions were transferred from the Ministry of Works to a Water Supply

Division under the new Ministry. The Division exercises responsibility for both urban and rural water supply, including that for the Guma Valley Water Company, which had been set up as a self-financing and independent entity for the water supply of the capital city of Freetown and its environs. In view of the special problems of the rural areas, a Rural Water Supply Unit (RWSU) was set up within the Water Supply Division to co-ordinate and assist in the execution of all rural water supply projects in the country. The Division is responsible for 24 urban water supplies in the eight districts of the country. In the rural water supply areas, apart from the Rural Water Supply Unit, there are other agencies involved in varying degrees. Notable among these is the Ministry of Agriculture and Forestry, through its Integrated Agricultural Development Projects (IADP), which by 1983 was engaged in constructing some 1,500 wells in seven of the eight districts in the country. Next are the Ministries of Health and Social Welfare, which are engaged in hand-dug wells and pit latrines.

Until the Rural Water Supply Unit was set up, activities for rural water supply were dominated by non-governmental organizations, such as CARE International, Catholic Relief Services (CRS), Canadian University Services Overseas (CUSO), and the Voluntary Services Overseas (VSO). The setting up of the RWSU in 1974 has helped to crystallize the approach to rural water supply projects. Currently the Unit works hand-in-hand with the other ministries. For instance, while the Unit is responsible for technical advice in construction of water supply systems, the Ministry of Social Welfare undertakes the mobilization of the communities to participate, while the Ministry of Health deals with the health education and environmental sanitation components of projects.

When the Integrated Agricultural Development Projects (IADP) of the Ministry of Agriculture and Forestry, which are assisted by the World Bank, EEC, ADB and the FRG, were started, there were problems between the IADP and the RWSU. The water supply components of the projects initially did not meet the standards of the RWSU, and the costs were underestimated. The problems were resolved when it was agreed that the IADPs should hand over the water supply components to the RWSU to implement in accordance with its standards and specifications, while the Ministry of Agriculture provides the funds. Other agencies involved are UNICEF, WHO and UNDP, which are assisting the RWSU and the Ministries of Health and Social Welfare in water supply and sanitation. Map 1 shows the international organizations involved in rural water supply and sanitation projects in Sierra Leone and the districts in which they are operating.

(b) Ghana

In Ghana a centralized parastatal organization, the Ghana Water and Sewerage Corporation (GWSC), was set up in 1965 to be responsible for both urban and rural water supplies and urban sewerage in the whole country. It was formed by bringing together the then Water Supply Division of the Public Works Department and the Department of Rural Water Development. Before the GWSC was established, other agencies involved in rural water supply and sanitation in varying degrees were the Department of Community Development of the Ministry of Social Welfare and Community Development, the Department of Agriculture, and the Ministry of Health and Local Councils. During the period when these departments were involved, community participation was actively promoted, incorporating health education and environmental sanitation. These functions ceased when the GWSC was made the sole organization responsible for water supplies in the whole country. The Corporation has branches in the 10 regional capitals of the country. Through these regional

MAP 1. INTERNATIONAL INVOLVEMENT IN RURAL WATER SUPPLY PROJECTS IN SIERRA LEONE



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branches, district level and community or village level water supply systems are constructed, operated and maintained. Since it was established, it has concentrated on conventional systems for urban supplies and, until 1983, has applied drilling of boreholes fitted with handpumps as the sole solution to the rural water supply problem.

Community involvement in rural water supply projects has been poor because the Corporation is not organized to deal with this important function. The error has been recognized, and efforts are under way to correct it by establishing a Rural Water Supply Division in the Corporation. In the area of water supply there are fewer problems with urban supplies at the regional and district levels. However, at the rural level, responsibility for the community/village level supplies is claimed by other national organizations. Unfortunately, these organizations have neither the technical nor the financial resources of the GWSC to do effective work. In the area of sanitation the organizational structure is unclear at all levels - national, regional and district.

A recent conference was held in Accra on Water Supply and Improved Sanitation, at which the GWSC presented to donor agencies its programme for clean water and improved sanitation for all by the year 2000. The report recommended, among other things, that the district administrations should be the focal point for rural water and sanitation projects (governmental and non-governmental), and that an interministerial committee for water supply and sanitation should be revived to co-ordinate policies at the national level. It was also recommended that GWSC should co-ordinate the activities of other governmental and non-governmental agencies for all rural water development in the country. On sanitation it was recommended that the GWSC, as the public organization for water supply and sewage disposal, should not saddle itself with provision of sanitation services, but should co-ordinate its activities with organizations in that sub-sector. It is to be expected that these will be based on the district organization of the government's proposed decentralization programme, which is shown in Figure I.

The international agencies involved in the water supply and sanitation sector in Ghana are UNDP, UNICEF, WHO, World Bank, CIDA, GTZ, KFW, ODA, JICA, World Vision International, Water Aid and Catholic Relief Services. Some of these agencies, particularly the non-governmental ones, until recently operated directly in parts of the country that they select without reference to existing policies and plans.

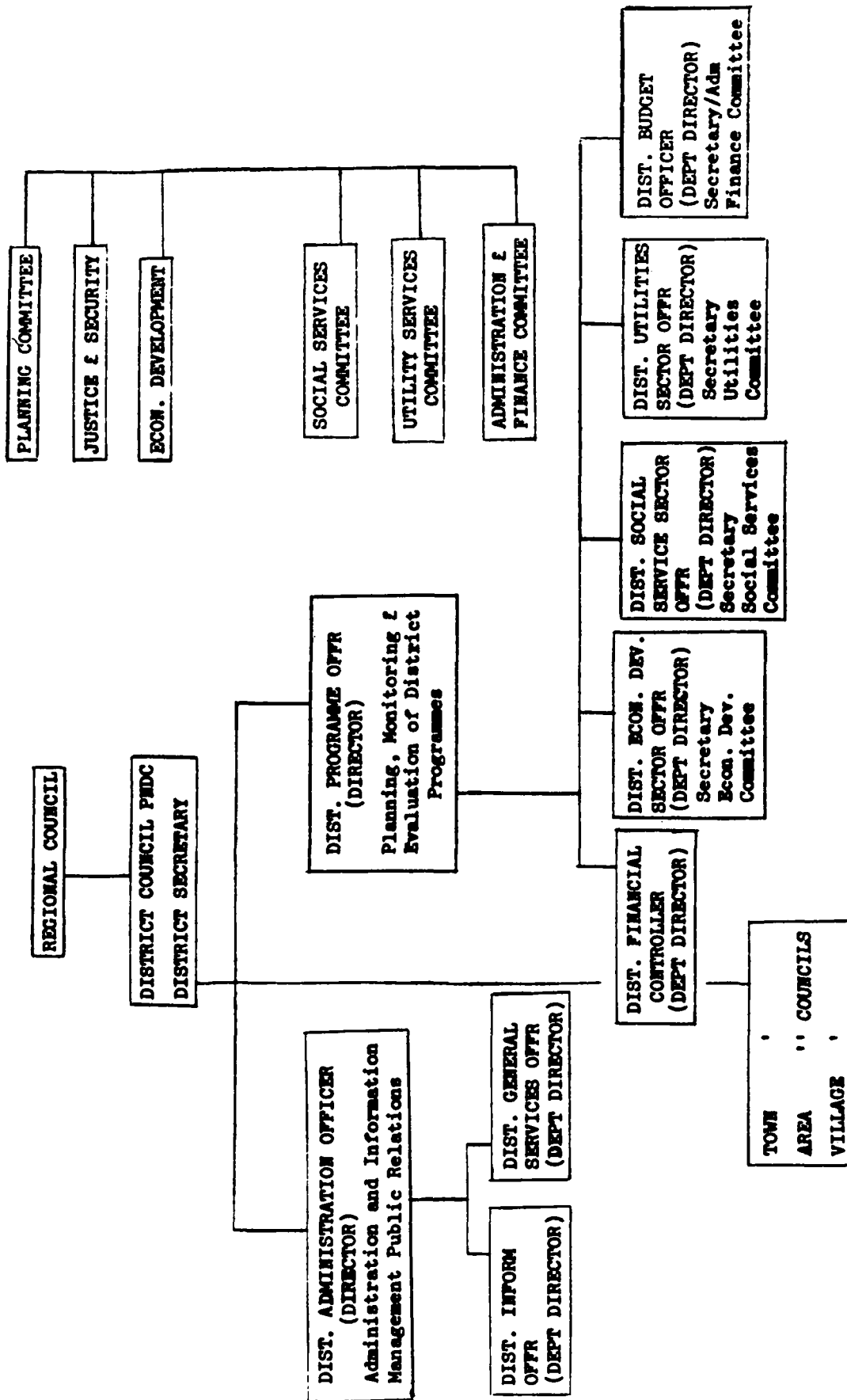


Figure I. District organizational structure of the decentralization programme in Ghana

Source: Rural Water Supply and Sanitation Strategy Study - Republic of Ghana. UNDP (1987) Project
GHA 02 006.

(c) Nigeria

In Nigeria, where the political set-up is of the federal type, the organizational structure is more involved (Okeke, 1986). The federal, state and local governments are involved, with their efforts being supplemented by international governmental and non-governmental organizations. At the federal level, the Federal Ministry of Agriculture, Water Resources and Rural Development (FMAWRRD) has overall responsibility for water resources development in the country. The Federal Department of Water Resources (FDWR) under the FMAWRRD is responsible for policy formulation, monitoring and co-ordination of activities in the water supply sector throughout the country, through its Division of Water Supply and Quality Control. This division focuses more attention on rural water supply.

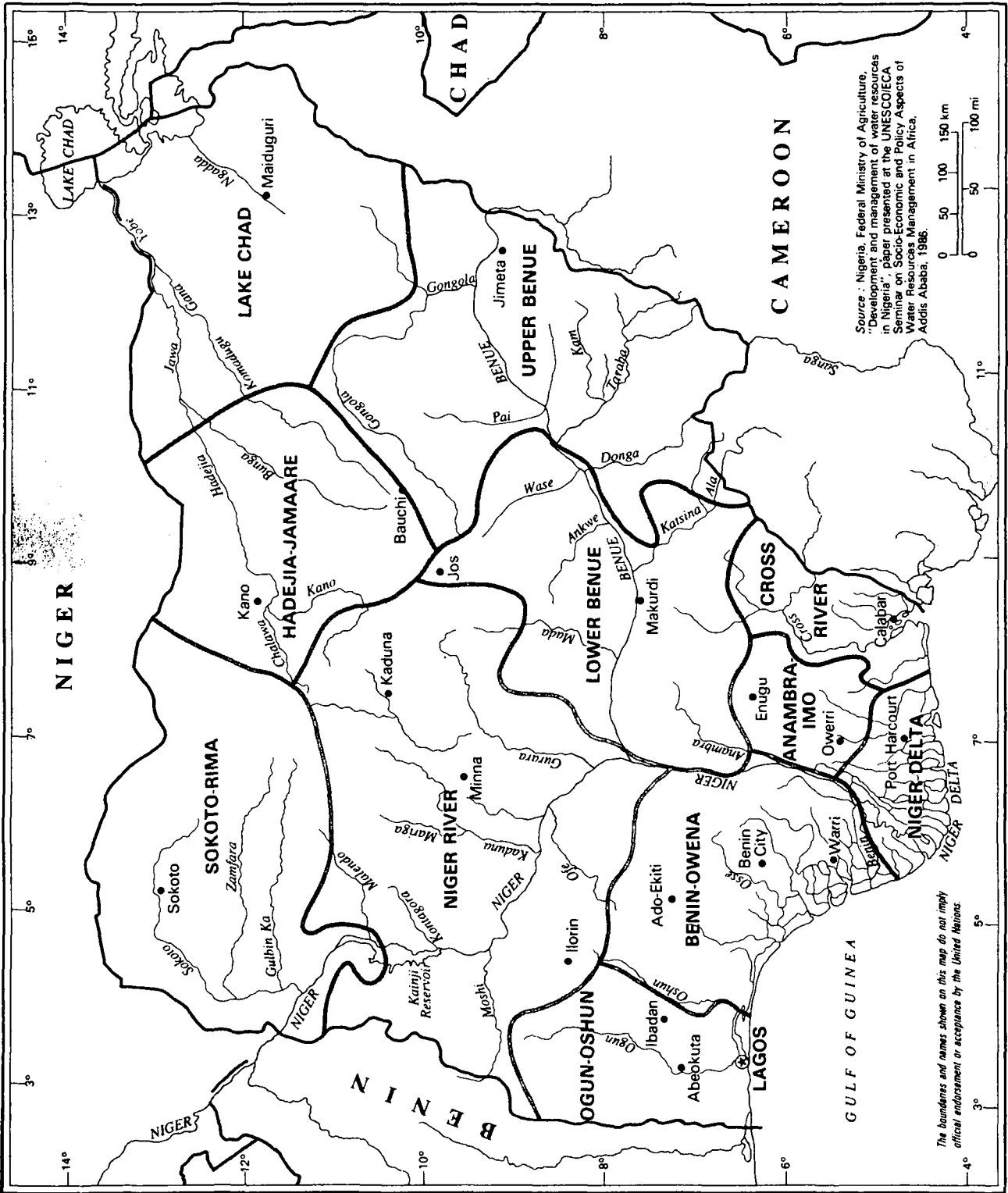
Under the FDWR, are 11 River Basin Development Authorities (RBDA) whose role in water resources development is the provision of bulk water through dams and boreholes. The river basins are shown in Map 2. Their activities are monitored by the FDWR. At the state level, the responsibility for water supply as a whole (urban and rural) rests with 20 State Water Boards (SWB). There is one for each of the 19 states and one for the Federal Capital Territory, Abuja. The SWBs are under the jurisdiction of other state ministries, usually the Ministry of Works.

At the local level, Local Government Authorities (LGA) have been set up. These are also involved in rural water supply project implementation, but responsible to the Ministry of Local Government. The situation of the various states is shown in Map 3, while the organizational chart for water resources and water supply development is shown in Figure II. Other agencies operating in the water supply sector in Nigeria are the Agricultural Development Projects (similar to the ones in Sierra Leone) which are joint ventures involving the federal and state governments and the World Bank. The agricultural projects have water supply components made up of shallow wells.

The recently created Directorate of Food, Roads and Rural Infrastructures is also involved, and since 1986 has been charged to check rural/urban migration through integrated development of the rural areas. The supply of potable water is a major component of this directorate. This agency is also expected to help achieve the goals of the IDWSS Decade.

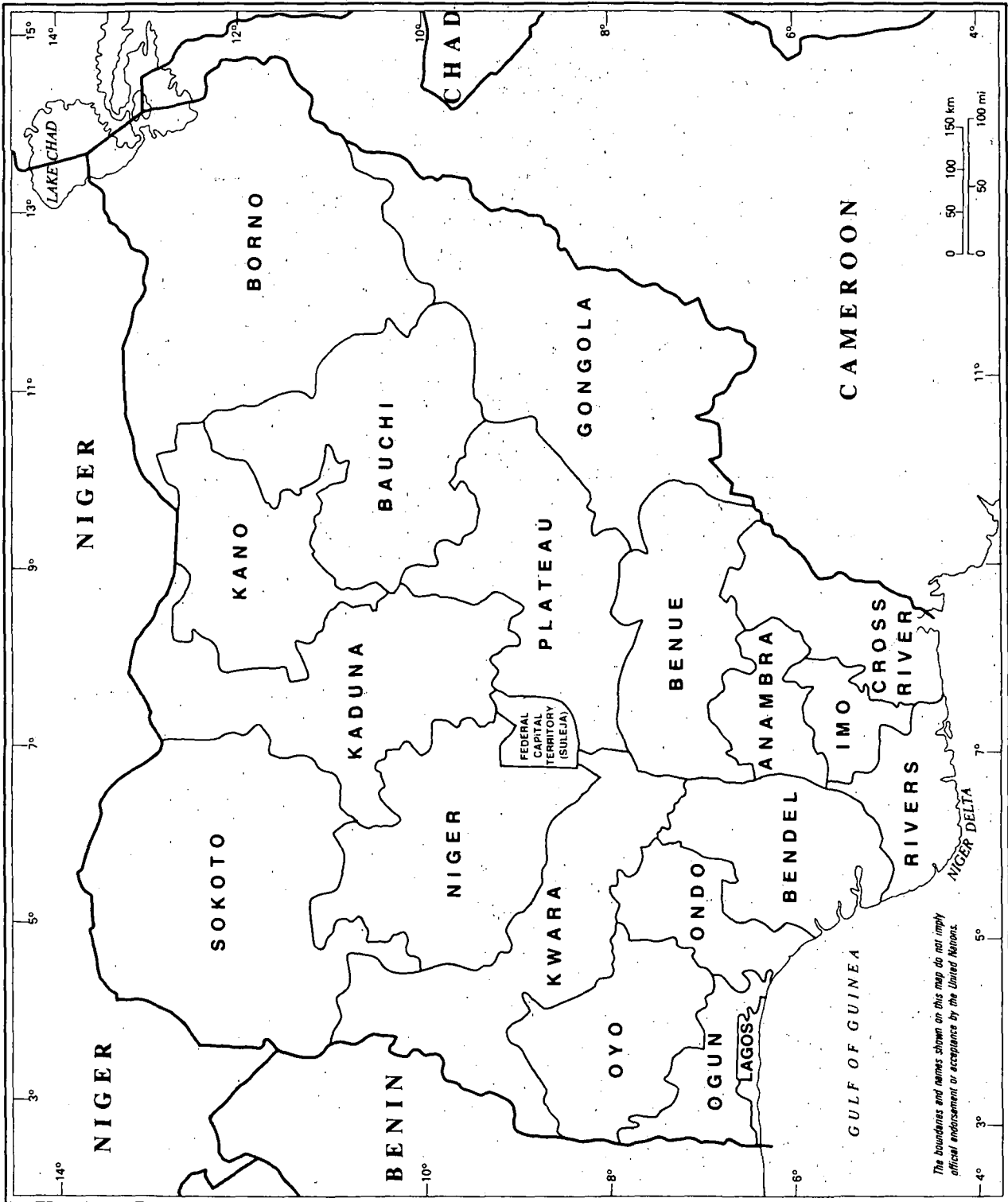
The international organizations involved in water supply and sanitation are mainly the World Bank and UNICEF. UNICEF has been working through the Ministry of Health and the Ministry of Social Welfare, Youth, Sports and Culture. Until recently these operations were not co-ordinated with the Federal Department of Water Resources. The institutional arrangement for water supply and sanitation is considered inadequate, as it is fraught with administrative bureaucracy at all levels. Discussions are therefore in progress involving the Federal Department of Water Resources, the state governments, local government authorities and the World Bank to work out the best institutional arrangement as well as the modalities for funding rural water supply in Nigeria.

MAP 2. RIVER BASIN AREA DEVELOPMENT AUTHORITIES IN NIGERIA



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MAP 3. STATES OF NIGERIA



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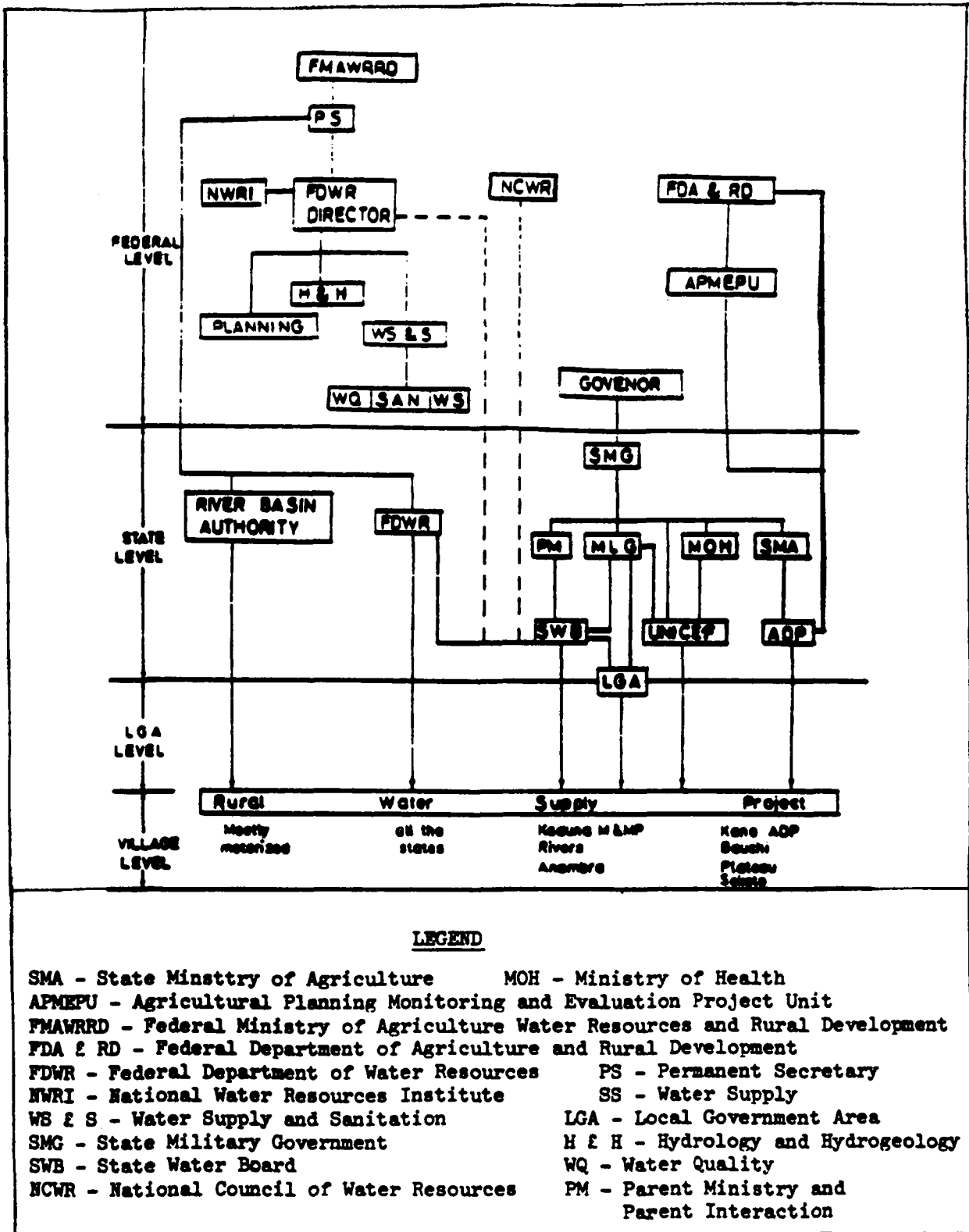


Figure II. Rural water supply organogram

Source: Director, Federal Department of Water Resources - Nigeria. (Paper presented at Workshop on Groundwater in Rural Water Supply, Accra, 1986.)

(d) The Sudan

In the Sudan, responsibility for urban and rural water supply rested with the National Water Corporation (Sudan, 1986), with a separate corporation for the capital city of Khartoum and its environs, as is the case in Sierra Leone and Nigeria. Other national agencies involved are the Sudan Gezira Board and the Ministry of Irrigation, which deal with the drinking water supply aspects of irrigation projects. Before the National Water Corporation was created in 1985, urban water supplies were the responsibility of the Central Electricity and Water Corporation, and rural water supplies were under the Rural Water Development Corporation.

As in Sierra Leone, Ghana and Nigeria, the responsibility for urban supplies was not difficult to assign over the years, but it was in the area of rural water supply that the organizational structure presented problems. In the case of the Sudan, the development of the organization for rural water supply had different antecedents than in the countries already mentioned. The need for rural water supplies arose from the need to prevent land degradation by livestock and conserve the vegetation and soils (Mohamed and others, 1986). A water supply unit was established in the Ministry of Agriculture in 1956, with the objective of supplying water to conserve soil and vegetation. The hafirs and small dams through which water was provided attracted both men and animals to the extent that land use around these water sources was abused. As a result objections were raised against soil conservation activities. In order to overcome these problems and ensure the proper use of water and land resources, the soil conservation section was reconstructed under the name Land Use and Rural Water Development Department (LURWD), to plan for and secure more effective development of water and land resources. However, this is not much different from the integrated agricultural development programmes of Sierra Leone and Nigeria, even though the reason for their establishment was different. In order to meet increased demand for water in the rural areas, in 1966 the LURWD was transformed into a new independent corporation, called the Rural Water Development Corporation (RWDC). It was made a part of the Ministry of Agriculture, and was assigned to co-ordinate water supply activities of government agencies dealing with rural development problems. Its other functions were to provide domestic water supply (for people and animals); classify land use (agricultural land, grazing land, etc.); and co-ordinate all activities aimed at development of rural life and settlement of nomads. Its headquarters were located in Khartoum, with regional offices in all the provinces of the country. The regional offices work in collaboration with the local authorities and the villagers and village institutions.

In addition to the Ministry of Agriculture and the Local and Village Councils, the other agency playing a major role in rural water is the Ministry of Health, which is interested in water treatment and in monitoring water quality. Until 1975, the RWDC was responsible for planning and execution of water supply programmes. After 1975 the planning and programming section was separated from the execution section. However, both continued to perform their duties under the Ministry of Agriculture, but as separate agencies. This affected the degree of co-ordination and implementation of programmes. In 1980 the gap between the two widened further when the implementing body was transferred from the Ministry of Agriculture to the Ministry of Energy and Mining, and its name changed to National Administration for Water (NAW). The next reform was effected when the Urban Water Supply Division of the Central Electricity and Water Corporation was separated and

joined with the NAW into the National Water Corporation, and made responsible for both urban and rural water supplies.

New legislation for both urban and rural water supply was enacted in 1986. Two acts determine the powers, functions, and organizational structures of the National Rural Water Resources Development Corporation (NRWC) and the National Urban Water Corporation (NUWC). Both corporations depend on the Ministry of Energy, Mines and Industry. The NRWC is intended to plan the development, use and conservation of rural water resources, while the NUWC has a similar plan in urban areas.

(e) United Republic of Tanzania (URT)

In the URT the provision of water supply is the responsibility of the Ministry of Water, Energy and Mines. Under this Ministry there is the Water Sector, which is organized at the national, regional and district/local council levels. Its relationship to other agencies within the political organization is shown in Figure III. The Sector consists of divisions for project preparation, construction and maintenance, planning and manpower development. At the regional level, the same units are repeated, except that the water sector is just a section of the Regional Development Director's office. The organizational structure for the water sector from the national to the district level is shown in Figures IV and V (Balaile, 1986).

The Regional Water Engineer is in charge of both urban and rural water supply in his region. Recently a separate National Urban Water Supply Authority was set up to take care of urban supplies only. The Authority has started functioning by taking over the water supply of the country's capital, Dar-es-Salaam. The other urban supplies are expected to be progressively taken over with time by this new authority.

The URT has based its domestic water supply and sanitation development on Water Master Plans, which by the end of 1985 had been prepared for 17 out of its 21 regions. These plans were prepared with the assistance from various countries namely, Sweden, Denmark, Finland, the Netherlands, the United States and Canada. The plans provide for each region an evaluation of the water resources potential (both surface and ground water) and an assessment of the needs for domestic water supply and sanitation, irrigation, flood control, power, etc. (Ayibotele, 1986). In the plans, emphasis has been given to domestic water supply and sanitation to meet the targets of the IDWSSD. It is recognized that co-ordination with other ministries and agencies involved in water development, such as the Ministry of Agriculture and Livestock Development, has not been good enough and needs to be improved. The provision of water supply and sanitation was made an area to be given top priority at the Party Conference held in 1973, after the Arusha Declaration of 1969 adopted a policy of socialism and self reliance (Balaile, 1986). Before the party conference, a decentralization policy had been adopted in 1973, meant to enhance the people's participation and bring decision-making close to the people at the regional, district and village levels. This was followed by a villagization policy adopted in 1975, which was intended to settle the people closer to each other in planned villages, so that it would be easier to provide them essential services such as water, hospitals, primary education, etc. More than 8,600 villages have been established. Problems arose with these policies and institutions because entities which were formerly responsible for various services were brought to a standstill. To overcome this a Local Government Act was

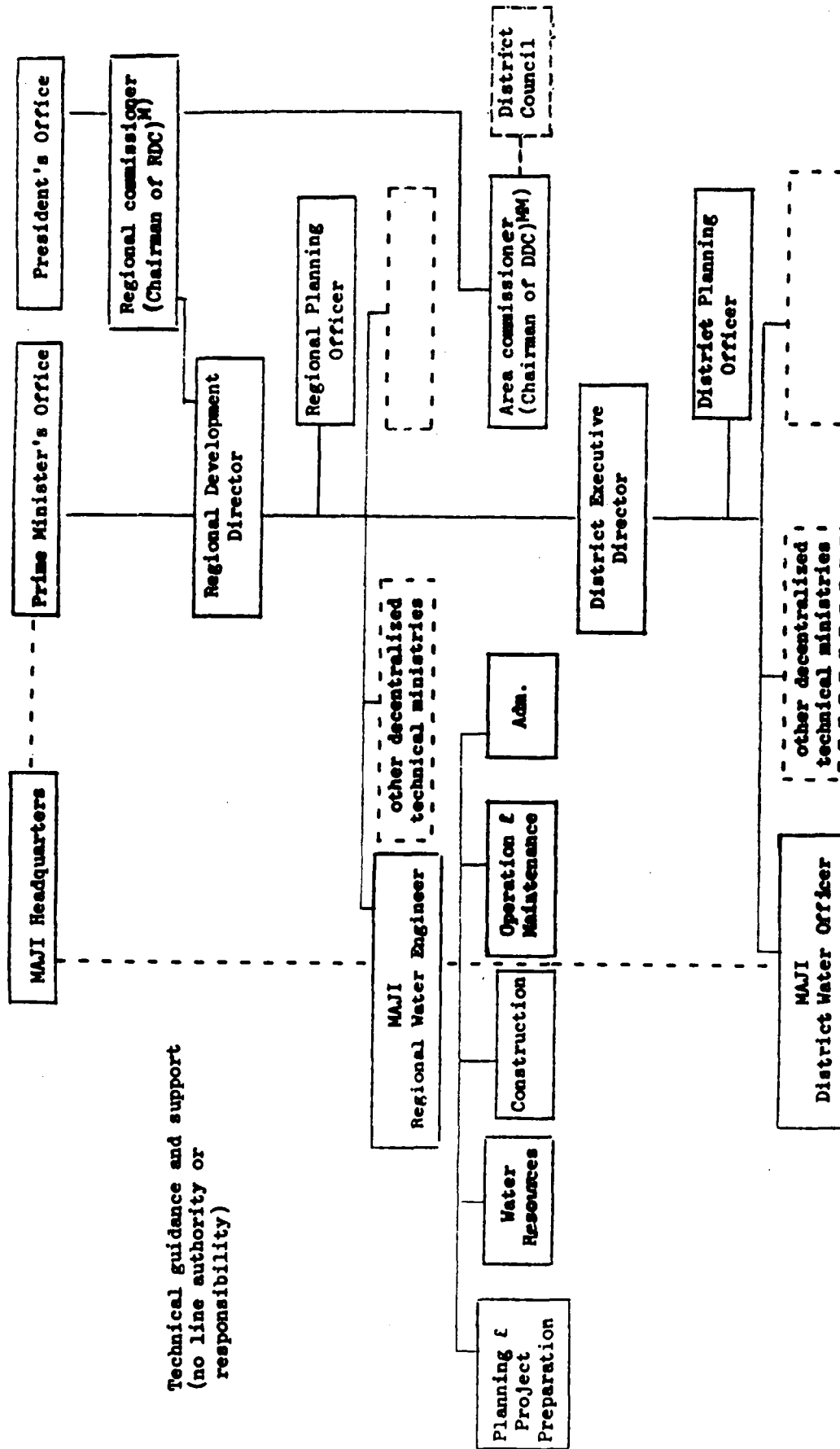


Figure III. Organization of Maji regions, United Republic of Tanzania.

Source: Balaille, 1986. (Paper presented at the Interregional Symposium on Improved Efficiency in the Management of Water Resources, New York, 1987.)

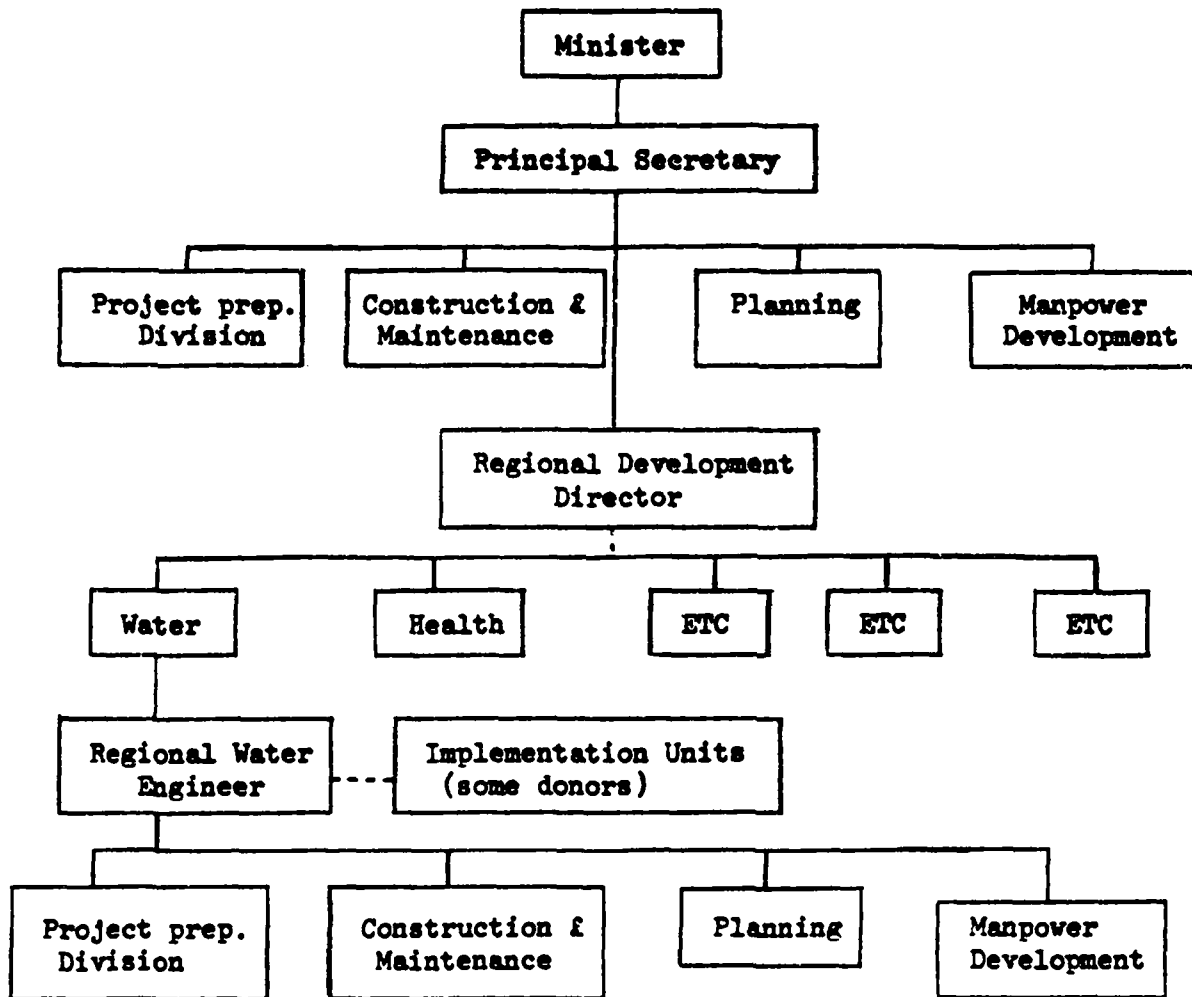


Figure IV. Organizational structure for water supply in the United Republic of Tanzania

Source: Balaile, 1986. (Paper presented at the Interregional Symposium on Improved Efficiency in the Management of Water Resources, New York, 1987.)

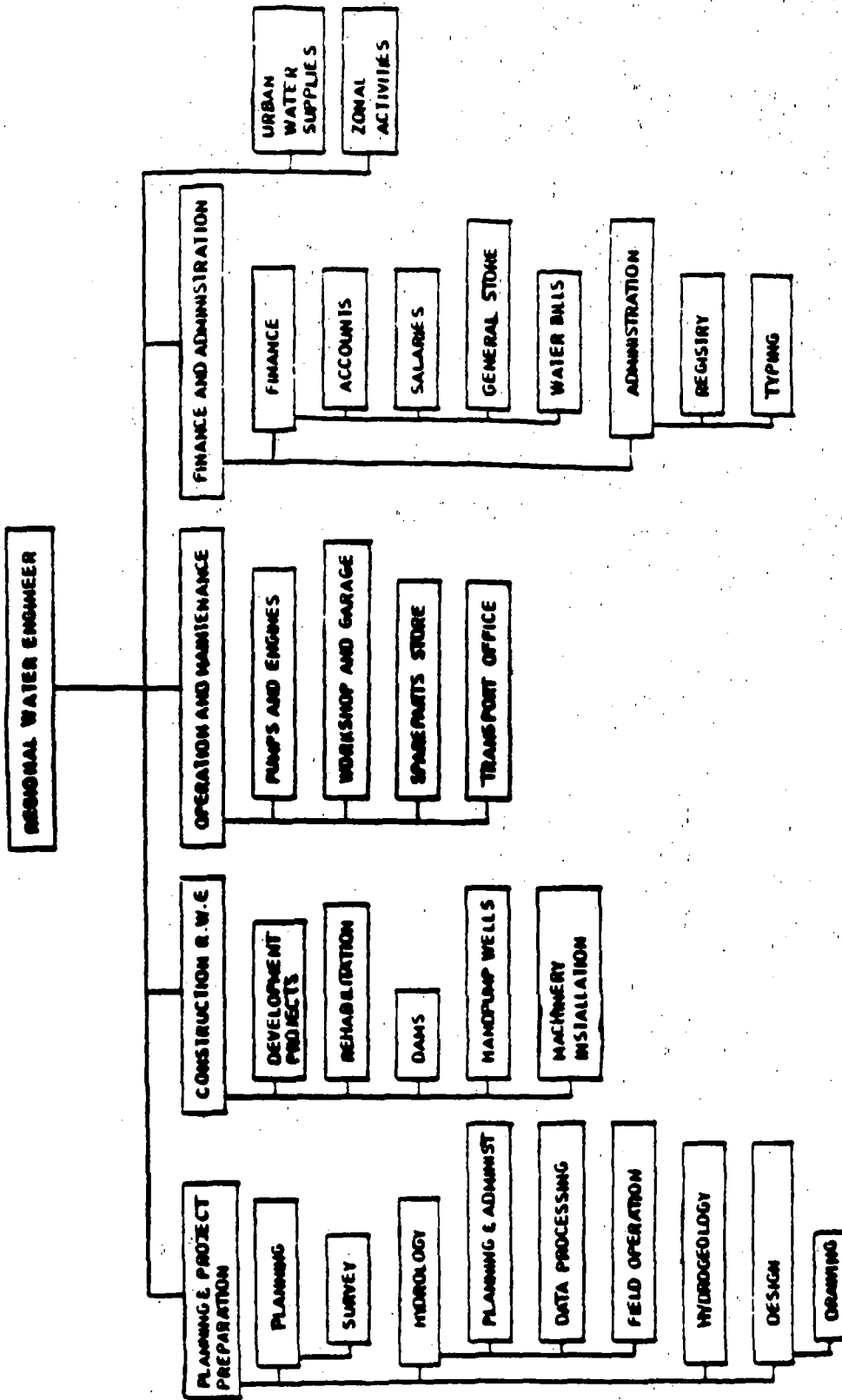


Figure V. Regional Water Development Division, United Republic of Tanzania

Source: Balaile, 1987. (Paper presented at the Interregional Symposium on Improved Efficiency in the Management of Water Resources, New York, 1987.)

reintroduced in 1984 in order to strengthen decentralization up to the district and village level, as shown in Figure V. It also enabled the provision of essential services to be reactivated by the local councils. In this regard the roles of the Ministries of Health, Education and Community Development necessary for the Decade were reactivated.

Apart from the national agencies, the other actors in the water supply and sanitation sector are external organizations whose assistance to the URT increased after the Mar del Plata Water Conference in 1977. These included the World Bank and funding agencies of the Governments of Sweden, Norway, Denmark, Finland, the Netherlands, Canada, the Federal Republic of Germany and the United States. They were all assigned regions in which to concentrate their assistance; those assigned regions are shown in Map 4. This is similar to the Sierra Leone situation; Ghana seems to be considering following a similar approach.

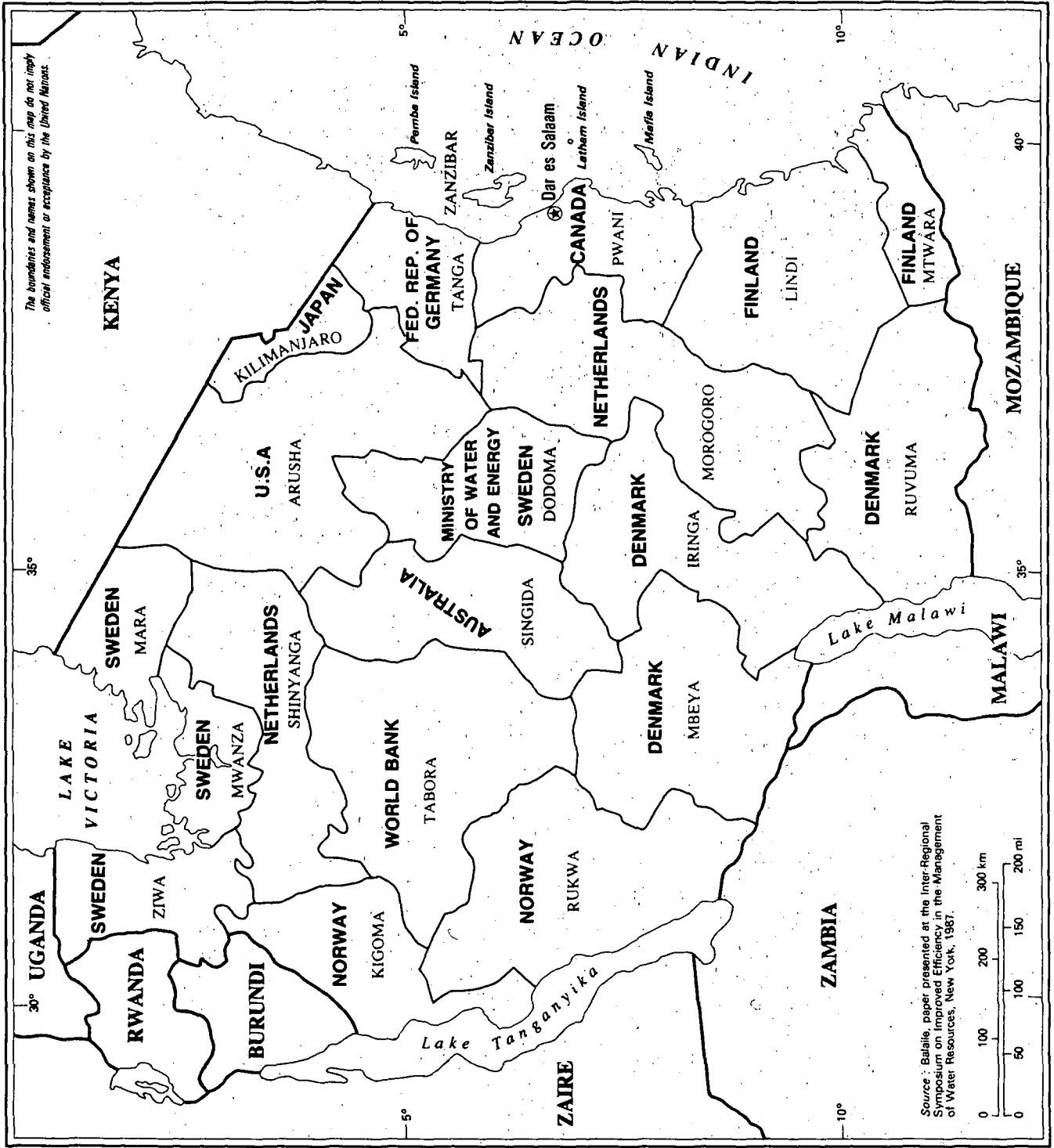
The Tanzanian experience shows that there were problems with the external agencies because there was no co-ordination, and each agency did what it felt was best. To overcome the problems created, a seminar was held in Arusha. Its objectives were to carry out a critical review of implementation activities in the Rural Water and Sanitation Sector; and prepare practical recommendations to the Government of the United Republic of Tanzania and to the donor agencies for continued action towards fulfilment of realistic targets for the sector. The seminar was attended by representatives of 14 nations, including the Nordic countries. The multilateral agencies which attended were the World Bank, ADB, UNESCO, WHO, UNDP and UNICEF. The seminar made recommendations which have action plans and schedules for implementation, operation and maintenance and human development. The action plan sought to answer "what, how, who, and when" for the implementation of each recommendation.

3. Concentration of services in urban or other favoured areas

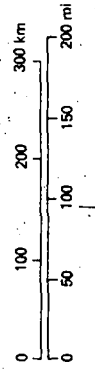
The urban areas are the relatively profitable and favoured areas where water supply and sanitation services have been concentrated. As an example, Ghana spent only about 39 per cent of its total capital investment in the water and sanitation sector in the rural areas during the period 1976-1982. It seems this trend will continue, because WHO (1986) estimates that globally, if the IDWSSD targets are to be met, 66 per cent of the investment would go to the urban areas.

A number of factors are responsible for the concentration of services in relatively profitable areas. First, is the population distribution, which shows a few urban centres, as against many scattered and sparsely populated rural areas, as already shown in the examples of Sierra Leone and Ghana. Second, historically national Governments attended to the needs of the urban areas when they started to assume public responsibility for water supply and sanitation. It was easier to identify the felt needs of the relatively few urban centres and plan to meet them, than those of the many scattered rural areas. Third, the development of the urban systems were based on conventional water supply techniques with which the colonial administrations were familiar. These techniques were formally taught in the foreign universities, where the local engineers were trained, and in the universities established locally. Rural water supply and sanitation techniques were until recently not taught in the training institutions. Fourth, the Governments of the developing countries, including those in Africa, found it easier to provide funding for investment in the urban water supplies and also to provide funds for their operation and maintenance. When tariffs were introduced to recover

MAP 4. DONORS FOR THE IMPLEMENTATION OF THE MASTER WATER PLAN IN THE UNITED REPUBLIC OF TANZANIA



Source: Balaila, paper presented at the Inter-Regional Symposium on Improved Efficiency in the Management of Water Resources, New York, 1987.



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costs, it was easier to collect them from the relatively better-off urban dwellers than from the rural people. Fifth, the organizational set up of the water supply bodies is more suited to running urban than rural water supply systems. Many countries are now looking for appropriate organizational structures, among other things, to deal with special rural needs; and until these have been found and put in place, and Governments make a determined effort to increase funding to these less favoured areas, the trend will not be arrested and reversed.

4. Overemphasis on hardware investments to the detriment of service-related (software) investments

One characteristic of the organizational structure of the water agencies, as already pointed out, is that they are more suited to serving the urban areas. Therefore, for a long time most water utilities saw water supply systems in terms of engineering, which dealt with reservoirs, treatment works, transmission mains, distribution reservoirs and distributing pipe networks. Investment in these hardware items did not pose much of a problem. Investments in software items, such as health education, environmental sanitation, water transport and usage, and water conservation, did not receive much attention until lately.

For many countries, meeting the targets of the Decade means rehabilitation of existing systems which have broken down for lack of proper operation and maintenance, as well as paying special attention to the needs of rural areas. Unfortunately the complexity of operation and maintenance problems and the question of paying for services, health education and environmental sanitation issues cannot be managed by the present organizational structures of the water and sanitation bodies in the region. Organizational reforms must therefore be carried out to deal with these issues. Sierra Leone, for example, started to deal with this problem in 1980, when the Rural Water Supply Unit was established in the Water Supply Division of the Ministry of Energy and Power. It adopted an integrated approach which involves other agencies. It confines itself to the technical aspects of projects, such as construction, and teaching villagers how to operate and maintain their systems. Mobilization of the communities is handled by the Ministry of Social Welfare, while health education and environmental sanitation aspects are the responsibility of the Ministry of Health. Funds are provided for each of these aspects.

What is now happening in Sierra Leone is what was practiced before the Ghana Water and Sewerage Corporation was established in 1965. A Rural Water Supply Division was recently established in Ghana after over 20 years of alienating the rural communities from participating in developing and manning their water supply systems. This is expected to function within a decentralized administrative structure which the Government is putting in place. It is expected that the local authorities will be given sufficient resources to mobilize rural communities to be involved in their water supply and sanitation projects, as well as for education in health and environmental sanitation. Moreover, a programme of investment has been worked out to rehabilitate a number of water supply systems which have run down due to inadequate resources for operation and maintenance.

In the Nigerian situation, as already stated, rural water supply is handled at the federal, state and local government levels. The Federal Government's instruments for implementing the rural water schemes are the River Basin Development Authorities, the Agricultural Development Projects, and the Directorate of Food, Roads and Rural Infrastructure. The states use the State Water Boards as

instruments for urban and rural water supply. The main external agency involved in water supply and sanitation is UNICEF. Investments are being carried out by all these agencies. However, all levels of the federal, state and local agencies face problems of operation and maintenance, health education and community participation. It is mainly UNICEF which has worked out programmes for community level operation and maintenance, but this is yet to be implemented. The same is true for community participation. However, the health education aspects are well in hand. The problems of federal, state and local agencies in these areas result from inadequate funding and an unreliable institutional framework to support them (Okeke, 1986).

In the Sudan a survey carried out between 1980 and 1982 by Mohamed and others (1986) has shown the need to organize the water authorities in relation to their service to the rural communities, and the need to support the organizations with adequate funding. In the United Republic of Tanzania, the Arusha Declaration of 1967 and subsequent villagization policies have strengthened awareness of the importance of community participation, and the organizational structure for rural water supply is being fashioned to make this possible. The extent to which efforts have to be made to bring about change can be seen from Figure V, which depicts the organizational arrangement under the Regional Water Engineer's responsibility. It is evident that to serve the rural communities further, the links with the Ministry of Health and the local communities must be consciously developed and incorporated in the organizational structure.

5. Limitations on community and private sector participation

It is unfortunate that "public monopoly" systems seem to have taken over water supply and sanitation in Africa. This need not be so, because the spirit of self-help or community participation was a practice that existed during the colonial period, particularly in the rural areas where local government was promoted. A number of factors may be held responsible for the change in the limitations on community participation.

First, soon after independence, the countries felt a need to be seen to be fully in charge of their administration. As such, central government was emphasized to the disadvantage of local government. Political platforms were based on what the central government would do for the people, but not what the people would do for themselves at the local level. Consequently, everybody from the villages to the cities began to look to the central government to meet their needs. Ghana, after independence in 1957 introduced a "water budget" aimed at bringing domestic water supply to the majority of the people. Similarly, the Government of the Sudan carried out an anti-thirst campaign in the rural areas during the period 1966 to 1969. These certainly had the effect of making the people look towards the central government to fulfil the needs.

The second factor which contributed to the move towards public monopoly systems is the state-oriented approach favoured by the newly created countries. Consequently, the position was taken that certain basic needs and the major factors of production must be in the hands of the state. The clearest position of the roles of the state was taken by the Republic of Tanzania, in the Arusha Declaration of 1967. Thus, in most countries the role of private entrepreneurs is limited.

The third factor which must be mentioned is the impact of the International Drinking Water and Sanitation Decade (1981-1990). The responsibility for implementing the Decade targets in the developing countries was accepted by the Governments of those countries. This is particularly so in the countries of Africa, where the economic situation of the people is poorest. The investment costs for drinking water supply and sanitation are generally beyond the resources of the people. The central governments have therefore assumed responsibility, and this has contributed to reinforcing the public monopoly system mentality.

It is not to be expected, more than half way through the Decade, that this attitude will or should be modified. Reviews and evaluations in the various countries show that the cost of providing safe and adequate drinking water and sanitary excreta disposal facilities cannot be borne by the central governments alone. Additional resources must be mobilized both internally and externally. Hence the communities are being called upon to participate, as was the case under self-help projects during the colonial period. There are also moves by Governments to decentralize their administration to the local level, so as to get the communities involved.

It must be mentioned that private mining and agricultural estates in Sierra Leone, Ghana, Nigeria and other parts of Africa are about the only examples where water supply and sanitation have been built, operated and maintained for community use without dependence on Governments. The Sudan, however, offers an interesting experience, where rural water supply systems have been handed over to private contractors to operate and maintain and generally administer (Mohamed and others, 1986). Though the system is said to have its disadvantages, it is reported to be spreading. It is an idea which can be tried in the other African countries. Overall, the organizational structures at the local level need to be restructured to involve the participation of communities and to give private persons a chance to invest in water and sanitation projects under guidelines to be worked out by Governments.

B. Managerial practices

Managerial practices as part of the factors affecting the implementation of the International Drinking Water and Sanitation Decade are considered under:

1. Inadequate operation, maintenance and monitoring

The inadequacies can be seen in both urban and rural areas. The situation is comparatively better in urban areas, because the organizational structure is centralized and better defined, with relatively better trained people than in the rural areas, where the structure is ill-defined, and the many actors in the sector do not have the resources for the responsibilities that they have assumed or which have been assigned to them. Probably the following description by the Ghana Water and Sewerage Corporation of the situation at the beginning of 1986 echoes the problems of many other water utilities in the region (GWSC, 1986):

"The very rapid downturn of the national economy between the years 1978 and 1982 has created desperate conditions in the Corporation. There was a near deletion of Ghanaian professional manpower. Morale and motivation to work have fallen down in all levels of staff. Regular servicing and maintenance of facilities has become impossible due to shortages of spares, materials and

logistic means. Coupled with the normal aging of facilities, this has resulted in more than one third of the water supply systems, mostly in the rural regions of the country, being completely inoperative now, and virtually all other systems operating below their design capacity. The Corporation's inability to secure approval for adequate and timely tariff increases or, in the absence of that, adequate subventions, coupled with hard-currency difficulties, have been a major contributory factor to this situation".

A subregional workshop on Groundwater in Rural Water Supply was held in Accra in October 1987 and was attended by Gambia, Sierra Leone, Ghana and Nigeria. The following points were made about operation and maintenance, which give an idea about the situation in the West African subregion.

- (i) In most of the countries, there exist only rudimentary organizations for the maintenance of dug wells, which is usually left in the hands of the users themselves. Sometimes technical assistance is provided by personnel from the water authorities or from the departments of community development. Activities include de-silting of well-heads, sanitation and repair works;
- (ii) Unfortunately the people do not take the maintenance role seriously, with the result that the well-heads are usually dirty; well parapets and concrete aprons are cracked or broken off, leading to the flow of dirty water back into the well; and in some cases algae blooms grow along the inside parts of the well lining;
- (iii) As part of environmental sanitation, however, newer dug wells constructed by special projects are being better maintained. On some projects, wells with bucket and pulley gear are provided, with initial spare buckets and pulleys, etc., by the project. Sometimes an effort is made to make items available for purchase by the community. In all cases, the communities are expected to provide the items on their own after an initial period. Where items are not easily available, the projects provide them for purchase by the villagers at minimal cost;
- (iv) For some rural handpump water supply projects sponsored by non-governmental organizations, local organizations usually indicate their willingness to carry out the maintenance themselves.

In the case of the Sudan, Mohamed and others (1986) report that problems of administration of rural water supplies in that country became very serious in the mid-1960s, when large numbers of water systems were not working because of breakdowns, lack of maintenance and spare parts. These problems led to changes in the system of management. Two bodies were made to share the responsibility of administration and management: Land Use and Rural Water Development became responsible for planning, construction, maintenance and general supervision of all water sources, while the Local Councils became responsible for administration and revenue collection. This system failed to achieve its objectives because of a number of problems, such as the limited financial and personnel capabilities of the rural councils, which led to corruption in revenue collection. In addition, there were no maintenance centres; fuels, oils and spare parts were in short supply. Pumps were old and of different types, and there was no means of communication to report breakdowns. Also the maintenance teams were not equipped to handle cases of breakdowns.

With regard to the situation in the United Republic of Tanzania, Balaile (1986) states that although it is the aim of any operation and maintenance system to have a scheme running all the time and deliver what it was meant for, it was not unusual to find only 30 per cent of total schemes working at any time. He attributed this to the following wrong assumptions by planners:

- (i) Funds will be available at all times and budgets available for water supply will not change drastically. However, in the United Republic of Tanzania only 43 per cent of development funds were provided, and just 25 per cent of those for operation and maintenance;
- (ii) Skilled manpower will be trained in great numbers, but this has not materialized;
- (iii) The transport situation was to be improved by having 1,300 trucks and 1,170 Land Rovers in working condition. Only 400 trucks and 450 Land Rovers could be acquired; and of these, more than 80 per cent are very old;
- (iv) Fuel would be available for any technology used, at any time. Unfortunately, the 1973 oil prices made it almost impossible to provide fuel for the already constructed schemes depending on it;
- (v) Adequate spares were to be procured and stored whenever required. As of today, the spares have not been supplied and have become the greatest problem; and
- (vi) Based on the policy of self-reliance, the people would be very enthusiastic to take part in the construction of water systems. This in most cases proved wrong, as the villagers treated the water schemes as government property, and did not take responsibility for them, because of their belief in the declared policy of "free water".

2. Ineffective evaluation of alternative means to satisfy service needs or targets

The effective evaluation of alternative means, such as development of new sources, reallocation of existing supplies or improvement in existing facilities to satisfy service needs or targets, would involve the availability of management capability to gather and analyse data and information on the following types of factors:

- (i) Population served, and its growth rate;
- (ii) Reliability of available water sources throughout the year;
- (iii) Condition of plant and equipment and ability to meet demand;
- (iv) Increases in water demand as a result of improved standards of living;
- (v) Leakages in the systems;
- (vi) Extent to which operations and maintenance procedures are followed;

- (vii) Adequacy of manpower, financial and logistic support for operation and maintenance; and
- (viii) Extent to which communities are prepared to participate in meeting investment costs, as well as operating and maintaining the systems.

In order to make the right decisions, an adequate and proper management information system must be established. It is necessary to gather sufficient data and information for analysis to enable the most economic and socially acceptable and affordable alternative to be selected. Unfortunately, those kind of data are not available for the rural systems in particular. Data-gathering and record-keeping are poor in these areas, because there are not enough people trained in such fields. Also, responsibility for keeping such records is often not well-defined. The water authorities who should do this are too bogged down by day-to-day administration to take time to set up and implement information systems.

When Sierra Leone determined in the mid-1970s to improve and expand water supplies in the rural areas, it did not have the basis to decide whether new sources should be developed or existing systems should be improved. It was the United States Peace Corps which assisted by carrying out a nationwide survey on the state of the rural water supply in Sierra Leone (Ayibotele, 1983). The results of this survey assisted the Rural Water Supply Unit in the country to know what to do in each case, whether to rehabilitate the existing systems or build new ones, and what type of systems to build.

In Ghana, a similar exercise was recently completed on the state of the water supply systems for both urban and rural areas. Table 6 shows an example of the type of data that were gathered. These have helped the Ghana Water and Sewerage Corporation (1986) to develop a five-year investment plan consisting of:

- (i) Rehabilitation of existing systems;
- (ii) Capacity expansion and extension of existing systems;
- (iii) Completion of ongoing schemes; and
- (iv) Construction of new schemes.

The Corporation has seen the need for a management information system. It has therefore started developing one, and it is expected to provide accurate and timely management data to facilitate decision-making, planning and programming. The new organizational structure worked out for the Corporation has had this incorporated at the headquarters, regional and district levels.

For Nigeria, the Agricultural Development Projects of the World Bank, federal and state governments have the problems of considering alternative approaches for solving projects, but data and manpower availability are constraints. To get around such problems, investments are made in drilling new boreholes. The United Republic of Tanzania has the same problem of considering alternative approaches to solve its problems but, unlike the other countries, the data base is available in the Water Master Plans.

Table 6. General data on water supply systems in the Ashanti Region, Ghana

Name of system	Code No.	Source and type of system*	Headworks location	Population 1,000		1990 Forecast	Installed capacity m ³ /day (20 hrs/day)	m ³ /yr x 1,000	Projected demand (1990)	Main problems; Ongoing work; Proposed solutions.
				1970 Census estimates	1984 Census or estimates					
KONA 144		R. Apren-Kensau PP 1°31'W, 6°52'N		3.5	4.6	5	154	250	75	Frequent breakdowns of old equipment. Unreliable standby. Defective PP parts. Planned extension from Kumasi system.
NKENKASU (Techniman) 111		R. Nkenkasu PP 1°54'W, 7°19'N	One town Nkenkasu	5.0	6.3	3	270	400	120	Inadequate water treatment due to deterioration of PP. Pumping equipment needs repairs and replacement parts. Proposed extension from ongoing Techniman project (Brong-Ahafo) in progress.
NYINAMIN 112		R. Adosu PP 2°07'W, 6°36'N	One village	4.8	6.3	7	430	350	105	Pumping equipment inoperative. No standby. Intake structure in poor condition. Weir crest is too low, and dredging is required. Defective PP dosers.
OBOGU		R. Kume PP 1°07'W, 6°31'N	One village	3.8	5.0	6	220	300	90	Pumping equipment lacks spares to be repaired. Standby unit cannibalized. There is no weir to direct the water from the river. PP parts defective.

Source: Ghana Water and Sewerage Corporation, 1986.

* CT = Conventional treatment; PP = Package plant; GW = Ground-water system; SF = Flow sand filter treatment plant; BH = Borchhole; LL = Low lift; HL = High lift.

3. Lack of analytical tools for proper investment evaluation

It must be said that the need for analytical tools has become necessary in countries of the developing world because, as stated earlier, the magnitude of investment needed to meet the targets of the Decade cannot be met with the funds available from both local and external sources. Therefore, before investment decisions are made, it is necessary to know which projects among the many proposed should be taken up for implementation in any particular year or plan period. This involves criteria for prioritizing the projects and ranking them. These criteria would include quantitative ones, such as the number of population to benefit; the increase in present per capita consumption; capital cost per person served; cost per additional unit of water supplied; additional amounts of water to be supplied; net present value; and benefit cost ratio. In addition, qualitative criteria must be considered, such as the geographic, economic, cultural and traditional importance of towns supplied by each system; and the prevalence of water-related diseases attributable to deficient or non-existent water supply.

Before the start of the Decade, these analytical studies and evaluations were not rigorously applied. A number of reasons account for this. First, there were no clear-cut policies from either Governments or the controlling boards of the water authorities demanding such analyses and evaluation. Even though it may have been implied in the acts of incorporation setting them up, no sanctions were applied for non-compliance. Second, engineers who are responsible for the planning divisions of the water corporations are few and more involved in day-to-day routine matters than in data collection, analysis and evaluation. Third, they may not even have been sufficiently trained to be able to carry out these tasks. Fourth, the data bases required for the analyses are usually unavailable or unreliable.

On this subject, the experience of the Ghana Water and Sewerage Corporation (1986) in preparing its capital investment programme for its Five-year Rehabilitation and Development Plan (1987-1991) is worth noting. The final document says in part:

"With regard to the cost estimates used for the exercise, the Corporation felt that the accuracy of the cost estimates of many of the proposed works is rather low, and they are sometimes based on differing unit costs and various levels of detail. Faced with acute shortages of engineering staff, it was impossible at this stage to properly examine the contents of all proposals submitted by the Regions, or to re-evaluate their costs on a uniform basis. This process will have to be followed at a later stage along with the review of plans of on-going and proposed projects. The consequence may be that certain projects will receive higher or lower priority than they appear to have at this stage. It was, however, considered that the present cost estimates were sufficiently reliable for this first analysis of priorities for the Capital Investment Programme."

There has been considerable international effort since the start of the Decade to correct these inadequacies in water authorities in countries of the third world. The effort has been led by the World Bank, followed by bilateral funding agencies such as GTZ, CIDA and ODA. They have been aimed at organizational reforms to incorporate and strengthen planning units in water agencies; establishment of management information systems, and training of personnel to be able to carry out project identification; undertaking pre-feasibility studies; project appraisal and negotiations; implementation; operation and maintenance; and project evaluation.

Strong emphasis has been laid on the analysis of the Water Supply and Sanitation Sector vis-à-vis the whole national economy. In the mean time, the experience is that foreign consultants are being used in the countries for studies.

4. Inadequate cost recovery and pricing systems

The question of cost recovery in the African region has posed problems for many Governments in the past. Because of the policies pursued by Governments, there has been the tendency to treat water as a free good which the people should be called upon to pay for directly. Changes in these policies are being forced by the magnitude of the investment, operation and maintenance costs. Some would want the urban communities to pay for water services, while these are provided free for the rural communities. This is predicated on the argument that the wealth of the urban areas has been made possible by production in the rural areas. As such, the rural areas must not be called upon to pay for this basic facility, which will improve their productive capacity to produce even more wealth for the nation. Some would also argue that urban communities should pay fully for initial investment costs, while rural communities should pay only for operation and maintenance costs. This leads to a third position suggesting that the water utilities should be managed in such a way that the profitable areas subsidize the non-profitable ones, so that overall costs and revenues balance up.

This lack of clarity of policy towards cost recovery contributes to the financial problems of the water authorities. This issue is central in rural areas, where the economic base is usually weak, and there are a multitude of different organizations pursuing parochial policies which are unco-ordinated. However, with the policy that communities should be involved and own their water supply systems, the question of them paying at least for operation and maintenance costs provides hope for relieving the financial burden on Governments.

Another point which must be mentioned in connection with cost recovery is that the acts of incorporation of water utilities usually require them to seek the approval of Governments before imposing tariffs. The experience is that in some cases because of political reasons, approvals are delayed to the extent that by the time they are given, high inflation rates, which is the bane of most African economies, have made the few tariffs ineffective. The Ghana Water and Sewerage Corporation's financial performance in recent years may be traced initially to its inability to obtain approval from the Government to a tariff increase in 1978, when it was due. It was not until 1981 that this was granted, and by then the increases had already become totally inadequate. The next tariff increase was submitted in 1982, and finally approved in February 1984, by which time the Corporation was already heavily in debt.

In Sierra Leone, communities benefiting from various water supply systems do not usually make any financial contribution towards the cost of implementation (Harleston, 1986). This is usually provided by the Government and from funds from external sources. Cost is recovered by way of labour provided during construction. Also, when the communities own the systems, they are responsible for the costs of operation and maintenance. This did not work so well in the past, but with the integrated approach introduced since 1980, recovery is better because the educational campaign has helped to create an awareness of the importance of having the systems working all the time.

In Ghana, the Government in the past provided the initial investment for both urban and rural water supplies. Tariffs were collected, but not enough to cover operation and maintenance. The Government until 1984 was expected to provide subsidies to make up the shortfall in the actual amount needed. In actual fact what was provided did not bridge the gap. Since 1984 subsidies have been stopped, and the Corporation is required to be on its own as far as operation and maintenance is concerned. Investment funds are still being provided, but very often with external assistance. The tariff policy is now for the urban areas to pay for the full cost of providing the service (initial investment and operation and maintenance costs), while in the rural areas at least the operation and maintenance costs will be recovered based on charges per household.

In Nigeria, the Federal Department for Water Resources (1986) recognizes that the cost recovery mechanism in rural areas is highly ineffective. For the urban water supply, where house and yard connections have been dominant, costs are recovered directly through metered consumption charges or flat rates. In the case of rural areas where water supply inadequacies are very acute, public standposts dominate. Instead of direct charges for water consumed, the water agencies apply some general charges on the Local Government Authority (LGA) for water supplies. The charges differ from state to state. The LGAs on the other hand, offset some of these charges through indirect taxation of people in the rural areas. The revenue generated from consumers is said to be insignificant and unable to sustain even the operation and maintenance of these facilities. Initial investment for water supply projects in both urban and rural areas are borne by the Government. The FDWR recognizes the necessity to institute appropriate cost recovery measures for equipment, chemicals and spare parts for the operation and maintenance of existing facilities. In the case of rural areas, the UNICEF-assisted Low Cost Rural Water Supply and Sanitation being carried out in the States of Gongola, Iaro and Kwara, is expected to provide information to develop an acceptable cost recovery funding system (Okeke, 1986).

In the Sudan, the instruments setting up the water authorities require that they fix rates to collect charges for services provided. As with the other countries, the initial investment costs for urban and rural water supplies are provided by the Government. In the rural areas, the communities contribute labour. For operation and maintenance, costs are recovered by cash contributions which take the form of:

- (a) Fixed amounts of money paid monthly by each family;
- (b) Fixed amounts of money collected when the need arises, e.g., in case of breakdown, shortage of fuel and purchase of spare parts;
- (c) Extra charges imposed at the source, collected normally by the water yard clerk or water committee; in some cases, the villages agree to raise the price of some rationed commodities, such as sugar and tea.

In the United Republic of Tanzania, the initial investment in both urban and rural water supplies is by the Government, with assistance from external funding agencies. The notion that water is a free good influenced a policy by which the Government also provided the funds for operation and maintenance. The failures of the past and the magnitude of the burden has forced a change in policy for the communities to own the systems and pay for operation and maintenance costs (Simonson, 1986).

5. Ineffective promotion of public support and co-operation

In connection with promotion of public support, it is important to note the views expressed by African water specialists at a seminar in Addis Ababa (ECA, 1986). They pointed out that there is a lack of awareness or appreciation of what public participation involves in its entirety. There had been the tendency to limit public participation to that of rural participation. They emphasized that it applied to the whole range, including policy making, planning, implementation, monitoring and evaluation, and all the actors needed to be sensitized or made aware of this fact. It had been the practice to plan from the top and hand it down. This did not make for good participation. Planning, project implementation and maintenance from the bottom upwards should be encouraged, and there should be good feedback or exchange of ideas between top and bottom. It was also noted that public participation had the greatest advantage of enabling the introduction of appropriate technologies, from the point of view of costs of operation and maintenance. It was noted that if an exchange of views between planners and beneficiaries was achieved, costly and inappropriate choices would be avoided.

It was also recognized that public participation was not a very easy concept to implement. Its realization required strong institutional support. In this regard, effective collaboration with other agencies who contributed to the success of water projects should be worked out. In particular, the role of departments of community development, social welfare, health, information and education should be recognized and integrated into all projects.

The costs to water authorities for neglecting the public have been heavy. Consequently, reforms are now being proposed or taking place all over, as previously shown in the cases of Sierra Leone, Ghana, Nigeria, the Sudan and the United Republic of Tanzania. The funding agencies are now making it a necessary complement in all water and sanitation projects before they provide funding.

6. Inadequate attention to groups such as women and children

Since the African social scene is dominated by men, most of the reforms have focused on men. However, it is women and children who are most involved with work connected with water. Their role in the collection and use of water is so prominent and pervasive that the earlier focus on men should be recognized as erroneous. This attitude of not recognizing the special role of women and children was very glaring at the workshop on Groundwater in Rural Water Supply held in Accra in October 1986. None of the participating countries, i.e. the Gambia, Sierra Leone, Ghana and Nigeria, paid any attention to the role of women. This is an omission which must be corrected. Women should be represented on the village water committees, and health and environmental sanitation education should focus on women and children in particular.

7. Inadequate design and monitoring of conservation measures

Both in the urban and rural areas there are urgent conservation issues that ought to be addressed. Some are of such magnitude that the water supply authorities should be organized to deal with them. In other cases other institutions, independent of the water authorities, should be made to take charge if effective monitoring and control are to be obtained. Losses of water through the distribution networks are known to be considerable. In Ghana, the GWSC estimates such losses to be 20 per cent. This increases the unit cost of water

charged to consumers. Water utilities should be capable of monitoring and eliminating such losses. The quality of water produced by the water utilities is normally according to WHO standards, but this needs independent checking from time to time by either the Ministry of Health or the national standards organization.

In systems based on ground water, Boeckh (1986) comments that in West Africa so far only a few areas face imminent dangers of large-scale ground-water pollution or aquifer depletion. In the Sudan and the United Republic of Tanzania, the depletion of aquifers, particularly in the dry season, is known. Also, the quality of ground water and sanitation around well-heads needs to be monitored from time to time.

The problem about monitoring is that there is generally no clarity about the existing institutional setup for doing so. The Ministry of Health, water authorities and local government authorities all get involved without knowing for certain where their roles begin and where they end. From a study made in the Sudan of rural water supply, Mohamed and others (1986) suggest that the Ministry of Health must play an active role in the water treatment programme and in monitoring the water supply facilities to guarantee public health and ensure that the facilities are properly operated and maintained. In Sierra Leone the Ministry of Health is required to incorporate national drinking water quality standards guidelines in the Public Health Ordinance, but this has not yet been done. The guidelines are still being worked out. Monitoring will be done by the Ministry of Health (Harleston, 1986). In Ghana, although the water corporation produces drinking water to WHO standards, there is as yet no independent check on this. In Nigeria, surveillance of public water supply is supposed to be carried out by the Ministry of Health, but its efforts are considered inadequate (FDWR, 1986).

8. Unnecessary use of high-quality water in low-priority uses

In water-scarce areas such as northern Nigeria or northern Sudan the use of high-quality water is a matter of considerable concern. Even in water-abundant areas, where the majority are not supplied with safe and adequate drinking water, it is difficult to justify a situation of this nature on grounds of social justice. The problem arises when treated water is used to flush toilets and to water lawns or household gardens or wash vehicles. The way to overcome this is to have excreta disposal facilities which do not require flushing or to use low-quality water for flushing or watering lawns. Where high-quality water is used, high tariffs can be charged to households and institutions which use flush toilets, so as to generate additional funds which can be used to meet the needs of communities which do not have access to safe drinking water.

9. Inability to use demand-spreading techniques aimed at relieving peak-demand pressures

The organizations required to introduce demand-spreading techniques, other than intermittent supply, are generally not in place. The utilities are faced with basic problems, which require solution before price-incentive techniques can be introduced. The billing systems which would require manpower and equipment for metering and monitoring are not likely to be effectively utilized within the present arrangements.

C. Legal regulations

In Africa, control of the use of water in traditional societies is governed by customary law, and has been since before and during the colonial period. During the colonial period and thereafter, water use or control was governed by administrative rules and regulations, and also by special legislation called Water Acts, as in Nigeria and the United Republic of Tanzania (URT). These acts are comprehensive and provide the general framework for water resources development (ECA, 1976). Ghana is also in the process of enacting similar legislation, to be applied under a proposed Water Resources Commission.

Another development which has occurred in the region since independence is the enactment of legislation to establish agencies responsible for individual uses of water. Examples are the public water utilities, such as the Guna Valley Water Company in Sierra Leone; the Ghana Water and Sewerage Corporation and Irrigation Development Authority in Ghana; the State Water Boards in Nigeria; the Central Electricity and Water Corporation and the Rural Water Development Corporation in the Sudan; and the recently established National Urban Water Authority in the URT.

It is obvious therefore that enactments establishing water supply authorities must take into consideration the general legal framework for water use and control in the country. In particular, their relationship with other enactments setting up other individual water organizations to develop water resources for other uses, must be clarified. Second, they should be clear in their relationship with any enactments that give authority to one national organization to formulate policies, plan, co-ordinate, monitor and evaluate overall water resources development and management in the country. Third, they should be clear vis-à-vis any enactments in connection with land planning, use and control. Fourth, they should also be clear in their relationship with the laws on local government administration in the country.

Because of lack of clarity on the above issues, implementation of the legal provisions of the water supply authorities generally tend to be ineffective. While the regulations may be clear, the institutional mechanism to ensure compliance as to who should apply sanctions, for example, is not always so. Another major stumbling block to enforcement of regulations is the people's own lack of awareness of the regulations and their usefulness in promoting health, and social and economic well-being.

1. Ineffective protection of supply sources

Inadequate protection of sources arises because the power to effect this protection is not with the water supply authorities alone, but also lies with other organizations. The result is that each expects the other to act, and eventually no action is taken. For instance, the Ghana Water and Sewerage Corporation is given power to make regulations by legislative instrument to prevent pollution of water. This applies to both the immediate environs of its surface impoundments and the overall watersheds commanded by the impoundments. But in 1974, an Environmental Protection Council (EPC) was also established and given the right to, among other things, co-ordinate the activities of all bodies concerned with environmental matters and to serve as a channel of communication between these bodies and the Government. The Corporation never made the regulations before the EPC was established. It is now assumed that the EPC should make the regulations. The EPC

started to deal with this matter in 1976. So far it has not been able to get a law passed on water pollution in the country.

In the mean time, therefore, the GWSC itself has not made the necessary regulations to prevent pollution in the immediate environs of its impoundments. Of course, as stated earlier, pollution control in the whole of the watershed is an area which has been assumed to be the domain of the Environmental Protection Council. The EPC itself is also finding problems with exercising this function because it has neither the organization, nor the manpower, nor the financial resources to do so. It is now being proposed that the local government administration should be brought in. But here again the manpower and financial constraints are equally operative, if not more so.

In Sierra Leone, according to Harleston (1986), the Ministry of Health, under its Environmental Health Division, carries out surveillance of drinking water quality and pollution control, under the Environment Health Ordinance of 1960. In the Sudan, water pollution control is effected under the 1975 Environmental Health Ordinance issued by the Ministry of Health.

In the case of ground-water sources of supply, the question of protection runs into trouble because of the same organizational and resource constraints. It is important that the well-heads of borehole supplies should be kept sanitary. This is almost a daily duty. As already pointed out, the water authorities are not organized at the community or village level to be able to do this. It was also shown earlier that the local councils cannot discharge this function. The only solution is to make it the responsibility of the communities. Now that community involvement and ownership of the water supply system have been accepted and are being promoted, it is expected that this problem of protection of the supply sources at the community level at least will be more effectively solved. Periodic monitoring by the health authorities will be necessary.

2. Inadequate definition of priorities and preferences

It is important that the water laws should be clear as to the priorities that should be attached to the use of water for various purposes, whether for drinking, irrigation, power generation, or river transportation. These priorities must be based, among other things, upon the water availability situation in particular areas of country. Thus, in water-deficient areas, the law must be clear as to preferences for meeting basic needs such as domestic water supply and food production. In the water-abundant areas, other uses can be catered for, such as hydropower generation, if the physical conditions are favourable. However, the law must be specific as to which needs must have priority in times of water shortage and during drought. As the African drought of 1981-1983 demonstrated, it is necessary that such situations should be anticipated and provision made in the law to take care of them.

In Ghana, the Ghana Water and Sewerage Corporation, under section 15(2) of its act of incorporation (Act 310 of 1965), says that the Corporation has preference over other authorities in the use of water resources for public, domestic and industrial purposes. Though this power seems adequate in the priority that it was established, its implementation could create difficulties in situations of conflict. There is therefore a need for refinement here, because the conditions under which this will hold are not stated. If it should be considered more important to supply water for domestic purposes, there could be a conflict with the

Irrigation Development Authority, which believes that food to feed the people is equally or more important and should therefore have preference over the use of available water. There is no body to resolve such conflicts in Ghana promptly, but it is hoped that the proposed Water Resources Commission will be given powers to deal with situations of this nature. Similarly, in Sierra Leone and the Sudan there is at present no single body with overall responsibility for managing water resources.

To avoid such conflicts, national priorities should be spelled out clearly in an appropriate legislation giving powers to an approved authority to allocate water for preferred uses under normal and emergency situations. In the Tanzanian situation, the Water Division of the Ministry of Water and Energy is one organization which deals with data collection, water resources assessment and development for domestic water supply, as well as water law and water allocation. It is easier to resolve such conflicts through such a body (Ayibotele, 1986). Also in Nigeria, because the Department for Water Resources has been given overall responsibility for the management of water resources, such conflicts are likely to be more easily resolved.

3. Rigid allocation mechanisms hampering the transfer and reallocation of water rights

The benefits that accrue when water is used for different purposes depend on the quantities of water allocated, the goods produced and their prices on the market, the social preferences of the goods produced, etc. The factors change with time. Hence the water allocation provisions must be made flexible and adaptable in such a way that the benefits can be maximized. Unfortunately, this is not normally the case. Examples can be found in the allocation of water for domestic water uses and for irrigated agriculture. The initial planning and designs allocate fixed quantities of water to the various water bodies that have been given rights over particular resources. Changing situations are not taken into account, and the beneficiaries lose an opportunity to maximize their benefits. Such a situation can be found in Ghana, in the matter of the Weiija and Tono Reservoirs, which are used for domestic water supply and irrigation. Similarly, problems exist in the selected countries for internal rivers and also for transboundary rivers. A flexible allocation provision which can transfer rights from one use to another in one year and do a different allocation in another year requires capability in water resources system planning, and simulation and optimization techniques which are not readily available to water authorities in the region.

4. Inadequate and cumbersome enforcement of rules

Sometimes the regulations made by the water authorities for the monitoring and control of their operations do not take into account their organizational capacity to implement them. For instance, in Ghana consumers are required to pay their water bills within 28 days of receipt of their bills. Failure to do so will result in disconnection of supply by the Ghana Water and Sewerage Corporation. However, the bills, which are computer prepared, are at least two months out of date. This is because it takes time for the revenue offices to feed details about payments to the computer. Therefore, consumers are sometimes disconnected when they have actually settled their bills. This creates considerable embarrassment for both the consumer and the corporation. The organizational capacity could be improved if up-to-date bills were prepared and the enforcement of payment within 28 days were adhered to.

5. Lenient application of sanctions and penalties

The first cause of lenient enforcement can be attributed to the perception of the law by the staff of the water agencies entrusted with enforcement. The lack of adequate perceptions is responsible for the tendency to punish even serious offences leniently. The proper education of such personnel will improve the situation. Moreover, sanctions are not updated regularly, with the result that with time they lose their effect. For example, a fine of \$200 10 years ago would not have the same deterrent effect today. Another factor is that where staff are not properly remunerated they find their own means of dealing with offenders and line their pockets in the process. Finally, enforcement is difficult when the offenders are powerful companies. Their operations usually have significant impact over the national or regional economies. They always threaten to close down their operations when complaints are made about pollution from effluents discharged by them. For fear of losing revenue, the authorities let them off.

6. Ineffective collection of tariffs and service charges

In most cases, before the start of the Decade it was not the practice to collect tariffs and service charges for water supply in many African countries. However, for reasons stated earlier, the situation has changed. In the urban areas, where supply is by house connections or public stand-pipes, it is possible to collect tariffs by disconnecting those who do not pay. The organizational structure, the manpower and the service provided must be adequate. However at the local levels, where the organization and staff are not in place, it is not possible for water authorities to collect tariffs effectively. As the tariffs cannot be collected, the funds to purchase spares and consumables to operate and maintain the systems are denied the utilities. The systems therefore break down often, or no service is provided. As the beneficiaries do not receive service, they also refuse to pay. Thus a vicious circle is created. In the URT, Balaile (1986) points out that owing to such problems it was not unusual to have only 30 per cent of the total schemes working at any time. Sometimes there is also a difficulty in keeping records as to who has paid and who has not. Since it has now been accepted that the water supply systems would be owned by the communities through their direct participation, this problem could be on the verge of being solved. They will be required to fix their own tariffs within general guidelines to be provided nationally. The importance of proper motivation of staff by adequate remuneration is relevant here.

7. Inadequate definition of standards for facilities, equipment and domestic fittings

Invariably there are regulations covering equipment and facilities which have been enacted by the water utilities. In view of the lack of funds to finance water supply projects, there has been appreciable reliance on external assistance, mainly in the form of grants or soft loans from bilateral or multilateral sources. Often the assistance has been tied to the technical assistance (consultants) and equipment of the donor countries. The result is that recipient countries have found it difficult to standardize equipment and facilities. An idea of the difficulties which national water agencies face in this area can be seen from Maps 1 and 4 showing the regions of influence of multilateral and bilateral agencies in Sierra Leone and the United Republic of Tanzania (URT) respectively. Generally, if a country is not prepared to accept equipment from a donor country it is difficult to receive assistance. In the URT, the problem created by having different techniques and equipment and facilities used by the various donors and

the need to find acceptable solutions was one of the reasons for the Arusha Seminar organized in 1986.

At the base of these problems is that the water supply organizations do not have manpower experienced enough to ensure that the contracts under which the donors and their chosen consultants operate are specified to common standards. The donors invariably are left to themselves, and there are no legal or administrative regulations requiring them to integrate their work properly into the organization that exists at the various levels of technical administration.

8. Ineffective regulation and use of in-house facilities such as roof-catchment systems and cisterns

The in-house facilities used for collecting and storing water in homes are the individual choices of families. However, the public health laws require that these facilities be maintained and cleaned from time to time so that they do not become agents for transmitting water-borne or water-associated diseases. Public health inspectors are expected to go into houses to check that house-owners keep to the regulations. In Ghana this was regularly carried out in the early 1960s. However the system of inspection has broken down. This results from inadequate manpower to cope with the increased number of houses in the urban areas, and to lack of clear-cut policies as to whether the health ministry or local government ministry should be responsible, particularly at the community/village levels.

9. Inadequacy of enabling legislation

Legislation is considered inadequate in the following areas:

- (a) Metering;
- (b) Inspection of sites and closure or penalties for unlawful works;
- (c) Requirements for in-house facilities;
- (d) Expropriation of water rights, law and facilities, and imposition of rights of way.

Invariably the legal instruments setting up the water supply authorities contain clauses which empower them to make regulations, usually by legislative instruments to enable them to carry out their functions effectively. As long as the water authorities were operating as centralized organizations without involvement at the community or village level, the enabling regulations could be considered adequate. For instance, the Ghana Water and Sewerage Corporation Act 310 of 1965, under section 14, gives power to the corporation to make regulations for the following:

- "(a) In respect of such matters as are required under this Act to be prescribed;
- (b) Fixing water rates, sewerage charges, and other fees necessary for giving effect to any matter specified in this Act;
- (c) For the prevention of the waste of water;
- (d) For the suspension of water supply;

(e) For the prevention of the pollution of water;

(f) For the inspection of any appliances whereby or in connection with which water is supplied or sewerage systems are established;

(g) For the conditions of service of the staff of the Corporation including conditions for the establishment of Provident Fund Scheme; and

(h) For any other matters for carrying out the principles and provisions of this Act."

The expropriation of water rights, law and facilities and imposition of rights of way is covered by section 2(3) as follows:

"For the purpose of carrying out any of its objects the Corporation may, by its officers, other employees or agents

(a) after giving notice to the owner or occupier of any land or premises, enter upon any such land or premises and thereon dig trenches, lay pipes and do other acts reasonably necessary for carrying out such objects, and

(b) enter any road or place to which the public have access for carrying out such objects;

Provided that the Corporation shall do as little damage as possible in the exercise of its powers under this section, and shall compensate for any damage caused by the exercise of such powers, and the liability for and the amount of, the compensation shall, in case of difference, be settled in accordance with the provisions of the Arbitration Act, 1961 (Act 38)."

As such it can be said that all the essential elements have been incorporated in the GWSC Act to take care of the concerns listed above. They have also been expanded in the Legislative Instrument 1233 of 1979.

If the decade targets are to be met, these have to be translated into action at the district, community/village levels. It is here that the enabling regulations are inadequate. However, it must be pointed out that the law establishing the corporation does make provision for its relationship with local councils. Under section 15(1), the relationship is set out as follows:

"A council within the meaning of the Local Government Act, 1961 (Act 54) shall exercise any object conferred or deemed to be conferred under that Act, subject to such directions as may be given by the Corporation, if such object is connected with or incidental to an object of the Corporation specified in Section 2 of this Act."

This provision is certainly inadequate as has been found from experience. It does not really address the structure of local government and the degree of decentralization of government activities. The need for the Ghana Water and Sewerage to decentralize itself from its current centralized structure has been recognized, and efforts are being made to get an amended law passed for the Corporation which will correct these inadequacies, among others. To be effective the amended law must not be viewed as an end in itself, but the necessary resources in trained manpower and finances will have to be provided to facilitate implementation.

II. TOWARDS MORE EFFECTIVE DRINKING WATER SUPPLY AND SANITATION SYSTEMS

The foregoing has shown that if the countries of the African region are to attain the targets they have set for themselves under the International Drinking Water Supply and Sanitation Decade, then each must, as a matter of urgency, undertake to evaluate the adequacy of the institutional and legal structures of their water supply and sanitation bodies. The object will be to introduce such reforms as will be necessary to improve and expand services, particularly to the rural areas.

A. Recommendations for organization of the sector

1. Standards for planning and evaluation

Varying standards for planning and evaluation are used. Some have been adopted from other regions and do not suit well the social and economic circumstances of the African region. To arrive at realistic standards, it is recommended that studies should be undertaken to establish:

- (a) Standards for per capita water consumption for urban and rural areas;
- (b) Water quality standards that suit national circumstances;
- (c) Standards for sanitation facilities in urban and rural areas.

These must take into account such factors as the level of service, extent of involvement of the communities and type of technologies that can be afforded.

2. Co-ordination of the sector

Because of the importance of water and sanitation to the overall economy, agencies in other sectors have varying interests in it. In fact the role of the ministries of agriculture, rural development, and health and local government in particular, must be recognized and taken into account in any organizational structure of a water supply and sanitation body.

To this end, it is recommended that African countries should review their organizational structures for water supply and sanitation in order to:

- (a) Strengthen or reorganize them to be able to deal effectively with needs in the rural areas as these are most pressing. This should be related to local government administration in the country;
- (b) Clarify and co-ordinate the activities of other national agencies engaged in the field;
- (c) Co-ordinate in particular the activities of external funding agencies, be they governmental or non-governmental, and ensure that they work through the national authority having overall responsibility for the sector. The external agencies must work according to national priorities and plans in the various regions and districts of the country.

3. Regional balance of services

There is a serious imbalance between the resources allocated to the urban and rural communities. This should be corrected in order to improve the productive base of the African economies. To this end, the following are recommended:

(a) Governments must make every effort to allocate more funds to the rural areas;

(b) More funds must be mobilized for (a); hence costs must be recovered from the urban systems for investment, operation and maintenance;

(c) Conventional techniques, with their initial high costs and operation and maintenance problems, should be avoided. Low-cost techniques which can be afforded, operated and maintained by the local people should be used;

(d) Universities in the region must as a matter of urgency teach low-cost water supply and sanitation techniques in addition to conventional traditionally taught methods.

4. Adequate internal organization

There is a need for organizational reforms in water and sanitation utilities, so that their services go beyond engineering to serving the people. To achieve this end, it is recommended that:

(a) Urban operations and maintenance be strengthened;

(b) Adequate and workable operation and maintenance systems are installed in rural areas, taking into account the peculiar circumstances of the beneficiaries;

(c) Links with agencies responsible for community mobilization be clearly spelled out;

(d) Similarly, links with agencies responsible for health, education and environmental sanitation be strengthened;

(e) Adequate funds be made available to invest in the above reforms.

5. Community participation

In view of the magnitude of the resources required to meet the decade targets and the limitation of funds, it is necessary that additional internal resources be mobilized by involving the communities. To this end, it is recommended that:

(a) Water supply bodies decentralize their operations taking into account local government administration;

(b) Communities in the rural areas, where management of water supply and sanitation systems is more difficult, should be mobilized to participate and assume specific responsibilities;

(c) Governments review their policies towards the private sector and encourage them to take over part of the investment load. Guarantees of the security of investment and adequate returns will have to be worked out to suit national conditions;

(d) Specifically, community participation should mobilize people to:

- (i) Assist in choosing sites, clearing and digging for construction;
- (ii) Provide sand, stones, water and other locally available materials for construction;
- (iii) Provide a number of able-bodied men and women on a daily basis or for a period (paid or unpaid labour) to assist with construction;
- (iv) Provide boarding and lodging for members of visiting project staff in the villages during construction, if necessary;
- (v) Provide secured rooms for storage of construction materials, tools and equipment, and appoint responsible persons as watchmen, usually in the absence of project personnel from the village;
- (vi) Participate fully in related health, environmental, sanitation, education and other self-help activities provided in the villages;
- (vii) Assume some measure of responsibility for the operation and maintenance of the water supply unit upon its completion.

B. Basic managerial requirements

1. Operation, maintenance and monitoring

For effective operation and maintenance and monitoring, it is recommended that:

- (a) The responsibility should be clearly assigned;
- (b) Those responsible must be trained in their respective roles;
- (c) Resources required must be provided;
- (d) Maintenance schedules should be followed and monitored;

(e) In the rural areas in particular, the final goal is to involve the communities in the maintenance of their systems, by ensuring the institution of water-user committees in each village, which are responsible for the determination of water rates and the nomination of one or two persons to serve as pump caretakers. The caretakers will be responsible for keeping the bore-hole surroundings clear, supervising the proper use of water points, carrying out maintenance, and reporting breakdowns to the water authorities maintenance offices at the district offices. This must be associated with educational campaigns on health and environmental sanitation.

2. Evaluation of alternative means to satisfy needs and targets

There is need to create or strengthen the capabilities of water utilities to analyse and make appropriate choices for satisfying needs and targets. To be able to do this effectively, it is recommended that:

(a) A division to undertake studies, planning and design should be set up in the water authorities, or existing ones strengthened;

(b) Capabilities of staff to undertake studies, planning and design should be improved by relevant training;

(c) Data and information on the water supply systems, as well as on the consumers and their needs should be collected on a regular basis;

(d) Special efforts should be made to strengthen the data-gathering effort on the rural systems.

3. Improved procedures for investment evaluation

As recommended earlier, a division for project preparation, evaluation and implementation needs to be established or strengthened in the water authorities. Staff should be trained to undertake project identification, pre-feasibility and feasibility studies. The use of analytical tools in project appraisal, evaluation and setting priorities should be included. Relevant data bases need to be established or strengthened.

4. Adequate cost recovery and pricing systems

In each country, cost-recovery policies should be clearly spelled out, taking into account the existing socio-economic situation. To this end, it is recommended that:

(a) In urban areas, where economic conditions are more favourable, investment costs and operation and maintenance costs should be recovered fully;

(b) In rural areas, the investment cost should be borne by the central government, while the operation and maintenance costs are borne fully by the communities. In situations where they have the means, the communities should also bear all or part of the initial investment costs;

(c) Under these general guidelines, each community should be left free to work out how it is going to price its water and recover the cost. It must be recognized, however, that different approaches are likely to be used in different communities in the same country;

(d) Governments in the regions should act promptly on the request by their water agencies to increase tariffs. The legal instruments may be amended to give Governments a maximum period of time to react in order to avoid deterioration in the financial position of water utilities.

5. Promotion of community and private participation

It is recommended that units dealing with the public must be established in the water utilities and provided with the necessary facilities to be able to do their work effectively. It is also recommended that these units be charged with the following functions:

(a) Creating public awareness that water is not a free good, and that it has to be paid for;

(b) Discussing with the community projects being planned or executed in their areas, the benefits to be derived therefrom, and the public's feedback;

(c) Liaising with other agencies, e.g. local government ministries, health, community development, and agriculture in ensuring community participation at local village levels.

6. Adequate regard for groups such as women and children

It is recommended that in view of the pervasive role played by women and children in the collection, transport and use of water:

(a) Women should be represented on the village water committees and should participate in the planning, construction, operation and maintenance of community water projects;

(b) They should be taught especially the correct ways of operating hand pumps;

(c) They should be special targets of education in health and environmental sanitation;

(d) The primary school circular and syllabus should include and/or emphasize water-borne and water-associated diseases, environmental sanitation and their impact on health.

7. Adequate design and monitoring of conservation measures

Conservation measures need to be very much improved. To this end it is recommended that:

(a) A properly designed metering of the pipe distribution networks be instituted to monitor losses so that early measures can be taken to eliminate them and conserve water;

(b) Samples of water should be taken periodically at selected points in the distribution networks to ensure that the water produced at treatment works is not contaminated in the process of distribution and delivery to consumers;

(c) The public health departments of local governments should ensure that the cleanliness around well-heads managed by village-level operation and maintenance committees is monitored to prevent pollution of ground water;

(d) For ground-water supplies, a network of ground-water-monitoring stations should be established to monitor aquifer behaviour, particularly with regard to depletion.

8. Selective use of high-quality water in high-priority uses

The choice of excreta disposal facilities to be introduced in urban areas in particular, should be critically examined, in order to avoid systems that use high-quality water for disposal. Water-disposal systems should be used only where there are no other appropriate alternatives. If it becomes inevitable to use high-quality water, then consumers should be made to pay extra tariffs to generate additional funds for investment in areas where communities do not have access to safe drinking water.

In water-scarce areas, it should either be prohibited altogether to use treated water for gardening or car washing or high tariffs should be introduced to curb such uses.

9. Introduction of demand-spreading techniques aimed at relieving peak-demand pressures

In order to reduce pressures on water utilities during peak-demand periods, supplies to commercial and industrial areas can be shut down during mornings and evenings while supplies to residential areas are opened. In the same way, supplies to commercial and industrial areas should be opened, and supplies to residential areas should be shut down during working hours.

For those industries that operate 24 hours a day, special high tariffs should be introduced for taking water in the area in which they are located.

C. Effective legal systems

There is a need for general legal reforms to amend, clarify and strengthen the water laws in the region. Each country should therefore undertake a general review of its water laws in order to harmonize the legal provisions setting up the water utilities with those establishing other water organizations.

1. Protection of supply sources

It is recommended that responsibility for the protection of immediate environs of supply sources should be given to the water corporation, in the case of urban centralized supplies; or the community/village water maintenance committees, in the case of rural supplies. The catchment outside the immediate environs of supply sources should be the responsibility of the national body charged with overall pollution control.

2. Definition of priorities and preferences

It is recommended that legal provisions with regard to priorities should be reviewed by countries in the region so as to define clearly the order of priority of water use for various purposes. These should take account of the water availability situation in various regions of the country. The laws should also be clear as to who determines the priorities and streamlined ways of enforcing them.

3. Flexible allocation mechanisms

It is recommended that regulations conferring water rights should be made flexible, so that in any particular situation water can be allocated in a way that will maximize benefits accruing to a region or to the country as a whole. This should be backed up by giving the relevant authorities capabilities in water resources systems planning, and simulation and optimization techniques.

4. Adequate enforcement of rules on use and conservation

To avoid the confusion that arises from having many agencies enforcing rules, with the result that nothing gets done, it is recommended that:

(a) Laws on water use and conservation be harmonized and streamlined, so as to remove conflicts;

(b) Responsibility for enforcement should be clearly assigned, having regard to the administrative, organizational and legal structure for water resources management in each country;

(c) Laws should specify clearly and simplify the procedure for dealing with offenders.

5. Application of sanctions and penalties

It is recommended that:

(a) Sanctions and penalties should be kept constantly under review and updated as and when necessary to correspond with prevailing conditions so that they do not lose their deterring effect;

(b) Staff should be educated to have an appreciation of the need for laws;

(c) Staff of water utilities should be sufficiently remunerated to prevent them from setting up "their own courts";

(d) Powerful companies should not be spared in spite of their claims to contribute to the economy; this is because a functioning and viable environment is in the long run more beneficial to the nation.

6. Adequate definition of standards for facilities, equipment and domestic fittings

It is recommended that in view of the economic situation in the countries and the lack of manufacturing capacities, the regulations regarding standards be reviewed and made flexible to accommodate what can be obtained. Donor countries should be requested to respect the standards of recipient countries and help with their standardization efforts. As early as possible, the capability to manufacture simple equipment should be acquired.

7. Effective regulation and use of in-house facilities such as roof-catchment systems and cisterns

It is recommended that the regulations which are normally covered under the public health laws should be strengthened. The public health authorities under the Ministry of Health should be given the resources to enforce these regulations.

8. Enactment of enabling legislation

The enabling legislation to allow the water authorities to make regulations to carry out their various functions effectively should be reviewed and brought up to date. The regulations should take into account changes in local government administration and the personnel and resources to enforce them. The legislation should take account of the need to enforce regulations in rural areas. In countries where no such regulations exist, efforts should be made to enact them.

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Part Two

INSTITUTIONAL ASPECTS OF WATER SUPPLY AND SANITATION
IN ASIA

INTRODUCTION

Lack of access to safe water and sanitation for the overwhelming majority of the poor throughout the world poses, in the words of the United Nations Water Conference 1977, "a fundamental challenge facing all mankind". 1/ Ironically, the problem is not technical. Even with the existing technology, the world has enough water to meet basic human needs for potable water. However, what is lacking is the institutional and legal mechanisms that can mobilize adequate resources to install, operate and maintain safe water supply and sanitation systems, especially for the rural poor. As a World Bank report rightly emphasized, "Institutional weakness is probably the most important single problem in rural water supply". 2/ These weaknesses are further aggravated by the failure of the invisible hand of the market to ensure optimum utilization of water, which is primarily characterized by common ownership, externalities or third-party effects. 3/ The evolution of an appropriate institutional and legal framework is, therefore, an essential pre-condition for harnessing a fugitive resource like water for the welfare of the poor in the developing countries.

This paper seeks to analyse the legal and institutional factors affecting the implementation in Asia of the International Drinking Water Supply and Sanitation Decade's I (DWSSD) objective of providing universal access to safe water and sanitation by 1990.

The findings of this study are primarily based on a comparative analysis of water supply and sanitation systems in five selected countries - Bangladesh, India, China, Malaysia and Iraq. These countries contain more than 70 per cent of Asia's population and represent different geographical subregions. They are at various levels of economic, political and social development. The per capita income of these countries ranges from \$US 130 (in Bangladesh) to \$US 2,300 (in Iraq) (see table 7).

They also represent different types of political system: India is a federal multi-party republic; Iraq a unitary single party republic; Malaysia a federal constitutional monarchy; China a single party people's republic; and, Bangladesh, a unitary multi-party republic. The percentage of population in rural areas varies between 30 per cent in Iraq and 82 per cent in Bangladesh (see table 7).

Table 7. Socio-economic indicators of selected Asian countries

Indicator	Bangladesh	India	China	Malaysia	Iraq
1. Total population (millions)	98.1	749.2	1 029.2	15.3	15.1
2. Total area (1,000 sq km)	144	3 288	9 561	330	435
3. GNP per capita (\$US in 1984)	130	260	310	1 980	2 300
4. Life expectancy at birth (years)	50	56	69	69	60
5. Daily calorie supply as per cent of total requirements (1983)	81	96	111	111	118
6. Rural population as per cent of total population	82	75	78	69	30
7. Population per physician (in 1981)	9 010	2 610	1 730	3 920	1 790

Source: World Bank, World Development Report, 1986 (Washington D.C., 1986).

I. CONSTRAINTS TO DEVELOPMENT OF DRINKING WATER SUPPLY AND SANITATION SYSTEMS

Asia today contains an unprecedented concentration of extreme poverty. More than two thirds of the world's extreme poor live in Asia. 4/ The magnitude of Asia's drinking water and sanitation problems is therefore colossal. According to WHO estimates, at least two thirds of those without adequate water supplies live in South and South-East Asia. 5/ The problems of providing water and sanitation to Asia's poor are compounded by the fact that the overwhelming majority of them are scattered in rural areas. Seventy-two per cent of the world's rural population live in Asia. The major constraints to provision of safe drinking water and sanitation may be discussed under three headings:

- Constraints arising out of organizational structures and regulations;
- Constraints relating to managerial practices; and
- Constraints arising out of lack of legal regulations.

A. Organizational structures and regulations

Despite the urgency of the problem, appropriate organizational structures for providing safe water and sanitation services have not evolved as yet in most of the developing countries. At national levels, there is a tremendous outpouring of pious wishes for the goals of IDWSSD, and a plethora of understaffed and ineffective organizations dealing with drinking water and sanitation. At grass-roots levels, the institutions are, moreover, either rudimentary or non-existent.

1. Proliferation of entities with overlapping functions

Several factors contribute to proliferation of organizations with overlapping functions in this sector. First, because of the importance of safe water and sanitation, all levels of government (national, state and local) are anxious to meet the basic needs in this sector. Secondly, within national and state governments a number of ministries and departments (e.g., health, public works, local government, rural development, and urban development) are directly concerned with the provision of water supply and sanitation facilities. Lastly, the design of water supply and sanitation projects varies according to size and standards of service. As a result, different types of organizations are needed for operating water and sewerage systems in various areas of a country.

In the People's Republic of China, urban water supply and sanitation is the responsibility of municipal administration. Three municipalities in China (Beijing, Tienjin and Shanghai) report directly to the central Government; 242 municipalities are controlled by provincial governments, of which 221 had piped water in 1984. However, the provision of safe water and sanitation in rural areas is a much more complex task. According to one estimate, there are 5 million villages in China with an average population of 160.4 per village. 6/ Rural water supply in China is governed by a policy of "self-reliance" (i.e., local and individual finance). Article 107 of the constitution of the People's Republic of China lays down that local government at and above the county level shall conduct

administrative work concerning public health within the limits of its authority. 7/ There are also residents' committees and villagers' committees for self-management of public health activities at the grass-roots levels.

Normally, economic organizations such as production brigades and production teams are responsible for providing water supply and sanitation facilities. In principle, aid from the provincial government or higher levels of local governments is available for the poorer communities, although they are of course, advised to rely mainly on their own efforts to attain self-reliance in water supply. Such assistance is generally needed in backward mountain communities which constitute about 56 per cent of rural counties in China. 8/ The main responsibility of the national Government is health education through public health campaigns. For example, the National Patriotic Health Campaign is responsible for China's participation in the IDWSSD. The para-medics, the barefoot doctors, are trained by the state to educate people in water quality control. They provide technical services to rural people in selection of the best sources of water, in improving drinking water supply by protecting and treating water, and in conducting drinking water surveys as an essential step in maintaining the quality of water. 9/

In Malaysia, the provision of drinking water and sanitation facilities is the constitutional responsibility of the states. At present, there is no uniformity in water supply administration. At the state level, there are three types of organization which implement water supply and sanitation projects: the Public Works Department (PWD); the Water Department; and the Water Board. In order to accelerate the development of water supply, a specialized Water Supply Department has been established in the states of Negeri Sembilan, Perak, Selangor, Terengganu and Johor. 10/ However, in the newly developed areas in the forests, water and sanitation facilities are provided by the Federal Government through the Federal Land Development Authority (FELDA) and regional development authorities. The Federal Government in Malaysia assists state governments and other agencies for improved water supply and sanitation.

In India, water supply and sanitation is the constitutional responsibility of the state governments. However, "the organizational pattern for execution of water supply and sanitation schemes varies not only between different states, but also in the state itself in the case of many states". 11/ In most states it is now realized that the Public Works Department (PWD) is not adequately staffed and equipped to install and operate water and sanitation systems. In many states, specialized water supply and sewerage boards have been established. Such boards combine the flexibility of parastatal agencies and the expertise of professional engineering departments. Apart from the state government, the Federal Government provides financial assistance for water supply and sanitation through the Minimum Needs Programme (MNP); the Accelerated Rural Water Supply Programme (ARP); incentive schemes; and Rural Low Cost Sanitation Projects. These programmes are executed by a variety of agencies such as the Public Health Engineering Department (PHED), Panchayati raj, Community Development Department, Rural Engineering Department, provincial PWD and central PWD. In some cases, these projects are executed in collaboration with local governments. In other cases, they are undertaken as components of national programmes for rural development. In urban areas of India, three types of organizations are responsible for water supply and sanitation systems; (a) a specialized agency for water supply and sanitation (e.g. Calcutta Metropolitan Development Authority and Bangalore Water Supply and Sewerage

Board); (b) a department in the municipal administration (e.g. Bombay Municipal Corporation); or (c) a project of the state government but operated in co-operation with the municipality.

Unlike India and Malaysia, Bangladesh is a unitary State. The responsibility for providing safe water and sanitation rests with the National Government. In two major cities, these facilities are provided by specialized agencies, e.g. the Water and Sewerage Development Authority in Dhaka and Chittagong. In 57 out of 62 district towns (excluding Dhaka and Chittagong), piped water systems were installed by the National Government through the Department of Public Health Engineering (DPHE) and the Local Government Engineering Bureau (LGEB) of the Ministry of Local Government. The rural water supply and sanitation projects are administered by the DPHE in co-operation with the local government, particularly the upazila parishads. Under a recent administrative decentralization, the upazila parishads have been authorized to supervise the execution of rural water supply and sanitation projects in their respective jurisdictions. Moreover, tubewells for irrigation, which were supplied through co-operative societies and commercial banks, are also often used for water supply purposes. Health education is the responsibility of the Ministry of Health.

In Iraq, there are two types of institutions for water supply and sanitation. The State Organization for Water and Sewerage is responsible for water supply and sanitation for the whole country, except the metropolitan area of Greater Baghdad. There are two separate water and sewerage authorities in the Greater Baghdad area, the Baghdad Water Supply Administration and the Baghdad Sewerage Board. The activities of these agencies are co-ordinated by the Department of Constructions, Buildings and Services of the Ministry of Planning. Apart from these agencies, the Department for Human Environmental Health of the Ministry of Health is responsible for controlling the quality of drinking water, as well as for conducting health education.

The recent institutional changes in Asian countries, especially in India and Malaysia, underscore the importance of combining urban and rural water supply systems under one semi-autonomous water board. As Saunders and Warford point out, such a board could: (a) provide a more stable source of revenue to subsidize rural operation and maintenance expenses; and (b) assure greater availability of experienced engineers to supervise and provide technical assistance in operation and maintenance. ^{12/} Such technocratic organizations, however, may undercut the autonomy of local governments and municipal organizations. There is thus a trade-off in the water and sanitation sector between operational efficiency and public accountability.

2. Lack of standards for planning and evaluation of programmes and projects

From the technological point of view, there is a wide choice of water supply and sanitation techniques. For example, drinking water may be supplied from unpiped sources, piped supply with standpipes, yard tap or house connection for internal plumbing. The alternative sanitation technologies include pour-flush toilet, pit latrine, communal toilet, vacuum-truck cartage, low-cost septic tank, composting toilet, bucket cartage, sewer aquaprivy, aquaprivy, Japanese vacuum truck cartage, septic tanks and sewerage. There is a trade-off between economic cost and the level of safety of drinking water. According to World Bank estimates, construction costs for water distribution systems can range from \$10 per person for standpipe service to over \$100 per person for service through house connection

(in 1980 prices). ^{13/} The cost in individual house connections will be much higher in small and isolated communities. On the other hand, the longer the distance from the distribution point, the greater the probability of water contamination. The installation of house connections leads to an increase in the consumption of water. This apparently beneficial act may in turn create a health hazard if there is no drainage system for the disposal of waste water. Similar trade-offs exist in quality standards for water supply. For example, standards which have little bearing on health (such as hardness of the water or presence of iron, manganese or chlorides) may lead to two types of problems. First, the villagers may prefer contaminated water from traditional sources to ground water with high iron and manganese content, which has a distinctive taste and discolours laundry and food. Secondly, water supply systems in such cases may suffer from encrustation and corrosion.

The range of sanitation cost is wider than that of water supply. The per person cost of a water-borne sewerage system is 20 times higher than that for a dry on-site system. The technical feasibility of sanitation technology should be evaluated on economic consideration. The social acceptability of the technology should also be taken into account. Thus it is very difficult to lay down uniform standards for sanitation in a country.

The special variations in the quality of water impede the enforcement of uniform water quality standards throughout a country. For example, in the north-east and north-west regions and in Shandong province in China, unusual concentration of fluoride affects 45 million people. ^{14/} There is also a problem of bitter alkaline water affecting 60 million people in China. Moreover, the water quality standards prescribed by WHO are not enforced in much of rural Iraq. Ground water with concentrations of up to 2,500 ppm is considered suitable for drinking in rural Iraq. This limit may be as high as 3,000 ppm provided that the nitrate content is less than 50 ppm. ^{15/} Moreover, bacteriological tests are not made for the ground water in rural areas of Iraq. Similar problems exist in the states of Rajasthan, Karnataka, Maharashtra, Bihar, Orissa and Uttar Pradesh in India. The quality of water is also unacceptable in the coastal areas of south-western Bangladesh.

Following Feachem and others, water supply schemes in developing countries may be divided into two categories: economic schemes and humanitarian schemes. ^{16/} The main criterion for economic schemes is the willingness and ability of the beneficiaries to bear the cost of capital, operation and maintenance of such projects. The economic issue is not confined to mobilization of resources alone. As Saunders and Warford suggest, "There is some evidence that villages tend to value their water systems more highly, make better use of the systems and operate and maintain them more efficiently, when they have combined resources (labour or money) to help cover construction costs, and are paying user fees which at least cover operation and maintenance costs." ^{17/}

However, the system of collecting local contributions for water supply and sanitation has some serious weaknesses in the least developed countries. The subsidized water supply and sanitation facilities under this system are most often monopolized by the rural élites and the rich. As the Water Supply and Sanitation Sector study in Bangladesh reports, tubewell allocation practices favour the richer and more influential villagers (approximately 5 to 10 per cent of the rural population), and thereby reinforce the control of the rural rich in water

supply. 18/ Thus the rural poor are denied access to water supply and sanitation facilities.

The main criteria for schemes provided on humanitarian grounds are the distance, reliability and quality of existing supplies. The more adverse those characteristics are, the higher the priority. This approach is followed in India, where 231,000 villages were identified as problem villages. According to official estimates, 192,000 problem villages have already been supplied with water, and the balance will be covered during the Seventh Five-Year Plan. The policy is to supply at least one source of safe water in each problem village. However, because of social restrictions, additional sources/water collection points may have to be provided for certain segments of the communities.

3. Concentration of services in urban or other favoured areas

The "urban bias" which afflicts the economic life of most of the developing countries is also evident in the water supply and sanitation sector. In all five selected Asian countries, the percentage of urban population covered by public water supply and sanitation system is considerably higher than that of the rural areas (see table 8).

Table 8. Access to community water supply services in selected Asian countries, 1980-81

Selected country	Water Supply		
	Urban (percentage of population served)	Rural	Total
China	50.0	40.0	42.2
Iraq	97.0	22.0	70.0
India	77.8	31.0	41.3
Malaysia	89.0	42.9	58.7
Bangladesh	46.2	34.0	36.2

Sources:

(1) For China: Dean T. Jamison and others, China: the Health Sector (Washington: World Bank, 1984) (mimeo), p. 81.

(2) For Iraq: Economic and Social Council for Western Asia, op. cit., p. 110.

(3) For India: Government of India, Seventh Five-Year Plan, p. 301.

(4) For Malaysia: Government of Malaysia, Fifth Malaysian Plan, p. 471.

(5) For Bangladesh: Government of Bangladesh, Master Plan Organization, National Water Plan, vol. I, pp. 6-3 to 6-4. Data for urban areas corrected to include population covered by hand tubewell.

Note: The definition of safe water varies from country to country. Thus, an intercountry comparison based on the above data may not be valid.

The differential between urban and rural areas in respect of water supply seems to be lowest in China. The actual urban-rural gap in provision of safe drinking water may be lower than what is suggested by table 2 because of the traditional Chinese habit of drinking boiled water. ^{19/} The urban-rural gap in respect of water supply has been partly narrowed in Malaysia in recent years. According to official statistics, the percentage of rural population covered by community water supply in Malaysia has increased from 42.9 per cent in 1980 to 57.6 per cent in 1985. The urban-rural gap in water supply seems to be very high in Iraq and India, where safe water is not available in arid and desert areas. The problems are, however, very acute in India, which contains a rural population of more than 560 million. There are still certain pockets of acute water shortage in India. For example, in Rajasthan province, a few villages (e.g. Agolai, in Jodhpur) are located at a distance of more than 20 miles from the source of water supply. According to newspaper reports, in 1986 adequate water was not available in 19,093 villages in Uttar Pradesh; similar problems were experienced in 13,390 villages in Gujarat state. The continuous drought in Kalahandi in Orissa has contributed to an unprecedented water scarcity. The problem is not, however, confined to rural areas. Smaller towns in India have also been neglected in respect of water supply. As table 9 indicates, the smaller the town in India, the lower the proportion of the population served by community water supply. In towns with population below 5,000, only 40.1 per cent of the population are supplied water by the Government, whereas 94.7 per cent are served by water supply schemes in cities with populations over 100,000.

Table 9. Urban water supply coverage in India, 1980

Classification of towns by population size	Total No. of towns	No. of towns with <u>water supply</u>		Percentage of population served
		No.	Percentage	
Over 100,000	151	149	98.6	94.7
50,000 to 99,999	219	206	94.1	84.1
20,000 to 49,999	652	542	83.0	76.4
10,000 to 19,999	987	649	65.7	60.7
5,000 to 9,999	820	423	51.6	51.2
Below 5,000	290	123	42.4	40.1

Source: Government of India, Sixth Five-Year Plan, 1980-85, table 23.6.

Even where water is available, the services are usually misappropriated by the rich and the influential. This problem is specially pressing in countries like Bangladesh and India, where the percentage of people below the poverty line is very high (see table 10). It has been rightly pointed out, "The poor are economically deprived. In the countryside where the population is scattered, isolated and unorganized, the poor are subject to discrimination (on tribal, caste, ethnic or linguistic grounds), manipulation (by land-owners, money-lenders and merchants), and exploitation. They are repressed, intimidated, and threatened by violence or harmed." ^{20/}

Table 10. Proportion of poor in total population in selected Asian countries

Country	Year	Proportion of poor %
China	1980	14.5
Iraq	1977	13.0
India	1984-85	36.9
Malaysia	1984	18.4
Bangladesh	1981-82	73.0

Sources:

- (1) For China: World Bank, World Development Report, 1982, p. 78.
- (2) For Iraq: Poverty and Development of Human Resources (World Bank Staff Working Paper, No. 406), p. 145.
- (3) For India: Government of India, Seventh Five-Year Plan, vol. 1, p. 33.
- (4) For Malaysia: Government of Malaysia, Fifth Malaysian Plan, p. 68.
- (5) For Bangladesh: Government of Bangladesh, Bureau of Statistics, Report of Bangladesh Households Expenditure Survey, 1981-82 (Dhaka: BIDS 1986), p. 44.

As a Bangladesh study suggests, the rural élites act as a net separating the poor from the Government and services destined for the poor ultimately enrich local influentials. 21/

The urban-rural differential in respect of effective sanitation seems to be much higher. In 1981, only 0.5 per cent of the rural population in India were covered by public sanitation projects, whereas 27 per cent of the urban population were using sanitation facilities provided by the Government. The percentage of rural population served by sanitation projects is expected to change marginally from 0.5 per cent in 1980 to 0.95 per cent in 1985. 22/ In Bangladesh present coverage of the rural population under government programmes is hardly 3 per cent, whereas the urban sanitation coverage was 32 per cent in 1985. 23/

In Iraq, there is no rural sanitation Master Plan. Specific details on conditions of existing sanitation facilities are not available. However, the available data clearly indicate the inadequacy of rural sanitation services. In China also, there is a wide differential between the urban and rural areas in respect of sanitation. However, low-cost nightsoil processing facilities such as centralized excreta vats, fermentation-settling tanks or biogas tanks have been developed in China to improve the sanitation facilities in rural areas. In Malaysia, the sanitation facilities seem to be better than in other selected Asian countries. According to official statistics, the proportion of population without any sewerage disposal system in Malaysia decreased from 16.4 per cent in 1980 to 10.2 per cent in 1985. 24/

4. Over-emphasis on hardware investments to the detriment of service-related (software) investments

The water supply and sanitation agencies in developing countries tend to over-emphasize the means rather than the end. Four factors contribute to this situation. First, the five-year plan prepared by the national Governments set targets for new water supply and sanitation systems, but do not usually earmark funds for rehabilitation of the old ones. For example, until the Seventh Five-Year Plan, the central Government in India did not earmark any funds for the operation and maintenance of its rural water supply projects. This strategy is politically convenient in many countries. As Ian Burton points out, "The construction of a new water supply is a glamorous and politically desirable activity. It enables politicians and leaders at local and/or national levels to promise a new water supply, to provide a new water supply, and then to be seen cutting the ribbon or turning on the first tap on opening day. It is a once-for-all activity which has glamour, visibility and immediate political benefit." 25/ Secondly, this emphasis on hardware of water supply and sanitation projects to the utter neglect of software, which involves the actual delivery and utilization of water by the beneficiaries, is reinforced in the developing countries by the donors' preference for the latest technology and techniques. Thirdly, there is no public health education unit in most of the water supply and sanitation agencies in developing countries. These organizations very often tend to be the ivory towers of technocrats. Finally, the specialized water supply and sanitation agencies are characterized by the well-known maladies of public sector organizations in developing countries such as overstaffing, financial mismanagement, and so on.

5. Limitations on community and private sector participation

The beneficiaries of most of the water supply and sanitation projects are often alienated from the system. Apart from the philosophical argument that planning is for people, and it is the people's basic democratic right to be involved in their own development, there are at least two specific compulsions for encouraging community participation in water and sanitation projects. First, in much of rural Asia, water use and excreta disposal involve a complex web of social obligations, cultural practices, family traditions and religious beliefs. Water supply and sanitation projects are not likely to be successful unless they are acceptable to local people. Secondly, rural water supply and sanitation systems are very often scattered in inaccessible areas. The operation and maintenance of these systems cannot be ensured by agencies from above without the spontaneous participation of local beneficiaries.

However, the level of community participation in water and sanitation projects in most of the Asian countries, except China, is very low. In Bangladesh, two non-governmental organizations are involved in health education. 26/ In India, a new scheme has been incorporated in the Seventh Five-Year Plan to involve voluntary agencies to implement water supply projects in rural areas, in order to improve community sanitation. 27/ In Sri Lanka, Sarvodaya Shramadana, a voluntary agency, has been quite successful at the community level. However, the area of operations of such voluntary agencies is severely restricted, and in most of the Asian countries there is no effective organization for mobilizing community support for water supply and sanitation projects.

In China, the degree of community involvement in water and sanitation projects is very high. The community participation is institutionalized through health

campaigns. The first campaign was launched in 1951, and on average, there are four or five campaigns per year. At the apex of this campaign stands an organization known as the Patriotic National Health Campaign. At each level from the national through the provincial, prefectural to brigades, there is a small unit for health campaign. At the production brigade level, the health campaign committee is headed by the barefoot doctor, and it mobilizes people to carry out programmes initiated from above and at the local level. The gains of these health campaigns were impressive. As a recent World Bank report states, "Such campaigns to promote better hygiene have probably been as effective in improving public health as increases in the quantity and quality of water and sanitation facilities." 28/

However, two weaknesses of the existing Chinese system are gradually surfacing. First, the new system for allocating responsibility for production may discourage voluntary participation in public health campaigns by inducing individuals to spend more time on individually profitable activities. The new economic system may offer an incentive to revert to such unsanitary practices as the use of untreated nightsoil on vegetable crops. 29/ Secondly, unless campaigns are repeated at regular intervals, health problems may recur. There is a danger of recurrence of schistosomiasis in certain areas of China as areas previously cleared are being reinfested with snails.

Community water supply and sanitation are almost an exclusive preserve of the Government in developing countries. A number of factors encourage the establishment of public monopolies in drinking water supply. First, most piped water supply systems are natural monopolies. A "natural monopoly" occurs where the market is not big enough to accommodate more than one producer. Secondly, the drinking water and sanitation services are merit goods in the sense that their social benefits are higher than those perceived by individuals. Water-borne diseases cannot be eliminated unless safe water can be provided to all inhabitants in the area. Lastly, the provision of these services is considered to be the responsibility of the Government for strategic and humanitarian reasons. Thus, in the Asian countries, the private sector is not directly involved in installation, operation and maintenance of piped water supplies. Of late, the monopoly of the public sector has been questioned for several reasons. First, the public sector tends to be inefficient and corrupt. Water rates are not properly billed and collected. In Bangladesh, there are widespread allegations of misappropriation of spare parts for handpumps by government-appointed tubewell mechanics. The spare parts supplied free by the Government are sold in the market, and beneficiaries seldom receive them free of charge. 30/ Secondly, the success of the private sector in operating efficiently the tubewells for irrigation in different parts of South Asia 31/ suggests that the private sector may be more effective than the public sector in running water supply and sanitation projects. The affermage system of private management (i.e., operating concession) has been tried successfully in some African countries. Thus, the potentialities of the private sector in operating and maintaining water supply systems may also be explored in some Asian countries. In some cases, co-operatives have also shown promise in operating water supply systems efficiently. In the Republic of Korea, rice co-operatives at harvest time withhold a percentage of the harvest to operate and maintain the water supply for their members. In Bangladesh, a multipurpose co-operative society (the Deedar Co-operative Society, in Comilla) provides drinking water from the deep tubewells used for irrigation purposes. However, this model could not be replicated in other parts of Bangladesh. 32/

B. Managerial practices

1. Inadequate operation, maintenance and monitoring

The drive for providing universal access to safe water has turned out to be a Sisyphean task: one step forward is followed by a step backward. As a result, the absolute number of people unserved remains roughly the same. ^{33/} One of the reasons for the agonizingly slow expansion of water supply and sanitation facilities is the frequent failure of already installed services. For example, the performance of handpumps in water supply programmes is quite disappointing. The failure rate of handpumps varies from 30 to 70 per cent within two years after pump installation. Once the supply of safe water is interrupted, the villagers start using water from unsafe and polluted sources.

In China, operation and maintenance (O and M) problems are most often experienced in the case of handpumps and tubewells. It is reported that, due to their poor quality and improper maintenance and operations, some well pipes are disconnected and the discharge is often reduced owing to siltation. ^{34/} Problems of salt water intrusion into wells are widespread in Hebei province. Appropriate tools for well repairing have been developed in Shantung province. Moreover, research has been undertaken by the Chinese Academy of Agricultural Machinery Science in collaboration with UNDP to improve the technology of handpumps.

According to a survey undertaken by the National Environment Engineering Research Institute in India, at least 30 per cent of water supply facilities installed in rural areas are inoperative. As the Indian Planning Commission rightly observes, "While impressive results have been achieved in providing water supply facilities in the rural areas in the Sixth Plan, the maintenance of these facilities, mostly the handpumps, has been badly neglected, partly because of lack of adequate funds for maintenance, and partly because of lack of suitable machinery for their maintenance. It has been realized that the assets created for provision of water supply in the rural areas at huge cost cannot be allowed to go to waste or even become partially defunct." ^{35/}

In Iraq, the Baghdad water supply facilities and networks are old and need immediate repair. The water losses are very high, and the existing facilities need to be replaced. There are also problems in operating and maintaining tubewells in the northern areas. The operation and maintenance of surface water supply projects in Malaysia are satisfactory.

The problems of O and M of water supply and sanitation systems were recently reviewed by the Bangladesh Water Supply and Sanitation Sector Study. The main findings of this study may be summarized as follows: ^{36/}

(a) The level of leakage and wastage is very high in urban water supply. In Khulna, 78 per cent of water pumped through the urban water supply system is wasted. This figure varied between 54 and 64 per cent in another town. These losses may be attributed to insufficient refill in the trenches on top of the pipes, overflowing tanks, leaking pipes, defective plumbing in the houses, and so on.

(b) Out of 269 shallow and deep tubewells surveyed, 80 (about 30 per cent) were found to be out of order, while an equal number of wells have an actual yield that has considerably decreased since installation. Only 40 per cent of the wells

were found to be in proper order. The main reason for the poor condition of the wells is the inadequate well construction methods and lack of proper maintenance.

(c) In Bangladesh, about 20 per cent of all handpumps do not function. The percentage of unsafe handpumps is much higher. Almost half of the handpumps have no or inadequate platforms, which results in unhygienic and unsafe conditions around the pumps and discourages water use. The malfunctioning of handpumps may be attributed to poor installation, bad maintenance, or choking up due to lowering of water table.

(d) The water-seal latrines provided by the Government at subsidized rates are quite often choked up by stones or leaves, as these are not properly maintained by the intended beneficiaries.

The problems of operation and maintenance are not confined to water supply alone, but also occur in disposal of wastes. Poverty and cultural practices contribute to lack of maintenance of privies. This has a negative effect on the environment because a poorly maintained privy may be worse than none at all.

2. Ineffective evaluation of alternative means to satisfy service needs or targets

In most Asian countries, there is an economic trade-off between new investments and rehabilitation of existing projects in the water and sanitation sector. Economically, it is more profitable to invest in the repair of existing projects for two reasons. First, the sunk costs of existing projects are excluded from economic analysis. Consequently, the economic rate of return tends to be very high in rehabilitated projects. 37/ Secondly, interruption in the supply of water creates a credibility gap. Consumers under such circumstances prefer to stick to traditional sources rather than switch to safe sources of water. The demands for rehabilitation of projects are very often ignored for two reasons. First, the management information systems of most of the water supply agencies are so weak that Governments do not have adequate information about the requirements of rehabilitation of existing projects. Secondly, new projects are politically more viable than the repair of old projects. In view of acute resource constraints, the alternative means of satisfying service needs should be carefully evaluated. The repair, modification and expansion of the existing water supply and sanitation projects should be carefully examined. In a few cases, reallocation of existing sources from less urgent to more urgent uses may also reduce the pressure on the existing system.

3. Lack of analytical tools for proper investment evaluation

The standard tools of cost-benefit analysis are not all appropriate for small-scale projects in the water supply and sanitation sector. Quantification of the benefits of such projects is difficult because the benefits are not direct and hence cannot always be measured. It is obvious that water supply and sanitation projects increase labour productivity through improvements in health and decreases in disabling diseases and epidemics. However, there are two problems in measuring these benefits. First, few, if any of the communicable diseases are transmitted by water alone. They may also be due to contaminated food, milk, and in some cases to other factors, such as flies. Second, the findings of studies on the relationship between water supply and improvements in health are often ambiguous. For example, one study in Uttar Pradesh in India suggests that improved water supply brings about an enhancement of overall sanitary status of the community and thus leads to

a lessened probability of transmission of infectious diseases. 38/ However, another study from Bangladesh indicates that the use of tubewell water for drinking is not a sufficient protection against cholera; cholera in rural Bangladesh is not primarily a water-borne disease, and the protection afforded by safe water is overwhelmed by the exposure to polluted surface water. 39/

The World Bank Health Sector Policy Report, 1980 rightly emphasizes that provision of water supply and sanitation facilities by themselves are not sufficient for the improvement of health conditions. 40/ Lack of community acceptance of water and sanitation projects, poor standards of personal and household sanitation, unhygienic water storage systems, continued use of unsafe water owing to cultural practices, lack of maintenance of sanitation facilities, and poor water supply and sanitation standards in food stalls, workplaces, schools and markets may considerably decrease the benefits of water supply and sanitation projects.

Most of the benefits of safe water and sanitation schemes are social and external to individual economic agents. People's decisions as consumers in this sector are not always consistent with their best interests as citizens. Individuals in developing countries suffer from the "isolation paradox". 41/ The penalties for non-use of safe water and sanitation are paid not only by those who are responsible for it, but also by those who use safe water and sanitation; individuals in isolation act to the detriment of each other.

An important benefit of water supply projects is that it saves time for fetching and carrying water. This may contribute to higher productivity. However, in most of the developing countries, many economic activities are not marketed at all. It is at times very difficult to measure the benefits of time saved.

Although the economic benefits of a water supply and sanitation project cannot be satisfactorily measured, it is easy to quantify the economic costs of such projects. Brian Grover, therefore, suggests a least-cost solution or cost-effectiveness approach for water and sanitation projects. 42/ This involves: (a) expressing all costs (capital and operating) for each year in economic terms; (b) discounting future costs to present values; (c) selecting the sequence with the lowest present value. This technique may be used to rank alternative sequences, screening of unrealistic and unfeasible projects and selection of the most efficient project. As an ESCAP publication states, "Decisions in the field of water supplies will always be taken on the basis of intuition and judgement, but cost-effectiveness analyses should help to improve or sharpen judgement." 43/

Investment decisions in the water and sanitation sector should not, however, be based on a mechanical least-cost analysis. Water and sanitation facilities are basic human needs. Meeting these needs is one of the basic responsibilities of the State. As the United Nations Water Conference (Mar del Plata Action Plan) rightly underscored, "All peoples whatever their stage of development and their social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs." 44/

4. Inadequate cost recovery and pricing systems

Recovery of the cost of water and sanitation projects from the beneficiaries is one of the widely accepted and equitable means for mobilization of resources for such projects. Failure to recoup these costs has two adverse effects. First, the

project is deprived of adequate funds for its operation and maintenance. Secondly, the rest of the society who do not get any benefit from these projects has to provide a subsidy to a privileged class of beneficiaries. Such a subsidy can only be justified if the beneficiaries are poor and unable to bear the cost of water and sanitation projects. In practice, however, the subsidy on projects in this sector is much higher than what can be justified on grounds of equity. As the experience of the World Bank shows, relatively few water and sanitation entities, even those serving urban centres exclusively, have been able to earn sufficient revenues to finance a substantial portion of their investment needs annually. The disappointing record is due principally to inadequacies in the level and structure of tariffs. 45/ A survey of water charges in rural areas in 84 countries in the 1970s shows that in 73 per cent of the cases, the villagers are required to pay at least a part of the O and M cost, and in 27 per cent of cases water was supplied free. Only 29 per cent of villagers also shared a part of the capital costs. 46/

In China, the costs of rural water supply are met by local economic institutions (such as communes, production brigades and teams) and local governments (such as counties and prefectures). However, in urban areas, the cost is recovered from the beneficiaries. In Malaysia, "The concept of beneficiaries paying for service through an adequate water rate is well established ... and the water rates in most cases are sufficient to meet operating costs, debt services and yield a small surplus. Water revenues have steadily increased in all states. Well established billing and collection procedures are in operation and collections are generally good." 47/ However, the investment costs of water supply and sanitation in newly settled and less developed areas are provided by the agencies of the federal Government. In Iraq, charges are required for water delivered through house connections only. Moreover, the existing tariff system is not adequate to cover operation and maintenance costs. As a result, the Government has to bear the lion's share of water supply and sanitation costs.

The water supply and sanitation systems in India and Bangladesh are primarily dependent on government assistance. In rural areas of India, water supply is financed by the state. The share of the Government's contribution to urban water supply varies from state to state. In the state of West Bengal, the Government pays not only for the fixed investment in water supply and sanitation, but also for their operation and maintenance. An analysis of the water supply systems in the state of Karnataka shows the following trends: (a) the proportion of towns with deficits in water supply and sanitation budgets has increased from 74.7 per cent in 1974-75 to 80.2 per cent in 1978-79 (see table 11); and (b) the problems of deficits in city budgets are more acute in the case of small and major towns. The performance of medium towns in this respect is slightly better.

In Bangladesh, the contribution of the local population to the operation and maintenance costs for handpumps in rural areas is very limited. In most cases all costs for rural water supply are paid by the state. The percentage of government subsidy in urban water supply is also very high. A study of water supply systems in 42 towns in 1982-84 reached the following conclusions: 48/ (a) Water and sanitation rates constitute only 57 per cent of the actual expenditure incurred for operation and maintenance of water supply and sanitation systems in the urban areas of Bangladesh. Thus, the rate of tariff is very low; (b) only 51 per cent of water and sanitation rates are collected. This implies that the revenue of water and sanitation systems constitutes only 29 per cent of the actual cost for O and M.

Table 11. Percentage of towns with deficit in water supply budgets in the state of Karnataka, India

Towns by size classification	Percentage of towns with deficits (1974-1975)	Percentage of towns with surplus (1974-1975)	Percentage of towns with deficit (1978-1979)	Percentage of towns with surplus (1978-1979)
Small towns	77.8	22.2	85.5	14.5
Medium towns	68.8	31.2	68.1	31.9
Major towns	80.0	20.0	94.7	5.3
All towns	74.7	25.3	80.2	19.8

Source: M. Nageswara Rao, Studies in the Urban Public Sector (New Delhi: Ashish Publishing House, 1985), p. 202.

The determination of tariff structure for water and sanitation services involves a trade-off between efficiency and equity. In most Asian countries, the disadvantaged groups are not in a position to pay the economic cost of water. One answer to this problem is discriminatory pricing policy comprising a low, subsidized rate for "lifeline" consumption of water for the poor, and higher rates for residential consumption above the minimum and for industrial and commercial use. This appears to be the standard practice in Bangladesh, India, Malaysia, China and Iraq. In some of the developing countries, there are, however, groups of ultra poor who cannot even afford to pay for the subsidized water rates for life-line consumption. This problem is especially acute for slum and pavement dwellers in India and Bangladesh who collect water from public standpipes. According to the estimates of a task force of the Government of India, the slum population of India in 1981 was of the order of about 32 to 40 million. ^{49/} About a third of the population in 12 major cities in India live in slums. According to one estimate, about 25 to 30 per cent of the population of Dhaka in 1980 lived in squatter settlements, slums and resettlement camps. The total number of slum dwellers in Dhaka City today will be more than a million. ^{50/} Several experiments have been made in different countries for collection of water charges from public standpipes. The concessional system under which a licensed private operator collects a fee for each bucket filled from public standpipes is in operation in Indonesia. Experiments have also been made with co-operative societies. In Bangladesh, the experience of NGOs shows that a communal sanitation facility works better where an appointed caretaker collects token user charges. ^{51/} The collection of a water charge from the communal facilities is not merely a financial issue. The provision of free services on grounds of equity has led to indiscriminate use of public standpipes and vandalism in the facilities provided by the state. Even if a caretaker cannot make any payment, he can render useful service by maintaining the hydrant in good order.

In developed countries, the rate of life-line water consumption is usually set at 3 to 5 per cent of household income (based on the official minimum wage). In developing countries, the poor and ultra poor families cannot afford to pay rates at this level. Therefore, a substantial part of the cost for water and sanitation will have to be subsidized. However, subsidized facilities tend to be misused. As

a first step towards resource mobilization, the reduction in wastage of water and sanitation facilities through active community participation should be encouraged.

5. Ineffective promotion of public support and co-operation

The introduction of a new water supply system not only provides better and more water, but also heralds a new social order. ^{52/} It may alter the balance of power within the community. It may also increase dependency on the national and regional government and decrease the ability to act independently in relation to other communities. Thus, the social implications of water supply and sanitation schemes are no less important than the technical aspects. Unfortunately, most water supply and sanitation organizations are dominated by technocrats who seldom understand the social interaction involved in these projects. The acceptability as well as the operation and maintenance of water and sanitation projects are crucially contingent on local participation and local capacity.

An analysis of the experience of successful irrigation groups in the Philippines, Indonesia, Thailand and Malaysia suggests the importance of legal status for the efficient functioning of water user groups. As Frances E. Korten rightly points out, ^{53/} "Local organizations can seldom command the respect of the agencies of the state ... and the latter commonly depends on their having a clear and independent mandate. There is a natural dilemma involved. It is unlikely that strong local organizations will flourish in the absence of a supportive policy framework that gives them the requisite qualifications. Yet governments are reluctant to give significant authority to local organizations which have not demonstrated the capacity to use it effectively." The legal framework for community participation is well developed in China, the Yemen Arab Republic and the Philippines. In China, national health campaigns are conducted by an organization known as the National Patriotic Health Campaign. In the Yemen Arab Republic, a democratically elected Local Development Association has emerged as a means of mobilizing people to participate in executing rural infrastructural works. ^{54/} In the Philippines, water user organizations have full and independent legal status and they are formally registered with the National Securities and Exchange Commission. Unfortunately, in most other Asian countries, there is no legal framework for mobilization of water user groups.

The advantages of people's participation could be significantly increased if users were involved from the earliest design stages rather than after completion. Involvement of the users from design stages makes it possible to tailor technical specifications to beneficiary needs. This also gives users an opportunity to develop their organizational capability well ahead of completion of the project.

6. Inadequate attention to groups such as women and children

The projects are impersonal, but the beneficiaries are not. Effective participation of the beneficiaries in a project cannot therefore be ensured unless the needs and aspirations of gender-specific and age-specific groups are taken into account. Viewed in this perspective, women have a greater role than men in water and sanitation projects because "women are the carriers of water and custodians of family hygiene in developing countries". ^{55/} Sociological research in India indicates that women suffer from special disabilities resulting from lack of access to safe water, including the following: ^{56/}

- The rate of illiteracy of women is much higher in water-scarce areas, because women and children have to spend a significant part of their time procuring water.
- Young wives are dominated and oppressed by mothers-in-law in areas with insufficient water.
- Girls from disadvantaged families are sent to be married to areas with water shortages.

Women are also the main sufferers of the lack of sanitation facilities. A study of the defecation habits of women in Bangladesh revealed that because of the purdha system women have to avoid defecation during the day and suffer from special disabilities when such needs arise. 57/ As the custodians of family hygiene, the support of women is essential for acceptability of new water in a community. Experiments for the operation and maintenance of rural water supply projects by women's groups have been undertaken by NGOs in Bangladesh, Sri Lanka, Indonesia and Malaysia. 58/ In Bangladesh, women's co-operatives have been used on an experimental basis for water supply projects. The results of these experiments are promising. Since women have a greater stake than men, women are likely to be more efficient operators of water supply systems. 59/ They can also play a useful role in designing, field-testing, and introducing new technology to water and sanitation projects. The direct involvement of women in water supply projects also creates employment for women. Water supply projects also indirectly contribute to a rise in women's income by reducing the time spent on procurement of water. An evaluation of a potable water project in rural Thailand concluded as follows: "Women and the children are the main bearers of water in Thailand. In households served by piped water, women and children have extra time that is generally used for activities such as weaving and gardening to either generate income or raise the household subsistence level. These activities are said to be less menial than water-bearing." 60/ Despite the imperative need for women's participation in water and sanitation projects, women's role in this sector is circumscribed by several factors. First, the purdah system which secludes women from men discourages participation of women in water supply projects. Secondly, the existing power structure is likely to be threatened by women's economic emancipation. Thus, women and children are denied their rightful role in water supply and sanitation projects.

7. Inadequate design and monitoring of conservation measures

Designs of water and sanitation systems in developed countries are often duplicated in developing countries. This leads to wastage of resources through overdesign as well as to operation and maintenance problems. Designs should be carefully tailored to suit local conditions. The following design problems are encountered by water supply systems in Bangladesh:

- Standard designs do not use local materials and technology; thus, there is an acute shortage of spare parts.
- Handpumps frequently go out of order; there is, however, an economic trade-off here; long-lasting pumps are more expensive.
- Very often there is no alternative arrangement to overcome problems of voltage fluctuations and supply outages in electricity.

Most Asian countries face three design problems. First, standard designs are not used in water and sanitation projects. Water and sanitation systems are very often designed on a one-by-one basis, and consequently there is a multiplicity of pipe sizes, materials, pumps and fittings. Standardization is highly useful for bulk purchase and for easy maintenance. However, the existing procedure of international competitive bidding followed by donor agencies discourages such standardization. Secondly, the technology for water supply is not always simple and understandable to local people. Thirdly, designs of water and sanitation systems do not pay adequate attention to conservation measures. A common feature of most urban water systems is an excessive amount of water loss. At least half of this water loss may be attributed to physical leaks in the distribution system.

8. Unnecessary use of high-quality water in low-priority uses

There is a major trade-off between quality and quantity of water supply. Most developing countries lack resources to provide quality water in adequate quantities. This dilemma can be partly resolved by earmarking untreated water for low-priority uses. This is followed in Baghdad City, in Iraq. The Baghdad Water Supply Administration has two separate networks for water supply: one network provides safe water for domestic consumption; another network supplies surface water pumped directly out of the Tigris River for irrigation of gardens. 61/

9. Inability to use demand-spreading techniques aimed at relieving peak-demand pressures

In most Asian countries there is an acute shortage of resources to meet the full demands of water supply in urban areas. This problem could be partly solved by using demand-spreading techniques, although in most cases utilities do not yet have the capacity to use them. First, peak-load pricing may reduce pressure on the system during peak hours. Secondly, low-priority uses may be discouraged through regulation. Thirdly, interruptible service contracts may be introduced. Under this system, concessions are made to large customers who agree to a termination over a specified time period or to a reduction of service during a crisis. Fourthly, fines may be imposed for over-consumption. For example, in China factories are financially penalized if consumption of water exceeds a prescribed limit. Individual households in the cities are also charged water rates depending on actual consumption, rather than a fixed service charge. 62/

C. Legal regulations

1. Ineffective protection of supply sources

The pollution of supply sources of water is emerging as one of the major problems in the developing countries of Asia. The pollution sources of water supply may be divided into two categories: point and non-point sources. Much of the non-point pollutions are caused by fertilizers and pesticides which are essential for attaining self-sufficiency in food. Point sources are mainly wastes discharged from mills, factories and sewerage treatment works. Point pollution is the main problem in most Asian countries.

According to an ESCAP report, in China, all major rivers have been seriously polluted in the stretches downstream of large cities. 63/ For example, the Huang He is reported to be polluted by phenols, cyanide and mercury. But pollution

is not confined to surface water alone. There have been reports of saline intrusion in the ground water in and around Shanghai. The water pollution problems have also spread to rural areas. For example, a local river near the Tongzi village in Hunan province was polluted by a tin mine some distance upstream, and the water cannot be used for drinking; even irrigation use creates difficulties. 64/ As a World Bank report rightly emphasized, "The spread of modern farming techniques and industrialization has increased water contamination, and, for the villagers, water carries not only the infectious diseases that were the scourge of yesterday, but also an entirely new range of chemicals that have been implicated in causing cancers, birth defects and a host of other diseases." 65/

In Malaysia, 6 rivers are grossly polluted, 8 moderately polluted, and 15 have potential problems. 66/ Three of the worst polluted rivers are Sungai Penang, Sungai Jelutang, and Sungai Sanggul. The major sources of pollution are attributable to agro-based industries, including the processing of palm oil, rubber, pineapple, tapioca, sugar, sago and to some extent paper and pulp manufacturing. In 1985, the total biochemical oxygen demand (BOD) load generated from human wastes in terms of sewerage and sullage discharge was 750 tonnes per day - more than that generated by industries. Because of legal measures taken by the Government, the quality of these rivers is gradually improving. However, adequate measures have not been taken as yet for ground-water protection. The disposal of toxic and hazardous wastes on land eventually affects the quality of ground-water resources.

In India, domestic wastes contribute about 20 per cent of the total pollution, while 7 per cent is contributed by large- and medium-scale industries, and 3 per cent by small-scale industries. 67/

An analysis of the pollution of the Ganges River shows that the Ganges Basin received one third of all the fertilizer used in India, and 3,000 tonnes of pesticides a year; 80 per cent of the river pollution was caused by the discharge of sewerage from 100 cities along the banks, and 20 per cent from untreated effluent, cattle wastes, farm fertilizers, pesticides and incompletely cremated human corpses. 68/ The Sabarmati River near Ahmadabad, the Cauvery, the Pennar, the Godavari and the Subarnaleka are also seriously polluted in stretches.

In Bangladesh, water pollution is mainly due to untreated or partially treated discharge of domestic wastes into the river system. There are also localized problems of water pollution from pulp and paper mills and tannery wastes. As a result, the Balu Sitalakhaya, Buriganga, Bhairab, Karanaphuli, Halda and other rivers have been polluted in stretches.

2. Inadequate definition of priorities and preferences

The supply of water is limited, but the uses of water are many. It is therefore essential to create a ranking of priorities among uses, and in some cases also a preference among users. Whenever water is in short supply, potable water should get the highest priority. This priority is often challenged by other users.

In Bangladesh, the shortage of drinking water in rural areas is aggravated by two factors. First, there is a serious conflict between increased abstraction of ground water for irrigation purposes and the viability of potable water supplies through handpumps. 69/ The expansion of irrigation with ground water has posed two

major problems to the rural water supply. First, the existing handpumps will have to be replaced with deep-set tubewells. Despite the development of a cheap, simple and serviceable direct action pump under the UNDP/World Bank Rural Water Supply Handpumps project (locally known as the Tara pump), substantial investment would be needed for replacing the existing hand tubewells (HTWs). Secondly, in some areas agricultural wells may have to be used during the period of lowest drawdowns. Thus, the distance between the point of safe water and households is likely to increase significantly. Consequently, the households may not be able to procure enough water for their total health requirements. This will encourage rural people to use unsafe surface water and ponds. Thus, the very purpose of providing rural water supply will be frustrated. Secondly, in the coastal areas of south-west Bangladesh, the expansion of brackish water shrimp cultivation jeopardizes the potability of shallow ground water for drinking. 70/ In some areas, this may be resolved by sinking deep tubewells. However, the additional costs of safe water will not be compensated by the beneficiaries of shrimp cultivation.

Similar problems arise where increased abstraction of surface water upstream causes upland progression of saline water. The salinity intrusion is harmful not only for crops, but also for potable water and human health. This is why the Japanese River Law of 1964 lays down a minimum-flow provision to protect fresh-water supplies from salt-water intrusion. The failure to arrest the upward progression of salinity intrusion is a major problem in the coastal areas of most Asian countries. Thus, the trade-off between various users of water should be resolved in such a manner that the basic human needs for potable water supply can be met.

3. Rigid allocation mechanisms hampering the transfer and reallocation of water rights

The allocation of water among competing users at any given time is based on an order of priority. However, such ranking of priorities is not immutable. The order of priorities of water use should be continuously revised so that the order remains pertinent to the current situation. However, such revision of priorities is extremely difficult. This dilemma was highlighted in a recent United Nations report in the following manner: "One of the most serious obstacles to promoting efficiency and savings in water use, and especially to the introduction of new measures, is the existence of prior rights that cannot be abolished without severe technological difficulties and considerable economic and social upheaval. The quest for efficiency and better utilization of scarce water resources may lead to the cancellation of all existing water-use rights in order to begin anew with a system that protects better the public interest. On the other hand, in most legal systems water-use rights are considered to be either property rights or administration rights entitled to protection. In any case, the use of water very often involves a heavy investment of resources, and the sudden abolition of the right of use could cause economic hardship and bring uncertainty into the water economy." 71/ For example, in Bangladesh, such conflicts have arisen between potable water, water for industrial purposes, fisheries and irrigation in the case of the Lakhya River, in the vicinity of Dhaka. 72/

There are two ways of solving such conflicts: assimilation of pre-existing uses into a new system after a period of grace; and, abolition of pre-existing uses. The solution will vary from place to place. However, in all cases, the demand for potable water should be given priority over all other uses.

4. Inadequate and cumbersome enforcement of rules

In the words of Gunnar Myrdal, most of the developing countries may be described as "soft states". In Myrdal's view, a soft State is "understood to comprise all the various types of social indiscipline which manifest themselves by deficiencies in legislation and, in particular, law observance and enforcement, a widespread disobedience to public officials on various levels, of rules and directives handed down to them and often their collusion with powerful persons or groups of persons whose conduct they should regulate. These several patterns of behaviour are interrelated in the sense that they permit and even provoke each other in circular causation having cumulative effects." 73/ The following problems are particularly encountered in enforcement of rules on use and conservation.

- Ineffective policing. The responsibility of enforcing rules and regulations lies with the central agencies, which do not have adequate manpower for policing. Such a problem was partly solved in Bangladesh, for example, by delegation of authority for regulating the siting and spacing of tubewells to the upazila parishads by Groundwater Management Ordinance 1985 (Ordinance No. XXVII, 1980).
- Bifurcation of prosecution and enforcement responsibility. Very often agencies which are given the responsibility to protect water uses and rights are not given the power to punish defaulters. This is usually done on the grounds that leaving the entire decision in the hands of water administration alone may lead to arbitrariness. This problem may be partly resolved by establishing special courts or tribunals which can arrive at a speedy decision.
- Lengthy appellate procedures. In most countries the appellate procedure in water rights cases is very lengthy. This is particularly true where the cases are tried by ordinary courts.

5. Lenient application of sanctions and penalties

The violation of water laws is very often dealt with very mildly. However, the enforcement of existing regulations cannot be improved by sanctions and penalties. There is scope for education and raising of consciousness of people on water laws and regulations. In many cases, laws are not known to the people at all. Specifically, the following methods may be used to promote public participation:

- Communicate directly with the people on the need for protecting water sources.
- Encourage the victims of violation of water law to articulate their rights.
- Encourage the formulation of water-users' associations at grass-roots levels.

6. Ineffective collection of tariffs and service charges

Most water supply and sanitation organizations are run as a social service rather than as a commercial operation. A commercial as distinct from an accounting department is therefore still a rarity in such organizations. Most of these organizations in developing countries are hopelessly dependent on the Government for their day-to-day operations. One of the major weaknesses of water supply and sanitation organizations is the ineffective collection of tariffs and service charges. The performance of water supply organizations in South Asia is highly unsatisfactory in this respect. A survey of medium and small towns in Bangladesh indicates that, on average, only 50 per cent of water bills are collected. In small and medium towns in the state of Karnataka, in India, the average rate of collection varies between 32 and 38 per cent.

This problem cannot be solved by draconian legal measures alone. The cutting-off of water supply connections can only punish the defaulters, but cannot ensure the financial viability of water supply organizations. The financial tangle in water utilization is a complex web of administrative inefficiency, improper procedures and technical failures. An analysis of the causes of ineffective collection of tariffs in the Dhaka Water Supply and Sewerage Authority (WASA), in Bangladesh, illustrates some of the fundamental maladies of the financial administration in such organizations (see table 12). Both the consumers and employees of WASA stated that irregular billing owing to lack of adequate and trained staff was the major cause of unsatisfactory services. This points to the existence of a vicious circle in water supply and sanitation organization. Consumers do not pay because they do not get satisfactory service; the water supply and sanitation organizations cannot provide satisfactory services because they do not have adequate funds for operation and maintenance; and they are short of funds because consumers do not pay. Thus the vicious circle is completed. It will have to be broken by either the water supply organization or consumers.

Table 12. Causes of ineffective collection of tariffs in the Dhaka Water Supply and Sewerage Authority, Bangladesh

Causes of non-payment according to consumers	Percentage of respondents citing cause	Causes of non-payment according to employees	Percentage of respondents citing cause
(as reported by consumers and employees of WASA)			
1. Irregular billing	88.5	1. Acute shortage of staff for billing and meter reading	71.4
2. Unsatisfactory services	82.5	2. Non-payment by government departments	57.1
3. Multiplicity of rating principles	27.5	3. Lack of incentives for collection	51.7
		4. Lack of transport and other facilities for investigations	35.7
		5. Multiplicity of rates	28.5

Source: Q. M. A. H. Saqui, Dhaka Water Supply and Sewerage Authority (Dhaka: Local Government Institute, 1977), pp. 122-137.

7. Inadequate definition of standards for facilities, equipment and domestic fittings

One of the features of water supply systems is the excessive amount of loss. Very often 30 to 50 per cent of water supplied in urban areas cannot be accounted for. Typically, half of the water loss may be attributed to administrative failures; the other half is attributed to physical leaks in the distribution system. Losses through the distribution system can be substantially reduced by rigorously enforcing standards for facilities, equipment and domestic fittings.

Better detection and repair of physical leaks in the distribution system are essential for the efficient functioning of the water supply system. Standardization of facilities and equipment will therefore significantly improve the performance.

A major weakness of the piped water system in developing countries is the virtual independence of users in the construction and use of their house plumbing systems. This contributes to exorbitant wastage of water in the house connections. In Bangladesh, the ordinance relating to municipalities provides some regulations and rules on this problem. However, these are hardly enforced.

8. Ineffective regulation and use of in-house facilities such as roof-catchment systems and cisterns

Rain-water catchments are cheap and suitable for individual households or small communities. In Male, the capital of the Republic of Maldives, where ground water has been polluted by sewerage, rain water is the major source of water supply. 74/ The Male Water Supply and Sewerage Project has undertaken two types of measures for collection of rain water:

- Collection of rain water on a small scale from the roofs of individual dwelling houses and storing it in small private rain water tanks;
- Collection of rain water on a large scale from roofs of public buildings such as government offices, warehouses and stores, and collecting rain water in large steel reservoirs, and, after centralized disinfection, distributing this water through pipelines to the places where needed.

While the Male Water and Sanitation Authority takes special care to ensure the safety of rain water, in most cases, "hafir" or cisterns used for rain-water collection are not properly designed. Regulations are needed in the following areas:

- Requirement of covering storage tanks to cut down evaporation losses;
- Protection against dirt; and
- Protection against mosquito breeding and other pollution in the stored water.

9. Inadequacy of enabling legislation

(a) Metering. Metering is one of the effective tools for reducing wastage of water. Studies in the developed countries show that metering contributes to substantial reductions in the quantity of water used. However, two supplementary policies are needed to realize the full economic benefits of metering. First, metering must be introduced in conjunction with discriminatory pricing policy, so that wastage of water is penalized. Secondly, universal metering reveals the inefficiencies of the water system by exposing the discrepancies between the quantity of water going into the supply and that actually received at the consumers' end. Policies for leak detection are thus needed.

However, universal metering is a rarity in both developed and developing countries. Only in Israel is every consumer required to install meters and conform to norms for per capita quotas (220 lpd) for domestic and municipal use. There are, however, several impediments to introduction of universal metering in developing countries. First, consumption of water tends to be lower in areas where people are poorer and do not have water-using appliances or do not have adequate means of disposing of waste water. Under such circumstances, savings from metering would not be substantial. A study of costs and benefits in Bangladesh indicates that, "Costs of metering in some areas or for some categories of consumers may be significantly greater than the benefits derived from metering the water used by these consumers." 75/ Finally, metering offers the administrative simplicity of treating everyone alike, but the question of whom to subsidize would not be solved by metering. A combination of subsidized connections and unmetered water for the

poor would cause an increase in the number of connections and would therefore increase costs while decreasing revenues. 76/

In India and Bangladesh, metering is not mandatory even in city areas where piped water is supplied. For example, in the city of Bombay, only 57 per cent of the piped water supplied is metered. In the state of Karnataka in India, there are three types of prices for drinking water: (a) a fixed percentage of the annual rental value of the property; (b) a flat rate per month/quarter/annum; and (c) metered rates. Metering has been used only in 21 per cent of the towns in the state of Karnataka. 77/ Metering is seldom used in the rural areas of most Asian countries. Metering would not be economically viable in villages where consumption is limited and where only a few houses may afford individual connections.

(b) Inspection of sites and closure or penalties for unlawful works.

Legislation for water supply and sanitation authorities relies primarily on economic penalties to discourage wastage of water. However, in areas of water scarcity, direct intervention to stop water wastage may be necessary. In most legislations, there is no adequate legal coverage for inspection of sites for stopping and penalizing unlawful works.

(c) Requirement for in-house facilities. One major reason for the wastage of water is defects in the plumbing system inside the houses. These can be reduced by prescribing minimum requirements for plumbing. However, most of the legislation for water and sanitation authorities does not cover this subject.

(d) Expropriation of water rights. Expropriation of water rights, land and facilities as well as rights of way are needed for construction of water supply and sanitation systems. However, the inordinate delay in acquisition of land and other rights hinders the implementation of such projects. The problems with such acquisitions are threefold. First, an elaborate procedure has to be followed to determine compensation of expropriated rights. Secondly, the procedure for acquisition is lengthy, and the appellate procedure often very elaborate. Finally, land records are not properly maintained. This causes problems in establishing the ownership of expropriated rights. 78/

II. TOWARDS MORE EFFECTIVE DRINKING WATER SUPPLY AND SANITATION SYSTEMS

A. Recommendations for organization of the sector

1. Standards for planning and evaluation

Realistic standards for planning and evaluation of programmes and projects should be prescribed. It must be realized that, given the resource constraints, most of the developing countries cannot attain ideal standards of water supply and sanitation in the foreseeable future. In this connection, the following measures should be undertaken:

- The temptation to adopt sophisticated technologies should be resisted. Economically, the developing countries cannot afford the initial over-design of water supply and sanitation projects and the consequent under-utilization of capacity;
- Water systems should be planned in such a manner that they can be expanded by stages as economic development takes place, per capita incomes rise and the demand for water and sanitation increases;
- Each country should prescribe water quality standards according to the individual circumstances of that country, rather than try to attain global standards overnight;
- As the Abidjan statement (1986) of African countries rightly emphasized: "Affordable and sustainable progress depends on the adoption of low-cost technologies" and "Technology choice must match the community resources available for upkeep of the system". Research on appropriate technology for water supply and sanitation should therefore be encouraged.

2. Co-ordination of the sector

There is an urgent need for close co-ordination of the activities of water supply and sanitation organizations and other related agencies at the national as well as local levels. At the national level, activities in this sector may be co-ordinated by a high-powered interministerial committee. At the local level, regional authorities may be established by merging independent water supply and sanitation systems in each basin or drainage area. This strategy has proved to be successful in the United Kingdom. Ideally, water resources should be planned for an entire basin or watershed, and the conflicts between competing uses should be resolved within the framework of a national water plan.

3. Regional balance of services

The gap between urban and rural areas in respect of water supply and sanitation services should be removed as early as possible. However, it is not sufficient to supply water and sanitation services in rural areas. Two additional measures are imperative to make rural water supply and sanitation projects meaningful:

- (i) Water supply and sanitation projects in rural areas must be supplemented by public health education campaigns. The performance of government programmes in this area has often been disappointing because "excessive reliance on the medium itself rather than the message has sometimes compromised the effectiveness of the communication." 79/ Innovative NGOs have proved to be more effective in public health campaigns.
- (ii) The rural poor will have to be organized at the grass-roots level, so that the services provided for the rural poor are not usurped by the rural élites and the upper caste.

4. Adequate internal organization

The organizations for water supply and sanitation should be strengthened by providing adequate autonomy, encouraging professionalism, and undertaking intensive training programmes for staff. The merger of small organizations into larger water boards would be helpful in attracting suitable professionals to this sector. Water and waste disposal should be combined in a single organization because separate institutions charged with sanitation often tend to be financially weak.

5. Community participation

The participation of local people in water supply and sanitation projects is essential for effective utilization of services, mobilization of local resources, and maintenance and operation of the existing facilities. In order to promote public support and co-operation, the following measures may be undertaken:

- (i) An institutional mechanism for local participation in water and sanitation projects should be established. In this connection, the possibility of emulating the Chinese public health campaigns may be explored;
- (ii) The users should be involved from the earliest design stages rather than after completion;
- (iii) NGOs and co-operatives may be mobilized to enlist participation of local people;
- (iv) Health campaigns with the assistance of grass-roots organizations should be repeated at regular intervals.

B. Basic managerial requirements

1. Operation, maintenance and monitoring

The Abidjan Statement (1988) of African countries rightly emphasized that "Maintenance is the key to long-term success." The first pre-condition for successful operation and maintenance of water supply and sanitation systems is a regular monitoring system of existing facilities. The following steps should be taken for the efficient operation and maintenance of water supply and sanitation systems:

- Institutional structures for regular maintenance should be established. The three-tier maintenance system in some areas of India has proved to be useful. This system consists of caretakers at the village level, mobile maintenance teams working out of district centres, and a regional support centre providing technical assistance, training and other backup services;
- Standardization of equipment and the use of locally manufactured materials will ensure the easy availability of spare parts for operation and maintenance;
- Adequate resources for operation and maintenance should be provided. Ultimately, responsibility for operation and maintenance will have to be borne by the local users. Experience in several countries shows that maintenance is not possible unless safe water has been made available and its advantages demonstrated to the public;
- Operation, maintenance and management of water supply and sanitation facilities should be carried out at the lowest possible organizational level. This implies that adequate authority and resources should be delegated to that level for effective operation and maintenance.

2. Evaluation of alternative means to satisfy service needs or targets

Given the magnitude of the problem of providing universal access to safe water and sanitation and the resource constraints of developing countries, first priority should be given to efficient utilization of existing facilities rather than new investments. Where new projects are required, they should be as economical and as cost-effective as possible. In the choice of technology, the needs and motivations of the user community should also be taken into account.

3. Improved procedures for investment evaluation

Cost-effective techniques are more appropriate than cost-benefit analysis for project appraisal in water and sanitation sectors. However, decisions in this sector should not be based on economic and financial considerations alone. The humanitarian imperative of providing universal access to safe drinking water should also influence the selection of projects in this sector. Priority should therefore be given to areas of acute water scarcity. The supply of safe water in all areas of the country should be continuously monitored, and the list of problem areas should be regularly updated.

4. Adequate cost recovery and pricing systems

The vicious circle of poor service owing to inadequate cost recovery and poor collection of revenue because of poor service will have to be broken. The following measures should also be undertaken to facilitate cost recovery:

- Financial and accounting systems in water and sanitation organizations should be reorganized on commercial lines;
- Billing and collection procedures should be improved;
- Large losses through water not accounted for should be reduced by severing unauthorized connections and repairing leaks;

- User organizations, co-operatives, NGOs and caretakers should be mobilized to collect on a commercial basis at least token charges from the ultra-poor who use public standpipes, and the proceeds should be used for protection and maintenance of those standpipes.

The pricing of water below its true cost not only leads to financial pressures on the public exchequer, but is also tantamount to creating a shortage of water in the future. The following measures should be adopted to streamline the pricing system of water and sanitation services:

- Excessive government interference in the setting of tariffs should be discouraged, and water supply and sanitation organizations should be authorized to review these benefits periodically on a commercial basis;
- A discriminatory pricing policy should be introduced so that life-line consumption of water may be cross-subsidized by higher tariffs on large and affluent users;
- Where metering is not technically or economically feasible; either because of low water pressures or because of costs, a similar discriminatory pricing policy should be followed. Rates should vary according to size and service connection, number of fixtures in the house or size or value of the property being served;
- Even the subsidized rate of tariff should normally cover operation and maintenance costs.

5. Promotion of community and private participation

Water supply and sanitation projects should not be the exclusive preserve of the public sector agencies. The potential of the affermage (i.e., operating concession) management system in the private sector for operating and maintaining water supply and sanitation systems in urban areas should be explored to reduce the losses of public sector agencies. In rural water supply and sanitation projects, the spontaneous participation of the local community is an essential pre-condition for effective utilization of services as well as for operation and maintenance of the facilities provided by the government. However, community participation is often manipulated by rural élites to serve their own interests. Care must therefore be taken to ensure that contributions from the community are provided in an adequate manner.

6. Adequate regard for groups such as women and children

Women and children are the main beneficiaries of water supply and sanitation projects. These projects may be used to create employment for women by training them to work as caretakers, workers in public health education campaigns, and as field assistants for testing new designs for water supply and sanitation projects. Women's co-operatives in the rural areas may be formed to operate water supply projects. NGOs may be encouraged to mobilize women for water supply and sanitation projects. The following specific measures should be undertaken to encourage participation of women in water supply and sanitation projects: 80/

(a) Global, regional or national campaigns should be carried out to create and raise public consciousness of the problems confronting women in the field of water supply and sanitation;

(b) As a means of integrating women in water supply and sanitation activities, preparation and experimentation of pilot activities for sanitary education on the development and conservation of water supply systems, sewerage disposal and food hygiene should be emphasized;

(c) The possibility of utilizing the services of women in the following areas of sanitation should be explored: adequate utilization and care of latrines by family members, particularly children; proper disposal of feces, how to wash hands after defecating, and before preparing or touching food; adequate recovery of waste water and excreta; adequate maintenance of sewerage systems by means of supervised services and daily conservation and repair operations; and inspection of domestic regional or municipal systems.

7. Adequate design and monitoring of conservation measures

The technology for water supply should be simple and understandable to common people. In inaccessible rural areas, where supply of spare parts is difficult, long-lasting pumps, though more expensive, should be used. Standard designs based on local materials and technology should be prescribed, and, whenever possible, the import of equipment for rural water supply should be discouraged. In the design, there should also be alternative arrangements for voltage fluctuations and possible supply outages in electricity. The following measures should be undertaken to encourage water conservation: (a) physical leaks in the distribution system should be carefully inspected, and vandalism of the distribution system should be sternly dealt with; (b) illegal connections should be detected and severed; and (c) standards for plumbing in the houses should be prescribed.

8. Selective use of high-quality water in high-priority uses

Selective use of high-quality water for priority uses may be encouraged by providing a separate supply line of low-quality water for inessential purposes.

9. Introduction of demand-spreading techniques aimed at relieving peak-demand pressures

Rates for water supply may be varied according to peak hours or seasonal fluctuations in the supply of water. Interruptible service contracts may be introduced to reduce the pressure on the water supply system, and fines may be imposed for excessive use of water.

C. Effective legal systems

1. Protection of supply sources

Water sources should be protected against pollution. In this connection, the following problems identified by the United Nations Interregional Seminar on Rural Water Supply (Uppsala, Sweden, 1980) should be addressed: 81/ (a) water legislation, especially as regards protective measures against pollution, should be enacted: a centralized enforcement agency should be set up, and adequate human and

financial resources should be provided; (b) periodic revision of laws and regulations is needed to deal with rapidly changing conditions; (c) education of political leaders and the public, and creation of public awareness are conducive to successful implementation; (d) legislation should be harmonized on a regional basis.

Steps should also be taken to reduce pollution of water owing to the absence or inadequacy of platforms around handpumps and unsanitary conditions resulting from poor maintenance of services.

2. Definition of priorities and preferences

Because of the multiple uses of water, there are often conflicts between different uses. In case of such conflicts, potable water should be given the highest priority. For example, adequate enactments are needed to resolve the conflicts between brackish-water shrimp cultivation and drinking water, and between irrigation equipment and handpumps. Such enactments should be formulated within the framework of a comprehensive water master plan.

3. Flexible allocation mechanism

The allocation mechanism for water resources should be flexible. Master plans for water should be continuously updated in the light of changed circumstances.

4. Adequate enforcement of rules on use and conservation

The responsibility of policing the enforcement of rules should also be delegated to local governments. An adequate number of staff should be provided to enforcement agencies. Public education campaigns should be conducted to acquaint the public with rules on use and conservation.

5. Application of sanctions and penalties

In minor cases, the power of imposing penalties and sanctions should be delegated to water supply and sanitation agencies themselves. Special tribunals should also be set up to dispose of cases in this sector and shorten the appellate procedures.

6. Effective collection of tariffs and service charges

The following measures should be taken for effective collection of tariffs and services charges:

- (i) Water and sanitation authorities should be run on commercial basis;
- (ii) Legal obstacles to disconnection of non-paying customers should be modified or removed;
- (iii) The Government itself and public sector agencies, often among the worst defaulters, should be required to pay water rates on time and treated like other ordinary customers;
- (iv) The costs of communal standpipes that serve the ultra-poor who cannot afford to pay water charges should be borne by the Government; it may be useful to explore the possibility of setting up local groups to pay at least part of the charges of a public standpost.

7. Adequate definition of standards for facilities, equipment and domestic fittings

Considerable wastage of water occurs owing to substandard facilities, equipment and fittings in domestic connections. Standards for plumbing systems should be clearly defined and enforced.

8. Effective regulation and use of in-house facilities such as roof-catchment systems and cisterns

Regulations should also be laid down for the safety of roof catchments. Regulations should cover, *inter alia*, the requirements of covering storage tanks, protection against dirt, mosquito breeding, and other pollution in stored sources of water.

9. Enactment of enabling legislation

(a) Metering:

Metering should be made compulsory to make it effective. Multiplicity of water and sanitation rates should be discouraged. Adequate staff should be trained to repair, replace and calibrate meters. Metering will have to be supported by an adequate pricing policy.

(b) Inspection of sites and closure of unlawful works:

Water supply and sanitation organizations should be given adequate power to inspect sites and close unlawful works. The existing procedure of collecting higher charges for waste water is not adequate. Water supply and sanitation organizations should be given direct authority to intervene.

(c) Enforcement of requirement for in-house facilities:

Regulations regarding standards of in-house facilities should be precise and there should be adequate staff to enforce these regulations.

(d) Adequate procedures for expropriation, condemnation or rights of way:

The existing land acquisition acts in most Asian countries should be amended to ensure speedier appropriation of lands and rights of way. Disputed titles, absence of up-to-date maps and registration, legal challenges to expropriation, disputes over compensation, and traditional customs, such as communal ownership and local complexities, have all impeded the execution of water supply and irrigation projects. Experience suggests that existing land acquisition laws should be reviewed at regular intervals to remove the obstacles to water supply and sanitation projects. Legal provisions should be made for requisition or "provisional public acquisition", to speed up the acquisition of private land. This gives Governments considerable strength in bargaining over acquisition prices and timing.

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Part Three

INSTITUTIONAL ASPECTS OF WATER SUPPLY AND SANITATION
IN LATIN AMERICA AND THE CARIBBEAN

INTRODUCTION

On 10 November 1980, the General Assembly of the United Nations declared the period 1981-1990 to be the International Drinking Water Supply and Sanitation Decade (IDWSSD) (Res. 35/18). This was the culmination of a process which included the United Nations Conference on the Human Environment at Stockholm in 1972; Habitat: the United Nations Conference on Human Settlements at Vancouver in 1976, the United Nations Water Conference at Mar del Plata (Argentina) in 1977; and the WHO-UNICEF International Conference on Primary Health Care at Alma-Ata (USSR) in 1978. This was the third decade during which the sector was given high priority within the region. 1/

According to United Nations estimates, 2/ by 1990 the population of the region 3/ will reach 453.2 million inhabitants. Thus, the objectives of the IDWSSD imply that an additional 220.8 million people will have to be provided drinking water, and an additional 307.5 million should be connected to sanitation networks or to excreta disposal systems by 1990. 4/ These estimates take into consideration that as of December 1980, 232.4 million people in the region had access to potable water and 145.7 million inhabitants were served by sanitation and excreta disposal systems. 5/ However, the vast majority of the countries of the region set up their own goals and objectives. Accordingly, by 1990, 79 per cent of the population should have access to drinking water supply (87 per cent of the urban population, and 59 per cent of rural inhabitants), and 60 per cent would be served by sanitation and excreta disposal systems (71 per cent of the urban population, and 32 per cent of rural inhabitants). Thus, drinking water supply ought to be extended, by comparison with 1980, to an additional 113 million people, while another 103 million inhabitants should be given adequate sanitation services. 6/

The goals of the region might be considered modest, if compared with the achievements of the 1970s. Indeed, a 15 per cent increase in the coverage between 1972 and 1980 reduces the expansion proposed for 1981-1990 to 12 per cent. Likewise, the expansion of sanitation services between 1972 and 1980 was 21 per cent, or 3 per cent above the 18 per cent increase planned for 1990. Nevertheless, the results as of 1983 show that actual achievements are meager. Thus, rural water supplies and sanitation services for both urban and rural population have reached only one ninth, one sixth and one seventh, respectively, of the levels required to achieve the goals provided for each one of these subsectors. 7/

The financial restrictions faced by the region since 1980 and the external debt are serious constraints on the programmes of the Decade. According to 1978 estimates, \$US 60 billion were needed to achieve the goals of the Decade. As of 1983, it was estimated that a minimum of \$US 30 billion were needed if the goals of the Decade were to be achieved. This last figure did not include improvements in operation and maintenance, neither did it allow for rehabilitation of existing systems. In fact, investment between 1981 and 1985 is estimated to have amounted to \$US 7.4 billion, with an average of \$US 1.5 billion per year (1983 prices). This average represented only 50 per cent of annual financial requirements, according to estimates adjusted in 1983. 8/

Financial restrictions, however important, do not end by themselves the ailments of the sector. Other legal and institutional factors have limited the implementation of the Decade: 9/

- (i) Limited legal alternatives which do not favour efficient programming or optimal use of scarce available resources;
- (ii) Fragmented institutional responsibilities and lack of co-ordination among the various organizations responsible for the sector;
- (iii) Lack of awareness, in political and administrative levels, of the importance of adequate water supply and sanitation systems and their connection with socio-economic development;
- (iv) Managerial weaknesses and lack of effective programmes for training, employing, and promoting human resources;
- (v) Use of inadequate technologies, especially in marginal and rural areas;
- (vi) Inadequate operation and maintenance, due to deficient planning and management, resulting in deterioration and underutilization of existing infrastructures.

The results achieved at mid-Decade, added to the constraints previously listed, have raised doubts as to the importance and meaning of the goals of the Decade. A Consultative Meeting of the World Health Organization (Geneva, 25 June-2 July 1984) concluded that while objectives could remain the same, the procedures for their achievement should be improved, in order to devise tools and techniques allowing the expansion of drinking and sanitation services in urban and rural areas. Modifications, if any, should relate to time horizons, rather than to changes in objectives. 10/

Accordingly, part three of this report discusses the legal and institutional constraints that affect the implementation of the Decade in Latin America and the Caribbean. Chapter I analyses the constraints resulting from organizational structures, legal regulations, administrative practices and general law. Chapter II suggests alternatives to improve sectoral organization and assess minimal administrative requirements, and proposes basic legal rules. Each chapter deals with the region as a whole. However, paucity of information at the regional level has resulted in a more extended analysis of Argentina, Brazil, Colombia and Chile.

I. CONSTRAINTS TO DEVELOPMENT OF DRINKING WATER SUPPLY AND SANITATION SYSTEMS

A. Organizational structures and regulations

1. Lack of planning and evaluation standards

In 1983, 11 countries had prepared national plans for implementation of the Decade. Another four were in the process of drafting plans. 11/ Sectoral planning was supposed to link global and project planning, translating general goals and objectives into investment projects. However, actual sectoral plans are often limited to declarations of general goals, and give little or no consideration to the availability of financial and human resources. Thus, sectoral plans are basically a list of projects which disregards financial and economic assessment and consideration of alternatives. 12/ Inadequate sectoral planning results in a lack of standards and criteria. Therefore, service-related agencies lack guidelines for their activities. Hence, programmes and projects are seldom, if ever, assessed and evaluated.

2. Proliferation of entities with overlapping functions

The weakness of sectoral planning is attributed to the fragmentation of policy responsibilities among different areas of government. In addition, there is a lack of communication between policy levels and technical or service agencies. According to central authorities service agencies have no interest in general socio-economic goals. Likewise, service agencies complain about excessive central interference and arbitrary intervention and control. 13/

The results of this lack of integration between policy and operation are poorly designed programmes, untimely delays of works and projects, lack of implementation of proposals, and lack of efficiency in operation and maintenance. These problems are aggravated by lack of trained personnel, scarcity of basic inputs, and use of inappropriate technologies. Consequently, there is a climate of mistrust which is translated into a low priority being given to the sector, jeopardizing the objectives of the Decade. 14/

3. Concentration of services in urban or other favoured areas

The impacts of constraints affecting sectoral planning vary from country to country, according to institutional arrangements and the degree of independence existing between political authorities and implementing agencies.

The case of Argentina is illustrative. In 1980 drinking water and sanitation services were transferred from the central government to provincial (state) agencies. The transfer was not co-ordinated with supporting measures, neither was it programmed within the planning framework for the sector. It was abrupt and unexpected. As a result, drinking water supply coverage was reduced from 57 to 53 per cent of the population between 1980 and 1985. Sanitation services also decreased from 29.7 to 27 per cent of the population. In addition, there is a progressive deterioration of facilities and infrastructure, while water pollution is on the rise. 15/

The decentralization process of Brazil was more successful. It was implemented by public agencies operating at state level and supported by a well-designed national sectoral programme. Planning was closely co-ordinated with financing. It improved the efficiency of executing agencies and strengthened and broadened the political support given to the sector. 16/

However, decentralization is not a pre-condition for successful sectoral planning. The characteristics of each country condition the possibilities of each different alternative. Thus, the efficacy of sectoral planning depends basically on the proper and adequate selection of procedures and technology.

In this last regard, Chile is a typical case. Administrative arrangements are centralized. However, between 1977 and 1983, it increased the coverage of drinking water supply services from 78 to 92 per cent of the population. Sanitation services coverage grew from 52 to 70 per cent of the population. The process was accompanied by a parallel reduction of the staff of service-related agencies. The ratio of users to employees changed from 149/1 to 293/1 over the same period. Personnel expenses and financial outlays were reduced. The system is financially self-sufficient, tariffs are efficient, and investment plans are carefully assessed. 17/

Assessment of the implementation of the "Decade" suggests that goals related to water supply in urban areas might be met with relative few problems. The same is not true for the rural sector, where there are significant deficits and the goals of the Decade will not be met.

Several factors influence this unequal performance. Urban areas generate strong political pressures, concentrate demand, thereby offering large economies of scale, and usually collect enough resources and revenues. Thus, production and distribution of drinking water supplies are favoured by political, financial and technical factors. However, even within large urban settlements, marginal areas do not benefit from adequate supplies. Executing, technical, and service-related agencies tend to favour relatively wealthier areas, since they assure a regular influx of financial revenues. This revenue-oriented behaviour only changes when political authorities exert pressure on service agencies, or when central governments subsidize services in marginal areas. 18/

Rural areas are affected by their own set of constraints. Since households are relatively scarce and scattered, conventional supply methods are extremely costly. Yet, these very same factors make ground water a good source of supply where available and appropriate. Dispersion and individual systems reduce sanitary risks. However, ground-water-based rural water supply programmes should be supported by educational and community-oriented campaigns. The experience of UNICEF in this regard is highly relevant. It goes beyond individual solutions, to involve community participation in constructing simple pipelines systems. 19/ However, community participation is prevented by many factors, which were identified when preparing the programmes for the Decade. 20/ Participation involves social strategies, selection of adequate technology, and mobilization of local resources. 21/ Although the removal of constraints is not easy, the institutional alternatives devised for rural sanitation are relevant. In many cases, sanitation responsibilities in rural areas are entrusted to the health authorities, which are not exclusively responsible for drinking water and sanitation as a sector. Thus, there is a divorce between programmes in rural and

urban areas. Human resources are not used to their full extent, and the often-present financial surpluses of urban areas are not used to compensate for the economic limitations affecting the rural population.

The definition of what constitutes a rural population in the specific case of drinking water supply and sanitation is not homogeneous and varies from country to country. Many nations use the conventional denomination of statistics demography. Any group below 2,000 individuals is considered a rural population. However, this system is of no avail for sanitation purposes, since it does not differentiate between dispersed and concentrated populations. The distinction is important in sanitation terms, since the sanitation needs of each group can be solved through different techniques. Thus, groups as small as 100 people can be served through central systems, based on community participation. 22/ Such participation takes place from planning to constructing, operating and maintaining the systems. Organizational arrangements are essential, since they must ensure community participation as the main requirements for viability of the solution. 23/

4. Overemphasis on hardware investments to the detriment of service-related (software) investments

Operation and maintenance have been relegated and postponed. Likewise, the region has shown scarce interest in rehabilitation of existing systems. 24/ However, adequate operation, maintenance and rehabilitation guarantees better services, provided at lower costs. 25/ The countries of the region show a marked preference for new works, 26/ to the detriment of operation and maintenance. The result is excessive investment in oversized equipment and facilities, lack of accounting for water volumes, 27/ selection of complex technologies inadequate to local conditions, lack of operation and maintenance, and want of financial and economic assessment in investment programming. 28/ These shortcomings result from weak managerial capabilities, deficient training, ignorance of appropriate technologies, and institutional inadequacies. 29/

5. Limitations on community and private sector participation

Almost everywhere in Latin America water-related services are provided by state-owned agencies under a monopoly system. There are a few localized and rare exceptions where community organizations and private purveyors are responsible for the service. Very often public agencies tend to restrict a greater community role, despite the relevance of this alternative for the achievement of the goals of the Decade. 30/

The rigidities of public monopolies also restrict private participation. There are few cases of services provided by private entrepreneurs, under authorization or concession, such as in France or Spain.

B. Managerial practices

1. Inadequate operation, maintenance and monitoring

The water supply and sanitation systems of the region are deteriorating at a rapid pace, since operation and maintenance are considered low-ranking mechanical tasks, to be carried out by low-level personnel. 31/ Therefore, construction of new water works is given priority. 32/ Although this conception is changing,

resources are still managed and organized according to a "structures oriented" outlook. Thus, working teams are not often organized with a view to improving operation, maintenance and monitoring. On the contrary, they tend to be created for new water works, to be then dismantled, to the detriment of day-to-day operational and maintenance needs.

Inadequate human resources policies aggravate the problem. Almost every sanitation agency fails in human resources management. Three common problems are: (a) lack of balance in assigning personnel among different functions and areas; (b) lack of qualified personnel; and (c) lack of programmes aimed at developing, motivating, and training human resources. 33/

2. Ineffective evaluation of alternative means to satisfy service needs or targets

Organizational and personnel restrictions, together with the restrictions posed by systems of public monopoly, have oriented the search for solutions to new water works and extension or enlargement of existing structures. Consequently, inadequate services are usually blamed on lack of financing, since financing is often the main constraint to new water works. Although the argument is partially correct, there is no doubt that the excessive emphasis on lack of financing omits to consider other relevant alternatives in improving the sectoral efficiency of the sector.

Scarcity of resources in Latin America and the Caribbean have reached superlative dimensions. Therefore, the use of available resources should be optimized. This implies that, among other things, the security margins used in the region in the past should be modified. Future investments should not be based on "requirements", but on effective demand, supported by pricing policies aimed at the efficient use of resources.

This applies to expansion versus maintenance and leak and loss detection and control. Distribution losses in the region vary from 40 to 60 per cent of capacity. Expansion costs are between \$US 25 and 35 million per cubic meter/sec. added. Detection and repairs, and replacement of equipment in the network, can cost from \$US 2 to 7 million. 34/

Therefore, programmes for leak detection, monitoring and controlling should be preferred to expansion schemes. The persistent tendency to expand capacity shows a very limited ability to analyse alternative means for satisfaction of water supply and sanitation needs. Thus, community contributions are not used to their full extent, although they could be the solution to rural water supplies problems if low-cost systems were used. 35/

3. Lack of analytical tools for proper investment evaluation

Investment programmes for the region, as well as their financing, are defectively assessed. Projects are badly evaluated, both at the micro and macroeconomic level. Hence, social costs and benefits are seldom well understood.

Most agencies for water supply and sanitation enjoy service monopolies. They do not have to adjust to a market. Their tariffs are usually political. Thus, the relationship between water pricing and investment efficiency is not often considered. This lack of connection between prices and investment results in structural overinvestments leading to financial bottlenecks. This could be

improved by applying marginal cost pricing. 36/ Yet, it has an adverse impact on low-income groups. The criticism could be overcome by applying binomial prices and tariffs. A basic, fixed charge allows a minimal consumption, established according to sanitation and health principles. Consumption beyond the threshold is paid for according to marginal-cost pricing. Thus, the total bill varies according to consumption. Low-income groups are protected, while large users are charged according to consumption. 37/

The macroeconomic effects of water supply and sanitation projects are seldom assessed. Social evaluation is not often done, although there are enough analytical tools that would allow one to correlate the social benefits of water supply and sanitation projects and their costs. Moreover, it has been proved that benefits usually exceed costs. 38/ Lack of adequate assessment results in low-investment priorities for the sector, reacting to projects justified on the basis of exceedingly ample social considerations. Low-investment priorities are also the result of past disregard of even minimal criteria of efficiency.

In addition, sectoral planning has provided weak links between general socioeconomic planning and project execution. The weakness of sectoral planning results from attributing planning and executive functions to a single agency. This type of organization is unable to act independently; its executive functions and interests dominate over planning and efficiency. Therefore, government subsidies are sought to finance excessive costs and are not based on actually proven social benefits.

4. Inadequate cost recovery and pricing systems

The managerial constraint of sanitation agencies, which affects the design of investment programmes, also affects their commercial management. Thus, 40 to 60 per cent of water production is not accounted for. In addition, arrears in tariffs collection might amount to 30 to 40 per cent of total billing. 39/ These constraints are aggravated by inefficient user records, inadequate accounting systems, no metering of consumption, etc. In fact, such constraints result from a basically engineering outlook to the activity. Water supply and sanitation are conceived as engineering activities rather than as integrated managerial systems. 40/

Water pricing, if properly used, is a powerful tool for investment optimization, demand management, and even social distribution of income and resources. 41/ Its application requires metering of consumption and use of marginal cost pricing to establish tariffs levels. However, there are few metered systems in Latin America. Even those systems which have metered volumes establish tariffs on the basis of accounting, and not of economic costs. In addition, the accounting systems of many agencies are chaotic - a fact that seriously limits the possibilities of knowing actual prices. 42/ The situation is aggravated by political tariffs, therefore limiting the financial autonomy of water supply and sanitation agencies. 43/

Prompted by inadequate user discipline and lax administrative monitoring, treated water is used for non-intended purposes (gardens, car washing) and prices are not used to even out demand at times of peak demand. Therefore, peak hours and high seasonal demands go by without being accounted for, while water disappears from some distribution systems as a result of scarce supplies and distance from distribution centres.

5. Inadequate attention to groups such as women and children

Water-related diseases and child mortality are common in the region. 44/ As of 1975-1980, infant mortality was 66.8 per thousand, while mortality within the group from 1 to 4 years was 6.3 per thousand. Strategies for the year 2000 were aimed at reducing infant mortality to 30 per thousand, and the mortality rates of the group between 1 and 4 years to 2.4 per thousand. 45/

Rural and marginal peri-urban areas record both the highest birth rates and the largest deficit of water supply and sanitation coverage. Hence, there is a contradiction between the health objectives for the year 2000 and the actual trend of service expansion, since priorities do not favour the lower income groups, the rural areas, or marginal peri-urban population. In addition, the definition of "reasonable access" does not take into account the distance to water sources affecting large sectors (mainly women and children) of the rural and peri-urban population. Thus, the recommendations of Copenhagen (1980) for the International Decade for Women seem to have had little effect in the region.

6. Ineffective promotion of public support and co-operation

Most sanitation agencies are part of the formal structure of the state. Hence, they are much affected by bureaucratic forms of organization and separated from the community. Coverage deficits and operative deficiencies have generated public criticism and widespread skepticism. Agencies have not been able to change this image, nor have they managed to enlist support and co-operation at the community level. 46/ This shortcoming strongly affects the possibilities of improving the sanitary development of the region.

7. Inadequate design and monitoring of conservation measures

Water management agencies have not traditionally been involved with water quality problems. 47/ Therefore, most waters within urban areas are heavily polluted by organic, domestic and industrial waste. 48/ Water policies concentrate on water supply and evacuation of liquid sewage. Not enough attention has been paid to the problem of final disposal and treatment of effluents. This, and the lack of environmental policies result in the degradation of water sources, reduction of water supplies and increased treatment costs. Bogotá, Santiago (Chile), Sao Paulo and Buenos Aires illustrate this situation. 49/

C. Legal regulations

1. Ineffective protection of supply sources

Pollution of water sources is favoured by inadequate legislation and/or inadequate controls. However, there is no lack of legislation as such in the region. 50/ On the contrary, most countries do have rules and regulations which sometimes overlap. However, the legislative techniques used seem to be inadequate. Most laws do not establish quality objectives for the source. Instead, they set up conditions for each point of discharge. They do not take into account the effects of cumulative discharge. Thus, failure in setting up objectives of final water quality at source level makes control quite inefficient. There are no standards against which to assess the actual conditions of a given source. 51/ In addition, most countries have no systematic bodies of water

legislation, neither have they compiled water-related norms into a single publication. Thus, legal principles are scattered in civil codes, administrative acts, irrigation, industrial and drinking laws, etc. 52/

Another aspect of the problem is that, with few exceptions, the police power of the State is not fully exercised on state agencies, which probably are the largest polluters. 53/ Thus, public polluters are not subject to strict controls. As a matter of fact, they are not even subject to the same controls as private polluters. Enforcement is more lenient. In addition, inadequacies in monitoring and controlling discharges, weak sanctions, and the political impossibility of enforcing closure measures makes control over private polluters quite inefficient. 54/

2. Inadequate definition of priorities and preferences

Inadequate administrative arrangements are a main cause of inefficient controls. 55/ Legal norms do not clearly reflect policy priorities. Thus, even strict rules are not enforced, while standards of water quality cede before the need to maintain productive activities. Thus, economic need takes precedence, even in cases of repeated violations. 56/

Generally, the limited implementation of the Decade shows that policy decisions are legally expressed and enforced only to a limited extent. This legal weakness can be clearly perceived in the budgetary laws and legal implementation of the objectives and strategies of the Decade.

3. Rigid allocation mechanisms hampering the transfer and reallocation of water rights

Some experts consider that the sector should have two sets of rules. A first group of norms should be addressed to the satisfaction of changing needs. They are by definition contingent on policies, budgetary allocations, changing circumstances, etc. A second group of norms should address the issue of legal certainty and stability. These rules should be permanent and ensure the long-term certainty of rights and interests. 57/

However, water legislation is affected by, and should adjust to, demographic growth, urbanism, industrial development, and related demands for domestic, industrial, and municipal water. Thus, it is possible to identify three stages in water legislation.

In the first stage, supply exceeded demand. Water laws encouraged water use and consumption (acquired permanent water rights, riparian system, free use of ground water, etc.).

The second stage is defined by demands exceeding supplies. Permit systems are implemented, priorities and preferences are set up, and even existing uses are subject to review.

The third stage aims mostly at preserving supplies or planning their uses. It attempts to increase supplies and therefore imposes measures such as recycling and aquifer recharges as legal expressions of policies aimed at expanding water availability. 58/

Yet, water legislation in Latin America has not changed according to this evolutionary process. Rigid water allocation rules prevent optimal development of water resources, since allocated volumes cannot be transferred according to economic yield. This constraint is often found in the arid and semi-arid areas of the region, particularly with reference to irrigation water rights. Although there is a trend to consider all waters public resources, there are countries that still prioritize the riparian owner over other possible users. 59/

There are exceptions, such as the water law of Chile, which permits a market for water rights; 60/ and the Peruvian legislation that allows change of the source of supply. 61/ However, there are cases of extreme rigidity which do not allow changes between uses or users, perpetuating systems and economic structures which are not only obsolete, but also inefficient. 62/

Riparian systems and rigid legal allocation evidence that some countries still adhere to rules that no longer suit the needs of the region.

4. Ineffective collection of tariffs and service charges

Institutional weaknesses are often aggravated by defective collection of tariffs in arrears. This, added to lenient sanctionary systems, seriously limit the institutional capabilities of the sector. The inflationary context of the Latin American economies demands rapid collection of revenue. 63/ Otherwise the financial needs of the supplying agencies are not met. However, a persistent and inadequate emphasis on the social aspects of water supply and sanitation services limits sanctions and fines for default in tariff payments. This conception even applies to commercial users. Thus, cost coverage becomes an intractable problem, since poor collection procedures are coupled with policies that in fact reward defaulting users.

5. Inadequate definition of standards for facilities, equipment and domestic fittings

Many countries have precise regulations for construction of facilities and connections to main networks and central grids. 64/ These rules, themselves necessary, result in long, costly and complicated bureaucratic approval procedures. Yet, formal approval of blueprints, designs and technical statements is not matched by factual inspection of actual works, facilities and designs. Therefore, alterations, changes, and non-authorized modifications are not monitored. In addition, enforcement relies only on relatively inadequate rules, while other procedures to promote awareness are not used. Thus, leakages, installation of illegal pumping devices, unauthorized recreational uses, and defective and hazardous storage systems are common occurrences. These constraints should be added to defective standards for the fabrication of sanitation implements and inadequate procedures for quality control at the factory level.

6. Inadequacy of enabling legislation

The region does not in fact have effective monitoring agencies. The fragmentation of functions and the overlapping of different political levels ensure maximum dilution of responsibilities. 65/ This organizational disarray, coupled with the legal and managerial constraints previously described show that the institutional capabilities of the sector should be upgraded.

II. TOWARDS MORE EFFECTIVE DRINKING WATER SUPPLY AND SANITATION SYSTEMS

A. Recommendations for organization of the sector

1. Co-ordination of the sector

The actions of the different agencies and administrative levels involved in the sector should be co-ordinated. Thus, co-ordination arrangements have a strategic relevance. National policies should be clearly spelled out. They should be addressed to the various facets and agencies of the sector, and supported by national sectoral planning. Strategic planning, global co-ordination and follow-up and monitoring are essential elements of sectoral planning.

Co-ordination is also essential for the adequate management of human resources development, sectoral information and allocation of financial resources. It also affects technological development, enactment of design and quality standards and criteria and co-ordination of external assistance.

2. Adequate internal organization

Improvements in the efficiency and efficacy of water and sanitation agencies are directly related to their internal organization. The latter should reflect that drinking water supply and sanitation are not purely engineering endeavours, but that the sector should integrate other disciplines, according to modern managerial methods. Administrative management and human resources policies should be aimed at the progressive development of internal cadres, their participation and motivation. Thus, a process of institutional development of the region should be supported and reinforced.

3. Standards for planning and evaluation

The efficiency of water supply and sanitation institutions is directly related to the criteria used to organize their investment programmes. Thus, assessment and evaluation standards are particularly important.

Accordingly, it is necessary to review traditional criteria related to technology, demand assessment, levels of coverage, and design of alternative models, in order to fit different economic, cultural and financial conditions. The consideration of alternative designs is particularly important since these allow the preparation of pre-investment studies to be adjusted according to the conditions of each country. This alternative will be a sensible improvement on current practices consisting of designing complete engineering projects which cannot then be carried out due to financial non-viability.

4. Promotion of community and private participation

Community participation is essential in developing drinking water supply and sanitation systems. Projects which do not involve the community are often a failure, since they might be resisted by the population, or might not fit into the conditions into which they should operate. Proper community participation might result in lower costs and improved systems of operation, maintenance, and administration. Moreover, private provision of drinking water supply and sanitation services should be reconsidered and reassessed. 66/ Although alternatives for

private provision of services should not be uncritically applied, their assessment and development will significantly contribute to the objectives of the Decade.

5. Regional balance of services

Every country presents differences in the levels of coverage provided to the urban and rural populations, as well as in the quality of the services provided to different areas. It is necessary to provide more equitable and balanced service levels to different sectors and areas. Equitable and balanced services demand to improve horizontal co-operation between the different agencies providing services within the same country.

Regional imbalances could be approached through improvement of regional co-operation between countries and also between regional organizations.

B. Basic managerial requirements

1. Operation, maintenance and monitoring

Operation and maintenance have been seriously neglected, with the ensuing deterioration of equipment and facilities; therefore, they should be consciously tackled.

An effective approach to the issue of maintenance and operation demands several parallel actions. Operation and maintenance should be assigned appropriate human and financial resources, and their administrative ranking should be upgraded. In addition, they imply the selection of technologies and facilities adjusted to local capabilities and community operation. Monitoring systems should also be part of a package aimed at improving operation and maintenance.

2. Evaluation of alternative means to satisfy needs and targets

Adequate operation and maintenance are not the only alternatives for the improvement of existing facilities. Rehabilitation programmes are a strategy that permits the recuperation of existing investments at a fraction of their replacement costs. 67/

Investment programmes have traditionally been subsidized by central governments. Subsidies have also been used to make up for deficits in operation and maintenance costs, even when at a lower rate than for investments.

Economic crises have decreased subsidies, demanding higher efficiency standards and new alternatives to satisfy the goals of the Decade. Community and private participation might be a partial answer to the search for new alternatives. The private sector can provide consultants, purveyors, concessionaires, etc. This will demand a change in current regional practices, which have tended to disregard the role of the private sector in water supply and sanitation. Thus, countries should explore a flexible range of possibilities in order to expand drinking water supply and sanitation services.

3. Improved procedures for investment evaluation

Adequate information that is readily available is a key managerial need. Cost data, for example, are fundamental, since continuous mistakes or outdated information might cause severe consequences.

Managerial information systems must be reformulated, especially as they refer to production costs. Present organizational arrangements either do not provide information or give inaccurate or untimely data. A persistent lack of adequate data affects operation and investment decisions. The sector should therefore improve its capabilities for data collection, processing and utilization.

4. Adequate cost recovery and pricing systems

The achievement of the objectives of the Decade requires adequate generation of resources by the sector itself. Hence, tariff systems should permit the recovery of operational and capital costs. Hence, efficiency standards must be upgraded. A corollary of this requirement is the need to meter consumption, in order to set prices, and to use marginal costs when determining tariff systems.

5. Promotion of community and private sector participation

Community participation is essential, should drinking water supply and sanitation programmes be expanded and extended. However, greater community support will not take place without a change in communication channels between agencies and users. Communication improvement requires the implementation of action programmes aimed at promoting public co-operation and support in every organizational activity. These programmes should be a continuing activity and should take place despite the apparent lack of short-term results.

6. Adequate regard for groups such as women and children

This report has emphasized the need to improve the management of drinking water supply and sanitation services. It has been stressed that agencies must upgrade their commercial and financial capabilities, adequately recovering operating and capital costs. However, the imperative of financial soundness does not exempt the sector from satisfying the needs of marginal groups and rural areas. Economic efficiency and social equity pose a serious dilemma that should be solved at the policy level. Thus, the issue is one of sectoral planning, which demands that subsidies to poorer areas, if any, be explicit and carefully calculated.

A viable alternative is to use cross subsidies, transferring resources from relatively higher-income, more profitable areas, to poorer sectors. However, this procedure, while socially acceptable, complicates the assessment of the internal efficiency of service providing agencies.

Whatever the procedure to be used to finance non-reimbursable costs, policies should attend the needs of the poorest areas since they have the highest percentages of infant mortality. In addition, the lack of adequate services require that an inordinate amount of women's time be allocated to carrying and fetching water. Thus, their possibilities to generate additional income are limited.

7. Adequate design and monitoring of conservation measures

The degradation of water sources is grave throughout the region. Water bodies are used as final dumping areas for industrial, urban, and agricultural wastes. The process imposes increasing treatment costs and is difficult to reverse. Hence, each country should pay special attention to the preservation of ground and surface water quality. Control programmes, however costly, are necessary, since the recovery of spoiled sources is even costlier. Adequate monitoring and priorities are essential to the success of quality control programmes.

8. Selective use of high-quality water in high-priority uses

Many cities are not able to satisfy the needs of their populations, although they have public supply systems. Their capabilities might be increased if adequate leak-monitoring systems were implemented. Hence, it is imperative to minimize network losses. At the same time, agencies should take measures to ensure that available volumes be used in priority consumption. Adequate tariff systems might greatly enhance allocation and controlling programmes. Thus, consumption exceeding a sanitary minimum should be penalized. Likewise, non-domestic consumptions should be charged at a higher rate than domestic uses. The same system can be used to penalize peak hours consumption in order to even out demand.

C. Effective legal systems

1. Protection of supply sources

Quality protection requires effective legal systems. Regional experiences seem to indicate that the detailed regulations currently used are not the most efficient systems. Therefore, it is necessary to search for controlling measures, monitoring processes, and adjust them according to the physical and economic conditions of the systems and their administrative needs.

Thus, instead of setting a priori discharge standards, it might be appropriate to establish final objectives of water quality. This type of process requires the participation and co-operation of polluters, since any serious process of pollution control is bound to generate political frictions.

In addition, agencies should research, encourage and promote controlling alternatives, such as joint treatment plants, land disposal systems, and financial charges based on the type and volume of generated pollutants. Progressive financial charges are a sensible device that would encourage polluters to gradually improve their treatment systems or reallocate final disposal of their effluents. 68/

Institutional arrangements should also be improved, since jurisdictional overlaps prevent uniformity and dilute responsibilities. Thus, central co-ordination is desirable even in federal systems.

2. Adequate enforcement of rules on use and conservation

The efficacy of legal systems largely depends on the effective enforcement of sanctions and penalties. Lenient enforcement of pollution controls negatively affects the usefulness of controlling arrangements. Therefore, effective application and enforcement of penalties should be a main concern of the sector.

Controlling measures must be orchestrated with policy objectives and co-ordinated with monitoring capabilities.

3. Definition of priorities and preferences

The "Decade" has determined a set of priorities that can be adapted, or adjusted, by the countries of the region. Whatever the position of each country, it is important to set policy priorities for the sector, establish sectoral planning measures, and legally enact them for the guidance and regulation of executing agencies.

The articulation of this logical sequence seldom takes place in practice. Many countries have established priorities and preferences. Fewer have translated them into planning measures at the sectoral level. Very few have enacted precise corresponding legislation. Thus, practical implementation tends to be a de facto matter, to be varied according to the abilities, views, and interests of each implementing agency. It is imperative to acknowledge policy priorities and preferences through the enactment of appropriate formal norms.

4. Flexible allocation mechanisms

Water scarcity has been aggravated by industrial and urban development and demographic growth. However, the legal systems pre-existing these changes have not always been modified. Riparian rights, appurtenancy principles, non-variability of the source of supply, constrain water management and impose high social costs. Thus it is suggested to allow for flexibility in the allocation and transfer of water rights and in the change of sources of supply. Water should be allocated according to principles of optimal use, maximizing the yield of its alternative uses.

5. Effective collection of tariffs and service charges

The region must improve the efficiency of its procedures to collect revenue; otherwise, the expansion of services to the have-nots will be forever prevented by the default of the ones actually privileged with adequate coverage.

Solutions to payment defaults are twofold. Punishment for lack of payment should be more rigorous, allowing supply disconnection, if necessary. Also, water supply and sanitation agencies should be summoned to expedite the collection of tariffs in arrears, upgrading the efficiency of their systems.

6. Adequate definition of standards for facilities, equipment and domestic fittings

Rules and regulations on domestic facilities and equipment are exceedingly detailed, while seldom applied in practice. In addition, quality control of facilities and equipment is highly deficient. Both shortcomings lead to water wastage and reduction of the benefits resulting from public water supply systems.

Regulation is not by itself a remedy to these situations. It should be complemented with awareness campaigns intended to alert the population. People should be informed of risks and health hazards, as well as of correct practices and conservation of water. In some cases, monitoring and controlling activities could be carried out by independent professionals under the tutelage of professional bodies.

Notes

- 1/ OPS, Metas de Salud en la Carta de Punta del Este: Hechos que Revelan Progreso, Informe de la OPS a la Cuarta Reunión del Consejo Interamericano Económico y Social, OMS-OPS, Publicaciones Varias No. 81, Washington, marzo de 1966. OPS, Plan Decenal de Salud para las Américas, Informe Final de la III Reunión Especial de Ministros de Salud de las Américas. OMS-OPS, Documento Oficial No. 118, Washington, enero de 1973.

- 2/ United Nations, World Population Prospects: Estimates and Projections as Assessed in 1982, ST/ESA/SER/A/80, New York, 1985.

- 3/ The "region" means Latin America and the Caribbean.

- 4/ OPS-OMS, Programa de Salud Ambiental, (op. cit.) (pág. 10).

- 5/ OPS-OMS, Programa de Salud Ambiental, Progreso del Decenio Internacional: Abastecimiento de Agua y Saneamiento en las Américas (1981-1983), noviembre 1984 (cuadro 1, p. 4).

- 6/ OPS-OMS, (op. cit.) (cuadros 3 y 5, págs. 11 y 13).

- 7/ OPS-OMS, (op. cit.) (cuadro 7, págs. 20 y 23).

- 8/ See Consulta Regional de Apoyo Externo, 21-24 abril 1986, Washington D.C., Perfil Regional de Movilización de Recursos, Ingeniería Sanitaria, vol. XL, No. 3, julio-septiembre de 1986, pág. 23.

- 9/ See OPS-OMS, El Decenio Internacional sobre el Abastecimiento de Agua y el Saneamiento en las Américas, junio 1985.

- 10/ OMS, El Decenio Internacional del Agua Potable y del Saneamiento Ambiental y sus Efectos Apreciados después de los Primeros Tres Años de Aplicación, Informe de una Reunión Consultiva de la OMS, Ginebra, 25 de junio-2 de julio de 1984, WHO/CES/84.1 (pág. 20). Ministerio de la Cooperación Económica de la República Federal de Alemania, Abastecimiento de Agua y Saneamiento en Países en Desarrollo, Ingeniería Sanitaria, vol. XL, No. 3, julio-septiembre de 1986, pág. 50.

- 11/ Naciones Unidas, Progresos Realizados respecto del Logro de los Objetivos del Decenio Internacional del Agua Potable y del Saneamiento Ambiental, Informe del Consejo Económico y Social al Cuadragésimo Período de Sesiones, marzo de 1985, A/40/108-E/1985/49.

- 12/ See Otterstetter, Horst: Institutional and Human Resource Development in Water and Sanitation Sectors in Latin America, Pan American Health Organization, s/f edición (pág. 2); Asociación Argentina de Ingeniería Sanitaria y Ambiental: El Financiamiento Internacional en los Programas de Abastecimiento de Agua y Saneamiento en América Latina y el Caribe, XX Congreso Interamericano de Ingeniería Sanitaria y Ambiental, AIDIS, Guatemala 16-21 de noviembre de 1986, Informe Final (pág. 10); Stetlman, Walter: Ajuste a las políticas sectoriales: Una necesidad para su desarrollo acelerado. BIRF, s/f de edición (pág. 5); Jáuregui Luis U. y Planas Andrés: Las Posibilidades de América Latina y el Caribe en el Decenio Internacional del Agua Potable y del Saneamiento Ambiental, Ingeniería Sanitaria, vol. XXXVI, No. 2, abril-junio 1982 (pág. 60); Yepes, Guillermo: La Problemática

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13/ Yepes, Guillermo: La problemática... (op. cit.) (pág. 143).

14/ Jáuregui Luis U.: El Agua Potable y el Saneamiento: Los Problemas Institucionales en América Latina, Conferencia Internacional sobre Abastecimiento de Agua y Alcantarillado, Cartagena, Colombia, julio 1985 (págs. 4 y 5).

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16/ See Mendouca Peris, Irvando: PLANASA - National. Basic Sanitation Plan. Evaluation 1967-1985, National Housing Bank, Brazil, May 1986. Also in Associação Brasileira de Engenharia Sanitaria e Ambiental: Saneamiento Básico: Prioridade Nacional na Década da Agua e do Esgotamento Sanitario, 13° Congresso Brasileiro de Engenharia Sanitaria e Ambiental, Alagoas, Brasil, agosto 1985.

17/ See Seal Comte, George: SENDOS 1984. Desarrollo Institucional; Alfaro Fernondois, Raquel: La Planificación de las Inversiones en el Sector de las Obras Sanitarias; y Urra, Sergio y Morgan, Luis: Avance en las Metas del Decenio Internacional del Agua Potable y del Saneamiento Ambiental. In XIX Congreso de Ingeniería Sanitaria y Ambiental, AIDIS, Santiago de Chile, 11 al 16 de noviembre de 1984; tema 4, vol. 1, págs. 1 y 11 y tema 1, vol. 1, pág. 1.

18/ Jáuregui, Luis U., Institutional and Human Resource Development, Americas Regional External Support Consultation, 21-24 April 1986, Washington D.C. (pág. 3).

19/ See Ferrari Bono, Bruno: La Cooperación del Fondo de las Naciones Unidas para la Infancia (UNICEF) en los Programas de Abastecimiento de Agua y Saneamiento, XVII Congreso de Ingeniería Sanitaria y Ambiental, AIDIS, La Paz, Bolivia, 7-12 de diciembre de 1980; y Present Perspective of UNICEF of the Co-operation with NGOs and Private Voluntary Groups in the Area of Water and Sanitation during the International Decade, Workshop for Private Voluntary Organizations, National Council for International Health, Washington D.C., December 1981.

20/ See MS.: International Drinking Water Supply and Sanitation Decade, Briefing Document, EHE/80/8, 27 February 1980 (pág. 8).

21/ See OMS, El Decenio ... y sus Efectos Apreciados ... (op. cit.).

22/ See Botteri, Amadeo: Participación de la Comunidad en el Financiamiento de Obras de Saneamiento, SNAP, Subsecretaría de Recursos Hídricos, Buenos Aires, 1974; Belacqua, Elida y Dufour, Alberto: Plan Nacional de Agua Potable Rural (República Argentina), Comisión Nacional para la Conferencia de las Naciones Unidas sobre el Agua, Reuniones Técnicas y Científicas, Mar del Plata, Argentina, CINFAGUA/C7/1, 1977.

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23/ See Solanes, Miguel: Water Users' Participation in Drinking Water Supply and Sewerage Systems, IVth World Congress of the International Water Resource Association, Buenos Aires, Argentina, 1982; Alfaro Juan: Rural Programs in Latin America: Evaluation Exercise, Water for Human Consumption, selected papers prepared for the IVth World Congress of the International Resources Association, Tycooly International Publishing Ltd., Dublin, 1982 (pág. 177 y sigs.).

24/ See OPS-OMS, Programa de Salud Ambiental: Progreso del Decenio ..., (op. cit.) (pág. 25), y Ferrer Crespo, Herbert: Breve Reporte de la Situación de la Región en el Area de Rehabilitación, Operación y Mantenimiento, America Regional External Support Consultation, 21-24 April 1986, Washington D.C., en Ingeniería Sanitaria, vol. XL, mayo-junio 1986, págs. 38 y sig.

25/ Yepes Guillermo: La Problemática ... (op. cit.) (pág. 45).

26/ This preference is being gradually modified by the implementation of programmes of operative improvement (Argentina, Brazil, Colombia, Chile). The change is a result of criteria enforced by financial organizations.

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30/ See, por ejemplo, OPS: Programa de Salud Ambiental: Decenio Internacional del Abastecimiento de Agua y del Saneamiento: Informe sobre la Marcha de los Trabajos, OPS-OMS, Washington, 1986, pág. 19; y OPS: Conclusiones ... (op. cit.), (área de reajuste No. 5).

31/ See Ferrer Crespo, Herbert: Breve reporte ... (op. cit.).

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