ANNEX 6

WATER SUPPLY AND SEWERAGE

CHAPTER 1

SUMMARY AND RECOMMENDATIONS

1.01 This Annex focuses on the prospects for the water and sewerage sector in Syria to the year 2000. The country's population is projected to double nearly every twenty years reaching 16.8 million in 2000 1/ compared to 4.6 million and 6.3 million for the census years of 1960 and 1970 respectively. About 65 percent of the total population by the year 2000 is expected to live in urban areas compared to 37 percent in 1960 and 43 percent in 1970.

1.02 Past levels of access to potable water supply in Syria have been above average for the Middle East. However, as a result of rural-urban migration and reduced investments in supply works during the past six years, available volumes are no longer adequate to meet the population served and large investments in urban water supplies are required in order to ensure adequate access in the future. Demand in major cities is projected to outstrip supply by mid-1980, and projects are underway to expand supply. However, existing supply systems are so constrained that further expansion is often possible only at higher costs. Pollution of traditional sources from urban sewage aggravates the supply situation. Consumption for urban areas is projected to grow from an estimated 106 million m3 in 1970 to 788.4 million m3 in year 2000 assuming a growth in urban per capita consumption from 107 lcd 2/ in 1970 to 200 lcd in 2000. Consumption per capita in the rural areas is projected to rise from 55 lcd in 1970 to 100 lcd in 2000. Urban population served by house-connections is projected to rise from about 70 percent in 1975 to 95 percent by year 2000 while rural population with reasonable access to supplies is expected to rise from 50 percent in 1970 to 90 percent in 2000. Finally, the urban population connected to municipal sewerage systems is projected to rise from 60 percent of total urban population to 90 percent in 2000.

1/ Projections which are stated in this and the following chapters are based on the sector mission's estimates and unless otherwise stated, do not represent either World Bank projections or official government projections or targets.

2/ lcd = liters per capita per day. (1 lcd = 0.26 US gallons per capita per day.)

This Annex is based on an unpublished World Bank sector report. The report was prepared by Messrs. V. Nwaneri (Economist) and S. Serdahely (Sanitary Engineer), based on their mission to Syria from November 11, 1976 to December 13, 1976. Messrs. W. Keilani and W. Cosgrove participated part-time on the mission.

1.03 With regard to the existing sector situation, present service levels throughout Syria (in terms of house-connections and public taps for water and house-connections for sewerage) are relatively high except for residents outside the planning limits of major cities. However in most cities, existing water distribution and sewage collection systems are old and need to be replaced. As a result water losses in distribution systems are high. In some cities supplies are intermittent. Most water meters are broken and need to be repaired or replaced. The Government's objectives had emphasized house-connections in both urban and rural areas except in those villages which do not have their own municipal authorities. In the past, urban water supply had rightly been given highest priority and this accounts for the present relatively high service levels in major cities. Although the Fourth Plan (1976-80) has been published, its targets were scaled down because of economic and financial constraints. It had originally proposed expansion of village water supply systems and provision of sewage treatment for the major cities of Damascus, Homs, Hama, Aleppo and Lattakia. This strategy reflected the fact that at present there is no municipal sewage treatment facility in Syria. Furthermore, in certain areas along the Quwaik river and particularly around Aleppo, the use of stream flow (which is polluted with untreated sewage) for contact irrigation by farmers located downstream from sewage outfalls contributes to a high incidence of waterborne diseases. The incidence reaches epidemic proportions and is causing considerable financial losses in crops destroyed during epidemics.

SUMMARY RECOMMENDATIONS

1.04 Priority should be given to extending services to areas outside existing city limits since a number of urban poor live outside these limits. The Government should consider such a measure in conjunction with overall urban population control and town planning policies. The emphasis of expanding urban house-connections within the existing city limits should, for the period up to 1980, be shifted to improving quality of services - replacing old water distribution and sewage collection systems, reducing water losses in the system, providing better quality of water for longer periods and repairing and replacing meters. Pollution of water sources from urban sewage should be studied and projects to control such pollution especially in the cities of Damascus, Aleppo, Homs, Hama and Lattakia have high priority. Furthermore the government should consider as urgent a pollution control legislation for the whole country to ensure protection of existing sources of supply.

1.05 The Fourth Five-Year Plan (1976-80) originally proposed to spend an estimated total of SL 2.6 billion (US$670 million). 1/ The principal factors likely to constrain the Government's original sector proposals for the Fourth Plan and limit the achievement of the mission's projected service levels include the following:

(a) limited budgetary funds due to Syria's recent political and economic developments;

1/ In 1975 prices, for Water Supply and Sewerage only (Chapter 3, Table A6.3.3).

(b) shortage of qualified staff;

(c) inadequate tariff structure and poor financial management by the authorities in the sector;

(d) inadequate coordination at both ministerial and operational levels;

(e) increasing costs of construction and materials; and

(f) insufficient project preparation capability.

Because of limited funds and increasing costs, only about 60 to 80 percent of the government's original sector targets based on 1975 prices are now likely to be achieved. The Government is now considering substantially reducing its Fourth Plan targets.

Recommendation:

A progressive tariff structure for water (and eventually for sewerage) designed to cover operating and maintenance costs of service with some contribution to system development is strongly recommended to ease pressure on Government budgetary resources. A legislation permitting increased average tariff structure has been passed recently but the proposed tariff increases for domestic consumers have not yet been effective. Thus the Central Government is modifying its policy of being the principal source of funds for sector development and encouraging greater generation of funds within the sector. The recommended progressive tariffs should also ensure that the poor are provided access to service. The recommended improvement in metering, billing and collections should also help alleviate present financial problems faced by water authorities.

1.06 The shortage of skilled staff throughout the sector will impose the most severe constraint to achieving service level improvements. The principal causes of the shortage include the absence of any formal training program in the sector and poor salary and wages structure for staff in public service. This report includes an assessment of present staff shortages in the sector and gaps to be filled before 1980.

Recommendation:

A training program designed to meet existing and projected manpower needs in the sector is recommended and should be given highest priority. Finance for such a national training program is already provided from an Arab Fund Loan to the Damascus Water Authority. The Government should therefore engage a consultant to assist local officials to start implementing the national training program as soon as possible. However, improving working conditions including the low salary structure is fundamental to the long-term solution of the skilled manpower shortage.

1.07 Several Government ministries are involved in the sector. However the most active is the Ministry of Housing and Utilities (MHU) which supervises all eight public water authorities in Syria and is directly responsible for rural water supplies. It also prepares the design and supervises the construction of all projects in this sector except in Damascus and Aleppo cities.

Recommendation:

Government's policy of establishing public water authorities in all the thirteen provincial capital cities of Syria is likely to lead to more efficient development of the sector. The sewerage subsector is, however, weakly organised at present within the local municipal authorities. A nucleus of staff at MHU in Damascus, prepares designs for projects but its staff is too small to make any effective impact. Improved organization for sewerage is therefore recommended. Alternative organizational arrangements to be explored should include establishing an autonomous national sewerage authority to be responsible for sewerage in all urban areas. At present, the staff shortage and absence of treatment facilities preclude setting up one sewerage authority for each provincial city as is the case for water.

PROJECTS RECOMMENDED FOR STUDY

1.08 High priority should be given to water projects that relieve demand pressure in urban areas and sewerage projects that reduce pollution of existing sources. A number of projects currently being studied or considered for study include: the Aleppo sewage treatment and collection, Palmyra multipurpose water supply from the Euphrates river, village water supply in the Kalamon region (for a group of 25 villages between Homs and Damascus), Lattakia sewerage (second phase), pollution control of Orontes and Barada rivers (including sewage treatment plants for Damascus, Homs and Hama), Tartous water transmission line, Deir-Ez-Zor sewerage and treatment plant and village water supply. Technical assistance is needed in the following areas; manpower training, groundwater exploration (especially in Palmyra), leak detection program, water distribution, sewage collection system analyses, billing and cost accounting management. Because of the manpower constraints discussed in Chapter 3, expatriate assistance will be needed to prepare these projects.

PROJECT PREPARATION

1.09 Part of the constraint imposed on sector development by the inadequate project preparation capability in Syria stems from the shortage of skilled manpower. With regard to project construction, authorities in the sector are pressing the Government to give special consideration to encouraging industries that produce construction materials (cements, plastic pipes, etc.). The Bank's recent project for Aleppo includes provision for technical assistance for the construction industry in Syria.

Recommendation:

Long-term and lasting solutions to the project preparation problem cannot be achieved unless the Government pursues a viable salary and wages policy as well as implementing the recommended national training program. Other measures include standardization and publication by MHU of design criteria now being used in the sector. With regard to the problem of low salaries in the public sector, the Government may consider a short-term measure of making exceptions for project related skills to facilitate implementation of major projects.

SEWERAGE

1.10 The current program to construct sewerage facilities in major Syrian cities will be seriously constrained by the present inadequate organization of this subsector and the extreme manpower shortage within the sewerage division of MHU. There is an urgent need to strengthen the capability of this division to enable it to undertake its project preparation and supervision responsibilities throughout Syria. A panel of professional engineers could be established to review and advise the sewerage division on the preparation of its projects. This could be an alternative but temporary solution to the severe shortage of technical staff within the division. The scope for technical assistance to establish such a panel while the training of permanent staff is undertaken should be explored.

CHAPTER 2

COUNTRY AND SECTOR SITUATION TO YEAR 2000

GEOGRAPHY AND CLIMATE

2.01 Syria has a total area of 190,000 square kilometers, about one third the size of France. Its topography is generally mountainous in the western coastal area becoming semi-arid or desert in the remainder of the country. In general terms, half of the country is arid, a quarter semi-arid and a quarter humid.

2.02 The climate is typically Mediterranean with moderate rainy winters and hot, dry summers. The coastal mountains form a barrier against the wet westerly winds, and rainfall west of the mountains diminishes as a consequence. Annual rainfall varies between 500 and 1,000 mm per year in the coastal and mountain areas. In the distant eastern and southeastern areas the variation is from 500 mm per year down to 50 mm per year.

TOTAL POPULATION

2.03 Syria's total population (Table A6.2.1) grew from 3.5 million in 1950 to 4.6 million and 6.3 million respectively for the census years of 1960 and 1970. During the two decades the average growth rate had gone up from 2.7 percent for the first decade to 3.3 percent for the second. The Government's Central Bureau of Statistics estimates that Syria's total population in 1975 was 7.4 million and likely to rise to 8.6 million in 1980, thus implying a slightly lower rate of growth than in 1960-1970. According to the United Nations projections 1/ Syria's total population would be roughly doubled every twenty years up to the year 2000 with the average annual growth rate at first rising to 3.5 percent for the decade 1980-1990 and then falling to 3.1 percent by the year 2000. In that year Syria's total population could reach 16.8 million on present trends.

1/ Projections used in this chapter are based on the high variant of the U.N. World Population Projections to Year 2000 (ESA/P/WP. 53, 10 March 1975). The total population projected for 1985 in this variant is the same as in the UN median variant projections (See Table SA 1B.1). However, the total population projected for the Year 2000 is 4.8 percent higher than the 15.824 million of the UN median variant projection, and the urban populations projected for 1985 and 2000 are 1.9 and 12.5 percent higher respectively than the 4.114 and 9.574 million projected in the UN median variant projections. These projections provide an outer limit on "population growth" induced demands on the water supply services in urban areas.

Table A6.2.1: POPULATION OF THE PROVINCES, 1960-1980
(thousands of people)

Province (Mohafazat)	Total /a 1960	Total /b 1965	Total /a 1970	Total /b 1975	Total /b 1980
Damascus City	530	641	837	1,042	1,292
Damascus	473	455	621	732	871
Aleppo	957	1,128	1,317	1,523	1,775
Homs	401	460	546	629	730
Hama	325	378	55	601	707
Lattakia	527	623	390	444	511
Deir-Ez-Zor	221	260	293	332	379
Idlib	333	374	384	429	479
Al-Hasakeh	353	374	469	532	608
Al-Raqqa	178	167	244	281	325
Al-Sweida	100	111	140	162	192
Dar'a	168	158	233	282	348
Tartous	-	-	302	348	403
Quneltra	-	136	17	19	22
Total	4,565	5,262	6,305	7,355	8,642

/a Population census results for September.
/b Mid-year estimates.

Source: Statistical abstract of SAR (1976) - all figures are rounded to nearest thousand.

URBAN POPULATION 1/

2.04 The proportion of Syria's total population living in the urban areas in 1975 was estimated to have increased to 46 percent, from 35 percent in 1950. According to U.N.'s projections, Syria's urban population would rise to 65 percent of total population in 2000, implying an average annual growth rate of nearly 6 percent, which is double the annual growth rate of total population by year 2000. The high rate of growth in the past reflects, in addition to natural increase, rapidly increasing rural emigration to the cities and influx of refugees during the 1967/1973 conflict and the more rece n Lebanese crisis.

1/ Refers to population of all settlements 10,000 and over.

PRESENT AND PROJECTED SERVICE LEVELS FOR WATER

2.05 The rapidly increasing urban population in Syria has put pressure on existing water and sewerage facilities. In the capital city, Damascus, demand has already exceeded supply, a situation which the second Bank water supply project is expected to resolve. In Aleppo demand is projected to outstrip supply by 1981. In these and other major cities (Homs, Hama, Lattakia) authorities are preparing projects to expand existing sources of supplies. Several factors contribute to the imbalance between supply and demand, the first is the constraint on supply.

SUPPLY CONSTRAINTS AND INCREASING COSTS OF URBAN SUPPLIES

2.06 As discussed in Attachment A-1 there are seven hydrological basins in Syria (see Map at the front of Volume 2, The Main Report) and these show a wide variation in annual rainfall and groundwater balance. As a result, some areas, for example along the Euphrates, have abundant water supply while other areas, for example the desert basin around Palmyra, suffer from chronic shortages. In addition to the uneven distribution of water resources, there is a growing problem of pollution of traditional sources such as the Orontes and Barada Rivers from domestic and industrial sewage. This has aggravated the supply situation in the regions of Damascus, Homs, Hama and Aleppo which have high concentration of population. In these areas existing sources are being severely strained; pumpage of water in excess of safe yield has resulted in damage to springs and increased pumping costs. The increasing cost of supply is evident in Homs and Hama where, because of the pollution of the Orontes River, new sources of supply are located 32 km and 90 km, respectively, from the centre of these cities. Aleppo relies on Lake Assad located 82 km distant on the Euphrates River rather than the Quwaik River nearby whose flow is insufficient to meet the city's needs. Its cost of supply is expected to increase as a result of a project to increase its supply from Lake Assad. The project is estimated to cost about SL 461.4 million (US$116.8 million) and will meet Aleppo's demand to 1991. 1/ Damascus traditionally had low cost of supply because the city is served from a spring (Ain Figeh) whose water flows by gravity 15 km to the city. Because of good raw water quality of the Figeh spring, no treatment is required. However, the cost of supplying Damascus is also likely to rise because of the high cost of a new project which will augment the city's supply to the year 1987. The project is estimated to cost approximately SL 1,027 million (US$260 million). The city is located on the Barada River but the river is polluted by domestic and industrial sewage. Cleaning up the river would add to the cost of the city's supply if its water is to be used for drinking. Similarly, the cost of supplying Homs and Hama is expected to rise, reflecting new projects required to expand supply from upstream of the Orontes River. It can be concluded therefore, that for Syria's major cities, the existing supply is so constrained that additional supplies will be forthcoming only at higher costs. This situation is reinforced by the rapidly increasing cost of supply materials, equipment and foreign consultant services (see para 3.11).

1/ After some minor investments are made in 1986.

CONSUMPTION PROJECTIONS TO YEAR 2000

2.07 Table A6.2.2 and Figure A6.1 show the consumption projections for all the urban and rural areas of Syria to the year 2000 as estimated by the sector mission. Table A6.2.3 gives a summary of published production and consumption data for 1971-74 for Syria's nine major cities served by public water authorities (para 3.04). The population of these nine cities in 1975 accounted for about 90 percent of Syria's total estimated urban population of 3.4 million. Because these cities are located in nine of Syria's water resource basins (Attachment 1), it is therefore fair to assume that the water consumption and production situation in these cities can be considered representative of the situation in all urban areas in Syria. These data were therefore used as a basis for projecting production and consumption levels for Syria to the year 2000. Additional information used in the projection was obtained from reports covering recent World Bank projects in Damascus and Aleppo, the two largest cities in Syria (accounting for 63 percent of total 1975 urban population). These were reinforced by data from current government projects in other main cities such as Homs, Hama and Lattakia as obtained during the sector mission.

Table A6.2.2: WATER AND SEWERAGE SERVICE LEVEL PROJECTIONS FOR URBAN AND RURAL AREAS

Year	1970	1975	1980	1985	1990	1995	2000
(1) Total population	6.3	7.4	8.6	10.1	12.1	14.2	16.6
URBAN							
(2) Population	2.7	3.4	4.2	5.3	6.8	8.6	10.8
(3) (2) as % of (1)	43	46	49	53	57	61	65
Water							
(4) Population with house-conn. as % of (2)	68	70	73	80	85	90	95
(5) Pop. with public stand-posts as % of (2)	15	20	17	13	10	7	3
(6) Other sources as % of (2)	15	13	10	7	5	3	2
(7) Per capita consump. (l.p.d.)	107	123	139	155	170	183	200
(8) Total consumption (million/m3)	106	153	213	310	447	596	788
Sewerage							
(9) Sewerage % served	60	65	68	75	80	85	90
RURAL WATER							
(10) Total rural population (millions)	3.6	4.0	4.4	4.8	5.3	5.6	5.8
(11) Rural per capita consump. (l.p.d.)	55	60	70	80	90	95	100
(12) % rural pop. with access to safe water	50	55	60	70	80	85	90

Source: Sector Mission estimates based on statistical abstract of SAR (1976) and U.N. World Population Projections to 2000 (ESA/P/WP53, March 10, 1975).

Table A6.2.3: PRODUCTION AND CONSUMPTION OF DRINKING WATER (MILL M^3) AND NUMBER OF SUBSCRIBERS ('000) IN PUBLIC WATER AUTHORITIES 1971-1974

Classification	1974	1973	1972	1971
Damascus Water Authority				
Accrual production	92.6	87.5	84.0	73.0
Priced consumption	44.5	41.1	37.0	33.1
Free consumption	21.9	20.3	18.1	16.3
Unaccounted for water	26.2	26.1	28.5	23.6
Number of subscribers	146.5	142.6	136.0	133.4
Number of utilizers	820.2	798.7	761.7	686.8
Aleppo Water Authority				
Actual production	37.3	38.0	33.2	31.2
Priced consumption	23.3	23.7	20.3	20.3
Free consumption	3.0	3.0	4.0	5.2
Unaccounted for water	11.0	11.2	8.9	5.7
Number of subscribers	104.5	100.3	96.2	92.1
Number of utilizers	521.8	501.5	668.9	460.3
Homs Water Authority				
Actual production	17.0	16.6	11.2	12.6
Priced consumption	10.0	7.4	6.3	6.0
Free consumption	1.4	3.1	0.4	0.2
Unaccounted for water	5.6	6.1	4.5	5.3
Number of subscribers	28.6	27.1	24.5	23.9
Number of utilizers	200.2	189.7	149.6	145.9
Hama Water Authority				
Actual production	9.7	8.3	3.0	7.5
Priced consumption	5.5	4.7	1.7	4.5
Free consumption	0.4	0.3	0.1	0.3
Unaccounted for water	3.8	3.3	1.2	2.7
Number of subscribers	18.5	17.8	17.0	16.3
Number of utilizers	145.0	142.0	136.0	130.4
Lattakia Water Authority				
Actual production	11.0	11.0	11.0	6.6
Priced consumption	5.1	5.0	5.0	4.7
Free consumption	2.8	2.2	1.1	0.7
Unaccounted for water	3.1	3.8	4.9	1.1
Number of subscribers	17.9	16.2	14.9	13.0
Number of utilizers	90.0	80.0	75.0	65.3

Classification	1974	1973	1972	1971
Raqqa Water Authority				
Actual production	4.3	2.9	2.9	2.1
Priced consumption	2.1	1.1	1.1	1.1
Free consumption	1.6	1.6	1.6	0.8
Unaccounted for water	0.3	0.3	0.3	0.2
Number of subscribers	5.8	5.2	5.2	5.0
Number of utilizers	28.9	23.0	23.0	24.0
Sweida Water Authority				
Actual production	0.4	0.7	0.6	0.9
Priced consumption	0.2	0.5	0.4	0.6
Free consumption	0.04	0.2	0.1	0.1
Unaccounted for water	0.1	0.1	0.1	0.2
Number of subscribers	3.6	3.5	3.3	3.1
Number of utilizers	28.0	24.0	20.0	18.7
Hasakeh Water Admins.				
Actual production	2.3	1.9	1.9	2.5
Priced consumption	1.1	0.8	0.9	1.0
Free consumption	0.7	0.7	0.8	1.3
Unnaccounted for water	0.5	0.4	0.1	0.2
Number of subscribers	4.0	3.7	1.3	1.3
Number of utilizers	39.2	36.8	30.5	30.5
Kamishli Water Admins.				
Actual production	2.0	1.3	0.8	1.3
Priced consumption	1.4	0.7	0.6	1.1
Free consumption	0.5	0.4	0.1	0.1
Unaccounted for water	0.06	0.1	0.03	0.04
Number of subscribers	3.9	3.7	3.7	3.3
Number of utilizers	39.5	36.2	36.2	36.2

Total of 9 Cities	1971	1974	1976c/	1980c/
Actual production ($m.m^3$)	137.8	176.6	202.6	254.8
Priced consumption (")	72.4	94.3	108.9	138.1
Free consumption (")	23.9	32.4	38.0	49.1
Unaccounted for water(")	39.6	50.7	58.1	72.9
Metered conn. (000) a/	291.3	333.2	361.2	417.3
Pop. house-conn.(mil) b/	1.6	1.9	2.1	2.6
Free cons. as 1% prod.	17.3	18.3	18.7	19.3
Unaccounted for water as % of prod.	28.7	28.7	28.7	28.6
Per capita cons. (l/c/d)	110	120	126	139

a/ Described as No. of subscribers in the Statistical Abstract.

b/ Described as No. of utilizers in the Statistical Abstract.

c/ Mission's estimates based on annual average increase over 1971-1974

Source: Statistical Abstract of SAR (1976)

2.08 On the basis of all these sources of information, it was estimated that about 95 percent of Syria's urban population of nearly 11 million could be served by house-connections by the year 2000 compared to about 71 percent in 1976. The growth to the 95 percent level is expected to occur mainly after 1980. This reflects the pipeline of projects to be completed in the major cities such as Damascus, Aleppo, Hama, and Lattakia. A per capita consumption of 200 lcd is assumed to be reached (as an average for all the urban areas in Syria) by the year 2005, even though this would be exceeded in Damascus and Aleppo by 2000. Urban population served through public taps is expected to continue to decline from an estimated 20 percent in 1975 to 3 percent by year 2000. This reflects the current policy of phasing out public taps in the urban areas of Syria, a policy which has so far been successful. Existing public taps are found largely in mosques and other public places.

2.09 Urban population using other sources of supply (wells, water vendors, public water tankers, etc.) are not expected to be completely served from public supplies until the year 2000. This reflects the fact that at present a significant proportion of urban residents live outside the city planning limits and are excluded from the existing facilities of public water authorities on the grounds that these residents are either illegal squatters on public land or that sources of supply are not adequate to cover them. Furthermore, authorities prefer to replace their existing problem ridden distribution networks, most of which are too old and contribute to high system losses rather than extend these network to areas outside the city planning limits. Residents in these areas rely for water supply mostly on private wells, few public taps and expensive water vendors who charge often as much as SL 10.0/m3 compared to the original charge of SL 0.40/m3 (US$0.40/1000 gals) which has just been increased. Service levels for the urban poor residing within the city limits are generally satisfactory but those outside these limits lack adequate service. However where extension of services outside city limits seriously conflict with government's urban population control and city planning policies, provision of rural facilities becomes important to stem the drift to the city. This measure is most important in those cities where the capacity of existing production and distribution facilities are limited. In some cities such as Damascus, most of these outside-city-limit residents have income below the city's average. The Aleppo Conference 1/ (Attachment A-4) strongly recommended that measures be taken to extend services to areas outside the existing city limits. This recommendation is supported in this report and the Government needs to consider urgently removing legal obstacles to achieving this objective.

2.10 The above consumption projections reflect primarily domestic water consumption rather than industrial water demand. Industrial users are served by the public authorities in most of the larger cities but their consumption is very low compared to domestic demand. In other areas most industries have their own private wells. However, in some of the smaller cities, with limited

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1/ This was the fifth Conference of the Public Water Authority Directors in Syria which was held in Aleppo November 6 and 8, 1976. Its recommendations are summarized in Attachment A-4.

resources, large unplanned industrial and military demands could impose severe strains on resources. In Sweida for example, the combined monthly military and industrial demand is equivalent to more than 9 days production. Similarly, the expansion of the oil refinery in Banias (located between Lattakia and Tartous) will add about 1 m3/sec. demand to an already over extended public water supply system. It is evident therefore that industrial location in the future should take into account water availability in the area.

IMPROVEMENTS IN QUALITY OF SERVICE

2.11 It is suggested that a major objective for the period before 1980 should be the improvement in the quality of service provided in the urban areas. Though the number of house-connections in Syria is above the average compared to other countries in the Middle East and North Africa Region 1/, the quality of service provided in the urban areas leaves much room for improvement. In the areas within the city planning limits, continuous service is provided in most cities. The rehabilitation of the existing distribution system is one of the main objectives proposed for the Fourth Five-Year Plan (1976-80) (see Chapter 3, para 3.07 and Table A6.3.3). Connections in most urban areas are said to be almost 100 percent metered. However, in almost all the cities, a significant percentage of the meters are either broken or malfunctioning; some authorities are no longer certain of the accuracy of consumption data. The need for a meter repair, maintenance and replacement program is urgent.

2.12 A comparison of the levels of water quality in the major Syrian cities is provided in Table A6.2.4. Disinfection by chlorination is most common, with gas chlorination utilized by the larger water authorities and high test hypochlorite applied by the smaller ones. MHU's standards for drinking water quality are the same as those of the WHO 2/. Sampling and analysis by operators vary considerably, from once per day to none at all. Laboratory facilities are provided by MHU and only the largest water authorities have adequately equipped laboratories of their own. Private laboratories are used for chemical analysis. Except in Damascus and Homs 3/, treatment is provided in the larger water authorities. There are water treatment plants in the following cities: Aleppo, Lattakia, Hama, Raqqa, Idlib and Deir-Ez-Zor. Generally, treatment consists of sedimentation, flocculation, filtration and chlorination. In some cases, as in the new Hama installation, the level of treatment provided may be higher than actually required because of the good quality of the raw water. For their filtration media, most plants utilize sand which is available in abundance in the vicinity of Tartous. Chlorine and aluminium sulfate are imported but lime is produced in Syria.

1/ This is confirmed by WHO - Surveys of Water Supply and Sewerage Services for 1970 and 1975.

2/ International standards for drinking water (Geneva 1971).

3/ Damascus source from Figeh spring and Homs from El-Tanor are of such a high quality that treatment is not required.

Table A6.2.4: WATER SERVICE LEVELS AND QUALITY (1976)

	Source	Population Served /d	Hours of Service	% Unaccounted for Water	Chlorination /b
Urban Area					
Aleppo	Euphrates River	1,027,000	24 /a	29	Yes
Sweida	Dam and Spring	40,000	20	30	Yes
Homs	Spring	120,000	24	50	Yes
Hama	Orontes River	-	24	33	Yes
Palmyra	Wells	30,000	22	33	No
Lattakia	Spring	250,000	24	48	Yes
Tartous	Wells	45,000	24	Not determined	No
Banias	Spring	30,000	24	Not determined	Yes
Raqqa	Euphrates River	-	24	25	Yes
Deir-Ez-Zor	Euphrates River	100,000	12	Not known	
Rural Areas /c					
Homs Mohafazat villages	Wells	300,000	70%-8hrs-30%-16hrs	30	No
Musharfiy	Dug Wells	6,000	8	Not known	No
Furlus	Wells	2,200	8	Not known	No
Sayed	Wells	1,800	8	Not known	No
Tiyzin (4 villages)	Wells	2,000	16	Not known	No

/a This applies to only 75 percent of the service area which is supplied under pressure. The rest are on a rotational basis depending upon peak load requirements.

/b B = Chemical and bacteriological analyses are undertaken regularly in major cities (Damascus, Aleppo, Lattakia) but not as regularly for other smaller cities.

/c Refers to the villages visited by sector mission.

/d Includes both house-connections and public taps.

2.13 Present water sampling and bacteriological quality control are inadequate outside the areas served by the largest water authorities such as EPEF and EPEA. Also, as indicated in Table A6.2.4 disinfection could be more widely practiced than at present. To meet the WHO quality standards, MHU needs to make regular sampling of sources in various provinces. Reports of high bacteriological contents in the sources are received regularly from MHU field officers. However the MHU is severely constrained to undertake appropriate solutions because of the following factors. First, there is an inadequate supply of both gas chlorine and hyperchloride from imports. Secondly, because of a shortage of trained laboratory and other technicians testing and analysis of sources are very irregular. Thirdly, there are inadequate laboratory facilities for such testing and analysis. To solve these problems the following measures need to be considered: (a) to establish a local factory to produce gas chlorine since the country has adequate raw materials and power for such production, (b) training of laboratory technicians and chemists for water analysis should be given priority, (c) extension of laboratory facilities to the province where appropriate.

RURAL WATER SUPPLY AND PROJECTIONS

2.14 According to the 1970 census results, the rural population of Syria was 3.6 million, accounting for 57 percent of total population of 6.3 million. By the year 2000, the rural population is projected to rise to 5.8 million (Table A6.2.2) accounting for only 35 percent of the total population. The MHU estimated that in 1970, 1.75 million (50 percent) of the rural population had reasonable access to safe water. By 1975, the proportion was estimated to have gone up to 55 percent and is projected to reach 90 percent by 2000 (Table A6.2.2). These projections reflect present Government policy to install rural facilities for villages with population above 200 (see para 3.07). These projections should be interpreted cautiously for various reasons. It is difficult to obtain reliable estimates of rural service levels for water because of the unclear definition of rural areas and inadequate data on rural population. This is further complicated by the existence of large numbers of nomads (Bedouins) in some areas. Inadequate data on water resource availability, quantity and quality in most rural areas is a further complication. Despite these difficulties, rural service levels in Syria are clearly above the average compared to other countries in the Middle East Region. This is due in part to the ambitious program of the Third Five-Year Plan (1971-75) (see para 3.06). During that Plan period projects were implemented in most of the villages. Those with existing municipal authorities pursued a policy of limiting or phasing out public taps and expanding house-connections. In the smaller villages with scattered or Bedouin population, public taps were installed within easy reach of the average villager 1/. In general, service levels are higher in the larger size villages than in the smaller ones. The imbalance will not be redressed until more of the smaller villages improve their water service level situation by establishing their own municipalities to operate and maintain the rural facilities.

1/ In the villages visited by the sector mission, the public taps are on average 200 m to 300 m apart and the most distant user in the village located approximately 500 m to 600 m from the public tap.

2.15 In those villages that have not benefited from rural water projects, quality of services vary widely, ranging from good in the villages with good quality springs nearby to very bad in those relying on highly polluted rivers or wells. In those villages using highly polluted stream flows for contact irrigation (for example, in the Hama, Aleppo and Deir-Ez-Zor areas), water-borne diseases tend to reach epidemic proportions, (see Attachment 1 on public health).

SEWERAGE SERVICE LEVELS AND PROJECTIONS

2.16 Service levels for sewerage are in general more difficult to assess in Syria than for water because the latter is managed by semi-autonomous authorities in major cities and by the MHU local officials for the rural areas. Sewerage on the other hand is almost entirely managed by municipal authorities who do not separate their operational responsibilities for all services, including sewerage. Although there are at present no sewage treatment plants in Syria, every large Syrian city has a sewage collection system which discharges into the nearest river, valley, sea or irrigation fields (see Table A6.2.5). All existing facilities are combined sewerage systems. Fairly comprehensive sewage collection networks exist in the major cities of Damascus, Aleppo, Homs, Hama and Lattakia. Parts of these collection systems in these cities are very old - the Damascus system is several centuries old while the Aleppo system dates back 50 to 60 years. Others are of more recent origin.

Table A6.2.5: SEWERAGE SERVICE LEVELS IN 1976

City	Estimated Population in 1973 (000) /c	% of City population served with piped sewerage /a	% of City population served with Cesspools /b	% served with Latrines or nothing
Damascus	1,257	70	30	
Aleppo	871	80	10	10
Hama	218	60	40	
Homs	312	95	5	
Lattakia	185	85	15	
Al-Sweida	47	50	30	20
Palmyra	20	95		5
Deir-Ez-Zor	110	80	10	10
Raqqa	71	50	25	25

/a Estimated as percent of population within city planning limits.
/b Includes residents outside the city planning limits.
/c Statistical Abstract of SAR, 1976.

Source: Municipal officials' estimates supplied to sector mission but figures should be interpreted with caution.

2.17 The mission estimates that in 1970 about 60 percent of Syria's urban population had house-connections to the municipal sewage collection systems and that by 1975 this percentage had risen to 65 percent. As with water, the principal objective before 1980 would be to improve the quality of existing collection systems. After that year, the percentage of urban buildings connected is expected to rise gradually to 90 percent by the year 2000. The projections are slightly less optimistic than expected by municipal officials who according to Figure A6.1 claim to have already connected over 80 percent of the urban population. Some of their data, however, refer only to population within existing city planning limits. The rest of the urban buildings not connected to municipal systems rely on cesspools or other means (see Table A6.2.6).

Table A6.2.6: SOLID WASTE DISPOSAL IN SEVERAL CITIES (1976 /a

City	No. of Trucks	No. of Employees	Disposal Method	Revenue Generated
Damascus	60	2,000	Open Dump	LS. 0.50/ton of Compost
Aleppo	7	1,300	Landfill and Compost Plant	LS. 20/ton of Compost
Al-Sweida	1	25	Open Burning	None
Homs	20	/a	Open Burning	None
Hama	12	/a	Open Dump	None
Palmyra	1	10	Open Dump	None
Lattakia	10	/a	Incineration	None, but new Compost Plant contracted
Raqqa	2	/a	Open Dump	None
Deir-Ez-Zor	4	/a	Open Burning	None

/a Included as part of overall municipal labor force.

Source: Data supplied by Municipal Authorities.

CHAPTER 3

PRESENT SECTOR ORGANISATION, PLANNING AND CONSTRAINTS

3.01 For administrative purposes, Syria is divided into thirteen provinces (called Mohafazat) and each province is subdivided into districts and sub-districts 1/. The municipalities are the administrative authorities for the cities, towns and villages (called Baladiya).

SECTOR ORGANIZATION

3.02 Until 1971 the Ministry of Municipalities and Rural Affairs was responsible for water supply and sewerage in both urban and rural areas. Since the dissolution of this Ministry, this function is now shared between the Ministry of Housing and Utilities (MHU) and that of local government (MLG). Regarding water supply and sewerage, the MHU is responsible for general guidance and assistance (to municipalities and other agencies in the sector) on technical problems and project designs while MLG has overall financial responsibility for the services provided by these municipalities (including water and sewerage). The Ministry of Public Works and Hydraulic Resources (MPW) has general responsibility for water resource management throughout Syria except that the Ministry of the Euphrates manages the large Tabqa hydroelectric dam and its associated irrigation schemes.

3.03 The MHU has two divisions at its headquarters in Damascus, one of which is responsible for potable water supply and the other for sewerage (See Attachment A-2, Figure 1 for the Organization Chart of this Department). The Water Supply Division has staff in the local MHU office located in each of the 14 provincial capitals in Syria. Through these provincial offices, MHU discharges its technical advisory responsibilities to the municipalities or the public water authorities (para 3.04). For the larger villages, the MHU designs the facilities including the source supply, treatment plant, the main distribution lines and reservoirs. If a village exceeds 1,000 people, it may establish a municipal administration which assumes responsibility for services including water and sewerage. In large municipalities, MHU's responsibility is principally advisory but in smaller ones or villages without established municipal administration, MHU is largely responsible for construction, operation and maintenance. As there are at present no sewage treatment facilities in Syria, the MHU provincial staff is almost exclusively devoted to water

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1/ Each administrative division (province, district or subdistrict) is named after its capital city or town. The term "urban population" in Syria often refers to the populations of these provincial and district capital cities as well as to all settlements of size 10,000 and over. However, the term is often used by the officials (especially in water sector) to refer to the population of the provincial capital cities only, while the rest of the country is the rural or village population.

supply problems. The responsibility for sewerage throughout Syria at present is vested in a small unit within MHU which gives occasional assistance to municipalities on sewage collection problems. The unit's main task is the designing of new sewage treatment facilities but at present it has little resources to effectively discharge its responsibility. The government should eventually reorganize sewerage, under an independent national authority. In the meantime the sewerage division needs to be expanded.

3.04 Eight major cities - Damascus, Homs, Hama, Aleppo, Lattakia, Sweida, Raqqa and Idlib - have semi-autonomous water authorities which are responsible for all aspects of water supply in their respective cities. Elsewhere, all but the smallest urban centers may be considered to have some form of water supply distribution systems which are managed by units within the local administrative structure. The eight water authorities are subject to the technical supervision and guidance of the MHU covering such matters as project preparation, design, construction operation and major contracts. Only Damascus and Aleppo have water authorities sufficiently large to be independent of the MHU's technical supervision and guidance.

3.05 In February 1974, the Government issued Decree No. 18 (see Attachment A-3) which now governs all public authorities, corporations and establishments in Syria. It formalizes previously existing customs and procedures, laying down general rules regarding location, lending and borrowing requirements, management by the General Director and a Board of Directors, financial and accounting requirements, ministerial responsibility, and the powers of the General Director, his Board of Directors and the responsible Minister. Decree No. 18 also specifies that each authority should have a separate Decree that contains the detailed regulations pertaining to that authority 1/. The eight water authorities have similar organisation structures. The recent Aleppo Conference calls for standardizing the organization structures of all these authorities (Attachment A-2, Figures 2, 3 and 4 give the organization charts of Damascus, Aleppo and Homs water authorities). A study to determine the optimal organizational structure for public water authorities is now in progress. It is expected to propose ways of standardizing the organizational structure of these public authorities.

SECTOR GOALS AND PLANNING

Third Five-Year Plan (1971-75)

3.06 The Third Plan proposed total expenditure for projects in the water supply sector was estimated in 1971 prices at SL 212 million (US$54 million). This included SL 101 million by public water autorities (see Table A6.3.1) and SL 111 million for the rural areas (see Table A6.3.2). The Government believes that over 75 percent of its goals for the Third Plan were achieved

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1/ For example, Decree No. 252 was issued on May 14, 1975, specifically for the Damascus Water Authority (EPEF). It defines the functions of EPEF, its capital, sources of funds and staff regulations (Attachment A-3).

in terms of amounts spent. The principal sector goals set for water supply in the Government's Third Plan (1971-75) included the following targets: 1/

(a) In the urban areas, to increase the percentage of users (those with house-connections) from 58 percent to 68 percent.

Table A6.3.1: SOURCES AND AMOUNTS OF PUBLIC WATER AUTHORITY PROJECTS FOR THIRD PLAN (1971-1975)
(Millions)

Water Authority by Province	Total Funds Required for Plan	State Development Budget	Internal Funds	Loans	Other Sources
Damascus Water Authority	43.0	7.5	1.3	10.2	24.0
Homs Water Authority	14.5	2.6	1.7	10.1	-
Hama Water Authority	1.8	-	0.8	1.0	0.1
Lattakia Water Authority	5.5	-	2.1	0.4	3.0
Aleppo Water Authority	36.2	9.0	7.5	19.7	-
Total	101.0	19.1	13.4	41.4	27.1

Source: Third Five Year Plan 1971-1975. Page 33. (Figures are rounded) - in 1971 prices.

(b) In the rural areas, to raise population served by public supplies from an estimated 45 percent in 1971 to 65 percent in 1975 by providing water to villages with population over 400 provided that the per capita cost does not exceed SL 60 (US$15.20).

1/ These are official targets as distinct from the sector mission's projections (see footnote 1, paragraph 1.01).

Table A6.3.2: SUMMARY OF THE PROPOSED SECTOR INVESTMENTS IN THE FOURTH FIVE-YEAR PLAN 1976-1980

Province	P.W.A. /d	M.H.U. /e	Municipalities Water	Municipalities Sewerage	Total
Damascus	1,023.5	105.7	-	60.0	1,189.2
Dar'a	-	32.4	-	-	32.4
Sweida	16.0	36.1	-	3.2	55.3
Homs	7.5 /a	55.1	3.3	6.5	72.4
Hama	9.0 /b	49.3	1.6	7.5	67.4
Aleppo	438.6	178.1	-	2.4	619.1
Idlib	-	72.0	-	-	72.0
Lattakia	56.3	95.8	-	30.0	182.1
Tartous	-	89.0	-	25.0	89.0
Raqqa	1.2 /c	23.0	-	4.2	49.2
Deir-Ez-Zor	-	60.6	3.2	-	68.0
Al Hasakeh	-	65.0	-	-	65.0
Quneitra	-	2.8	-	-	2.8
Water Supply Directorate	-	11.7	-	-	11.7
Mechanical Directorate	-	22.9	-	-	22.9
Water Department	-	10.0	-	-	10.0
Palmyra City	-	-	6.0	2.0	8.0
Total	1,552.1	909.5	14.1	140.8	2,616.5

/a Original amount requested SL 12,000,000 also total of new projects is 7,750,000 + 550 thousand transferred projects.
/b Original amount requested SL 15,000,000.
/c Has been increased to SL 25,000,000.
/d Refers to only 7 authorities established before 1976.
/e Mainly for rural areas.

Fourth Five-Year Plan (1976-80)

3.07 The Government's original proposals for the Fourth Plan (1976-1980) aim at further decentralization of responsibility for urban water supply by establishing more public water authorities to serve all the provincial capital cities. In the rural areas, the original goals of the Fourth Plan included the provision of public water facilities to all villages with a population of no less than 150 each in the northeastern provinces of Raqqa, Deir-Ez-Zor and Hasakka and no less than 200 in all other provinces, ultimately serving 2,400 villages (population of 1 million) by the end of the Plan period. However as already indicated (para. 1.03) the Plan has been revised to scale down its targets.

3.08 Although the Fourth Plan has been revised, it should be noted that the sector mission estimated that both the urban and rural water projects originally proposed in it could cost about LS 2,616 million (US$662 million) at 1975 prices (Table A6.3.3). This amount comprises (a) SL 1,552 million (US$393 million) for the eight public water authorities, (b) SL 910 million (US$230 million) for the MHU and its rural areas and (c) municipal projects of SL 155 million (US$40 million) of which SL 14 million was for water and SL 141 million for sewerage. These proposed investments include ongoing projects carried over from the previous Plan as well as new projects. The bulk of the sector program (58 percent) includes the Damascus water supply project being partly financed by the Bank, the Aleppo water supply project also being appraised by the Bank and the Lattakia Water Authority project. Attachment A-5 lists other potential projects identified during the sector mission. Of these projects priority should be given to those which relieve demand pressure in urban areas and pollution of existing sources in both rural and urban areas.

Table A6.3.3: SECTOR INVESTMENTS IN RURAL AREAS IN THE THIRD FIVE-YEAR PLAN (1971-1975) /a

Province	Totals for the Five Years		
	Local Currency	Foreign Currency	Total
Damascus	5.4	1.3	6.7
Dar'a	1.0	1.1	2.1
Sweida	4.8	8.8	13.6
Quneitra	-	-	-
Homs	5.3	1.7	7.0
Hama	5.8	3.3	9.1
Lattakia	4.3	11.8	16.1
Tartous	4.8	2.3	7.1
Idleb	5.5	4.4	9.9
Aleppo	9.0	2.2	11.2
Raqqa	7.2	2.1	9.3
Deir-Ez-Zor	8.9	1.9	10.8
Al-Hasakeh	4.8	3.0	7.8
Total	66.8	43.9	110.7

/a Excludes investments by public water authorities.

Source: Third Five-Year Plan (1971-1975), Page 81.

3.09 The Government has in the past given higher priority to developing water supply in both urban and rural areas than sewerage facilities. However, current Government goals for sewerage have received high priority in response to increasing pollution of major water sources by sewage discharges, and the consequent hazards to public health. As a result, studies are currently being undertaken by consulting engineers for the pollution control of the Barada and Orontes rivers and sewage treatment for Damascus, Homs and Hama. Similar studies are being planned for Aleppo and Lattakia. The findings of the sector mission support the high priority being given to sewerage and pollution control projects.

CONSTRAINTS TO SECTOR DEVELOPMENT

Political and Economic

3.10 Among some of the political developments likely to affect sector development are the 1967 and 1973 conflicts and the Lebanese crisis. Both of these developments had put pressure on Government budgetary expenditures. They had also led to increased urban population due to migration of refugees to Syrian towns. In early 1976, Iraq decided to suspend its crude oil shipments through Syrian territory thus reducing Government revenue from transit fees. In addition to these political developments, there were domestic economic factors such as the reduction in crude oil export receipts, declining tax revenue, expanding current and investment expenditure requests, etc., all of which have contributed to the increasingly severe budgetary and balance of payments pressures. As a result of these the Government had to scale down its ambitious Fourth Plan investment program, which reflected the optimism in 1974-75 regarding the availability of financial resources. The final program which emerged from the revision of the Fourth Plan emphasized the completion of ongoing projects. In the water supply and sewerage sector, the revision is likely to affect the rural water supply program more than urban water projects because major urban projects have already started.

3.11 Inflation is also imposing a serious constraint on current sector development effort in Syria. Although the wholesale price index which reflects extensive price controls, rose by only 7 percent in 1975, it is thought that actual inflation may have been closer to 20 percent. Though this might have declined to 15 percent in 1976, officials believe that construction and materials' costs in the sector are showing little sign of declining from the 1975 high level. Few if any of these officials now expect to finance all their proposed projects or achieve even 80 percent of their original targets in the Fourth Plan even if the amounts they originally requested were granted.

Manpower and Training

3.12 In addition to the economic problems another factor constraining development is the shortage of skilled manpower in the sector. Table A6.3.4 presents estimates of existing manpower shortages by professional categories. This problem is common in all sectors and in most developing countries. In Syria, it can be attributed to the following causes:

(i) The low salary and wage structure for the public sector as a whole compared to better salary levels and working conditions for skilled people in the private sector and in other Arab countries.

(ii) The absence of any formal training program in Syria designed exclusively for the water supply and sewerage sector.

Table A6.3.4: MANPOWER SHORTAGES IN 1975 AND PROJECTED REQUIREMENTS 1976-1980 FOR PUBLIC WATER AUTHORITIES

Public Water Authority	Damascus	Al-Sweida	Homs	Hama	Aleppo	Idlib	Lattakia	Al Raqqa	Total
Civil/Sanitary Engineers	18	3	4	4	4	5	9	5	52
Engineers /a	5	7	2	1	8	-	-	4	27
Accountants /b	12	2	9	5	4	19	7	1	59
Technical Assistants /c	32	28	10	10	55	-	15	11	161
High School /d	12	34	-	6	27	62	4	2	147
HS Administrative Clerk	2	13	8	4	20	34	5	1	87
Junior High /e	4	114	13	45	43	76	135	-	430
Supervisors	72	-	-	-	6	-	5	12	95
Laborers/ Drivers	74	-	-	-	13	6	-	33	126
Lawyers	4	1	2	-	4	-	-	1	12
Total	235	202	48	75	184	202	180	70	1,196

/a Includes: Mechanical, electricial, geologists, topographers.
/b Includes: Statisticians, administrative.
/c Includes: Mechanical, electrical, civil.
/d Includes: Industrial, technicians, laboratory technicians, draftsmen.
/e Includes: Clerks, technicians, guards.

Source: Fourth National Five Year Plan (1976-1980). Draft Proposal Supplied to the Sector Mission by MHU and mission estimates.

3.13 These two problems are interrelated and measures to remedy them need to be adopted quickly by the Government to ensure successful sector development. Any proposals regarding training are likely to be weakened if the low salary structures in the public sector are not improved. For example, the sewerage division of MHU cannot retain its skilled staff because of its poor salary and conditions of service (see 3.16). In the long run, the low salary problem will have to be resolved for the whole public sector but in the short-term, the Government may take separate measures allowing water authorities to

grant attractive salaries and other improved conditions of service to highly skilled staff needed to prepare and operate projects. If the water authorities were allowed to be autonomous in the sense of charging economic rates for services as well as being free to pay competitive salaries, they could generate funds internally to meet any increases in salaries and wages.

3.14 The present manpower situation throughout the sector can be illustrated from the experience in the Damascus Water Authority (EPEF). Until October 1974, EPEF was required to obtain authorization from the Government before it could increase its higher level skilled staff and even then had to comply with Government's rigid low salary policy. As a result of these stringent requirements, EPEF's authorized staff did not increase proportionally with its tasks. Most of EPEF employees relied on overtime payments or earnings from second jobs to supplement their salaries. EPEF also relied heavily on consultants for its technical work. After October 1974, a staffing decree was issued authorizing EPEF to negotiate slightly improved conditions of employment for staff to be employed in its new project unit created to execute the authority's projects. Even this has not enabled EPEF to attract the required skills and it is recommended that the decree be extended.

3.15 To help resolve EPEF's staff problems, the Arab Fund for Social and Economic Development included KD 0.4 million (US$1.4 million) for national training in the second Damascus water supply project jointly financed with the Bank. The Arab Fund training assistance includes in addition to the assistance for EPEF an amount to finance part of a national training program for water and sewerage. The assessment of the manpower requirements for the sector being provided in this annex (Table A6.3.5) could provide the basis for the proposed program. Furthermore, the program should include:

(a) The establishment and maintenance of a training center. In order to benefit from existing facilities, for example laboratories and treatment plants, the center should be adjacent to one of the existing eight public water authorities. The center should be a semi-autonomous statutory entity like the public water authorities with MHU having supervisory responsibility. This will enable the center to pursue a flexible policy regarding the design of courses and recruitment of staff.

(b) Preparation of a program of study appropriate to meeting the technical needs of the water authorities and other agencies in the sector. Assistance from experienced consultants (to be financed from the Arab Fund Loan) will be required in planning the training programs and related activities in the fields of design, operation, maintenance, management, accounting and administration of water and sewerage systems.

Table A6.3.5: MANPOWER REQUIREMENTS FOR THE FOURTH PLAN 1976-80
M.H.U. HEADQUARTERS AND PROVISIONAL OFFICES

Province	Engineers /a	Technical Assistants /b	Chemists and Assistants	Draftsmen	Technical Supervisors	Mechanics	Network Superintendents	Drivers	Total
Damascus	20	22	2	7	20	40	25	20	155
Aleppo	21	38	2	7	15	102	19	25	229
Homs	20	19	2	2	39	61	54	8	205
Hama	17	23	2	2	8	50	8	10	122
	15	20	2	4	21	63	10	12	147
Tartous	17	24	2	5	20	68	68	8	212
Idlib	29	43	2	4	8	100	38	14	238
Deir-Ez-Zor	23	74	9	7	97	28	51	30	319
Raqqa	11	24	2	7	12	24	12	31	123
Hasekah	10	6	2	4	16	23	17	34	112
Dar'a	8	22	2	5	10	56	22	22	147
Suwayda	21	64	2	4	13	46	38	14	202
Qunaytira	8	27	2	3	10	30	10	10	100
Water Supply Directorate	48	17	6	9	2	-	-	-	82
Mechanical Directorate	15	9	-	2	-	-	-	-	25
Total	283	432	39	72	291	691	372	283	2,418

/a Includes: Geologists, Mechanical Engineers, Civil Engineers.

/b Includes: Machinists, Topography Specialists, Electricians, Assistant Engineers.

Source: Fourth National Five Year Plan (1976-80).

3.16 There is an urgent need to strengthen MHU's professional staff particularly the sewerage division whose professional staff have recently declined from eight Syrian engineers and four expatriates to just three Syrians and one expatriate. Continued dependence on expatriates in MHU's line positions does not develop the required national talent. Reallocation of staff and greater communication between headquarters and local MHU, municipal and water authority staff should be explored but above all, training of staff and improvement of conditions (including salaries) holds the best hope for solving MHU's staff problems (See paras 1.09 and 3.13).

PROJECT PREPARATION, IMPLEMENTATION AND OPERATION

3.17 Part of the constraint imposed by the inadequate project preparation capability in Syria stems from the manpower shortage discussed above. The recent Aleppo Conference discussed the effects of the shortage of qualified technical staff on project preparation and implementation and recommended that the Government give water authorities priority when allocating technicians (including those completing their military service) to the ministries and dependent agencies. The Conference also recommended the establishment or expansion of locally based manufacturing industries (cement, plastic pipes, chlorine, etc.) to produce materials needed for water projects. This is one of the major sector objectives of the Fourth Plan (1976-80).

3.18 The MHU is responsible for project preparation for both water and sewerage throughout Syria except for the largest public water authorities. Although MHU has some of the required design capability, the country would continue to depend heavily on the foreign consulting firms for preparation of large water and sewerage projects for some time partly because of the manpower problems discussed above. The country should start a program of ultimately eliminating its dependence on foreign consultants. Such dependence often leads to diversity in project designs when the country needs standardization. There is also a tendency to prefer more sophistication to simple designs. Design standards are communicated verbally during project preparation. Standardization and publication of design criteria are recommended.

3.19 Another serious constraint to sector development is the inadequate operation and maintenance capability throughout the sector. Organized leak detection and repair programs are nonexistent in most authorities. There are also inadequate meter repair and maintenance programs, resulting in large numbers of unmetered water services in most urban water facilities in Syria. Therefore, training in leak detection and repair techniques is necessary for most urban authorities. Staff from these authorities should also be encouraged to train or rotate from one urban facility to another to broaden their experience as part of the development of the national training program. The shortage of operators in training is critical in most authorities. A unique case is the new Hama water treatment plant which had no operators being trained to take up operation and maintenance of the facility when it is completed.

SECTOR FINANCES

3.20 The Central Government is the principal source of funds for development projects. For example, Table A6.3.1 shows that in the Third Five-Year Plan (1971-75) the principal sources of public water authority funds would be the following Central Government sources - the state development budgets, loans from the public debt fund and other Central Government sources. Altogether these sources provided 78 percent of the estimated total of SL 112.64 million (US$28.52 million) to be invested by the water authorities of Damascus, Homs, Hama, Aleppo and Lattakia. The remainder would come from the budgets of these authorities themselves and even these budgets are subsidized by the Central Government, through the municipality budgets, state loans and direct

subsidies. These were supplemented by revenue from sale of water rights and charges for connections and water supplies. In the original Fourth Plan, Central Government was expected to continue providing the bulk of the funds for investment. As an example, for the two major water projects for Damascus and Aleppo, the Central Government and its guaranteed foreign loans would provide 88 percent and 78 percent respectively of the required investment.

3.21 Due to the pressure on the Central Government budgets and the certainty of reducing the sector Fourth Plan investment program, serious consideration is being given to generating more funds from the sector activities through an improved tariff structure (see paras 1.05 and 3.24). The magnitude of the investment program is probably a reflection of the fact that inadequate tariffs in the past have not generated the surpluses required to finance rehabilitation and renewal of the existing systems or to provide the expansions required for the increasing urban population. As a result of inadequate tariff structure whose maximum was, until recently, legally fixed throughout Syria at SL 0.40/m3 (US$0.40/1000 gals), the water authorities and municipalities are dependent on Government funds for nearly all capital works. Water and sewerage are regarded by the Syrian people as an important social service which must be provided at low prices. At present there are no sewer charges in Syria. In most parts of the country, water tariffs have not changed for several years. Until the Government changes this policy and implements tariffs approaching the incremental costs of water, the pricing system will not indicate the true cost of water and the sector will be incapable of generating the finances necessary for new investment. On May 1, 1977 a legislation to increase tariffs was passed but the increase is not effective yet for domestic consumers.

3.22 The tariff system in Syria before the new legislation (para 3.24) is illustrated with the Damascus (EPEF) tariff structures in Attachment A-7. Within the legal limits of SL 0.40/m3 for water and SL 0.60/m2 of building space for sewerage connection charges, there was wide variation in the average tariffs for most urban areas. Damascus and Aleppo were among those with the lowest average tariffs. The Damascus Water Authority (EPEF) had an average tariff of SL 0.20/m3 (US$0.05/m3) in 1976. Though it has low operation costs (since it has no pumping and treatment costs), nevertheless the EPEF's tariff structure was completely inadequate to generate the revenues necessary to carry on its operations and finance the needed program of works. Aleppo's average tariff was SL 0.30/m3. The Homs Water Authority charged SL 0.25/m3 while its cost was SL 0.36/m3 in 1975. The tariff increase proposed on May 1, 1977 would, if implemented, provide acceptable financing for at least two years.

3.23 A low tariff structure poses more serious problems in the smaller cities whose resources are highly limited. The situation was critical for the newly established water authorities such as Sweida, Idlib and Raqqa. Above all, there is serious inequity in the sense that some of the urban residents living outside the city limits are paying as much as SL 10.0/m3 (US$2.53/m3) for water from vendors. Some of these are amongst the urban poor, especially in large cities like Damascus and Aleppo. A progressive tariff structure

(para 1.05) is therefore highly desirable and consideration should be given to implementing such a tariff as soon as possible.

3.24 The Government's recent legislation permitting water and sewerage charges that reflect costs of providing these services is necessary in order to achieve projected service levels (Table A6.2.2). Now that the Government's policy on tariff has been reviewed, the public water authorities themselves can improve their financial situation by reducing unaccounted-for water, undertaking extensive meter repair and replacement programs, improving level of billing and collections, and undertaking consumer education on water conservation.

3.25 The quality of financial management throughout the sector needs to be improved. This problem stems partly from the dependence of operating agencies on Central Government funds. As a result, the system of accounting throughout the sector is designed to meet Government requirements. Operators prepare only annual budgets in a form suitable for requesting further Central Government's funds. Budgeting and accounting in general are not aimed at generating data for improved management decision-making. The extent of this problem varies from one authority to another. EPEA in Aleppo has the best record in the sector. Billing and collections are poorly undertaken in most authorities, thus contributing further to their poor financial performance. 1/

COORDINATION

3.26 At present, the sector responsibilities are divided between four ministries, eight independent water authorities and numerous municipalities. There is a need for coordination at both levels of ministerial responsibilities as well as the operational level. At the ministerial level, strong coordination is vital for multipurpose projects involving use and re-use of water resource. For example, the proposed project to bring water to Palmyra from the Euphrates River would involve a number of Ministries (MHU, Tourism, Planning, Agriculture, Euphrates, MPW and Industry). The highest degree of coordination amongst these ministries will be required for effective planning of such projects.

1/ In Lattakia, for example, the Harbor Authority which is a large consumer, is given flat rate monthly bills that are known to represent grossly less than the actual consumption. For some unexplained reason, the Harbor Authority's meters seem to break down as soon as they are installed, and the Water Authority is incapable of persuading the Harbor Authority to accept higher bills. Both Authorities believe that since they obtain their funds from the same Central Government, the problem is purely one of transfer of funds; and there is no need to cover the economic cost of supplying water. In fact the foreign shipping companies that use most of the water in the port are indirectly being subsidised by the Water Authority.

3.27 At the operational level, existing public water authorities could coordinate their operational and planning activities to ensure efficient use of their resources. As an example, prospects for joint regional water supply or pollution control projects should be explored by public authorities (such as Homs and Hama) which are located in the same source. Although the Directors of all public authorities in Syria have regular conferences (such as the recent Aleppo Conference) to exchange views on problems of the sector, there is still much room for improving effective coordination in matters of management and planning. The MHU should be strengthened to enable it achieve a more effective coordination between all public water authorities in addition to assisting the municipalities. Strong coordination from MHU should however not jeopardize the independence of these authorities.

ANNEX 6
Attachment A-1

WATER RESOURCES

Quantity and Quality of Water and Public Health

Water Resource Basins

1. Syria has seven distinct hydrological basins which are shown on the Map in the front of Volume 2, The Main Report. These are the Damascus basin, Upper Jordan basin in the southwest, Orontes basin, Coastal basin, Aleppo basin, Middle Euphrates basin and the Steppe or Desert basin around Palmyra. These basins have differing characteristics including varying rainfall, groundwater balances and arable land areas.

Surface Water and Quality

2. The principal rivers in Syria which are utilized for public water supplies are (i) the Euphrates River which serves Aleppo, Raqqa, Deir-Ez-Zor and numerous villages; and (ii) the Orontes (or Assi) River, which provides for the needs of Hama, and several small villages. Although the Barada River flows through Damascus, its polluted condition from urban sewage limits its use to irrigation, and it is not depended upon as a source for organized public water supplies. The Quwaik River is not utilized for the Aleppo Water Supply because of insufficient quantity. The Khabour River, tributary to the Euphrates, provides water for the city of Hassaka and several villages as well. Following construction of the Euphrates Dam and the formation of Lake Assad, seasonal variations in the river flow have been relatively equalized, with no problems associated with the quantity of water available for public water supplies. High turbidity creates occasional treatment problems.

3. The Orontes River, with an average flow of 12 m3/s at the border between Syria and Lebanon provides a satisfactory raw water source for Hama. However, progressive pollution downstream due to discharge of urban sewage in the water course in Syria has reached the level where the Orontes River is no longer exploited for public water supplies in the large communities. Lake Khatina, with a total area of approximately 40 km2 is the impoundment created by damming the Orontes River south of Homs. Although this lake serves the needs of several large industrial installations, pollution problems preclude its use as a source for public water supplies.

Groundwater Quantity and Quality

4. While several of the geological formations of Syria are impervious and water-bearing, and the most important unconfined or semi-confined aquifers are in gravels, conglomerates or sandstones, the most important confined aquifers are the karstic limestones, dolomites and also the chalky limestones

which produce the more significant springs. Several springs (called "ain" in Arabic) serve as major sources. One of these, Ain Figeh, provides for the Damascus metropolitan demand (approximately 3 m3/s) by gravity flow over a distance of 15 km. The Homs Water Authority now depends upon Ain Tanour (2 m3/sec discharge) to meet its needs and those of several adjacent villages. In order to meet the 6000 m3/day demand in the Sweida Water Authority and in several "off taking" villages, both Ain Mezrib and the impoundment of Roman Dam are utilized, each accounting for approximately half of the Authority's demand. Ain El Sinn, whose discharge averages 6 m3/s is utilized for irrigation in addition to being the source for the Lattakia water supply.

5. Generally, the quality of groundwater is satisfactory, requiring little treatment. However, there are a few exceptions. In the village of Banias (population 30,000), which has a spring source within the built-up area, the spring is not protected, and domestic sewage pollution has created severe contamination problems.

Public Health

6. General mortality in the country, as measured by the crude death rate was approximately 15 per 1,000 population in 1975. Of the seven principal infectious diseases reported by kind during 1966-75, typhoid fever, dysentery and scabies ranked among the most prevalent in the country. Although the health statistical documentation in the Ministry of Health (MH) is well organized, Government facilities are not utilized for treatment of all cases. As a result, during major outbreaks, many cases are not reported. From 1970 to 1976 at least four outbreaks of cholera took place in Aleppo in areas where sewage is utilized for contact irrigation. According to the Ministry of Health's local office in Aleppo, the cost of medical treatment together with that of lost man-days of production and the cost of crops destroyed in order to check infection was estimated at more than SL 90 million for one year. Schistosomiasis foci are present in Hamman Turkman on the Belikh River near Raqqa and in the north on the Euphrates River and in some villages on the Khabur River. In early December 1976, an outbreak of typhoid fever occurred in Banias (population 30,000) in which an estimated 2,000 persons were affected. In Hama province, it is estimated that, among the villages depending upon rivers for water supplies, 90 percent of the diseases contracted by villagers are waterborne in origin. For this reason, the Director of the Office of International Health in the Ministry of Health defines the need for safe water supplies and adequate waste disposal as most important for the health of the people.

7. A Conference of Syrian Water Authority Directorates made strong recommendations to "control water pollution particularly at source" and for continued studies of pollution problems and their effects on public health in Syria.

8. There is at present no sewage treatment in any of the Syrian cities. All the sewerage systems in Syria are combined systems, and designed principally as storm-water collectors. Disposal is directly into rivers and water

courses, without even primary treatment. Widespread use of the stream flow for irrigation of small agricultural plots is common. Thus, during the dry season periods when there is little or no flow in the water courses, the undiluted raw sewage is used for irrigation, creating serious health problems. However, the demand for irrigation water is great. In Palmyra, for example, the Municipality receives SL 1,500 (US$380) annually from a "wholesaler" who resells the water to farmers.

FIGURE 1:
ORGANISATION CHART OF THE MINISTRY OF HOUSING AND UTILITIES
WATER & SEWERAGE DEPTS.

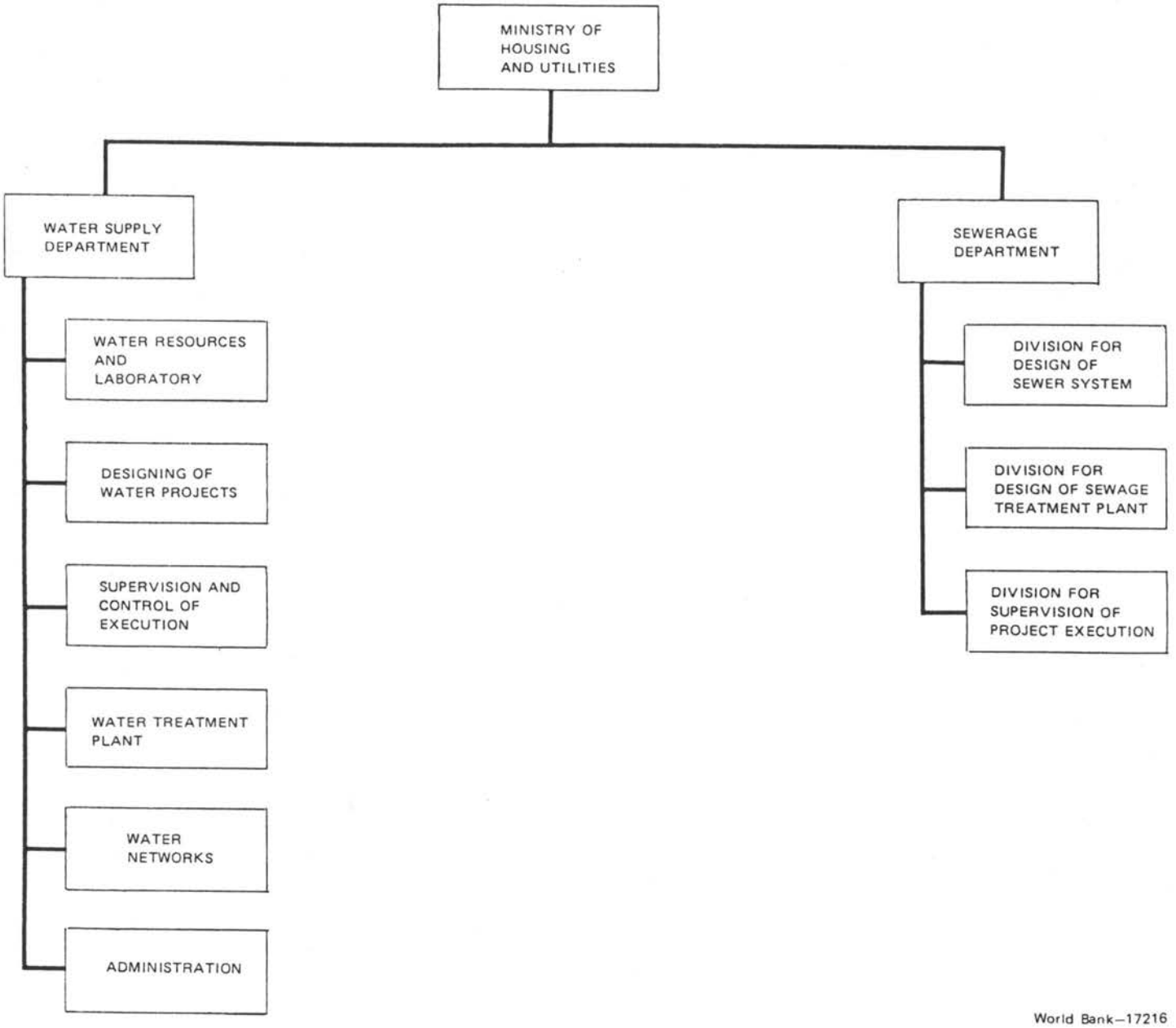

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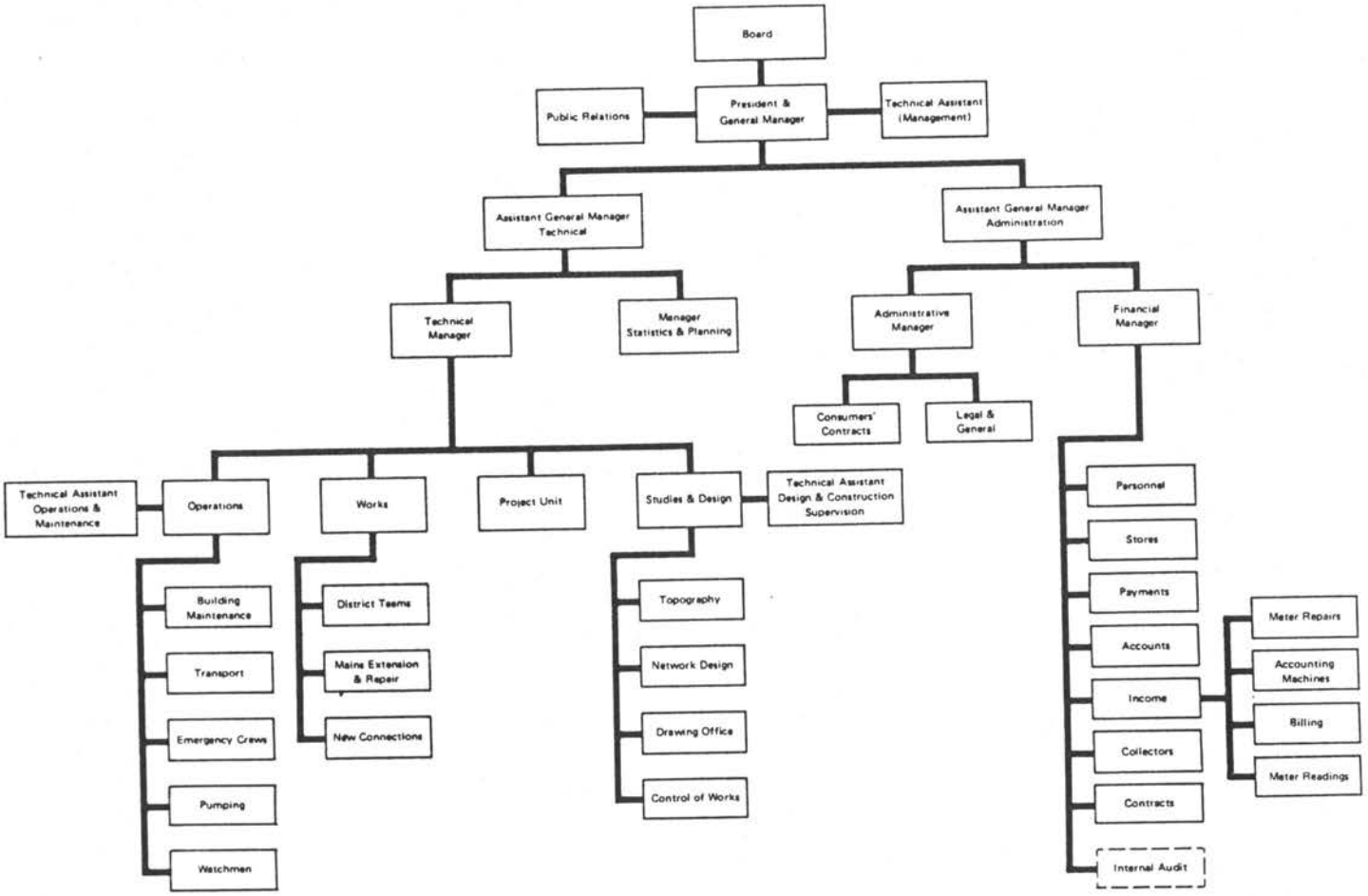
FIGURE 2: E.P.E.F. – ORGANIZATION 1975



World Bank–15339(R)

FIGURE 3:
ETABLISSEMENT PUBLIC DES EAUX D'ALEP (EPEA)
ORGANIZATION CHART

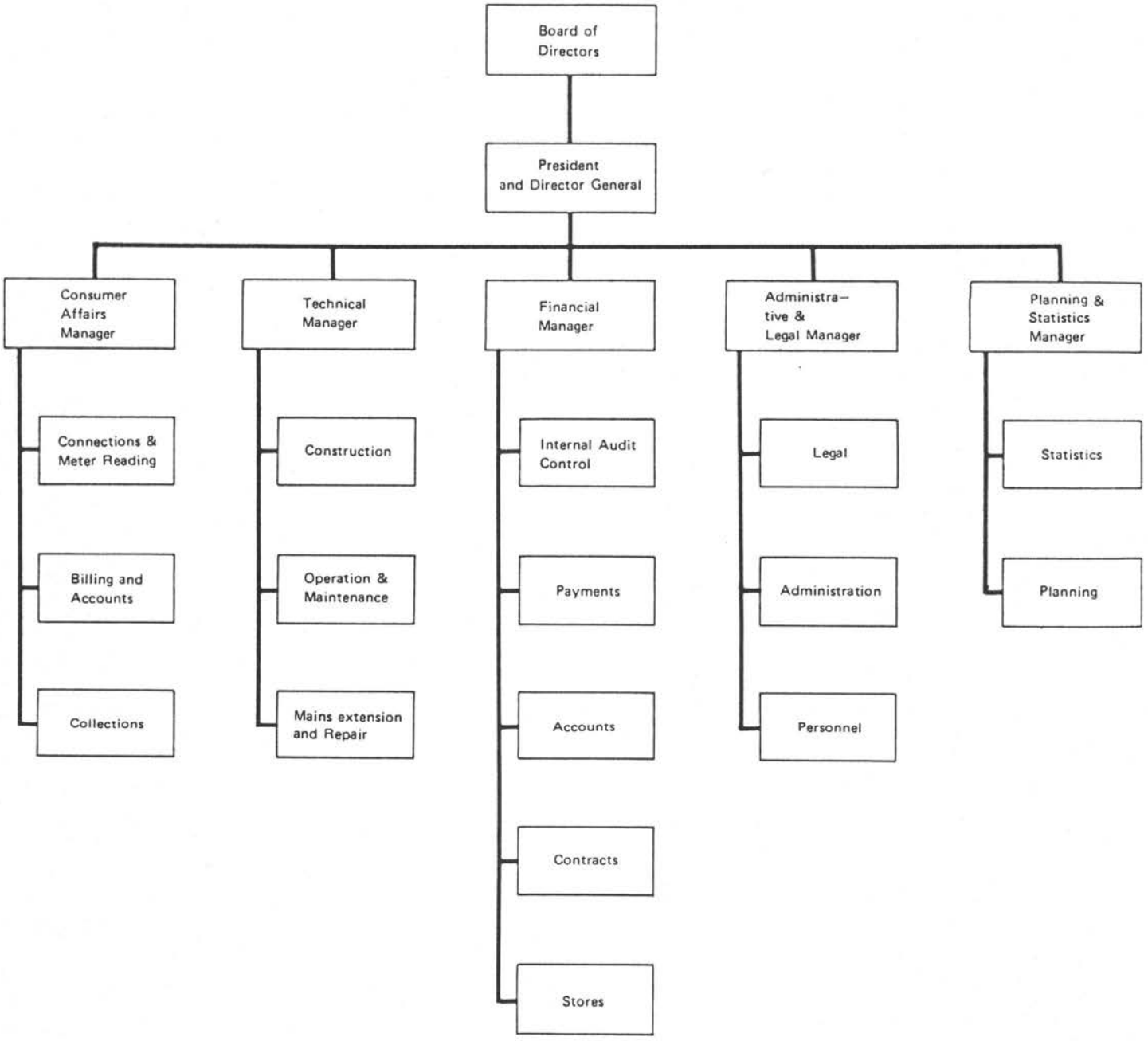
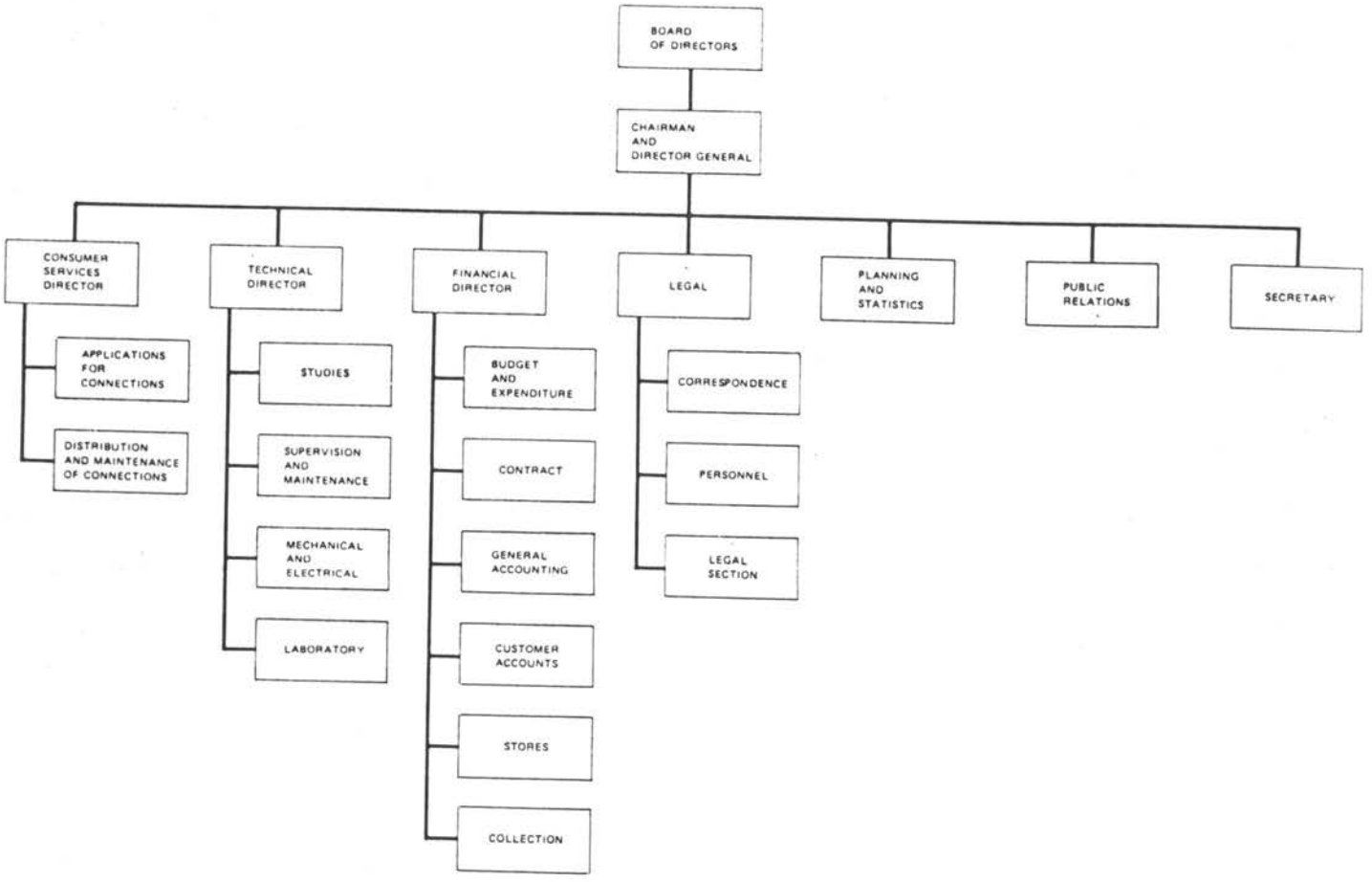


FIGURE 4:
ORGANISATION CHART OF THE HOMS WATER AUTHORITY



August 1977

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ANNEX 6
Attachment A-3

OUTLINE OF LEGISLATION

Decree No. 18 passed in 1974 determines general activities of the Water Authorities in Syria. The following is an outline of the principal elements of this decree.

A. Decree No. 18, February 15, 1974

Law Governing Establishments, Public Societies and Companies

1. The following articles of the decree affect establishments which are considered to be an "Etablissement Public", (e.g. the 8 semi-autonomous water authorities).

2. In order to achieve its objectives, it shall apply the various appropriate methods while acting within the limits of the laws and regulations currently in effect. It may:

(i) execute the conditions of the decree which created the establishment;

(ii) create, join, divide or eliminate economic units;

(iii) create branches or interior centers or eliminate same;

(iv) grant loans to public societies or enterprises governed by this decree and guarantee loans which are granted to them;

(v) enter into loan agreements with the State or financial and banking establishments, local or foreign, without prejudice to the rights of the State planning authority in virtue of the regulations presently in force.

3. It is administered by a director general (named by a decree which establishes his salary and indemnities) and an administrative council whose members, chosen in accordance with the laws and regulations in force, shall include:

(i) the director general (as president);

(ii) five directors from within the establishment;

(iii) a workers representative who is an executive member of the trade union concerned and who shall be designated by the executive of the General Federation.

The president and directors shall be confirmed in their positions by ministerial order.

4. By-laws related to the following matters shall be promulgated by decree: finances, accounting, procurement, financial incentives, and on fundamental principles to be followed in arbitration and transaction.

5. Following matters shall be established by ministerial order:

(i) the administrative organization and responsibilities;

(ii) regulations related to supplies, distribution, storage and public relations;

(iii) transfer of personnel between establishments under the authority of the same ministry and entering into contracts with experts and technicians;

(iv) nomination of one of the directors as deputy director general.

6. The administrative council is the authority responsible for the adoption of the policy to be followed by the establishment in order to achieve the objectives for which it was created. It shall:

(i) establish a draft of the essential principles and by-laws to be promulgated by the appropriate authority (paras 5 and 6);

(ii) establish standards;

(iii) decide policies and production, export, sales, operations, commissions and income objectives in order to meet the goals decided by the State;

(iv) establish detailed plans and work programs to guarantee production, ensure quality control and the economic use of resources and to ensure increased productivity in order to meet the needs of the establishment;

(v) establish the annual plan for the establishment for which it is responsible, including:

(a) operations
(b) production
(c) sales
(d) labor
(e) costs and revenues
(f) budget estimates

(vi) assure coordination between the public societies and the establishment for which it is responsible and act in a manner to reduce differences between them;

(vii) study the regular reports presented to it on the operations of the establishment and its financial situation and take any appropriate measures;

(viii) study all matters which the minister or director general decides useful to submit for its consideration which is relevant to the operations of the authority.

7. The administrative council presided by the minister shall:

(i) approve the annual plan of the establishment within the framework of the five-year plan and without prejudice to the powers of the Ministry of Plan;

(ii) approve the annual financial reports;

(iii) propose an increase or decrease of the authorized capital of the establishment. A final decision on this shall be taken by the superior planning council;

(iv) create, join, divide or suppress economic units.

8. The administrative council may constitute its members into one or more commissions to which it may provisionally delegate its powers; it may retain the services of such experts as it may deem necessary.

9. The director general has the following functions:

(i) to execute the decisions of the administrative council;

(ii) to manage the "etablissement public", evolve work methods, to reinforce management and to delegate, name, advance or transfer staff in accordance with the approved annual plan for labor and considering the available credits in the budget;

(iii) supervise the works of the establishment;

(iv) award bonuses within the limits of the approved budget and impose fines on the personnel;

(v) delegate certain of his functions to the directors.

10. Its capital shall be composed of:

(i) shares owned by the State;

(ii) State equity investments;

(iii) fixed assets;

(iv) other sources fixed by the establishing decree.

11. Revenues shall be composed of:

(i) its net profits;

(ii) reserve funds and depreciation;

(iii) borrowings and credit facilities;

(iv) State credits;

(v) special revenues from its activities or service provided to third parties.

12. It shall invest its financial resources in:

(i) financing of its plans and covering its expenses and payments required by the nature of the tasks assigned to it;

(ii) deposit of the excess of its revenues to the treasury of the Public Debt.

13. (a) The accounting system shall conform to the principles of commercial and industrial accounting and its budget shall be established on the same principles.

(b) The assets shall be considered as the property of the state with the exception of assets which are designated by law to the public use.

(c) It shall have the right of expropriation to house its employees and economic units in conformity with the law governing expropriation.

B. Decree No. 252, May 14, 1975

Applying Decree No. 18 of 1974 to "Etablissement Public des Eaux de Figeh" (EPEF)

1. The dispositions of Decree No. 18 apply to EPEF which shall be attached to the Ministry of Housing and Utilities.

2. EPEF is charged with the supply and distribution of the waters from the Figeh source or any other to which it may obtain the right. It shall assure the distribution of water within the administrative limits of the city of Damascus and the villages of the Barada River (El Figeh, Ain el Khadra, Bassine, El Achrafie, El Jedaide, El Hame, Jamraya) as well as the Yarmouk refugee camp.

3. Its capital is fixed at LS 85 million covered by:

(i) funds contributed by the State and;

(ii) its fixed and moveable assets.

C. Decree No. 265 of October 29, 1974

EPEF's Organization

1. A temporary unit for major projects is established for EPEF. This office consists of the following posts (86 posts named, from engineers to doorman).

2. These positions may be filled by nomination, from the Government payroll or by secondment of civil servants or public sector employees. Engineers hired from outside the public sector will be retained in accordance with Decree No. 60 of 1961. For all other positions wages and salaries will be determined according to the year of graduation with an incremental step for each year of experience.

3. The work of this office shall terminate on completion of construction of the works financed by the World Bank.

D. Decree No. 6, January 30, 1975

Establishing a Special Commission for EPEF's Projects

1. The Commission shall be composed of Messrs.:

- The Minister of Housing and Public Utilities - President
- The Director of EPEF - Vice President
- The Deputy Minister of Housing and Public Utilities responsible for Technical Affairs - Member
- The Director of Technical Affairs of the Municipality of Damascus - Member
- The Engineer Nibras Mouayad, Chief of the Projects Office of EPEF - Member

This Commission shall be responsible for following the implementation of the new projects of EPEF.

2. The Commission is considered responsible for undertaking the necessary studies and for following the implementation of these projects until they are ready for operation and this during a fixed delay of three years following the date of this Decision. The Commission has the right to use the services of Arab and foreign technicians and to take the necessary measures to resolve the

difficulties they may encounter. It is however authorized to have recourse of the offices of the Civil Service and to take its employees by detachment or by assigning them to carry out works through overtime.

3. The Commission is authorized to award incentive bonuses and overtime pay to civil servants and salaried employees working on the above-mentioned projects and this by its own decision.

4. The Commission has the full powers needed to carry out its assignment; its decision and its activities shall be exempt from all laws and regulations in force in Syria, except as they concern the issuing of personnel appointments in any form.

ANNEX 6
Attachment A-4

Summary of the Main Recommendations of the Fifth Annual Conference of Syrian Public Water Authority Directors Held in Aleppo November 6-8, 1976

1. Supplies to Areas Outside City Limits. Urgent attention should be given to the problems of water supplies to residents outside existing city planning limits. At present, supplies to these areas are hampered by legal restrictions, and inadequate housing, streets and drainage.

2. System Leakages and Malfunctioning Meters. Each authority should establish a leak detection unit and supply it with equipment to maintain regular checks in the distribution network. Damascus and Aleppo Water Authorities would assist in training staff and securing equipment for other authorities in this effort. A meter repair program should also be started and blueprints for water networks (mains, connections, etc.) made by all authorities.

3. Public Taps and Other Public Supplies. Wastage of water at places of worship (e.g. mosques) with public taps should be controlled, their consumption limited and payments made for supplies.

4. Water Quality. Aleppo Water Authority is to import chlorine and ensure its quality for all other authorities. Control of source pollution should be accorded high priority.

5. Training and Manpower. A National Training Center should be established and EPEF is empowered to implement this proposal. Government is urged to seek solution to existing shortage of technical personnel.

6. Project Construction and Implementation. Shortage of funds, skilled staff and construction materials were said to be major constraints and Government is urged to seek solution to these, e.g. expeditious transfer of funds, expanding local production of materials, etc.

7. Organization. Standardization of organization structures of all the authorities was recommended.

ANNEX 6
Attachment A-5

LIST OF PROJECT POSSIBILITIES

1. (a) Aleppo Water Supply: This project has been appraised by the World Bank (see Chapter 1, para. 1.09).

(b) Aleppo Sewerage Treatment Plant: This is currently being considered for study as part of the Aleppo water project 1(a). Authorities have sent out requests for proposals from consultants and received 90 answers which are now being short-listed.

2. Homs Water Transmission Line: This will be parallel to existing line and is necessary to meet needs of the city up to year 2000. Its present status is not clear.

3. Palmyra and Neighboring Villages Water Supply. The Ministry of Tourism requested that the sector mission visit Palmyra and make specific review and recommendations on the water supply situation of the area. The mission has reviewed the information and studies collected during its discussions in Damascus, Homs and Palmyra itself. On the basis of these, it concluded that the quantity and quality of groundwater (as revealed by several explorations undertaken in the area to date) are not adequate to meet the needs. The only available groundwater from the "Amy" wells located north of the town is of very bad quality. However, test drillings undertaken so far had not exceeded 150 m depth. The following alternatives for supplying the area could be studied in greater detail. At present there is an inter-ministerial committee coordinated by the Ministry of Planning to make recommendation on a Palmyra project.

(i) Groundwater Source. This requires further hydrogeological study to obtain more conclusive data on the present groundwater situation.

(ii) Euphrates Source. Government and local officials showed keen interest in the possibility of bringing water to the area from the Euphrates river. This was explored extensively during the sector mission's discussions. Such a scheme may involve one of the following projects:

(a) The use of existing oil pipelines (formerly used for oil shipment from Iraq) with connections to the source at Euphrates River and to the users in the Palmyra area.

(b) The construction of a transmission line different from (a) from the Euphrates for community water supply (including tourism) and possible combinations of irrigation, agriculture and industry.

(c) The construction of a transmission line by an existing phosphate company primarily to serve its own needs but with Palmyra as a possible off-taker.

(iii) Improvement of the existing production and distribution system in Palmyra City with consideration of alternative methods of treatment.

4. Hama Sewage Collection System. This will replace the existing old system which has deteriorated considerably. This project is already in progress and the main sewer network is completed.

5. Water Supply for Villages in the Kalamon Region. This is a rural (regional) water supply scheme to serve about 25 villages located between Homs and Damascus. This is a new project that deserves urgent consideration.

6. Pollution Control of Orontes and Barada. This project is currently being studied by consulting engineers - (see chapter 1, para. 1.08).

7. Tartous Transmission. Water supply to the city of Tartous from existing treatment plant which is located on the Sinn River 45 km from Lattakia. This project is being considered as follow-up to 8(a) below.

8. (a) Lattakia Water Transmission Line. This project is already under construction but is being held up by the Lebanese problem and disputes with Cecka Construction Company which is in charge of the project.

(b) Lattakia Sewerage. This project is in two stages. The first stage is relocation of the present sewage outfalls to avoid port expansion and an extension to serve the tourist area and a new development area. Preparation for this stage is expected to start shortly. The second stage will include a treatment plant. Proposals are being sent out to prospective consultants.

9. Deir-Ez-Zor - Sewerage and Treatment Plant. To serve:

(i) The existing parts of the old city that are already connected to the existing collection system.

(ii) New development on the North side of Euphrates River.

(iii) Neighboring Villages: It will make possible cleaner water supply for downstream villages.

The project is not yet initiated. Similar projects could be explored for Salamiah, D'ara and Raqqa.

10. Rural Water Supply for Villages Above and Below the Euphrates River. The UNICEF expressed interest in rural water schemes for this region.

11. Baliak River Project. This river is infested with snails which are causing schistosomiasis in villages which also use its bad quality water for drinking.

12. Scope for Technical Assistance Exists in the Following Areas:

(a) Groundwater exploration - especially in the Palmyra area.

(b) Leak detection program - development and execution.

(c) Distribution and collection system analysis.

(d) Maintenance and operation program for both water and sewerage.

(e) Project design especially for small treatment plants.

(f) Use of local materials instead of imported materials.

(g) Manpower development and training.

ANNEX 6
Attachment A-6

DESIGN CRITERIA*

Water Supply

General	Urban	Rural
Design Period - Gravity Systems	25 years	30 years
- Pump Systems	10 years	15 years
Assumed Average Daily Demand	200-300 lcd	100-125 lcd
Maximum Day Demand	1.35 x Average	1.35 x Average
Maximum Hourly Demand	2.0 x Average	2.4 x Average
Storage - Total	20% x Average	50% x Average
- Elevated	5-10% x Average	25-30% x Average
System Design Pressure	3-6 atmospheres	2-3 atmospheres

Transmission and Distribution

Friction Coefficient (based on Colebrook Formula at 12°C)

K = 0.025 for Asbestos Cement Pipe

K = 0.05 for Ductile Iron, Cement lined

K = 0.1 for Reinforced Concrete

Velocity: 0.4 to 1.2 m/sec.

House-connections: 1/2 in.

Meters: Universally specified for each connection

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* These are unpublished criteria obtained in discussions with officials in the Ministry of Housing and Utilities.

ANNEX 6
Attachment A-6

Treatment

Rapid sand filtration rate (max.): 5-6m3/m2/hr).

Sedimentation retention time (min.): 4 hrs.

Flocculation time : 30 min.

Chemicals: Aluminium Sulfate and Lime

Sewerage

Collection System Diameters	Sizes
Plain concrete pipe	20 cm - 60 cm
Reinforced concrete pipe	over 600 cm
Reinforced cast in situ oval. section	60 cm x 1.0 m (vertical)
Reinforced concrete pipe w/cunette	1.0 m x 3 m (vertical)
House-connections	20 cm. min.
Collectors	25 cm. min.

Min. Velocity: 0.6 m/sec. (occasionally less)

Max. Velocity: 4.0 m/sec.

Design period: 40 years

Treatment

None as yet.

ANNEX 6
Attachment A-7

EPEF'S 1976 TARIFF STRUCTURE

Description		Payable By	Amount
Non-Recurring Charges			
(i)	Water Right Purchase	Applicants 1/ with premises over 100 m2	LS 2000 per m3/day 2/
(ii)	Capital Contribution	All applicants	Minimum LS 75
(iii)	Connection Fee	- do -	Cost plus 20%
(iv)	Subscription Fee	- do -	LS 5
(v)	Meter Installation Fee	- do -	LS 5
(vi)	Deposit	- do -	Consumption deposit plus value of meter depending on size of connection and type of consumption.
Recurring Charges			
(i)	Metered Supply	Water right holder - excessive	LS 0.20/m3
		Others - All consumption 3/	
(ii)	Annual Fee	Water right holders	LS 14 per m3/day of water right
(iii)	Meter Rent and Maintenance	Consumers who do not own meters	Varies (Basic = LS 9 per year)
	Meter Maintenance Only	Consumers who own their meters	Varies (Basic = LS 4.8 per year)
(iv)	Contribution to Distribution System Maintenance	- do -	LS 3.60 year
(v)	- do - (Temporary Supplies)	As appropriate	LS 50 year

ANNEX 6
Attachment A-7

Incidental Charges

(i)	Transfer of Water Right	All consumers	LS 15
(ii)	Name Correction	- do -	LS 5
(iii)	Reconnection Charge	- do -	LS 3
(iv)	Meter Testing	- do -	LS 5
(v)	Meter Relocating	- do -	Not less than LS 15
(vi)	Meter Destruction	- do -	Cost of repair or replacement plus 20%. Minimum LS 15
(vii)	Meter Reading Requested by Consumer	- do -	LS 5

1/ Public, religious and certain other types of premises are exempt.

2/ The allowance which must be purchased depends on the size of the premises.

3/ Although EPEF may charge for public standpipes and religious buildings there has been no charge in the past.