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AND PROSPECTS

OF

TANZANIA

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VOLUME III

ANNEX IV: WATER SUPPLY AND SEWERAGE SECTOR

May 22, 1972

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1 Tanzanian Shilling = US\$0.14
1 U.S. Dollar = Sh 7.14

ABBREVIATIONS AND ACRONYMS

MWDP - Ministry of Water Development and Power
TANESCO - Tanzania Electric Service Corporation
Mgd - Million Imperial gallons per day
Igcd - Imperial gallons per capita per day

This report is based on the findings of a mission composed of Messrs. J. Warford, C. Spangler, and E. Greenwood (IBRD) and Messrs. G. Bachmann, G. F. Heide and T. R. Jacobi (WHO) who visited Tanzania in the period September 28-October 25, 1971, and a follow-up mission composed of Messrs. Warford, Spangler (IBRD) and Kent (WHO) from April 19-May 1, 1972.

TANZANIA

WATER SUPPLY AND SEWERAGE SECTOR

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TANZANIA

WATER SUPPLY AND SEWERAGE

SUMMARY

- i. This report has been prepared from information gathered by two visits to Tanzania by joint WHO/Bank missions, one in September/October 1971 involving about four man months in the field; and a follow-up mission in April/May 1972 involving about one and a half man months. The Bank has not been previously involved in the sector in Tanzania and so far as can be determined no reports on current studies carried out by others appear to exist. While the limited data presented in this report is believed accurate, it will be apparent that because of peculiarities in the definition of rural and urban; the fact that the organization responsible for water supply is in process of major reorganization; and because much data which is needed for sound analysis is not available; it becomes extremely difficult to reach meaningful conclusions with respect to the long-range outlook for the sector and what future investment policy should be.
- ii. A piped water supply is available to about 80% of the urban population but only about 10% of the rural population has access to supplies which are reasonably convenient and safe. The 80% figure is considerably better than most countries of Africa and is somewhat better than most countries of Latin America. The 10% figure for rural supplies, while low, is probably not much different than for most other countries with similar economic conditions. Use of either figure for comparison purposes is not meaningful, however, because the definitions of urban and rural supplies in Tanzania differ from those used in nearly every other country. Urban supplies in Tanzania are defined as systems on which consumers are charged for the water and while such systems can usually be expected to meet the definition of urban in other countries, smaller systems in Tanzania now classed as rural, might in many other countries be considered as urban (urban is frequently defined as communities with populations greater than 2,000). A further problem in using the data for planning purposes is that presence of a piped water system does not necessarily mean that water is available from the system. Where supply works are not made to keep pace with urban growth and extensions to the system, service must be reduced or new customers, including industrial, denied service. The 80% figure for population served in urban areas of Tanzania is consequently difficult to interpret. It is known, for example, that industrial water users are not able to satisfy their needs at present in several of the urban communities. Where this is the situation, it may be that high priority should be given to investment in urban systems whereas the 80% figure by itself suggests that the urban areas are not in great need.
- iii. The Government has stated that its objective is to make water reasonably accessible to the entire rural population in 20 years. The average annual investment necessary to reach this goal is estimated at Sh 75 million. No express objective for urban water supplies has been adopted, but estimates are that the cost of full coverage in the same period would be equivalent to an annual average investment of some Sh 16 million. Sewerage, which is currently provided in five towns serving some 150,000 people, is given a much

lower priority than water supply but some investment, increasing as time goes on to a level similar to the one for urban water supply, will be called for during the twenty-year period.

iv. A program of water supply developed along the lines now proposed would require an annual average capital investment in excess of Sh 100 million. In contrast, the average investment in water supply during the first five-year plan (1964-1969) was about Sh 25 million per year, and during the first three years of the current second five-year plan it has been Sh 49 million. There should reasonably be some doubt about the feasibility of such a large increase, especially given the acute limitations on available staff and local funds. A mechanism for grouping of projects has been studied that can be used as a guide for establishing priorities and for reaching decisions on the systems to be selected for construction once the spending level has been fixed. The approach taken and the results of the study are shown in Appendix 7 of this report.

v. One of the most difficult problems likely to be encountered is that of assuring a sufficient growth of local funds for surveys, feasibility studies, preliminary engineering and to provide for the construction, operation and maintenance expenditures for the new systems. This problem will be accentuated as a consequence of the priority given to rural water supplies, which currently do not produce any revenue at all. It is clearly conceivable if no change in policy occurs, that a point will be reached where further assistance for new construction cannot be used with benefit because sufficient funds for operation and maintenance will not be available. It is thus of vital importance to the long term success of the Tanzanian water program that the potential of water systems for raising revenue, at least to cover recurrent expenses, be utilized. Steps should be taken to introduce as rapidly as possible the concept of total cost support by charges for water systems. In particular, rural systems should be upgraded by introducing and gradually increasing charges as communities become more able to make some contribution to the cost of supply.

vi. Present procedures require that capital and operating expenditures for water supply be made available from funds provided in the national budget, all receipts from the sale of water at each system being turned over to the national treasury. In recent years allocations to the sector have varied widely, depending on the budgetary constraints prevailing at the time. Because of the uncertainties which occur as the result of these practices and because funds for maintenance are usually the first to be cut when national budgets have to be pared down, local managers cannot be held responsible for the efficiency of their operations. There is need for a review of these policies and for the establishment of as much fiscal independence for water authorities as possible.

vii. Changes need to be made in the accounting and budgeting system of the newly created Ministry of Water Development and Power (MWDP) so that costs and revenues for urban (revenue-producing) systems can be related to each other and to the needs of the systems. With knowledge of the costs, proper charges for water can then be established.

viii. It seems clear that if anything like the program contemplated for the sector is to be achieved, Tanzania will need not only continued but

also increased foreign assistance. A number of countries have indicated their willingness to support various parts of the development program. Considering this and taking into account the manpower and local financing problems, coordination is required so that a rational high-priority program can be composed without duplication of efforts. A process of major reorganization has been in progress and a mid-plan review of the second five-year development plan has recently been completed. It is desirable that the results of this review be studied as soon as available to determine to what extent some of the existing problems mentioned above are being overcome. Until these problems are on the way to solution, new investment should be tailored to the capacity of local funds and staff.

I. INTRODUCTION

1.01 Joint IBRD/WHO missions visited Tanzania^{1/} in September-October 1971 and April-May 1972 in order to evaluate the existing situation in the water supply and sewerage sector, to review development plans for the sector, to identify problems restricting progress, and to consider and discuss possible solutions to these problems with national officials. This report is based on the findings of these missions.

II. THE PRESENT SITUATION

Geography and Climate

2.01 Tanzania (see Maps) is the ninth most populous nation in Africa, with a mainland population of over 13 million; its area is about 362,000 sq miles. The country lies between 1° and 12° south latitude and 30° and 40° east longitude. Mount Kilimanjaro in the north rises to over 19,000 feet and a high ridge runs southwest from the Usambara mountains west of Tanga to the highlands around the tip of Lake Nyasa. Most of the country is made up of a plateau of about 4,000 feet elevation.

2.02 Rainfall ranges generally from 30 to 40 inches per year except in a small area west of Lake Victoria where the variation is between 80 and 90 inches annually. On the interior plateau there is a single short rainy season, while along the northern coastal belt there are two--November to January, and March to May. There are wide variations throughout the country as to temperature, humidity and wind; in the coastal belt temperature ranges from a mean low of 75°F to a mean high of 85°F, and humidity is generally high.

Water Resources and Health

2.03 Many rivers have no flow during the dry season. The Rufiji, entering the Indian Ocean, and the Kagera, flowing into Lake Victoria, are navigable.

2.04 In many parts of the country, hard rock is close to the surface, and brackish water is found in the upper horizons. Underneath the brackish water and below granite, gneiss, and similar formations, water of good quality occasionally may be found at depths ranging from 70 to 600 feet. Water is scarce in most of the interior of the country, but shallow groundwater is available in parts of the coastal plain. In the interior, hydrogeological investigations are being made to locate additional groundwater.

^{1/} This report concerns conditions in mainland Tanzania only.

2.05 The presence of turbidity and pollution of surface water during various seasons, salinity of many underground water resources, and high fluoride content in some aquifers, boreholes, and streams create serious water quality problems. Bacterial pollution and schistosomiasis vectors are found in most shallow water holes. Surface water exceeding by as much as ten times the upper limit of fluoride content suggested by WHO is used in some places.

2.06 Intestinal water-borne diseases are common; although there have been no reports of epidemics traceable to water, no firm judgement of the situation is possible as health records, particularly outside of Dar es Salaam, are minimal.

Population

2.07 The current population growth rate is about 2.7% per year. Mainland population development is estimated as follows:

<u>Year</u>	<u>Mid-year Population</u> (000's)
1950	8,041
1960	10,016
1970	12,896
1980	17,081

An annual growth rate of 3.0% per year was used by the Central Statistical Bureau for 1975-80 in projecting the 1980 population. The country is predominantly rural. At the time of the latest census, in 1967, only 6% of the population lived in towns and 40% of the urban population was in Dar es Salaam. Projections of 1987 population are 21.8 million rural and 3.4 million urban (about 1.6 million in Dar es Salaam). Populations and densities for 1967 are shown in Appendix 1. There were 18 towns in 1967 with populations over 5,000.

Water Systems

2.08 In Tanzania, "urban" water supplies are defined to be those for which consumers are charged either by means of a metered rate or as a property tax. Those systems which are not to any degree self-supporting are defined as "rural". According to these definitions, there are 94 urban and 1,200 rural water systems in the country (see Map IBRD 3722R1). The urban systems, summarized in Appendix 2, are reported to serve about 715,000 persons, equivalent to 80% of the urban or town population. The number of private connections in urban systems has increased from 26,000 in 1960 to about 54,000 in 1970 (over 20,000 are in Dar es Salaam). The average per capita consumption is about 30 Imperial gallons per day (Igd) (including industrial use). This amount is below amounts ranging to in excess of 100 Igd experienced in the highly industrialized countries, but is near the amounts usually encountered in countries of like economic status. Supplies vary from untreated surface and groundwater to completely treated and filtered water in Dar es Salaam.

1/ With few exceptions all urban areas are served by "urban" water systems in the sense used here.

2.09 Slightly more than 10% of the rural population is served by the so-called rural systems. These supplies range from dug wells with no pump to piped systems with public standpipes. During the 1964-69 period, some 250 rural projects were developed to serve 400,000 people. The 1970-74 program contemplates the development of some 700 projects to serve almost 1.5 million additional people. The government has decided to accelerate the rural program in an effort to serve the total rural population in 20 years.

2.10 The Dar es Salaam system is supplied from two sources--Mtoni (0.7 to 1.6 IMgd) and Upper Ruvu (10.0 IMgd). The Upper Ruvu supply is now being increased by an additional section of pipeline and new treatment units. When completed, production from this source should increase to 14-18 IMgd. A Lower Ruvu development is expected to provide an additional 22.8 IMgd by 1975.

2.11 A few multi-purpose hydroelectric, irrigation, and flood control projects have been developed and others are planned, which also would provide water for rural or urban domestic consumption or industrial use. Most of these are dependent on power production for financial feasibility.

Sewerage

2.12 There are only five communities with sewerage service in Tanzania--Arusha, Dar es Salaam, Moshi, Mwanza and Tanga; the population served numbers about 150,000. Systems are being designed for Dodoma, Morogoro and Tabora to serve 100,000 more. The Dar es Salaam central business district is served by a system with a sea outfall discharging untreated sewage. There are also various oxidation ponds serving small areas of Dar es Salaam, and the other towns where there are sewerage systems; the only conventional sewage treatment plant is at Moshi.

2.13 The long-term goal for sewerage in Dar es Salaam is a fully sewered city by 1989. A proposed oceanographic study is expected to show whether liquid wastes should be disposed of through sea outfalls. Sewerage development in Dar es Salaam was curtailed in 1971-72 because of budget cut-backs (from Sh 13 million to Sh 3.8 million). Storm water drainage in Dar es Salaam is usually carried out in conjunction with housing and industrial development projects, but some separate projects have been included in the second five-year plan. Anti-malaria swamp spraying in the area is reported to cost over Sh 1 million annually, but both the technical and economic aspects of further drainage are in need of study.

Organization and Finance

2.14 Prior to July 1, 1971, urban water supply was the responsibility of one ministry, rural water supply was the responsibility of another, while water resources planning was the concern of the National Resources Council under a third ministry. On the above date, however, all water

activities were consolidated in a new Ministry of Water Development and Power (MWDP). Legislation assigned the following responsibilities to the new Ministry:

"Water Policy and Development. Rural Water Supplies.
Urban Water Supplies. Sewerage and Drainage. Irrigation.
Flood Control. Power (Electricity) Policy and Development.
TANESCO. National Water Resources Council."

2.15 The new Ministry was in the process of organization and physical consolidation at the time of this study, with management assistance being provided by Scandiaconsult through arrangements with the Swedish International Development Authority. The terms of reference of this 32 man-month contract are summarized in Appendix 3; the period of activity was May-December 1971.

2.16 The Ministry is organized, as shown in Appendix 4, into five major divisions, under the Principal Secretary:

Planning and Project Preparation
Construction
Finance and Administration
Research and Training
Operation and Maintenance

Overall control of water resources is accomplished through the Water Officer and an appellate Water Advisory Board. The effectiveness of the new Ministry has yet to be demonstrated, but the combining of all agencies concerned with water and drainage in one ministry should be conducive to administrative efficiency.

2.17 The structure of the organization at regional level (18 regions plus Dar es Salaam) shown in Appendix 5 is about the same as that of the central organization except that research and training are not included. Regional Water Engineers report to the Principal Secretary, but deal directly with central division heads on matters in their respective functional areas.

2.18 Operation, maintenance and construction of the urban and rural water systems are financed through the budget of the MWDP with allocations to the regions. The revenues from metered charges made to users in the 94 urban systems with private house connections are paid into the national treasury. The present accounting system does not permit any firm conclusions as to the financial performance of these urban water systems. The bills for accounts in a few of the larger towns, including Dar es Salaam, are prepared by computer in the Ministry of Finance; other bills are prepared manually. Payments are made to national treasury offices in Dar es Salaam or in regional headquarters. The collection of water bills by the Tanzania Electric Service Corporation (TANESCO) has been suggested, and appears to have merit if customers have services common to the two.

2.19 Although most sewerage systems in Tanzania were constructed by the national government, the towns in which they are located are responsible for operation and maintenance. In most cases these functions are carried out inadequately, and it might be better for the MWDP to assume responsibility for them. Of all the government-constructed systems, only Moshi paid part (55%) of the construction cost, and now collects and retains a Sh 3 per 1000 IMg water consumption charge for the service.

2.20 The rates charged for water service in the 94 municipal systems vary from Sh 2/- to 6/- per 1,000 Imperial gallons (see Appendix 6). These charges are fairly high by any standards. Reduced rates for industrial consumption are common. Of a total number of residential connections of 54,000, about 25% pay Sh 2/- and almost 60% pay Sh 6/-. A new uniform rate schedule for the whole country is being proposed by the Ministry as follows:

<u>Rate/1,000 gal.</u>	<u>Monthly Consumption</u>
6/-	up to 100,000 gal.
5/-	100,000 to 500,000 gal.
4/-	over 500,000 gal.

Minimum monthly charge Sh 5/-.

2.21 There appears to be an incompatibility between present planning objectives and the domestic finance needed to meet them. This is suggested by the emphasis being placed on the rural water program which, by definition, concerns those systems which are non-revenue producing. Realization of the objectives set for the next 20 years for the rural supplies will consequently be attainable only by one of the following actions: a) urban water investment is reduced to a level which will seriously restrict urban growth; b) funds are directed from other sections; c) rural systems are made to produce some revenue; or d) some combination of the foregoing.

Manpower and Training

2.22 There is a serious shortage of qualified staff within the water sector. Despite the fact that many expatriates are retained, the number of vacancies in higher positions is large. Thus, out of some 350 authorized positions for technical staff over 200 were vacant and only 50 are filled by Tanzanians. Among a group of 50 authorized administrative type positions over 30 were vacant. At the time of the mission there were over 60 Swedish volunteers at work--30 technical assistants, 24 mechanical inspectors, one geologist and 8 accountants. Other expatriates employed through direct hire or supporting foreign government cooperation totalled over 90, including the majority of the Regional Water Engineers. To a great extent, the difficulties in filling vacancies with qualified local personnel stem from the low salaries which can be paid. This situation is, of course, not unique and is frequently encountered where staff are tied to governmental pay schedules and where it becomes unworkable to raise one group of workers without offering the same benefits to others. It is for this reason, among others, that corporations and authorities have been created to provide water and sewerage services at local and national levels.

2.23 Training of technical assistants is being undertaken by the Division of Research and Training of the MWDP, utilizing the Dar es Salaam technical college in presenting a three-year course. The course includes six months of field work in the second year. Also presented are short courses in surveying, driver training, soil mechanics, and hydraulics. A geophysical school at Dodoma provides a three-year course in drilling and related activities. The Central Establishment Division, a part of the President's Office, provides annual courses in various clerical, administrative and fiscal subjects. The Ministry of Communications, Transport and Labor operates a National Industrial Training Center for mechanical training.

2.24 Training has been started for auto and drilling rig mechanics and on-the-job training is carried out for plant operators and in the regional mechanical maintenance shops. Training is needed for technical assistants in design and cost estimating. There are competent expatriates in the employ of the Ministry to provide all of this training. Plans have been prepared for the construction of facilities for a Water Resources Development Institute--dormitories and training facilities--and it is hoped to increase the output of technical assistants to 40 per year. A basic problem, however, is the recruitment of students because of the low pay scale and inadequate conditions of service in the Ministry compared to other comparable employers.

III. SECTOR OBJECTIVES AND STRATEGY

3.01 In September 1971, TANU, the political party of Tanzania, decided that future development programs should emphasize water, education, and health services for rural areas. The plan for rural water is to provide reasonably accessible water to all the rural population in 20 years time at an estimated cost of some Sh 1.5 billion (US\$210 million). To serve the additional urban population plus some industry in the same period is estimated to cost about Sh 330 million. Paralleling urban water needs will be increasing demands for waste disposal and treatment, both domestic and industrial; a 20-year program for the 15 principal towns might cost Sh 350 million.

Expenditure History and Projections

3.02 During the first five-year plan 1964/65 to 1968/69, water development expenditures averaged about Sh 25 million per year--Sh 8 million for rural and Sh 17 million for urban systems. During the first three years (1969/70 to 1971/72) of the second five-year plan, rural system expenditure will average about Sh 30 million per year and for urban about Sh 19 million per year,^{1/} the large overall increase incorporating a significant shift in emphasis from urban to rural development.

^{1/} The figure for urban systems has been falling, from Sh 29 million in 1969/70 to Sh 9 million in 1971/72.

3.03 The cost of supplying all of the rural population with reasonably accessible water in a 20-year period, as outlined in Appendix 7, would be above Sh 75 million annually, and for similar urban coverage about Sh 16 million, a total of some Sh 90 million per year. In order only to maintain existing standards of service for the urban population during the next 20 years without increasing the relative coverage, annual development expenditures of some Sh 12 million would be required.

3.04 Future cost estimates, based upon the assumptions detailed in Appendix 7, were obtained from analyses of various feasibility studies made by consultants and cost information available in MWDP files. For this purpose, rural areas were classified according to population density--high, medium and low--for each region. Projections were also made for principal towns and groups of towns in each region. In the absence of any officially expressed priorities other than the general one for rural areas, the mission assigned priorities, designated as I, II and III, to rural and urban developments to reflect apparent urgency of need. These priorities were established primarily without regard to cost and based principally upon factors such as public health, availability of current supplies, industrial water requirements and so on (see Appendix 8).

3.05 The cost of the 20-year program, by sector and priority, is estimated as follows:

<u>Sector</u>	<u>Cost by Priority</u> (Sh million)			<u>Total</u>	
	<u>I</u>	<u>II</u>	<u>III</u>		
Rural	482	744	265	1,491	(82%)
Urban	<u>304</u>	<u>10</u>	<u>13</u>	<u>327</u>	(18%)
Total	<u>786</u>	<u>754</u>	<u>278</u>	<u>1,818</u>	

3.06 The composite 20-year water program is summarized below:

<u>Program</u>	<u>Additional Population Served (thousands)</u>	<u>Development Cost (Sh million)</u>
Rural	20,000	1,491
Urban - Dar es Salaam	1,280	198
- Other towns	<u>1,400</u>	<u>129</u>
Total	<u>22,680</u>	<u>1,818</u>

3.07 The costs of future rural and urban water development were based on population projections and per capita costs derived from various feasibility studies and limited construction data. Per capita cost figures for rural areas are expected to range as follows:

<u>Density</u>	<u>Per Capita Cost Range</u> (Sh)
High	60 - 120
Medium	50 - 90
Low	49 - 70

These figures are based on the assumption that the high density rural areas would normally be served by systems possibly involving some treatment, and including piped transmission, storage and distribution lines serving kiosks and even some house connections, whereas the low density areas would be served by shallow wells and only rarely have piped transmission, treatment and distribution. It is clear that these unit costs could be increased or lowered to some degree by changing the assumed standard of service to be provided, but sufficient data for a more refined analysis were not available

3.08 Great care needs to be exercised in interpreting per capita cost figures for urban systems, for these vary not only according to locational and population density factors, but are also influenced to a greater or lesser degree by projects designed to cater to industrial demands. Thus of 14 major towns in Tanzania, the per capita investment cost needed to meet currently known industrial requirements plus those for the predicted domestic population in 20 years' time are estimated to vary from Sh 27 in Mbeya to Sh 217 in Tanga. The figure for Dar es Salaam is Sh 155.

3.09 Sewerage, quite justifiably, has not been given a very high priority by the government in future development plans. Rough estimates (see Appendix 7) based on per capita costs derived from feasibility studies and construction cost records indicate that a 20-year program might be as follows:

<u>Program</u>	<u>Cost</u> (Sh million)
Expand existing urban systems	130
Tanga development and expansion	20
New systems - Dodoma, Morogoro and Tabora	100
Seven additional towns	<u>100</u>
Total	<u>350</u>

3.10 In order to achieve maximal benefits in the shortest time from the sector development program, projects will have to be ranked and carefully selected in accordance with specific criteria. These criteria will have to take into account the unit costs of various schemes, but also the various factors relating to urgency of need for improved supplies in different communities (see paragraph 3.04). In addition to these intra-sectoral considerations, it is likely that in the eventual ranking of

projects the government will also want to take other factors into account, unrelated to the water supply sector per se, such as the regional income distribution. Identification of water supply costs and the priorities internal to the sector will then help to make clear the consequences of such decisions.

Program Feasibility

3.11 The Government of Tanzania is roughly at the half-way stage of its second five-year development plan (mid 1969-mid 1974), and at the time of this study was in process of making a mid-plan review to determine program accomplishments and to adjust the program for the balance of the period. The 1969-70, 1970-71 and 1971-72 budget estimates of the MWDP are summarized in Appendix 9. The 1971-72 budget for water supply and sewerage provides Sh 41.5 million for recurrent expenditures and about Sh 66 million for development, of which Sh 39 million are for construction. Sources of finance contemplated in the 1971-72 estimates are summarized in Appendix 10. In the water development area, foreign grants and credits for 1971-72 are summarized as follows:

<u>Country or Source</u>	<u>Amount</u> (Sh million)
UNDP grants (technical assistance)	1.5
Norwegian grant (technical assistance)	3.5
Swedish credits (technical assistance Sh 6 million, balance for construction)	<u>31.5</u>
Total	<u>36.5</u>

Parallel internal finance amounts to Sh 20.4 million.

3.12 Future financing will be determined as a result of the mid-plan review of the second five-year plan. It was reported that budget appropriations, particularly for urban projects, have been cut significantly--from Sh 29.4 million to Sh 23.9 million in 1970-71, and to Sh 8.7 million in 1971-72. Construction estimates for the urban program are summarized below:

<u>Activity</u>	<u>Original</u>	<u>Expended</u>	<u>Balance of</u>	<u>New Estimate</u>
	<u>Estimate</u> <u>1969-74</u>	<u>1969-72</u>	<u>Original</u> <u>----- 1972-74</u>	<u>Required</u> <u>-----</u>
	Sh million			
Industrial waste treatment	11	4	7	20
Lower Ruvu Scheme (Dar es Salaam)	32	<u>1/</u>	32	60
Urban Water Supply & Drainage	<u>114</u>	<u>53</u>	<u>61</u>	<u>128</u>
Total	<u>157</u>	<u>57</u>	<u>100</u>	<u>208</u>

1/ Less than Sh 0.5 million.

3.13 The principal recent foreign assistance in urban water supplies has been a US loan of US\$2.2 million for additions to the Dar es Salaam water supply plant; the project was completed in 1970. An earlier (1968) loan of US\$840,000 was made for studies, equipment and local construction costs for improvements to the water systems of 10 major and 40 minor towns in Tanzania. In future, Canadian aid is expected to finance the Dar es Salaam lower Ruvu supply development. West German aid is expected for Tanga, Buguruni, Tabora and Morogoro.

3.14 Swedish credits, summarized below, have played a major role in the financing of Tanzania's rural water program since 1964:

<u>Credit</u>	<u>Years</u>	<u>Amount</u> (Sh million)
First	1964-66	14
Second	1966-69	42
Third	1969-70	21
Fourth	1970-72	<u>47</u>
Total		<u>124</u>

It is expected that the fifth Swedish credit, for the 1972-74 period, will be Sh 60 million, and that Sweden will continue to finance a significant portion of the rural development program.

3.15 If Sweden continues to support the rural program at the rate of some Sh 20 million per year and the Sh 185 million Dar es Salaam Lower Ruvu program is supported by Canada, the rural balance to be financed would be Sh 55 million per year and the urban balance would be about Sh 3 to 7 million per year (see paragraph 3.03). While it seems quite likely that additional bilateral development assistance will result after the 11-nation regional water resources master plans (see paragraph 4.06) have been completed, it may still be necessary to extend the water program over a longer period than 20 years. A sewerage program of over Sh 15 million per year, as indicated earlier, would require considerable external assistance, and sewerage system development will undoubtedly require an extended period of activity.

3.16 If in fact it is concluded that something less than universal coverage has to be accepted even after the 20-year program, the system of priorities indicated above (see paragraph 3.04) can be used to compose different more feasible investment programs. Annual development expenditures, by priority, for the 20-year program (details in Appendix 8), compared with those of the first (FFYP) and second (SFYP) five-year plans are tabulated below:

<u>Program</u>	<u>Annual Development Expenditures (Sh million)</u>					
	-----20-year plan-----					
	<u>FFYP</u>	<u>SFYP</u>	<u>Priority</u>			<u>Total</u>
		<u>I</u>	<u>II</u>	<u>III</u>		
Rural	8	30	24	37	13	74
Urban	<u>17</u>	<u>19</u>	<u>15</u>	<u>0.5</u>	<u>0.7</u>	<u>16</u>
Total	<u>25</u>	<u>49</u>	<u>39</u>	<u>37</u>	<u>14</u>	<u>90</u>

3.17 From this, it would seem that accomplishment of a 'first priority' rural and urban program (Sh 39 million per year) might not be too difficult to support. On the other hand, accepting the priority currently given to rural areas, one finds that already the inclusion of first and second priority rural investments would result in an expenditure level (Sh 61 million per year) which is considerably in excess of that of past years, and this entirely without investment for urban areas. However, any balanced investment program should include at least part of the first priority urban investments. Thus a Sh 50 million per year program, which might reasonably be achieved, could be made up of the total priority I rural program (Sh 24 million) plus half of the priority II rural (Sh 18 million) and half of the priority I urban (Sh 8 million). Anything in excess of this, although well worth attempting, would appear to be very difficult to achieve.

IV. PROBLEM AREAS FOR SUCCESSFUL SECTOR DEVELOPMENT

4.01 The Ministry of Water Development and Power has only recently been set up. The process of establishing the organizational details and procedures is continuing with the assistance of Swedish consultants. Generally speaking, the consolidation into one ministry of functions previously performed by several agencies and ministries should improve coordination and be conducive to increased efficiency in planning and resource allocation. What remains to be seen is how far the utility approach to water supplies, which gradually should be introduced, is compatible with the restrictions set on a government department. However, until the organization has had time to settle into its new form and to prove itself, judgement on the appropriateness of various features must be withheld. Thus only a number of broad problem areas will be indicated in the following paragraphs, most of which are not directly related to the institutional framework.

Financial Policy

4.02 In order to increase the availability of local funds for the water program, increasing emphasis needs to be placed on the ability of water supplies to generate revenues through user charges. The net demand

on the government budget for funds for recurrent expenditure should be minimized by setting adequate levels of charges for urban (revenue-producing) systems and by gradually upgrading rural (non revenue-producing) systems to the urban category. By introducing depreciation as a cost to be covered by charges, revenues can also be made to contribute towards future capital expenditure. If no such actions are taken the continued construction of new water systems will put progressively heavier strains on the government budget, and there may easily develop a situation where new construction cannot be supported locally despite availability of foreign assistance. The recommendation that rural consumers should start to pay something for the water they consume is also based in part on the assumption that if they do so, they will have more respect and appreciation for the facilities, resulting in fewer operation and maintenance problems.

4.03 An initial step that would be required to advance such a policy is a separation of the accounts for the revenue-producing undertakings of the MWDP, so that revenues raised can be related to the costs incurred for them. Further, a system is needed whereby the management is given a substantial degree of control over the use of the funds accumulated by the excess of revenues over cash outlays; the present practice where all revenues go to the consolidated government revenue account does not give adequate incentives for prudent management.

4.04 A related problem concerns budgeting. At the present time funds are allocated for water operations without sufficient regard to prior detailed estimates of the expenses required to operate the water systems. Instances exist where lack of funds has led to considerable operational difficulties in some regions. It is of utmost importance that sufficient funds, including amounts for adequate maintenance, at all times be provided for the existing systems, or else the scarce capital resources allocated for the water program will at least have been partially wasted. The budget for operation should therefore always be based on a detailed assessment of the needs of the various systems.

4.05 In order to achieve the best utilization of funds for capital expenses, there is need for a firm long-term commitment of resources to the water and sewerage sector, combined perhaps with a more realistic planning. It is undesirable to be forced to accommodate sudden changes in the magnitude of funds allocated to on-going programs, such as illustrated by the recent budgetary cuts for urban water development as compared with amounts foreseen in the second five-year plan (see paragraph 3.12). Once a proposal for capital expenditure has been approved, the Government should give a firm commitment for the timely provision of funds for completion of the work. Currently, funds are not provided for beyond one year and instances have occurred where delays in the completion of projects has been the consequence of a sudden lack of funds. Similarly, actual capital expenditure should be more regularly compared with prior estimates so that cost overruns can be detected as early as possible and remedial action taken.

Planning and Procedures

4.06 Water is a valuable resource which is scarce in many parts of Tanzania. Data are currently lacking on such important variables as rainfall, streamflows, groundwater availability and chemical quality of different waters. A series of water resources studies have been proposed for the eighteen regions of the country, and these should contribute significantly to the knowledge of the water resources available. Appendix 11 gives a list of the proposed studies together with an indication of preliminarily expressed foreign support. As this list involves eleven countries, it is important that the studies be carried out on a uniform basis so that the eventual reports will provide comparable data and a firm basis for future water development planning. A systematic collection of all well logs and pumping test results would also give much valuable information on the groundwater resources and should be begun as soon as possible.

4.07 So far not many instances of conflicts arising from competing water demands have occurred, but it can be foreseen that this will happen in the future. Unnecessary problems have occasionally been created by the location of Ujamaa villages without due regard to availability of water. Similarly, sites for industrial development have sometimes been selected where expansion is later stifled by the lack of water. Furthermore, little attention has been given by industries to design and operate their installations in a manner which will minimize water demands.

4.08 A greater uniformity than experienced in the past is desirable in project preparation. Feasibility studies should have standard terms of reference, in order that they will result in reports which are comprehensive and which make it easy to assess relative priorities; furthermore, they should attempt to meet the requirements of external lending agencies as a matter of course. Project preparation should be begun sufficiently in advance of contemplated construction to allow for engineering surveys, design and contract procedures--especially so when foreign financing is expected.

Technical Services

4.09 Under the conditions in Tanzania, where technical staff is in very short supply, there is a strong need with regard to the smaller systems for standardizations of design and design criteria. A detailed construction manual is required, together with a training program for construction inspectors. Elaborate designs and systems should be avoided so as not to unnecessarily cause problems on the operational level. If it is possible, a gradual standardization of equipment, both fixed and mobile, would reduce

the problems of maintenance and spare parts supply. Records of the existing installations have not been brought up-to-date since about 1963. As-built plans should be maintained as a basis for the planning of future system extensions and also for maintenance purposes.

4.10 In several instances existing systems are plagued by a lack of spare parts for equipment and report very long delivery times. Responsibility here rests both with the MWDP and with the State Trading Corporation which handles all imports. A rapid procedure should be established for ordering and getting deliveries by air so as to avoid the necessity of building up large inventories of parts. Prompt processing at central levels of payment documents is one of the requirements for this.

4.11 The proposed rural water program is very ambitious. Economy in design, self-help labor, maximum use of local materials and utilization of the most economical water source in each case--ground or surface--should be encouraged. While there clearly should be standards adopted for the safety of water for domestic use, those chemical and physical standards which concern only taste, appearance or hardness of the water should be applied with judgement; what is attainable in countries and areas where good water is abundant may be too expensive in areas where this is not so. There are thus instances where waters have been condemned for human use in Tanzania, e.g. because the concentration of sulphates exceed recommended limits by WHO, even when no alternative reasonably accessible source is available. Sufficient attention has not been paid to simple manual methods of obtaining shallow water from alluvial formations by means of dug, driven or jetted wells. These low cost, labor intensive methods might have application in the coastal plain and river valleys in various parts of the country.

Manpower and Training

4.12 The MWDP is now heavily dependent on expatriate staff with higher technical skills and this situation is likely to persist for a long period. A Faculty of Engineering is to be established at the University of Dar es Salaam in 1972 (with assistance from the Federal Republic of Germany), but this will, at least initially, only provide training in civil, electrical and mechanical engineering. The first graduates will not be available until 1976, and even then experience from other developing countries shows that the water and sewerage sector is not usually very successful in the competition for the first groups of local engineers. Meanwhile, the expanding water program is likely to demand an increasing number of engineers, and it is thus realistic to conclude that it will probably be 10 years or more before most of the expatriates can be replaced. Government employees including expatriates under contract can voluntarily retire after 45 and must retire at 55. Unless there are exceptions to this rule, some of the older expatriates with the longest experience will soon be retired with no trained subordinates to replace them.

4.13 In view of the above, it is important that engineers be employed only where their skills are really needed. Engineers are now often charged with rather routine administrative or technical problems which should be handled by assistants. Such staff can be trained more easily in short

courses, and their skills successively up-graded through on-the-job training. Similar combinations of short formal courses and on-the-job training should be given to up-grade personnel already employed in operation, maintenance, simple design and cost estimating.

V. CONCLUSIONS - THE ROLE OF EXTERNAL AGENCIES

5.01 Tanzania is predominantly a rural nation, only 6% of the population lived in towns in 1967 and projections indicate that this proportion may be some 13-14% in 1987. Safe water supply meanwhile is available to a majority of the urban population but only to an estimated 10% of the rural. The Government has decided to give top priority to a stepped-up program of rural water supply with the objective of making water reasonably accessible to the entire rural population in 20 years. The average annual investment necessary to reach this goal is estimated at Sh 75 million. No express objective for urban water supplies has been adopted, but estimates are that the cost of full coverage in the same period would be equivalent to an annual average investment of some Sh 16 million. Sewerage is, quite justifiably, generally given a lower priority than water supply but some investment, increasing as time goes on, will be called for during the twenty-year period. Estimates for a minimal program indicate an investment level similar to the one for urban water supply.

5.02 The recent level of development expenditures for water supply, an annual average of Sh 49 million for three years of the second five-year plan, has only been achieved with substantial foreign assistance. It seems clear that if anything like the program indicated in paragraph 5.01 is to be achieved, increased foreign assistance will be necessary. Many countries have indicated their willingness in principle to provide funds for the sector; the list includes: Canada, Denmark, Finland, the Federal Republic of Germany, India, Italy, Japan, Netherlands, Norway, Sweden and the USA. All of these countries have offered to participate in the regional water master plan studies and in many cases also to support current development programs. Particular interest has been indicated for projects in a number of cities, including Dar es Salaam. There are, however, also a number of towns with immediate water needs where financing of projects has not yet been agreed on. These include: Arusha, Dodoma, Iringa, Kigoma/Ujiji, Lindi, Mbeya, Moshi, Mtwara, Misoma and Mwanza. Sweden has provided about 75% of the funds for the rural water program in the past eight years and can be expected to continue to give substantial support in the future. Even so, because of the greatly increased spending level contemplated for the rural program, there will be room for additional donors.

5.03 One of the most difficult problems likely to be encountered is that of assuring a sufficient growth of local funds for surveys, feasibility studies, preliminary engineering and to provide for the construction operation

and maintenance expenditures for the new systems. This problem will be accentuated as a consequence of the priority given to rural water supplies, which currently do not produce any revenue at all. It is clearly conceivable if no change in policy occurs, that a point will be reached where further assistance for new construction cannot be used with benefit because sufficient funds for operation and maintenance will not be available. It is thus of vital importance to the long term success of the Tanzanian water program that the potential of water systems for raising revenue, at least to cover recurrent expenses, be utilized. Steps should be taken to introduce as rapidly as possible the concept of total cost support by charges for water systems. In particular, rural systems should be upgraded by introducing and gradually increasing charges as communities become more able to make some contribution to the cost of supply. In view of the importance of this problem, future donors would be well advised to assist the Government of Tanzania in developing adequate financial policies in this respect.

5.04 Assistance has been provided by Swedish consultants in developing the organization of the new ministry (MWDP) and providing procedural guidelines. Such assistance should be continued until complete organizational and management effectiveness is achieved, both at headquarters and in the regions. In all likelihood the present 32 man-month contract will not be adequate for full accomplishment of this. Effective management of the MWDP requires a very much improved financial information system. To this end a Swedish consultant in the Ministry of Finance has proposed significant modifications of the budgeting system and the provision of a cost accounting system. The implementation of these proposals should be integrated with the overall institutional improvements and may also require some further assistance. The provision of a management advisor in the Ministry should also be considered.

5.05 Aside from the regional water master plan studies mentioned above, there would seem to be no need for outside assistance in making feasibility studies. With the exception of Moshi, Musoma and Mwanza, all larger cities are already covered by water studies. What limited further studies are necessary, relating to both water and sewerage, should normally be made by MWDP staff. Use should be made of the many studies already made by consultants, updating and amplifying them as necessary. There has been sufficient experience with bilateral aid that the Ministry should be able to meet the requirements of external lending agencies. Only if it should become clear that shortage of local staff would in a particular instance unduly delay preparation of a priority project does further outside assistance seem warranted.

5.06 Considering the large number of potential bilateral donors on the one hand, and the manpower and local financing problems faced in Tanzania on the other, careful coordination is required to avoid duplication of efforts and also to ensure that the projects undertaken will be the ones which have the highest priority from the national point of view. At the

time of the mission's visit, the new unified national water organization had just been set up and consultants were working on the development of appropriate procedures and instructions. While it can be said generally that the new organization should be conducive to improved planning and project coordination, it was not possible to evaluate at that time to what extent further assistance in this respect might be helpful to the government. Similarly, it was not possible to get a clear picture as to the adequacy of the existing offers of aid as several of the interested countries had only indicated a general willingness to extend assistance and not yet agreed to specific financing commitments. These and other circumstances point to the desirability of another review of the situation when the MWDP has had some time to get a firmer grasp of the problems it is facing and when the outcome of the mid-plan review (see paragraph 3.11) is known.

July 18, 1972

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

Population and Area Summary
1967

Administrative Area	Number of Districts	Total Population 000's	Area 000's sq km	Population per sq km	
				Total	Without towns
Tanzania		12,313	866.1	13.9	-
Mainland		11,959	883.5	13.5	-
Zanzibar and Pemba		354	2.6	1,342.0	-
Arusha Region	3	610	82.1	7.4	7.1
Arusha Town		32			
Coast Region	5	512	33.7	15.2	15.2
Dadoma Region	3	709	41.3	17.2	16.2
Dadoma Town		24			
Iringa Region	3	690	56.8	12.1	11.8
Iringa Town		22			
Kigoma Region	3	473	37.0	12.8	12.3
Kigoma/Ujiji Town		21			
Kilimanjaro Region	2	652	13.2	49.4	47.8
Moshi Town		27			
Mara Region	2	544	21.8	25.0	23.3
Musoma Town		15			
Mbeya Region	5	969	83.1	11.7	11.5
Mbeya Town		12			
Morogoro Region	3	685	73.0	9.4	9.0
Morogoro Town		25			
Mtwara Region ^{1/}	7	1,041	82.8	12.6	12.4
Lindi Town		13			
Mwanza Region	4	1,056	19.7	53.6	52.1
Mwanza Town		35			
Ruvuma Region	3	393	6.4	6.4	6.4
Shinyanga Region	3	899	50.8	17.7	17.7
Singida Region	3	458	49.3	9.3	9.2
Tabora Region	3	563	122.0	4.6	4.5
Tabora Town		21			
Tanga Region	5	771	26.8	28.8	26.6
Tanga Municipality		61			
West Lake Region	4	659	28.7	22.9	22.8
Bukoba Town		8			
Dar es Salaam	-	273	0.1	3,100.2	-

^{1/} This region has recently been divided, so that a new region (Lindi) has been added.

TANZANIA - WATER SUPPLY AND SEWERAGE SECTORUrban Water System Characteristics
by Regions 1969-70

<u>Region</u>	<u>No. of systems</u> ^{1/}	<u>Annual Water Consumption</u> <u>IMgd</u>	<u>No. of connections</u>	<u>Populations served (000's)</u>	<u>Per Capita Consumption</u> <u>Igcd</u> <u>(includes industrial)</u>
Arusha	10	493	2,819	15.5	87
Kilimanjaro	2	418	2,917	29.7	38
Mtwara	7	187	2,140	39.6	13
Tanga	7	614	6,026	59.6	28
Dodoma	4	257	2,260	26.7	28
Iringa	6	139	1,743	27.4	14
Mbeya	6	152	1,884	34.0	12
Singida	3	39	634	3.0	37
Ruvuma	3	41	600	6.0	19
Kigoma	4	114	1,076	34.5	9
Mara	3	154	1,044	18.5	23
Mwanza	9	505	3,328	49.0	28
Shinyanga	5	62	1,068	17.0	13
Tabora	5	250	2,793	29.5	23
West Lake	6	78	835	9.9	22
Coast	3	13	282	5.0	7
Morogoro	8	233	2,383	28.9	21
Dar es Salaam	<u>1</u>	<u>3,154</u>	<u>20,153</u>	<u>280.0</u>	<u>31</u>
Total	<u>92</u>	<u>6,903</u>	<u>53,985</u>	<u>713.8</u>	<u>27 (average)</u>

^{1/} Data are not included for two recently added systems.

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

Extract from Terms of Reference for Consultancy Services
Scandiaconsult
Ministry of Water Development and Power
23 May 1971

Object of the Study

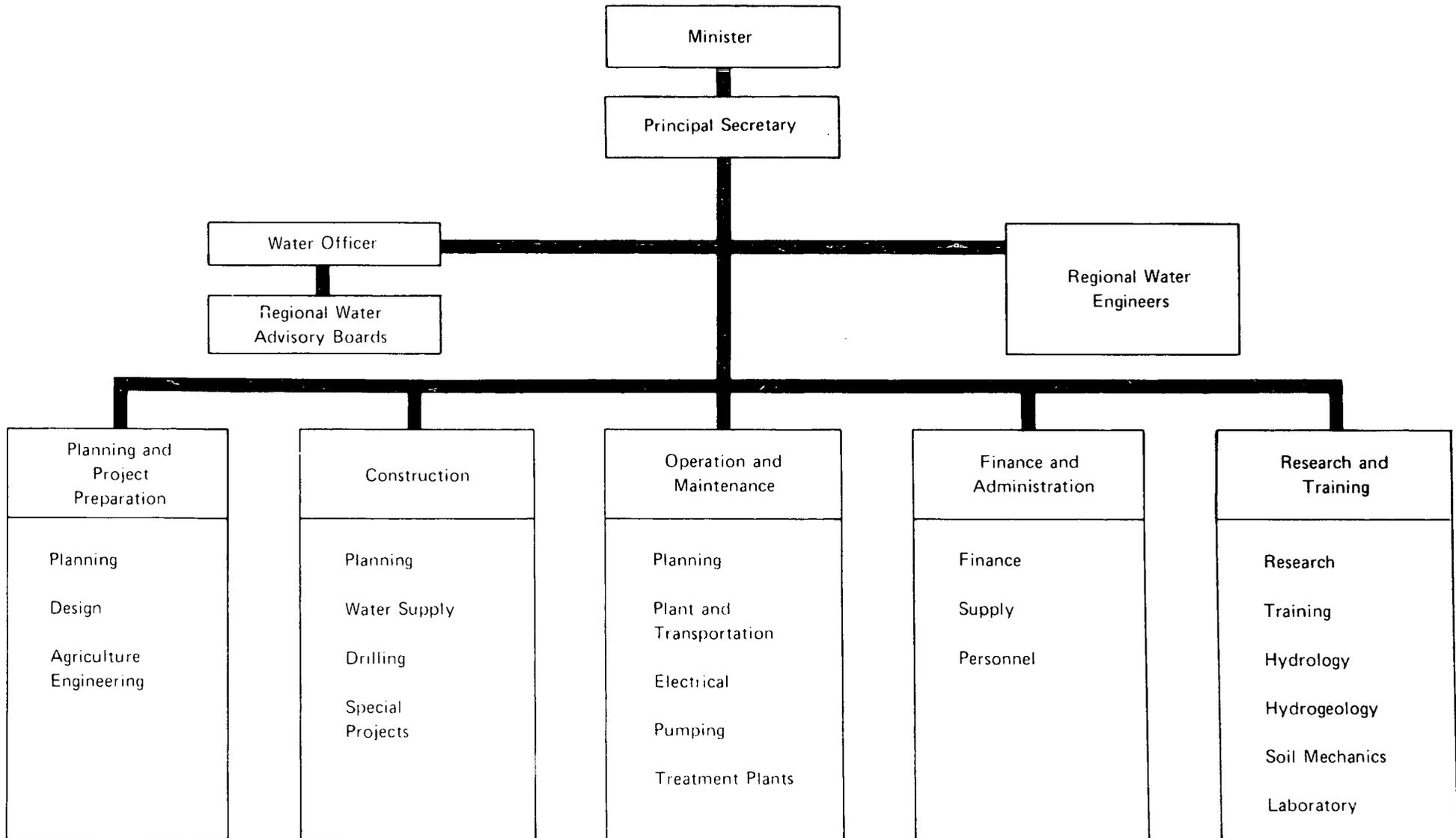
In the context of the agreed functional structure above to review carefully the responsibility and recommend to the Government the detailed set up of the new Organization so as to enable it to function efficiently.

Terms of Reference

1. To study the available information related to the structure of Water Development and the proposed changes.
2. To review carefully the responsibilities of each of the proposed Divisions of the Ministry and their relative functions and coordination of their activities so that they function in unison.
3. To review the grouping of activities within divisions and sections and, if deemed necessary, propose regrouping of such activities.
4. To study in detail the work to be performed within each working group, section and division of the new organization.
5. To develop a set of basic office procedures covering the principal working processes: pre-investment studies, planning and programming, surveys, design, construction, preventive maintenance, repairs, requisitioning of transports and supplies, storage of materials, material control, tenders and procurement, data collection and distribution (progress reports), filing system, internal communication and general office work.
6. To develop a complete reporting system, including instructions and design of the required forms.
7. To formulate job descriptions for gazetted posts giving work content, duties and responsibilities, and necessary qualifications.
8. Items 3-7 should apply both to Headquarters and Regional Offices. Items 4 and 5 should be performed at the Headquarters and at two Regional Offices.
9. In order to enable the staffing position of the Ministry to be substantially localized at a given target date, with a special emphasis on early localization of operation and maintenance:
 - (a) to review the training program for sub-professionals with regard to present syllabus and needs of sub-professionals over time and make appropriate recommendations;

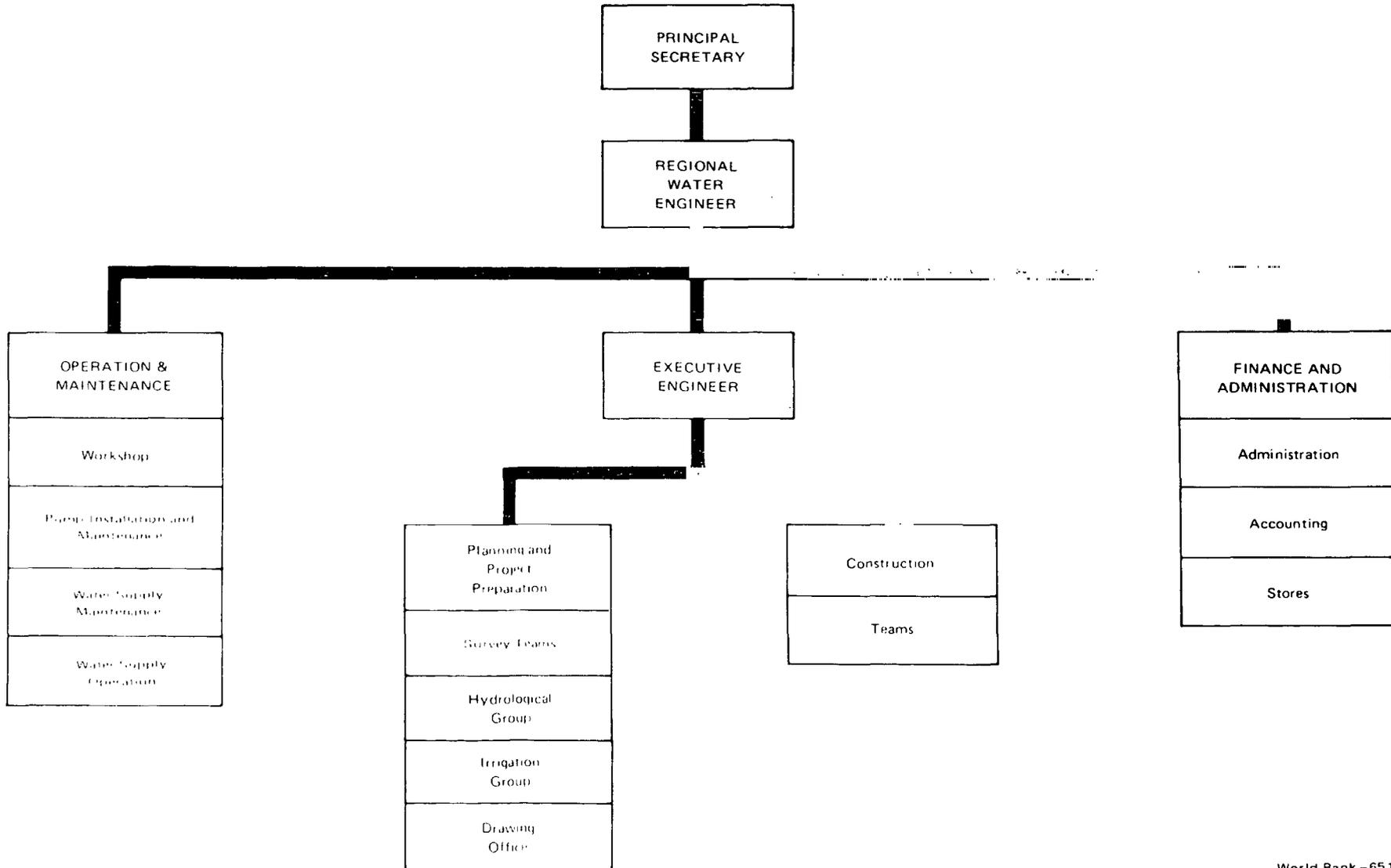
- (b) to review the training of professionals with regard to needs over time and make appropriate recommendations.
- 10. To prepare at an early stage a plan of implementation of the recommendations.
- 11. On completion of the study submit a report to the Government identifying posts to be filled immediately and those to be phased in.
- 12. To assist in the implementation of proposed changes.

TANZANIA
WATER SUPPLY AND SEWERAGE SECTOR
ORGANIZATION CHART
MINISTRY OF WATER DEVELOPMENT & POWER
October 1971



APPENDIX I

TANZANIA
WATER SUPPLY AND SEWERAGE SECTOR
REGIONAL ORGANIZATION
MINISTRY OF WATER DEVELOPMENT AND POWER
OCTOBER 1971



APPENDIX 6

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

URBAN WATER RATE SUMMARY

1971

<u>Region</u>	<u>Connections at various rates</u>									<u>Total</u>
	<u>2/-</u>	<u>2/50</u>	<u>3/-</u>	<u>3/50</u>	<u>4/-</u>	<u>4/50</u>	<u>5/-</u>	<u>5/50</u>	<u>6/-</u>	
Arusha	2,229		279	187		74	21		29	2,819
Kilimanjaro	2,730								187	2,917
Mtwara									2,140	2,140
Tanga	5,022			248	142		384	118	112	6,026
Dodoma	382			184					1,694	2,260
Iringa		10	1,318		55				360	1,743
Mbeya	1,241								643	1,884
Singida									634	634
Ruvuma							119		481	600
Kigoma					867		103		106	1,076
Mara			893						151	1,044
Mwanza		2,590		145			178		415	3,328
Shinyanga								166	902	1,068
Tabora									2,793	2,793
West Lake			670						165	865
Coast									282	282
Dar es Salaam									20,153	20,153
Morogoro	<u>1,699</u>	<u>—</u>	<u>4</u>	<u>—</u>	<u>—</u>	<u>21</u>	<u>68</u>	<u>—</u>	<u>591</u>	<u>2,383</u>
Total	<u>13,303</u>	<u>2,600</u>	<u>3,164</u>	<u>764</u>	<u>1,064</u>	<u>95</u>	<u>873</u>	<u>284</u>	<u>31,838</u>	<u>53,985</u>
Per cent	<u>24.7</u>	<u>4.8</u>	<u>5.9</u>	<u>1.4</u>	<u>2.0</u>	<u>0.2</u>	<u>1.6</u>	<u>0.5</u>	<u>58.9</u>	<u>100.0</u>

Note: Rates are in shillings per 1,000 Imperial gallons.

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

COST ESTIMATES

1. This appendix presents estimates of the costs of carrying out future rural and urban development programs, and assigns priorities to projects, determined by urgency of need. It is considered that information of this kind is essential for rational investment planning, and that the difficulties encountered in making the following estimates are evidence that data need to be improved for this to be achieved. Although the cost estimates referred to in the body of this report apply to the 20-year period 1971-90, the basic data upon which they are based were obtained from reports and studies which referred to the period from mid-1967 to mid-1987. It is assumed that the pattern of unit development costs is unchanged by the slight difference in the time period covered.

A. Population and Per Capita Costs

2. It is expected that by the year 1987 the total population of mainland Tanzania will be in excess of 25 million persons, of which almost 22 million will live in rural areas, and over 3.4 million will live in urban areas, including some 1.6 million in Dar es Salaam. Projections are based on these figures compared with a present population served with reasonably accessible water--700,000 urban and 1,300,000 rural.

3. Per capita costs of rural water development averaged about Sh 120 in the first five-year plan (1964/65 to 1968/69) and are estimated at Sh 140 in the second five-year plan. There is, however, considerable variation around this mean. Total expenditures for rural water development averaged about Sh 8 million per year during the first five-year plan, while in the second plan actual expenditures of Sh 23 million in 1969-70 are projected to increase to Sh 65 million in 1973-74. The total cost of serving all rural people with accessible water is estimated at some Sh 1.5 billion; in order to achieve this target over a 20-year period, the average annual expenditure will have to be almost Sh 75 million per year.

B. Water Development Costs

4. Appendix 8 presents projections of rural and urban water development expenditures, broken down into regions (18 including Dar es Salaam), rural areas according to population densities (high, medium, low), and town systems. Estimates are based upon completed projects, engineering reports, and data from towns and rural localities with existing or planned systems.

5. Population growth--1967 to 1987--was computed at varying rates based on density, geographical location and other influencing factors. Per capita development costs reflect regional/local conditions such as population density, hydrogeological conditions, special water treatment requirements and the like, as explained in the footnotes to Appendix 8. Per capita costs of urban water development vary considerably, ranging

from Sh 22 in Masasi for the service of over 2,500 additional persons to Sh 217 in Tanga for a scheme, which includes industrial water. Estimates of the cost of serving Dar es Salaam up to 1989 total Sh 198 million for an additional population of over 1,200,000 - Sh 155 per capita.

6. As shown in Appendix 8, the computed total development costs for "full supply" by 1987, are estimated at Sh 1,491 million for the rural sector and Sh 327 million for the urban sector, i.e. proportions of 82% and 18% respectively.

C. Water Program Modifications

7. Shortage of available finance may make it necessary to modify the program, and this may be done in a number of alternative ways. The choice should depend in part upon the cost of achieving certain targets of service in various urban and rural areas of the country, in part by variations in the urgency of need for water, and in part by considerations unrelated to water supply per se. The object of this appendix is to present only the costs and judgements as to priority that can be made by experts on water supply. They are therefore not the sole criteria for project selection, but are an essential piece of information that policy-makers require in making these decisions.

8. Priorities assigned in Appendix 8 to projects in rural districts and urban towns or town groups, are the judgement of the mission. The I, II and III ratings are based on urgency of need and other factors described in the footnotes of Appendix 8. In summarizing total program costs by priorities the following recapitulation is provided:

<u>Sector</u>	<u>Sh millions by Priority</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>Total</u>
Rural	482	744	265	1,491
Urban	<u>304</u>	<u>10</u>	<u>13</u>	<u>327</u>
	<u>786</u>	<u>754</u>	<u>278</u>	<u>1,818</u>

These figures do not include operation and maintenance or overhead.

D. Operation and Maintenance Costs

9. Data are not available to determine operating and maintenance costs from the development figures of Appendix 8, even taking into account local or regional characteristics and conditions. Operating and maintenance costs relating to a water supply system depend on such variables as:

- (1) Pumped or gravity supply, or some combination thereof.
- (2) Water quality, requiring treatment of different kinds and intensities.
- (3) Storage capacity needed or available, and
- (4) Availability and local price of electric current, fuel, chemicals and other materials.

To consider all of these factors would require a detailed study of individual operations and areas, each comprising a variety of conditions as reflected in districts of varying characteristics as in Appendix 8. It appeared more feasible, therefore, to apply a percentage for operation and maintenance against development costs. The 50% figure used was decided upon on the basis of a review of various feasibility studies.

10. The composite rural/urban program up to 1987, including operation and maintenance, is summarized below:

<u>Project</u>	<u>Additional Population served (000's)</u>	<u>Cost Sh millions</u>		
		<u>Development</u>	<u>O&M</u>	<u>Total</u>
Rural	20,000	1,491	745	2,235
Urban - Dar es Salaam	1,280	198	99	297
- Other	<u>1,400</u>	<u>129</u>	<u>65</u>	<u>194</u>
Total	<u>22,680</u>	<u>1,818</u>	<u>909</u>	<u>2,726</u>

The average development expenditure needed to achieve 100% coverage would therefore have to be about Sh 90 million per year, as compared with Sh 25 million per year of the first five-year plan and of the Sh 49 million per year of the second plan.

11. Investment needs, including those for currently known industrial water requirements for principal urban centers are as follows:

<u>Town</u>	<u>Population 000's</u>		<u>Investment Cost Sh 000's</u>	<u>Per Capita Cost Shs</u>	<u>Priority</u>
	<u>Served 1969-70</u>	<u>Est'd. 1987</u>			
Arusha	12.7	350	10,500	31	I
Dar es Salaam	273.0	1,550	198,000	155	I
Dodoma	20.0	85	6,780	104	I
Iringa	22.0	135	8,100	72	I
Kigoma/Ujiji	30.0	48	1,920	102	II
Lindi	20.0	30	900	90	II
Mbeya	25.0	87	1,515	27	I
Morogoro	20.0	90	3,600	51	I
Moshi	28.0	140	14,000	125	I
Mtwara	8.1	40	2,800	87	I

<u>Town</u>	<u>Population 000's</u>		<u>Investment Cost Sh 000's</u>	<u>Per Capita Cost Shs</u>	<u>Priority</u>
	<u>Served 1969-70</u>	<u>Estd. 1987</u>			
Musoma	15.0	80	4,800	74	II
Mwanza	34.9	120	4,800	57	I
Tabora	20.0	42	2,100	95	I
Tanga	50.5	180	28,100	217	I
Total			<u>287,915</u>		

F. Sewerage Development Costs

12. Sewerage system development costs, according to 1967 and 1971 feasibility study estimates, range from Sh 40 per capita for service to 400,000 or more population in Dar es Salaam to Sh 700 per capita to serve some 80,000 (year 2000) population in Tabora (1967 population - 21,000). A Dodoma estimate for 50,000 population in 1979 amounted to Sh 475 per capita. Other estimates for portions of Dar es Salaam ranged from Sh 50 to 215 per capita.

13. The need for sanitary sewerage systems will become more acute as piped water systems to individual properties are developed. In the future, existing systems in Arusha, Dar es Salaam, Moshi and Mwanza will require expansion; a 20-year program might cost over Sh 130 million. The small Tanga system will require considerable development at a possible cost of Sh 20 million. Systems for Dodoma, Morogoro and Tabora were being designed at the time of this study; a 20-year development for these three towns will probably cost in excess of Sh 100 million. The following additional towns of importance do not have sewerage systems:

	<u>Populations 000's</u>	
	<u>1967</u>	<u>1987 (estd)</u>
Iringa	22	135
Kigoma/Ujiji	21	47
Mtwara/Mikid	20	41
Musoma	15	88
Lindi (new regional headquarters)	13	30
Mbeya	13	60
Singida	<u>10</u>	<u>65</u>
	<u>114</u>	<u>466</u>

The provision of sewerage systems for these places to serve their estimated 1987 populations would cost close to Sh 100 million (at Sh 200 per capita).

14. Hence, a total 20-year sewerage program for the 15 principal towns of Tanzania is roughly estimated at Sh 350 million (at Sh 200 per capita). It seems doubtful that such a program can be accomplished in view of the estimated Sh 1.5 billion rural water program and a Sh 330 million urban water need.

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

Projections of Population and Rural and Urban Water Development Costs
1987-1987

Region	Districts (by density) and Town Systems ^{1/}	Estimated Population in 1987 (Thousands)	Unit Development Cost for 1987 project ^{2/} (Sh per capita)	Total Investment Cost for 1987		Priorities (assigned independently of costs) ^{3/}	
				Rural	Urban	Rural	Urban
				(Sh 000's)			
1. ARUSHA		1,529	-	109,700	10,200		
	High	440	120 ^{4/}	53,000	-	I	
	Medium	550	80 ^{4/}	44,000	-	II	
	Low	181	70	12,700	-	III	
	Arusha town system	350	-	-	10,500 ^{4/5/}		I
	9 other systems	8	50 ^{4/}	-	400		III
2. KILIMANJARO		2,490	-	125,700	14,320		
	High	1,050	100 ^{4/}	105,000	-	I	
	Medium	296	70	20,700	-	II	
	Moshi town system	140	100 ^{4/}	-	14,000		I
	Kilimanjaro town system	4	80	-	320		III
3. MTWARA		2,040	-	116,000	5,362		
	High	570	70	40,000	-	I	
	Medium	1,070	60	64,000	-	II	
	Low	306	40	12,000	-	III	
	Lindi town system	30	30	-	900		II
	Mtwara town system	40	70	-	2,800		I
	Machingwea town system	24	-	-	612 ^{5/}		I
					(1,050 ^{6/})		
4. TANGA		1,716	-	91,700	50,460		
	High	915	70	64,000	-	I	
	Medium	312	60	18,700	-	II	
	Low	225	40	9,000	-	III	
	Tanga town system	180	-	-	28,100 ^{5/}		I
	Korogwe	20	70	-	1,400		III
	5 other systems	16	60	-	960		III
	Handeni scheme	48 (1992)	-	-	15,000 ^{5/}		I
					(5,000 ^{6/})		
5. DODOMA		1,470	-	136,500	7,820		
	Medium	1,365	100 ^{4/}	136,500	-	I	
	Dodoma town system	85	-	-	6,780 ^{5/}		I
	Kandoa town system	15	50	-	750		III
	2 other systems	5	60 ^{4/}	-	300		III
6. IRINGA		1,366	-	101,900	8,640		
	Medium	830	90 ^{4/}	74,500	-	II	
	Low	390	70 ^{5/}	27,400	-	III	
	Iringa town system	135	60	-	8,100		I
	5 other systems	11	50 ^{4/}	-	540		III
7. MBEYA		1,881	-	88,900	2,325		
	High	750	60	45,000	-	II	
	Medium	289	50	14,500	-	II	
	Low	735	40	29,400	-	III	
	Mbeya town system	87	-	-	1,515 ^{5/}		I
	5 other systems	20	40	-	800		III
8. SINGIDA		870	-	73,500	1,953		
	Medium	710	90 ^{4/}	64,000	-	II	
	Low	136	70 ^{5/}	9,500	-	III	
	Singida town system	23	-	-	1,833 ^{2/}		I
	2 other systems	1	60 ^{4/}	-	60		III
9. RUVUMA		643	-	28,600	1,520		
	Medium	200	60	12,000	-	II	
	Low	415	40	16,600	-	III	
	Songea town system	23	60	-	1,320		II
	2 other systems	5	40	-	200		III
10. KIGOMA		586	-	41,200	2,370		
	Medium	409	60	24,500	-	II	
	Low	420	40	16,700	-	III	
	Kigoma town system	16	40	-	640		II
	Ujiji town system	32	40	-	1,280		II
	2 other systems	9	50	-	450		III

Region	Districts (by density) and Town Systems 1/	Estimated Population in 1987 (thousands)	Unit Development Cost for 1987 Project 2/ (Sh per capita)	Total Investment Cost for 1987		Priorities (assigned independently of costs) 3/	
				Rural	Urban	Rural	Urban
				(Sh 000's)			
11. MARA		1,170	-	58,400	5,200		
	High	407	60	24,400	-	II	
	Medium	681	50	34,000	-	III	
	Musoma town system	60	60	-	4,800		II
	2 other systems	8	50	-	400		III
12. MWANZA		3,297	-	121,100	6,550		
	High	1,405	60	84,200	-	I	
	Medium	757	50	36,900	-	II	
	Mwanza town system	120	40	-	4,800		I
	3 other systems	35	50	-	1,750		III
13. SHINYANGA		1,697	-	144,000	2,100		
	Medium	243	50 4/	127,000	-	II	
	Low	15	70 4/	17,000	-	III	
	Shinyanga water system	15	40	-	600		II
	Mahama water system	14	40	-	600		II
3 other systems	15	60 4/	-	900		III	
14. TANCRA		1,026	-	69,000	3,240		
	Medium	555	80 4/	45,000	-	II	
	Low	400	60 4/	24,000	-	III	
	Tabora water system	42	50 4/	-	2,100		I
	4 other systems	19	60 4/	-	1,140		III
15. WEST LAKE		1,370	-	73,700	1,200		
	High	820	60	49,200	-	II	
	Medium	374	50	19,200	-	III	
	Low	139	40	5,500	-	III	
	Rukoba water system	27	40	-	900		III
5 other systems	5	50	-	300		III	
16. COAST		346	-	41,400	600		
	Medium	408	60	36,400	-	II	
	Low	405	40	17,000	-	II	
	3 water systems	33	40	-	600		II
17. MOROGORO		1,321	-	62,500	4,600		
	Medium	522	60	51,700	-	II	
	Low	286	50	14,600	-	III	
	Morogoro water system	90	40	-	3,600		III
	Kilosa water system	9	40	-	400		III
	6 other systems	12	50	-	600		III
18. BUR ES SALAAM		1,550	-	-	193,000 7/		I
TOTAL		25,174		1,491,000	327,230		

1/ Density groupings: High = more than 45 persons per sq km. Medium = 12 to 45 persons per sq km. Low = less than 12 persons per sq km. All districts for which density group is indicated in this manner are rural.

2/ Quality of service provided generally assumed to be similar between density groups. High-density rural areas would be served by systems possibly involving some treatment, and including piped transmission, storage and distribution lines serving kiosks and even some house connections, whereas the low-density areas would be served by shallow wells, but rarely would there be piped transmission, treatment or distribution. A blank in this column indicates non-comparable unit costs, primarily caused by the inclusion in the total of large projects for industrial water supply.

3/ Priorities assigned to the rural and urban projects were not primarily related to costs, but based principally on factors relating to the urgency of need, such as: public health; complete lack of convenient water supply; densely populated rural districts; Ujamaa village and similar rural development programs; industrial water requirements; and advanced engineering, contractual and/or financing status.

4/ Includes possible defluoridation, long-distance transmission or high drilling costs.

5/ From previous reports and studies.

6/ Modified due to differing projection periods or for other reasons.

7/ Costs are for extensions of existing urban systems.

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

Budget Estimates
 Ministry of Water Development and Power
 (Sh thousands)

	<u>1969-70</u> ^{1/}	<u>1970-71</u> ^{2/}	<u>1971-72</u> ^{3/}
<u>RECURRENT</u>			
<u>Division</u>			
Finance and Administration	-	-	3,392
Planning and Project Preparation	-	-	3,982
Operation and Maintenance	-	-	26,884
Construction	-	-	6,000
Research and Training	-	-	<u>1,272</u>
Total Division	<u>-</u>	<u>-</u>	<u>41,529</u>
<u>DEVELOPMENT</u>			
<u>Funded</u>			
Project Preparation	4,020	16,668	14,729
Operation and Maintenance	1,095	250	250
Construction	40,908	57,140	39,490
Technical Education and Training	101	1,920	1,400
Drainage and Irrigation	-	-	50
Items not repeated	13,700	5,000	-
Total Funded	<u>59,824</u>	<u>80,978</u>	<u>55,919</u>
<u>Unfunded</u>			
Surveys and Investigations	-	-	1,000
Urban and Rural Water	-	-	<u>9,195</u>
Total Unfunded	<u>-</u>	<u>-</u>	<u>10,195</u>
TOTAL	<u>62,849</u>	<u>106,907</u>	<u>133,275</u>

1/ Actual
2/ Approved
3/ Estimated

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

Internal and External Finance of Development Expenditures
 Ministry of Water Development and Power
 1971-1972
 (Sh thousands)

	<u>Internal</u>	<u>External</u>	<u>Total</u>
<u>Project Preparation</u>			
Surveys and Investigations:			
Hydrometeorological Survey	700	180 ^{1/}	880
National	1,500	-	1,500
Kangera River Feasibility Study	512	1,337 ^{1/}	1,849
Stiefler's Gorge	-	3,500 ^{2/}	3,500
Rural Water - Surveys and Investigations	<u>650</u>	<u>5,950 ^{3/}</u>	<u>6,600</u>
Total	3,362	10,967	14,329
Urban/Rural Water:			
Lower Ruvu Scheme	50	-	50
Tanga Water Supply	<u>150</u>	-	<u>150</u>
Total	200	-	200
Drainage and Irrigation:			
Irrigation and Flood Control	<u>200</u>	-	<u>200</u>
Total Project Preparation	<u>3,762</u>	<u>10,967</u>	<u>14,729</u>
<u>Operation and Maintenance</u>			
Drainage and Irrigation:			
Satellite Ujumaa Village Irrigation	<u>250</u>	-	<u>250</u>
Total Operation and Maintenance	<u>250</u>	-	<u>250</u>
<u>Construction</u>			
Urban/Rural Water:			
Expansion of Facilities	225	675 ^{3/}	900
Rural Water Supply	2,743	12,607 ^{3/}	15,350
Purchase of Plant, Vehicles and Equipment	-	4,150 ^{3/}	4,150
Rural Water Supply (carry over)	3,532	7,068 ^{3/}	10,600
Urban Water Supplies and Drainage	<u>8,490</u>	-	<u>8,490</u>
Total	14,990	24,500	39,490
Technical Education and Training:			
Training - Rural Water Supplies	350	1,050 ^{3/}	1,400
Drainage and Irrigation:			
Irrigation and Flood Control	<u>50</u>	-	<u>50</u>
Total Construction	<u>15,390</u>	<u>25,550</u>	<u>40,940</u>
<u>Unfunded</u>			
Project Preparation - Rural	1,000	-	1,000
Construction:			
Rural Water Supply	-	-	3,145
Purchase of Plant Vehicles and Equipment	-	-	1,050
Urban Water Supplies and Drainage	-	-	<u>5,000</u>
Total Unfunded	<u>1,000</u>	<u>-</u>	<u>10,195</u>

^{1/} UNDP Grant
^{2/} Norway Grant
^{3/} Swedish Credit

TANZANIA - WATER SUPPLY AND SEWERAGE SECTORRegional Water Master Plan Study Support (Tentative) ^{1/}1971

<u>Region</u>	<u>Supporting Country</u>
Arusha	U.S.A.
Coast	Canada
Dodoma	Tanzania ^{2/}
Iringa	Italy
Kigoma	Norway
Kilimanjaro	Japan
Lindi (new)	Finland
Mara	Sweden
Mbeya	Norway
Morogoro	West Germany
Mtwara	Finland ^{2/}
Mwanza	Sweden
Ruvuma	Norway
Shinyanga	Netherlands ^{2/}
Singida	India ^{3/}
Tabora	Denmark
Tanga	West Germany ^{2/}
Westlake	Sweden

^{1/} These studies are planned for the period 1972-1975, and are expected to cost T Sh 100-150 million.

^{2/} Under way.

^{3/} Committed.

TANZANIA - WATER SUPPLY AND SEWERAGE SECTOR

WATER AND SEWERAGE - DAR ES SALAAM

A. Present Water Supply

1. Dar es Salaam, with a present population of 350,000 receives water from two sources:

<u>Source</u>	<u>Output (IMgd)</u>
Mtoni (seasonal)	0.7 to 1.6
Upper Ruvu	10.0
Total	10.7 to 11.6

Mtoni is 4.5 miles from Dar es Salaam and Upper Ruvu 45 miles. The Upper Ruvu scheme consists of a raw water intake, a treatment plant four miles from the Ruvu River intake, and a high-lift pumping station. Near Dar es Salaam there are three reservoirs--2 of 1.76 IMg and 1 of 4 IMg. Two 21-inch mains deliver the water from the reservoirs to town. The mains have digital meters and no flow recorders. The night flow ratio is at present believed to be as high as 83%, this being partially accounted for by the filling of storage tanks at night. It is estimated by the Water Supply Section of Dar es Salaam Regional Office and the Medical Officer of the Dar es Salaam City Council that at present between 94% and 96% of the present population of Dar es Salaam draw water from the distribution system and only 4% to 6% of the population draw water from other sources. No records of water borne diseases in the Dar es Salaam area were found.

The past and estimated future water consumption of Dar es Salaam is as follows:

Past and Estimated Future
Population and Water Consumption
in Dar es Salaam
1967 - 1989

<u>Year</u>	<u>Population 000's</u>	<u>Consumption - IMgd</u>			
		<u>Major Industrial</u>	<u>Kiosks</u>	<u>Domestic</u>	<u>Total</u>
1967	273	0.88	0.37	3.91	5.16
1969	320	1.50	0.74	5.14	7.38
1974	500	2.41	0.64	12.03	15.08
1979	630	4.14	0.44	18.77	23.35
1984	795	5.93	0.24	27.60	33.77
1989	1,028	9.37	0.04	39.50	48.91

B. Future Water Supply

2. The top priorities in the field of water supply for Dar es Salaam are to increase the capacity of the Upper Ruvu supply and to construct the Lower Ruvu scheme, which will provide an additional 22.8 IMgd by 1975 (see Table 1). Priority has also been given to the construction of five miles of 30-inch pipeline to complete the second supply main from the Upper Ruvu treatment plant, and to the construction of supply mains to the Ubungo and Tabata area of Dar es Salaam. Since the Upper Ruvu plant is designed for only 5 to 6 IMgd and is at present producing 7.8 IMgd, it is overloaded. The coagulation and sedimentation are very poor, and the outgoing water has a relatively high turbidity. The Mtoni water source consists of a dam, filtration galleries, treatment plant and a pumping station. The plant has no constant output due to a water shortage during the dry season. Groundwater has so far not been utilized in Dar es Salaam as a substantial source for water supply. Hydrogeologists of the Ministry of Water Development and Power, however, are at present interested in investigating deeper groundwater strata which have so far not been explored. Efforts are being made to obtain results from deep boreholes drilled by an oil company.

C. Water Quality

3. The chemical quality of Dar es Salaam water is occasionally tested by the Government chemist. Bacteriological tests are carried out weekly by the Central Pathological Laboratory. The available laboratories at Upper Ruvu and Mtoni Water Works have no equipment to carry out full chemical water analysis and there is no equipment for bacteriological analysis.

D. Sewerage Systems

4. The city has a sewage collection system and sea water outfall to which about 30,000 people as well as industrial and commercial areas are connected. The sea water outfall has a capacity of about 20 IMgd; but the actual dry weather flow does not exceed 2 IMgd. In addition to this system, there are six other sewage collection systems (partially under construction) with oxidation ponds. The estimated costs of water and sewerage facilities in the second five-year plan for Dar es Salaam are shown in Table 2.

E. Sewerage Development

5. The Ministry requested Sh 13 million for 1971-72 for sewerage development in Dar es Salaam but received only Sh 3.8 million, so that a number of projects were stopped. The long-term goal for the sewerage in Dar es Salaam is outlined in the Dar es Salaam master plan, aiming at a fully sewered city by 1989 when the population is expected to reach 1,000,000. Latrines, septic tanks and even stabilization ponds are considered as interim solutions. A proposed sea water study is of importance to this goal. Upon completion of this study, it will be possible to determine the extent to which liquid wastes can be disposed of through sea outfalls.

F. Drainage

6. The improvement of storm water drainage is usually carried out in connection with the development of land for housing and industry. The master plan for town development establishes certain priority projects for the second five-year plan, but there is need to establish criteria for drainage and a general program for the improvement of water courses. The Medical Officer of the City Council of Dar es Salaam indicated that swamps within the city boundaries cause malaria and bilharzia. The swamps are sprayed regularly; the cost was Sh 1,019 million in 1970 and is expected to increase to Sh 1.2 million in 1971, and Sh 2.0 million by 1976. The technical and economic aspects of the drainage of these swamps should be part of an overall study related to sewerage and drainage.

G. Organization

7. The Dar es Salaam Regional Office has responsibilities for planning, design, construction, operation and maintenance of water supply, sewerage (operation and maintenance by City Council) and drainage facilities for the Dar es Salaam region. There is at present no detailed plan of the organization of the Dar es Salaam Regional Office.

H. Finance

8. The annual costs and revenues of Dar es Salaam water supply between 1957 and 1968 are shown in Table 3. In future projects, listed in Table 1, Sh 115 million will be required for the Lower Ruvu water supply scheme, more than doubling the capital assets. It is likely that the Lower Ruvu scheme will be financed by the Canadian Government. Future program details should be incorporated in a revised master plan for water in Dar es Salaam. Water rates for Dar es Salaam, which are planned to be introduced for the whole community, are shown in Table 4.

I. Cost Estimates

9. Cost estimates for the different phases of the water supply projects for Dar es Salaam are included in Table 2. In addition to this, investments will be required for the secondary and tertiary water distribution system. The total system investment in the Dar es Salaam water supply is estimated to be:

<u>Year</u>	<u>Amount</u> (Sh million)
1975	219
1980	236
1985	339
1989	361

The Ruvu River is of limited supply and will not be sufficient to meet the long-term water requirements of Dar es Salaam. The national capital master plan of Dar es Salaam proposes, therefore, a systematic study of all water

resources. In view of the fact that a receiving water study is necessary as a basis for the planning of future sewerage and drainage facilities for Dar es Salaam, there are at present no realistic cost estimates for the long-term target which aims at the connection of the whole population of Dar es Salaam to a sewerage system by 1989.

J. Manpower and Training

10. There is a shortage of both professional and non-professional staff. Short courses should train technical and administrative assistants and operators.

K. Pre-Investment Studies

11. Two major studies have been proposed. One is a study of the surface and groundwater resources of the Dar es Salaam area in order to plan the best solution for the long-term water requirements. The other study is of the ability of the sea to be used to receive waste water. This will most likely be financed by the Danish Government. Rainfall is seasonal on this coast and sewage treated in stabilization ponds should be a valuable source of irrigation water for agricultural land.

Table 1: Planned Water Supply Projects for Dar es Salaam
 (Population growth estimated at 6% per year)

<u>Project and Description</u>	<u>Schedule</u>	<u>Cost Per Phase</u> (Sh million)	<u>Population Served</u> (000's)	<u>Investment Cost</u> (Sh/capita)	<u>Production or Demand</u> (IMgd)	<u>Per Capita Consumption</u> (Igcd)	<u>Other Consumption</u> (IMgd)
Upper Ruvu: reconstruction of existing plant	Design : 1971/72 Construction: 1993	3.5	578 ^{1/}	13/60	18 ^{2/} 6.4 ^{3/}	25 25	3.43 (industry)
Lower Ruvu: New source 3 phases	Design I : 1970 Design II : 1973 Phase I Construction: 1975 Phase III : 1989	I- 115.0 II- 70.0	790 ^{4/} 11,028 ^{5/}	542/- 295/-	40.8 ^{2/} 58.9 ^{2/}	35 40	12.6 17.9
Upper Ruvu: Rising main 5 mile, 30 inch diameter	Design : 1971 Construction: 1972/73	4.0	450	8/90	18	25	3.43
Extension of distribution system: 24 inch line from Kimora tanks to Ubungo and Taba'a	Design : 1971 Construction: 1972/73	I- 2.0 II- 3.5	150 90	13/30 39/-	3.75 2.25	25	-

1/ as in 1977

2/ Total

3/ Additional

4/ as in 1983

5/ as in 1989

Table 2: Estimated Costs of Water and Sewerage Facilities ^{1/}
Dar es Salaam, 1969-74
(Sh thousands)

	<u>Water</u>	<u>Sewerage</u>	<u>Drainage</u>
Phase 1	4,875		150
Phase 2		3,742	1,175
Phase 3	725		725
Phase 4	<u>1,675</u>	<u>5,180</u>	<u>1,005</u>
Total	8,325	8,922	3,505
Unphased, but in the third five-year plan (1975-79):			
a) Water Mains	7,702		
b) Sewerage and storm drainage, Kinondoni, etc.		43,251	
c) Water Mains - industrial area and water course improvement	840		125
d) Water Mains, Kurasini	10,441		
e) Sewerage, Kurasini and water course improvement		<u>6,085</u>	<u>500</u>
Total	18,983	49,336	625
Grand Total (1969-79)	<u>27,308</u>	<u>58,258</u>	<u>4,130</u>

^{1/} Excluding water works (water production)
and sewerage sea outfalls.

Table 3
FINANCIAL SUMMARY
DAR ES SALAAM WATER SUPPLY
UNITED REPUBLIC OF TANZANIA
1957 - 1968

Fiscal Year ending June 30	Consumption IMg	Capital ^{1/} Value Sh millions	Costs - Sh 000's			Cost per 1000 gal Sh	Total ^{4/} Revenue Sh 000's	Revenue per 1000 gal Sh	Base Rate Sh
			Int. & Sinking ^{2/} Fund 5.326%	Operating ^{3/} Costs	Total				
1957	758	20.0	1,066	1,221	2,287	3/02	2,414	3/18	3/25
1958	798	20.5	1,089	1,207	2,296	2/88	2,677	3/35	3/25
1959	743	21.3	1,133	1,268	2,401	3/23	2,738	3/69	3/25
1960	888	51.5	2,744	1,794	4,538	5/11	2,899	3/26	3/25
1961	952	52.9	2,815	2,015	4,830	5/08	4,080	4/29	4/50
1962	997	54.2	2,887	2,248	5,135	5/15	4,297	4/31	4/50
1963	1,050	55.1	2,937	2,300	5,237	4/99	5,983	5/70	6/00
1964	1,032	55.5	2,955	2,490	5,445	5/28	N.A.	N.A.	6/00
1965	1,317	57.2	3,044	2,965	6,009	4/56	N.A.	N.A.	6/00
1966	1,637	71.2	3,790	3,232	7,022	4/29	N.A.	N.A.	6/00
1967	1,884	83.6	4,454	3,697	8,151	4/32	8,394	4/46	6/00
1968	2,288 ^{5/}	88.6	4,720	3,508	8,228	3/60	8,500 ^{5/}	3/71	6/00

^{1/} Capital value - at end of previous fiscal year.

^{2/} Interest and sinking fund based on Ministry of Communications, Labor and Works Accounting practices.

^{3/} Includes 18% overhead charge.

^{4/} Includes revenue from connection charges and meter rent.

^{5/} Estimated.

From: Recommendations for the Dar es Salaam Water Supply System, United Research, February 1969.

Remarks:

The undepreciated assets in the Dar es Salaam System were valued at Sh 88,620,000 at the end of the fiscal year 1968. Since over 75% of the capital value was added during the past 10 years when large capital investments were required for the Ruva system, most of the assets are likely to last until the end of the study period. However, the value of the assets is overstated because assets are not removed from the capital accounts at the end of the economic lives.

The Ministry applies an annual cost factor of 5.326% to the assets to determine the annual cost of capital. The 5.326% is the sum of a 4% interest charge and a 1.326% annual sinking fund factor based on a 3% interest rate and a 40-year life.

The 40-year life was selected as an average life of waterworks facilities in Tanzania. Some thought should be given to classifying assets according to their economic lives and applying the appropriate capital recovery factors so that the amortization charge will more accurately reflect the real cost of the physical assets.

Table 4
PRESENT WATER RATES

DAR ES SALAAM

1971

1. Metered Supplies (Rule 7)

All metered water will be supplied at the rate of Shs 6/- per 1000 gallons or 4546 litres.

The minimum monthly charge per meter for metered supplies shall be Shs 5/-.

2. Industrial Rates

Consumers using over 100 000 gallons (or 454 600 litres) shall be charged special industrial rates for that portion of their consumption which is in excess of 100 000 gallons or 454 600 litres, the special rates per 1 000 gallons or 4 546 litres of water consumed within the ranges set out hereunder are chargeable as indicated:

Gallons per month over 100 000 and under 500 000
at the rate of Shs 5/- per 1 000 gallons.

Litres per month over 454 600 and under 2 273 000
at the rate of Shs 5/- per 4 546 litres.

Gallons per month over 500 000 at the rate of
Shs 4/- per 1 000 gallons.

Litres per month over 2 273 000 at the rate of
Shs 4.- per 4 546 litres.

3. Flat rate for unmetered supplies (Rule 7)

	<u>Area of Premises</u>		<u>Rate per Month</u>
	<u>Sq. Ft.</u>	<u>Sq. Meters</u>	<u>Shs</u>
Over	2 100	Over 195	20/-
	1 401 to 2 100	131 to 195	15/-
	351 to 1 400	32.5 to 130	10/-
Under	350	Under 32.5	6/50

Table 4 (continued)

4. Meter Rent (Rule 29)

<u>Meter Size</u>		<u>Rental Per Month</u>	
<u>Inches</u>	<u>MM</u>	<u>Shs</u>	<u>CTS</u>
½	15	1	50
¾	20	1	50
1	25	2	50
1½	40	5	00
2	50	8	00
3	80	10	00
4	100	12	00
6	150	40	00

Source: Finance Section, Dar es Salaam Water Supply

