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Zambia: Water Supply and Sewerage Sector Study

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CURRENCY EQUIVALENTS

(October 1974)

Currency Unit	-	Zambian Kwacha (K)
US$ 1	-	K 0.64
K 1	-	US$ 1.56
K 1	-	100 Ngwee

MEASURES AND EQUIVALENTS

Kilometer (Km)	-	0.62 mile
Square Kilometer (Km^2)	-	0.386 square miles
Meter (m)	-	3.28 feet
Cubic Meter (m^3)	-	35.3 cubic feet
	-	264 gallons (US)
	-	220 gallons (Imperial)
Hectare (ha)	-	2.471 acres - 10,000 m^2
Liters per second (l/sec)	-	19,900 Imperial Gal/Day

ACRONYMS AND ABBREVIATIONS

GRZ	-	Government of the Republic of Zambia
MDPNG	-	Ministry of Development, Planning and National Guidance
MEC	-	Ministry of Education and Culture
MF	-	Ministry of Finance
MH	-	Ministry of Health
MLNR	-	Ministry of Lands and Natural Resources
MLGH	-	Ministry of Local Government and Housing
MPTW	-	Ministry of Power, Transport and Works
PSC	-	Public Service Commission
MRD	-	Ministry of Rural Development
DWA	-	Department of Water Affairs (MRD)
ZESCO	-	Zambia Electricity Supply Corporation Limited
BB	-	Buildings Branch (MPTW)
PSC	-	Public Service Commission
IPF	-	Indicative Planning Figure
NDP	-	National Development Plan

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SUMMARY

0.01 Zambia's population of 4.6 million in 1973 is expected to reach 6.7 million in 1985 (50-50% urban-rural, compared to 35-65% in 1973). The official definition of "urban" in Zambia includes all communities in the following categories: three cities, five municipalities and eleven townships. All other aggregates, including rural councils, are considered as "rural". These definitions have been used in this study. In 1973, an estimated 75 percent of its 1.6 million urban population and 10 percent of its three million rural population had access to piped water systems. The 1969 census indicated that almost 60 percent of urban dwellers and between three and four percent of rural dwellers had flush toilets.

0.02 The Government is in its Second National Development Plan (1972-1976) which provides for some urban and rural water supply expansion, but there are no long-range goals for either water supply or sewerage. In this report it is suggested that by 1986 (end of Fourth NDP) 90 percent of urban and 36 percent of rural populations will have access to piped water supply (house connections and stand pipes) and 60 percent urban and 15 percent of rural population will have access to water-borne sewerage. These targets have been determined on the basis of manpower and financial constraints.

A. Problems and Constraints

0.03 The principal difficulties to be overcome in accomplishing these objectives relate to technical manpower, technical deficiencies, and institutional and management weaknesses. Finance of development programs may constitute a problem in the future, although in recent years the GRZ has not called for outside assistance in support of water supply and sewerage activity.

0.04 The technical manpower problem is the principal constraint in the sector, it effectively inhibits an expansion in the development program, and even thereafter its effective continuation. It is characterized by:

(i) the absence of Zambian Engineers in the sector, and consequent reliance on expatriates;

(ii) dissatisfaction on the part of expatriates with working arrangements;

(iii) inadequately trained sub-professional nationals, with resultant use of expatriates even in some of these positions; and

(iv) the small number of secondary school leavers and students enrolling in science courses and the consequent low production of engineers and sub-professionals.

0.05 Technical shortcomings arise from:

(i) the lack of national plan for water supply and sewerage development;

(ii) inadequate hydrogeological and hydrological data;

(iii) incomplete plans and records;

(iv) non-uniform and expensive designs resulting from the lack of appropriate design criteria and standards;

(v) inadequate supervision of consulting firms; and

(vi) poor operation and maintenance practices.

0.06 Institutional, organizational and management problems result from:

(i) inadequate data collection, retrieval and reporting relative to water supply and sewerage;

(ii) across-the-board budget cuts induced by national mineral (copper) revenue fluctuations;

(iii) unwieldy recruitment procedures causing many vacancies in technical positions;

(iv) poor practices by local authorities in metering and meter reading, billing and collection;

(v) inadequacies of the Water Act. Chapter 312 (1948) as to control of abstraction of surface and underground water and as to control of discharges of wastes into surface and underground waters.

B. Proposals and Recommendations

0.07 Suggestions for improvements in the water and sanitation sector of Zambia are focused on the reduction of the foregoing problems and constraints. Some action can be taken internally; other problem solutions will require external assistance.

0.08 Since Zambianization will take years to accomplish in the water supply and sanitation sector, expatriates must be used until Zambian engineers and technicians can take charge of sector activities. Action required to solve the manpower problem should include:

(i) sponsoring the Department of Water Affairs (DWA) junior technicians for engineering studies;

(ii) training of sub-professionals through study courses (Data Sheet 01);

(iii) improved expatriate recruitment (Data Sheet 02);

(iv) improved expatriate employment conditions; and

(v) expanded use by DWA of public administration and management courses.

0.09 The following principal actions should be taken to correct technical shortcomings:

(i) the Government of the Republic of Zambia (GRZ) should set long-range targets for water supply and sewerage development;

(ii) master plans for Lusaka and the Copperbelt urban centers should be developed (data Sheets 03 and 04);

(iii) a comprehensive plan should be drafted for rural water supply development (Data Sheet 05);

(iv) hydrogeological activity should be accelerated (Data Sheet 06);

(v) water quality standards should be adopted and enforced (Data Sheet 07);

(vi) complete plans and records should be developed for all water supply and sewerage systems;

(vii) the DWA should prepare national design criteria and standard designs and drawings for water supply and sewerage development;

(viii) the DWA should prepare general terms of reference for consulting firms for the guidance of local councils;

(ix) studies should be made of leakage and wastage in urban water systems (Data Sheet 08);

(x) intermittent water supplies should be checked by the DWA for corrective action to be taken; and

(xi) environmental health activity should be strengthened (Data Sheet 09).

0.10 Correction of organization, management and institutional problems will require action as follows:

(i) give the DWA or a Water Affairs Commission (WAC) technical responsibility for all water resources including water supply and in the medium term, sewerage;

(ii) give DWA (or WAC) operating and maintenance responsibility for township and rural council water supply and sewerage systems;

(iii) reorganize the DWA internally and give it increased stature as a commission (WAC);

(iv) give DWA (WAC) the responsibility of developing a comprehensive data collection and retrieval system (Data Sheet 10);

(v) in reorganizing the DWA (WAC), improve its accounting system; strengthen its personnel administration; improve procurement management;

(vi) the GRZ (Ministry of Planning and Finance) in making necessary budget cuts should consult with DWA before deciding what parts of the program should be reduced;

(vii) revenues from all urban and some rural water supply and sewerage system operations should cover operating and maintenance expenses, debt service, and the provision of a reasonable portion of capital investment requirements; and

(viii) the operators of systems should administer metering, billing and collection so that all revenues due are collected;

0.11 Organizational assistance should be provided DWA by the Organization and Methods Unit (Cabinet Office) and arrangements made to staff, equip and provide adequate facilities for it as a Water Affairs Commission.

C. Program Proposals

0.12 On the basis of the suggestions for improvements in the water supply and sewerage sector, as listed in Section B of this chapter, the mission proposes a development program. The mission believes that the needs of the population for water supply and sewerage systems still are great and that the sector deserves continuous attention of Government. On the other hand, the country's economic development supplies the means to spend a higher amount for investment in water supply and sewerage. The proposed development program of the sector for the Third and Fourth National Development Plan (1977 to 1986), therefore, involves a 50% increase over the SNP. The needs for good water supply are more urgent in rural areas than in towns. The development of

sewerage systems has not kept pace with water supply in the past. In towns, the mission proposes high investment expenditures for sewerage systems to improve the present situation and to service the population moving from rural areas. The missions's program proposals for the period 1974 to 1986 are summarized below:

WATER SUPPLY

Item	Percentage Served by 1986		
	House Connection	Standpipes	Total
Urban	72	18	90
Rural	15	21	36

0.13 The sewerage plan proposals are:

Item	Percentage Served by 1986		
	Water Borne	Other	Total
Urban	60	40	100
Rural	15	58	73

0.14 The estimated development costs of the proposed programs in 1973 and in current prices 1/ by plan periods are as follows:

Item	Estimated Costs - K Millions - By Plan Period					
	1974-1976		1977-1981		1982-1986	
	1973 Prices	Current Prices	1973 Prices	Current Prices	1973 Prices	Current Prices
Water Supply						
Urban	7.7	9.6	37.5	63.8	30.0	75.0
Rural	7.6	9.6	10.3	17.6	12.8	32.0
Total	15.3	19.2	47.8	81.4	42.8	107.0
Sewerage						
Urban	14.9	18.6	34.4	58.5	35.7	89.3
Rural	4.7	5.9	8.6	14.6	8.5	21.2
Total	19.6	24.5	43.0	73.1	44.2	110.5
Grand Total	34.9	43.7	90.8	154.5	87.0	217.5

1/ The assumed price increases are: 1974: 12%, 1975: 10% 1976 and thereafter: 8%.

D. Technical Assistance

0.15 A technical assistance program is outlined in Data Sheets 1 to 11. It is estimated (in 1973 prices) to cost US$5.2 million (K 3.4 million) of which the foreign currency component would be about US$3.3 million (K 2.2 million).

E. Operation and Maintenance

0.16 The estimated total cost of operation and maintenance of the water supply and sewerage systems by plan period which should be covered by charges to the consumers is as follows (the amounts indicate totals for the three and five year periods):

	1974-1976		1977-1981		1982-1986	
Item	1973 Prices	Current Prices	1973 Prices	Current Prices	1973 Prices	Current Prices
	in K millions					
Water Supply	24.1	30.1	55.9	95.1	85.8	214.5
Sewerage	13.3	16.6	27.9	47.4	38.0	95.0
Total	37.4	46.7	83.8	142.5	123.8	309.5

Attention is drawn to the fact that, except for 1977-1981, costs of operation and maintenance are larger than the capital investments of the development program. This illustrates the importance of adequate operating funds to make use of capital investments, and the need for adequate tariffs to generate such funds (see Annex 38).

F. Composite Program

0.17 The combined proposed program, including operation and maintenance and technical assistance, would be as follows:

	1974-1976		1977-1981		1982-1986	
Item	1973 Prices	Current Prices	1973 Prices	Current Prices	1973 Prices	Current Prices
	in K millions					
Development	34.9	43.7	90.8	154.5	87.0	217.5
Technical Assistance /1	2.5	3.1	2.5	4.3	2.5	6.3
Operation and Maintenance	37.4	46.7	83.8	142.5	123.8	309.5
Total	74.8	93.5	177.1	301.3	213.3	533.3

/1 Includes costs of programs outlined in Data Sheets 1-11 plus unspecified amount of K 4.1 million.

0.18 Past national development expenditures per plan period in the sector were as follows:

	Amounts - K Millions		
	Water Supply	Sewerage	Total
First Plan 1967-1971	16.1	6.2	22.3
Second Plan (2 years) 1972-1973	14.2	5.5	19.7

G. Finance

0.19 A rough approximation of sources of finance of the composite program is outlined below:

	1974-1976			1977-1981			1982-1986		
Agency	1973 Prices	Current Prices	(%)	1973 Prices	Current Prices	(%)	1973 Prices	Current Prices	(%)
	(in K millions)								
Central Government									
Development	24.4	30.6	(70)	45.4	77.3	(50)	43.5	108.8	(50)
Technical Assistance	1.0	1.3		1.0	1.7		1.0	2.5	
Operation and Maintenance	2.0	2.5		4.0	6.8		6.0	15.0	
Local Authorities									
Development	3.5	4.4	(10)	13.6	23.2	(15)	17.4	43.5	(20)
Operation and Maintenance	35.4	44.2		79.8	135.7		117.8	294.5	
External									
Development	7.0	8.7	(20)	31.8	54.0	(35)	26.1	65.2	(20)
Technical Assistance	1.5	1.8		1.5	2.6		1.5	3.8	
Total	74.8	93.5		177.1	301.3		213.3	533.3	

Note: % is of development only.

0.20 Success of the proposed plans will depend on minimizing the constraints outlined, a continued growth of the economy, a determination by the Government to make progress in the water supply and sanitation sector, and an approach by Government to external agencies for assistance, including co-ordination of such assistance within the sector.

I. INTRODUCTION

A. Motivation

1.01 A preparatory visit was made to Zambia by a member of the IBRD/WHO Cooperative Program 19-26 January 1973. The full mission was in residence from 2 October to 2 November 1973, and made field trips to Livingstone, the Copperbelt, Mongu and Chipata and intermediate urban and rural places. The purpose of the study was to review past activity and analyze the present situation in the sector; consider future plans; identify constraints and suggest ways and means or minimizing them; and recommend, in consultation with Government, a program for sector development.

1.02 Contacts were made with appropriate national and local government, international institutions and bilateral agency representatives. The assistance provided to the mission by the Department of Water Affairs and by the many individuals contacted is gratefully acknowledged.

B. Setting

1.03 Zambia is located in Central Africa, and covers an area of 753,000 km^2, having common boundaries with Namibia, Angola, Zaire, Tanzania, Malawi, Mozambique, Rhodesia and Botswana (see Map A).

1.04 Generally the land is made up of high plateaux, 1,000 to 1,370 meters above sea level. The climate is sub-tropical, with rainfall (see Map B) varying from 1,750 mm annually in the north to 600 mm in the south-east; the rains occur from November-December to March-April. Mean annual temperatures vary between 20 and 26°C, with a hot spell in October with temperatures up to 35°C and a cool spell in July with temperatures down to 5°C.

C. Administration

1.05 Zambia is divided politically (see Map A) into eight provinces--Northern, Luapula, Eastern, Central, Copperbelt, North-western, Western and Southern--each headed by a Minister. There are districts in each province headed by District Governors.

1.06 Local urban government is provided by three city councils, five municipal councils and eleven township councils, all closely controlled by the Ministry of Local Government and Housing. The 19 councils cover the urban population of the country.

1.07 There are also 34 rural councils similarly controlled. Other rural areas are administered by District Governors (reporting to the Provincial Ministers), who are also concerned to some extent with the local authorities within their districts. Annex 1 shows the districts, cities, municipalities, urban townships and rural councils by province.

D. Water Resources

1.08 Two principal rivers (see Map C) cross the western half of Zambia. The Kafue River runs through the Copperbelt and constitutes the main source of water for this Province and Lusaka. It runs to the south-west and then easterly to flow into the Zambezi at Chirundu.

1.09 The Zambezi River, which originates in Angola, flows south through North-western and Western Provinces and then east forming the southern border of Zambia. It provides a major tourist attention--Victoria Falls--at Livingstone. In the Eastern Province, the main river is the Luangwa.

1.10 Only the largest rivers are perennial; run-off from small catchments is unreliable due to the six to eight months of no rain.

1.11 Underground water resources have been little explored, except in parts of Southern, Central and Copperbelt Provinces along the line of rail. Great inland lakes are on the Northern border of Zambia, Lake Tanganyika and Lake Mweru. In the Northern Province is Lake Bangweulu, and on the South-western frontier is Lake Kariba. There are also swamplands in the Northern and Central Provinces.

E. Population

1.12 Zambia's only two census counts showed populations of 3.49 million in 1963 (21 percent urban) and 4.06 million in 1969 (30 percent urban). Mean projections indicate a probable total population in 1985 of 6.7 million (50-50 percent urban-rural).

1.13 Between 1963 and 1969 two provinces lost population--Northern (3.4%) and Luapula (5.9%)—all others gained--Copperbelt (50%) and Central (41%) being the fastest growing. The total gain for the country as a whole in the six years was 16.3 percent, or about 2.5 percent annually.

1.14 The average population density in 1969 was 14 persons per square mile, with a range of 8 to 17 except for the Copperbelt which had 739 persons per square mile. Map D shows the 1969 distribution of population.

1.15 Population projections made by the mission from 1969 to 1986, by province --urban, rural and total--are tabulated in Annex 2, showing an expected total in 1986 of 6.9 million (50.5% urban and 49.5% rural).

1.16 Historical and projected urban, rural and total growths (1963-1990) are presented in Annex 3 (tabular) and Annex 4 (graphic).

1.17 Urban population growth is 8 to 10 percent per year, whereas rural growth is only one percent per year. By 1990, mission calculations indicate that the urban figure will be 4.5 million--exceeding the estimated rural figure of 3.5 million.

F. Economy

1.18 The economy of the Republic of Zambia is based principally on agriculture and mining of copper, zinc, lead, manganese and cobalt. The country has good potential for agricultural production but development depends on successful re-settlement schemes and irrigation during the dry season.

1.19 Zambia's per capita Gross National Product (in 1970 US$) increased from $180 in 1950 to $400 in 1970 due to favorable copper prices and in that year compared with Ghana's $310, Cameroon's $180, Uganda's $130, Nigeria's $120, Zaire's $90 and Malawi's $80 per capita figures. However, although Zambia's GNP is relatively high due to copper mining, the average Zambian's living conditions are quite comparable to those in neighboring African countries.

1.20 The Nation's land-locked situation was aggravated by the closure of the Rhodesian border in 1972, but some relief is expected when the Chinese-built Tan-Zam Railway is completed.

II. PRESENT SITUATION

A. Water Supply

2.01 According to available records there are 48 major water supply systems in Zambia. About 75 percent of the urban and 10 percent of the rural population have access to piped water systems.

B. Urban Situation

2.02 The urban centers, i.e., the three cities (Lusaka, Ndola and Kitwe), the five municipalities (Chingola, Kabwe, Livingstone, Luanshya and Mufulira) and the eleven townships (Choma, Kalomo, Mazabuka, Monze, Pemba, Mongu, Kasama, Mbala, Mansa, Chipata and Kafue) all have a central water supply (see Map E).

2.02 At present, about 45 percent of the urban population is served by house connections and 30 percent by standpipes. While the water is generally of acceptable quality (most is treated) the quantity delivered to the average user is often not sufficient. Squatter areas and high density areas have water shortages, whereas the high cost housing and low density areas have sufficient water.

C. Wastage and Leakage

2.04 In several urban places, it is reported that treatment (production capacity) and theoretical per capita consumption (use) ranges from 340 to 780 liters per capita per day as compared with normal design figures of 200 to 300 l/c/d as indicated in the following tabulation.

Place (1)	Population Served 1,000's (2)	Water Supp. Capacity 1,000 m^3/d (3)	Water Supp. Production 1,000 m^3/d (4)	Per Capita Use 1/c/d Related to Cap.(3)/(2) (5)	Related to Prod. (4)/(2) (6)	Normal (7)
Lusaka 1/	260	187 (1975)	118	720	453	300
Ndola	180	123 (1973)	72	680	400	250
Kitwe	225	82 (1973)	60	365	270	250
Kabwe	50	17 (1973)	--	345	---	200
Livingstone	40	31 (1973)	25	780	625	200

2.05 This excessive production was necessitated by excessive wastage and leakage which latter is estimated at 25 percent of production. Water losses are caused by poorly laid or deteriorated pipes, open drain valves, overflowing reservoirs and faulty house connections.

2.06 Wastage by customers is encouraged by the absence of metering, poor meter maintenance or meter reading and failure to control water use. Many customers leave taps open all day and use treated water to irrigate gardens. Wastage by government agencies is also common; the Lusaka Airport and Army Barracks use three times as much water (and pay for) as would be normal.

2.07 Metering varies considerably. In Lusaka, all the service connections (17,500) are metered but the township of Chipata (population 17,000) only has 800 metered connections, and the township of Kalomo (population 6,400) has 200 meters which are not used.

D. System Characteristics

2.08 Lusaka has had a piped water supply scheme since 1954. Its borehole source was augmented in 1964 by galleries and supplemental boreholes were drilled in 1967-70 bringing the total supply to over 15 mgd. In 1968-70, a supply from the Kafue river, 30 miles from the city, was built, the first stage delivering 10 mgd to the system. Further details relative to the Lusaka water supply system are contained in Annex 5.

2.09 The water sources of the other two cities--Ndola and Kitwe--are mainly river water, which is treated. Kitwe's water comes partly from a treatment plant owned by a mining corporation. There is excessively high production in both places and a leakage and waste survey is being undertaken by Ndola.

2.10 The water supplies of the five municipalities are similar; the sources are mostly surface water. Not enough hydrogeological sounding and siting for possible groundwater exploration has been done. These communities are subject to water shortages as well as to health hazards resulting from inadequate treatment of polluted river water.

1/ Figures are based on Consulting Engineers' Report (Nicholas O'Dwyer and Partners) September 1974.

E. Rural Situation

2.11 Rural water supply is provided to some 10 percent of the three million rural population through piped systems. Boreholes or wells serve over 40 percent. The 1969 census indicated rural water supply characteristics as follows:

Type	Dwellings (1000's)	Rural Population (1000's)	Percent of Rural Population
Private taps	17	70	2.5
Shared taps	56	229	8.0
Wells or boreholes	300	1,240	43.5
River or stream	270	1,113	39.0
Other	48	200	7.0
Total	691	2,852	100.0

2.12 Rural water supplies are of four types--hand-dug wells, boreholes, dams and weirs, and small supplies pumped from perennial streams and rivers. Because of the risks of contamination in shallow wells and streams, boreholes are the safest source of water for scattered communities.

2.13 In general, boreholes in Zambia are 150 mm in diameter and about 70 m deep. They are fitted with hand-pumps, windmill or diesel driven pumps with ground or elevated storage. At a few sites, boreholes are up to 100 m deep and 300 mm diameter with fine screens.

2.14 In the Second National Development Plan (SNDP), three sources of capital for rural water supplies are available --funds of cooperatives and villages, a special fund of K 6 million allotted to the Ministry of Rural Development (MRD) and about K 1 million per year from the provincial ministries. The facilities to be provided through these programs will be dug wells, small boreholes or well points with hand pumps.

2.15 A large number of rural water supplies, including wells and water points, are inoperative due to lack of maintenance resulting from technical staff and fund shortages.

F. Hydrogeology

2.16 Hydrogeological surveys preceding well drilling are done by the Hydrogeological Branch of the DWA. It undertakes investigations, maintains records of drilling logs and water quality tests (totalling over 3,000 to date), and is responsible for testing boreholes throughout the country by the resistivity method after a geological reconnaissance.

2.17 There are limited areas in Zambia where limestone or sandstone aquifers exist, and 150 mm boreholes may be expected to produce reliable

yields up to 12 liters per second. In most of the country, however, underground water is found only at shallow depths in the decomposed zone of basement rocks, granite, schists, and quartzites. Although the safe yields in these areas may be no more than one-half to one liter per second such boreholes constitute a very useful source of water in rural areas. In some places alluvial deposits give good yields and fine screens are needed only at about 5 percent of the sites drilled; elsewhere slotted casing suffices.

G. Drilling

2.18 In the past, boreholes have been sunk by percussion drilling rigs powered by 50 HP diesel engines. Although these machines are still suitable for most of drilling required, it has been impossible for some years to recruit competent drilling superintendents. As a result, present supervision of drilling, casing and developing boreholes is unsatisfactory.

2.19 During the First National Development Plan (FNDP), a start was made in providing safe rural water supplies, which are essential to the maintenance of health and the prevention of disease. By December 1969, more than 800 wells had been sunk and 360 boreholes drilled.

2.20 In 1971, about 240 boreholes were drilled, and in 1972 about 260, only 25 percent of which were done with DWA drilling rigs; others were done by drilling firms. In 1972, the USSR drilled some 60 holes in the Eastern province. DWA's current estimate of boreholes required for rural water supplies, irrigation projects, rural clinics and intensive rural development projects is about 300 per year. It is considered, therefore, that the DWA's drilling capacity should be not less than 200 boreholes a year. The balance should be done by private firms.

H. Sewerage

2.21 There are 15 sewerage systems in Zambia. All eight cities and municipalities and three of the urban townships have water-borne systems (see Map E) serving something over half of the population of each place--about 60 percent of the total urban population. The 1969 census provided the following information relative to urban sewerage:

Type	Dwellings (1000's)	Population (1000's)	Percent of Urban Population
Flush toilets	108	689	57.5
Aqua privy	13	85	7.0
Pit latrines	50	317	26.5
Bucket service	3	22	2.0
None	14	90	7.0
Total	188	1,203	100.0

2.22 Only four of the 34 rural councils have water-borne sewerage systems --serving a total of about 5,000 people. The 1969 census provided the following data relative to rural sanitation:

Type	Dwellings (1000's)	Population (1000's)	Percent of Rural Population
Flush toilets	25	103	3.5
Aqua privy	4	17	0.5
Pit latrines	232	960	33.5
Bucket service	1	3	-
None	429	1,771	62.5
Total	691	2,854	100.0

2.23 Lusaka is partly sewered, but a major portion is served by septic tanks and pit latrines. The sewered areas are connected to a 24-inch trunk sewer, traversing the city from north-west to south-east, which presently is running to capacity over most of its length. A relief sewer, deemed necessary in the near future, has been estimated to cost K 2.1 million.

2.24 Lusaka's sewage is treated at five locations--two conventional sewage treatment plants and three stabilization ponds; the total population served by these plants is about 180,000. The largest plant treats 20,000 cubic meters per day; an extension of the plant is being built. The degree of treatment is good, and the final effluent analysis shows values meeting conventional standards.

2.25 The other (western) treatment plant will, after an extension which is under construction, have a total capacity of 9,000 cubic meters per day. The effluent of this plant, expressed in Biochemical Oxygen Demand (BOD) and settleable solids, is not within acceptable limits at present; this applies also to the stabilization ponds serving the rest of the sewered area. Inadequate operation and maintenance may account for this deficiency.

2.26 Sewerage systems in the cities of Ndola and Kitwe cover only parts of the populated area, but are being expanded. The city of Kitwe, in September 1973, put a new K 2.4 million sewage treatment plant into operation. Treatment consists of a two-stage activated sludge process utilizing old bio-filters in a parallel second stage. The sludge is dewatered in centrifuges and conditioned by pasteurization. Operation and maintenance of the plant poses problems by requiring specially trained staff. In the opinion of the mission, this plant is an example of an over-sophisticated design representing a waste of money and efforts.

I. Operation and Maintenance

2.27 The DWA of the Ministry of Rural Development (MRD) operates and maintains 27 water supply schemes in four provinces and from 1975 onward, it will also operate and maintain 21 schemes in four other provinces, presently

operated by the Buildings Branch (BB) of the Ministry of Power, Transport and Works (MPTW). The total population of these 48 places is estimated at about 110,000 and the annual expenditure (1973) is K 300,000--about K 3 per capita.

2.28 The other water supply and sewerage systems are maintained and operated by the individual local authorities which charge for the services and connections to the systems on various bases. Where the systems are operated and maintained by DWA and BB, revenues are turned over to the respective ministries except for an administrative amount--usually 10 percent--which is retained.

2.29 On the basis of available information, it has been estimated that the total investment (original cost) in water supply systems in the last 10 years may be about K 50-60 million and in sewerage systems K 15-20 million. It is obvious that unless these systems are properly operated and maintained this investment will be endangered and excessive repair and rehabilitation costs will be incurred.

2.30 Operation and maintenance practices differ depending on the location--urban or rural--and the availability of trained staff and materials. While the cities and some of the municipalities operate and maintain their systems reasonably well with a minimum of personnel available, the others, and the majority of townships and rural councils, fail to do so simply because they do not have operators, material or money.

2.31 Shortage in operators and maintenance staff is prevalent in the water supply and sewerage sector. Several efforts of Government, provincial and local water engineers to start local training courses had no response or were suspended after short periods since the day to day workload imposed upon the small number of engineers available did not allow additional commitments.

2.32 In some provinces and districts there are maintenance centers having stores and workshops with a reasonable range of spare parts and tools. Transport is always a problem which complicates operations of the maintenance staff. In many districts the rural councils are responsible for the operation and maintenance of water works and sewerage facilities. Here the shortage of staff and equipment is extremely serious and represents imminent danger in case of breakdowns.

2.33 Many pump stations in water supply and sewerage systems have a triplicate equipment--two pumps sets installed at the pump station for alternate operation and one spare set in the work shop. Since local operators are not skilled and not equipped to repair defective pumps and engines on the spot, the defective set is replaced by the spare set from the work shop and removed for repair. This is considered to be more effective than to send mechanics around the district to make the repair. It does require, however, a large plant investment compared to a normally equipped station.

2.34 As a consequence of the closure of the border to Rhodesia, the import of chemicals for water treatment from South Africa is not possible. Therefore, chlorine and alum which must come from greater distances, are not available at times. Equipment importations involve quotations from European suppliers and import licences for each allotment.

J. Institutional Characteristics

2.35 Of the ministries making up the National Government (see Annex 6), the following have varying roles in the water supply and sanitation sector: Local Government and Housing; Rural Development; Planning and Finance; Health; and Power, Transport and Works.

2.36 The Ministry of Rural Development (MRD) is responsible for coordinating national water resource development and for planning the balanced utilization of water resources in consultation with the Cabinet Office and the other concerned ministries. Its Department of Water Affairs (DWA) is responsible for executing and supervising or advising the construction, repair and maintenance of water supply and sewerage schemes generally.

2.37 The Buildings Branch (BB) of the Ministry of Power, Transport and Works, is also concerned with water supply and sewerage as it relates to public buildings, schools, hospitals and some local authorities, but DWA will take over responsibility for local authority--city, municipal, township and rural council--guidance in these matters in 1975.

2.38 The water supply systems presently maintained and operated by DWA and BB are summarized in Annex 7.

2.39 The general organization of the Ministry of Rural Development is shown in Annex 8. That of the Department of Water Affairs, one of five departments of the Ministry, is shown in Annexes 9 and 10. The general organization of the Ministry of Power, Transport and Works is shown in Annex 11, indicating that the Buildings Branch is a part of the Works Department.

2.40 Responsibilities of various central and local government agencies for features of water supply and sewerage development are summarized in Annex 12.

2.41 The Ministry of Local Government and Housing (MLGH) is concerned with the direction and control of local authorities, reviewing and approving their budgets, auditing and providing financial aid in the form of loans or grants from the National Government with the advice and concurrence of the Ministry of Finance within budgetary limits.

2.42 The system of decentralized administration in Zambia involves Provincial Ministers, District Governors and Provincial and District Development Committees as well as the city, municipal, township and rural councils. A 1972 study (Annex 13) suggested some modifications in the system which are reported to be receiving favorable consideration by Government. Action in line with proposals should be generally helpful to the water supply and sanitation sector, by strengthening the system of decentralized administration and improving local government.

K. Manpower and Training

2.43 The manpower situation in the field of water supply and sewerage activities is characterised by an extreme shortage of trained personnel both in technical and key administrative posts. As an example, the November 1974 staffing establishment of the DWA (Annex 14) is summarized below indicating professional posts provided for and the vacancies:

Staff Type and Position	Establishment	Vacancies
Superscale	10	3
Director	1	-
Deputy Director	1	1
Chief Water Engineer	2	-
Principal Hydrologist	1	-
Senior Hydrogeologist	1	1
Senior Water Engineer	4	1
Professional	28	16
Hydrogeologist	4	3
Hydrologist	2	2
Mechanical Engineer	1	1
Water Engineer	20	9
Chemist	1	1

2.44 All the posts, except one are occupied by expatriates; the position in the local authorities is even worse. In the eight city and municipal agencies, only about 20 per cent of the engineering posts are filled, and in some cases no such posts exist. Expatriate provincial water engineers are assigned in the DWA to each of the eight provinces. Two, possibly four, engineers will leave the Department for good in 1975.

2.45 According to the 1969 census, there were scarcely 3,000 Zambians with technical and higher education. Although primary and secondary school output has risen significantly during the First National Development Plan period, at the beginning of 1970 only 20 per cent of primary school leavers entered secondary schools. During the SNDP period, 1972-76, the secondary school output is likely to reach around 15,000 a year on average.

2.46 A significant secondary schools development program is the Zambia/ World Bank Education Project, which is scheduled for completion during the present Plan. The project includes the construction of nine new and extensions to 56 existing schools; the total cost is K28 million (SNDP figure).

2.47 Technical education after secondary schooling has been given higher priority in the SNDP, since a serious shortage of technical and managerial manpower is indicated. For example, the planned output of engineers and technicians in 1976 is about 550 as compared with annual requirements, 1971-1980 of almost 1,100.

2.48 It is recognized in the SNDP that "Zambianization is essential in order to achieve the greatest self-sufficiency and independence, and is an indisputable prerequisite to manpower development". Since August 1974, the GRZ is reviewing the education sector; results of the study will be available around mid-1975.

2.49 The Zambia Institute of Technology, ZIT, has begun courses in Kitwe and Luanshya providing a three-year post-secondary education which leads to a Diploma of Technology in twelve major fields. Enrolments are projected to increase in technological training from 473 in 1971 to 21,230 in 1976, but there is no prediction of out puts in water and sanitary engineering.

2.50 The Northern Technical College (Nortec), which opened at Ndola during the SNDP and will be enlarged under the Zambia/World Bank Education Project, is designed for 1,000 enrolments of which about half will receive technological training, to the Certificate or Diploma level. Only mechanical and electrical courses are being provided, however, so the possible benefit to the water/ sewerage engineering field will be minimal.

2.51 The Natural Resources Development College provides three-year courses at the sub-professional level leading to Junior Engineering Assistant qualification. A limited number of personnel working with DWA and local councils have been trained through this college.

2.52 The outputs of technical and administration institutions in Zambia for 1972 and 1974 are shown in Annex 15, which indicates an estimated total in the Industrial Technical area of some 1,500.

2.53 The University of Zambia's School of Engineering was established in 1969, and in 1971 awarded its first diplomas. It provides a five-year program of study leading to the degree of Bachelor of Engineering, in the civil, electrical and mechanical fields.

2.54 The first year comprises studies of natural sciences for all students. The second and third years are designed to provide a background in science and engineering principles common to all engineering subjects. Specialization in either of the three disciplines follows in the fourth and fifth years. Presently there are courses in hydraulics, engineering economics, water resources development and public health and municipal engineering.

2.55 In 1973, the number of students taking engineering courses at the University was still small, as indicated below:

Year	Number
2nd	60
3rd	38
4th	30
5th	25

The number by type of engineering graduates are as follows:

Type	Number 1973 - 1974 (estimated)	
Civil	5	12
Mechanical	10	9
Electrical	10	9

2.56 The average annual output of civil engineering graduates is expected to be 10 to 12, of which only two or three may specialise in water or sanitary engineering. In order to facilitate the growth and strengthen engineering education in Zambia, the School of Engineering has developed associations with both government and industry agencies. Hence, the majority of engineering students are sponsored by these agencies and are required to work with them after graduation. DWA has two engineers on leave for studies.

2.57 The Department of Technical Education and Vocational Training, through its various training programs, also offers a number of courses in trades and business and commerce that are useful for personnel employed in water and sewage operations.

2.58 Another Government training agency is the National Institute of Public Administration which presents an annual (three-term) program of courses covering administrative, legal, professional and executive groups. Almost 1,600 participants were in the 1973 program.

2.59 Special management training is provided also by the Management Development Training Advisory Centre (opened in February 1971 for three and a half years) and the Evelyn Hone College of Applied Arts and Commerce. Most of the participants are employed by the parastatals.

L. Health

2.60 In the Ministry of Health (MH), the Chief Health Inspector is in charge of environmental health. In each province, a provincial health inspector carries out the work through health inspectors and health assistants. Out of a total of 86 health inspectors, 34 are employed in cities and municipalities and the balance in rural areas—about one per 70,000 population.

2.61 The development of basic sanitary services is an activity of the health inspectors. Regular water checks are not carried out by them; however, when a supply is suspect, samples may be sent to the laboratory of the MH or to one of the few other laboratories in the country. The MH plans to strengthen this activity by creating a special division of environmental health headed by a public health engineer.

2.62 Communicable water-borne diseases cause a high degree of morbidity in the country. Health statistics of the MH for 1972 indicate a high incidence of diarrhoea, totalling over one million cases, as well as the prevalence of typhoid fever, amoebiasis and dysentery. There is ample evidence of the need for action in the water sanitation sector. Abatement will depend chiefly on improvement in environmental health conditions.

M. Finance

2.63 Zambia has financed its water supply and sewerage programs since Independence essentially without external assistance. The GRZ, through the Ministry of Planning and Finance (MPF), via the Ministry of Local Government and Housing, loans money to local urban authorities for water supply and sewerage works. The Ministry of Rural Development has funds budgeted for rural water development and similarly the Ministry of Power, Transport and Works has funds budgeted for rural sewerage development.

2.64 According to annual financial reports of the MPF, the following expenditures (generally about the same as budgeted amounts) were made by the National Government for water supply development since 1966:

	Amounts K(000)		
Year	Rural	Urban	Total
1966-7(18 months)	100	300	400
1968	500	500	1,000
1969	1,100	5,500 (mostly Lusaka)	6,600
1970	1,800	1,200	3,000
1971	3,100	3,000	6,100
1972	3,200	5,100	8,300
1973	3,000	4,500	7,500
1974 (estimated)	3,500	5,200	8,700 /1
Total	K 16,300	K 25,300	K 41,600

/1 Includes expenditures for sewerage in urban areas.

2.65 Similar data reflect historical expenditures for sewerage:

Year	Amounts K(000) Rural	Urban	Total
1966-7(18 months)	-	100	100
1968	-	1,000	1,000
1969	100	1,500	1,600
1970	300	1,500	1,800
1971	400	1,400	1,800
1972	300	2,400	2,700
1973	400	2,300	2,700
Total	K 1,500	K 10,200	K 11,700

2.66 Debt service repayments by local councils are reported to be satisfactory. The Government loans to local councils for water and sewerage development are given in Annex 16 (for water supply) and in Annex 17 (for sewerage). These loans were 4 percent up to 1968 when the rate was increased to 6-1/4 percent (30-year).

2.67 The government loans to the eight city and municipal councils (Annex 18) for housing, water and sewerage during the 1968-1972 period were 47 percent for housing 40 percent for water supply and 13 percent for sewerage.

2.68 Financial records of some of the cities and municipalities were such as to provide some idea of the total investment in their water and sewerage systems (Annex 19). The average figures for seven cities and municipalities were K 41 per capita for water and K 22 for sewerage, and seem about right. The estimates of population served are, however, imprecise.

2.69 Urban water service income and expenditures during 1972 (Annex 20) indicate that 6 of the 19 places showed a surplus, 11 showed deficits and 2 had no records; the total income was some K 6.3 million compared K 6.4 million expenditures.

2.70 Urban sewerage service income and expenditures during 1972 (Annex 21) reveal only 2 places with a surplus, 14 with deficits and 3 with no records; total income was K 1.3 million compared with expenditures of K 2.3 million.

2.71 Rural council water system finance, summarized for 1972 in Annex 22, is mostly in a deficit position; only 3 of the 34 places showed a surplus. The deficits are made up out of the general funds, which in turn are subsidized by the National Government.

2.72 Urban domestic water charges (summarized in Annex 23) vary through a considerable range--generally 40 to 50 ngwee per 1,000 imperial gallons (equal to US$ 0.52 to US$ 0.62 per 1000 US gallons) down to as low as 10 to 20 ngwee per 1,000 imperial gallons (equal to US$ 0.13 to 0.26 per 1,000 US gallons) for large consumption. Industrial rates range from 36 to 90 ngwee

per 1,000 imperial gallons (equal to US$ 0.56 to 1.16 per 1,000 US gallons) in Lusaka to 5 to 25 ngwee per 1,000 imperial gallons (equal to US$ 0.07 to 0.32 per 1,000 US gallons) in Livingstone. Water from standpipes is supplied free of charge.

2.73 Few places make a water connection charge as such for the right to connect, but most charge varying amounts for the cost of the connection--K 20 to K 95 for water. Deposits (K 7.25 to K 10) are also required to insure payment, and in a few cases a meter deposit (K 5) is required. These amounts appear to be fairly reasonable, although cost analyses are not available.

2.74 Sewerage charges, where they exist, are on a point basis--a point being a toilet or equivalent. A two point minimum is quite common at K 1.50 per point. Sewer connections are generally done on a cost basis. Community sewerage services are supported from the general property tax.

2.75 Metering of water is fairly prevalent, although comprehensive information was not available. It was reported, however, that few cut-offs are made for non-payment, in some cases because health officials oppose it as a health hazard. Comprehensive data on the extent of arrears in payments were not available.

2.76 Debt service constitutes as much as 40 to 60 percent of water supply and sewerage expenses. It is deducted from annual expenditure totals to arrive at operating and maintenance costs (Annex 24). A ten-place sampling showed the water system operations and maintenance costs range from K 1.00 to K 4.60 (US$1.56 to 7.20) per capita and the sewerage range to be from K 0.20 to K 2.70 (US$0.31 to 4.20) per capita, annually, which is low and may reflect improper operation and insufficient maintenance in several of the systems.

N. External Assistance

2.77 There has been relatively little external assistance to GRZ in recent years in the water supply and sewerage sector, although there is some current activity.

2.78 The 1972-1976 UNDP Country Programme includes an Indicative Planning Figure (IPF) of US$15 million, none of which is for water supply and sewerage.

2.79 IBRD is expected to finance a major portion of a K 26 million program to upgrade squatter or slum areas in Lusaka, which includes water supply and sewerage services; and is also providing funds for a major national secondary school program.

2.80 UNICEF has provided 60 hand pumps for rural and suburban districts, including the Kabwe Rural Health Demonstration Centre.

2.81 The Federal Republic of Germany is considering technical assistance of DM 1 million for the analysis of Lusaka's aquifer and for a water supply and sewerage management study.

2.82 SIDA has provided the services of a chief drilling superintendent for 3 years and is considering a request by DWA for the provision of four engineers. A 1974 credit of S.K. 50 million will be allocated for various purposes.

2.83 Russian experts are training Zambians in drilling techniques in the context of a commercial type drilling operation in the Eastern Province, with five rigs to provide about 300 producing wells by 1976.

2.84 Bilateral assistance possibilities for the sector by other nations are summarized in Annex 25.

III. CONSTRAINTS, ISSUES AND RECOMMENDATIONS

3.01 Accomplishment of the urban and rural water supply and sewerage programs proposed in Chapter IV of this report will require the reduction of constraints relative to manpower, materials, technical shortcomings and institutional and management weaknesses; finance may pose a problem also, during certain years, as indicated in the Program Summary. The GRZ will have to take action on its own, but will also require some external assistance if progress is to be made.

A. Manpower

3.02 At present, there is only one Zambian engineer in DWA concerned with water supply. In the DWA there are 63 vacancies among 256 budgeted positions; the top engineering positions 18 are filled by expatriates and out of 94 technical assistant positions, 16 are filled by expatriates. The remaining positions are filled by Zambians or are vacant.

3.03 At the professional level, there is a lack of job satisfaction in many instances due to the low degree of professional skill required in many positions. As a result of this and unsatisfactory contractual arrangements, there are only about 50% renewals of contracts and little job continuity in staffing key posts. This situation is prevalent also among the city, municipal and township staffs, where job grading is lower, and recruitment more difficult.

3.04 At the sub-professionals level, expatriates have been replaced by Zambians who lack experience. Sub-professionals, assistants, technicians and operators are not fully trained and are few; as a result, plant operation and maintenance are deficient and the large plant investments are not properly protected.

3.05 Expatriate recruitment procedures are long-delayed, and selections are often not appropriate for positions. There are 18 high level vacancies in the DWA which could be filled by expatriates.

3.06 The lack of Zambian engineers and technicians is attributable basically to the small number of secondary school leavers who have enrolled for science courses.

3.07 Key posts in contractor and drilling firms are filled by expatriates supported by sub-professionals also from abroad. Zambians are given on-the-job training within these organizations, but at present only about 25 percent of foreman-level posts are filled by Nationals.

3.08 Zambianization, although highly desirable, will take years to accomplish in the water supply and sanitation sector. Expatriates will be essential until Zambian engineers and technicians can be educated and become experienced sufficiently to take charge of sector activities. Action required to solve the manpower problem should include:

(i) Provision of incentives to Zambians to pursue secondary schooling with science courses leading to engineering and related studies at a higher level, and also to engineers to enter government service in the water supply and sewerage fields.

(ii) Selection of DWA junior employees for sponsorship (bursary) to attend School of Engineering courses.

(iii) Training of sub-professionals - assistants, technicians and operators - by establishing training courses (see Study Data Sheet - 01).

(iv) Improvement in expatriate recruitment procedures, through external assistance (See Study Data Sheet - 02).

(v) Considerable improvement in the employment conditions of expatriates, better pay, benefits, housing arrangements.

(vi) Utilization by DWA of public administration and management courses.

B. Materials and Equipment

3.09 The closing of the Rhodesian border poses transport problems for materials and cessation of purchases from South Africa of materials and equipment needed for water supply and sewerage has increased costs and decreased availability, especially fortreatment chemicals.

3.10 Local production of asbestos-cement, steel and concrete pipe also involve some material importations except cement. Local production of pumps and foundry items has not developed sufficiently to provide an adequate input to the water supply and sewerage program, and importation of such items is necessary. PVC pipe production has been started on a small scale, and should be developed to cope with increased demands in the future.

3.11 A number of civil engineering works contractors also do water supply and sewerage construction. About 12 firms are considered capable of doing pipe-network jobs, whereas only about 6 firms are reported capable of constructing treatment facilities. These firms have the necessary equipment for excavation, trench work and the like, but importation of special equipment or parts poses problems for them because of procedural formalities.

3.12 Import formalities should be streamlined relative to essential water supply and sewerage materials so as to reduce the long delays now experienced.

3.13 The capacity and number of contractors in the water supply and sewerage sector must be increased if a substantial expansion of these facilities is to be accomplished during future national development plans.

C. Technical Shortcomings

3.14 Many of the problems and constraints relating to effective water supply and sewerage service in Zambia are of a technical nature - planning, investigation, design, use of consultants and operation and maintenance.

3.15 There is no comprehensive planning of water supply and sewerage programs, nor are there long-range goals. Some isolated studies have been made, but they fall short of requirements for effective development.

3.16 Hydrogeological and hydrological data are scanty; these operations are not at optimum level; exploratory drilling activity is too limited; and does not cover regions of acute water need. Full exploration of water resources has not been accomplished; therefore, planning is based on inadequate resources information. As a result, expensive surface water supply systems have been constructed without proper investigation of groundwater as a source of supply.

3.17 As-built plans and records are not complete and basic data relative to existing systems are not available, so that maintenance and planning are made difficult.

3.18 The lack of design criteria results in frequent over-design of systems. In addition, limited use of standard designs and drawings makes design costs high and designs non-uniform.

3.19 Inadequate supervision by local authorities of consulting firms results in studies and reports which are not up to acceptable standards and do not meet the requirements of external financing agencies.

3.20 There is excessive loss and wastage of water for many recognized reasons, but no corrective action can be taken without adequate and trained staff to minimize or to eliminate these deficiencies. As a result, additional capital investments are made to augment systems already having an adequate capacity.

3.21 There are instances of intermittent water supply in places where water is abundant - simply because operating procedures are ineffective.

3.22 Technical deficiencies in the sector have resulted in many over-expenditures and extensive inefficiencies causing high recurrent expenditures. Many of the corrective actions described below will result in the upgrading of existing water supply and sanitation systems with a consequent more effective and economical utilization of the heavy investment already made in the sector.

The following actions should be taken to correct the shortcomings:

(i) The GRZ should set long-range targets for water supply and sanitation development - see the recommended program - Chapter IV.

(ii) Master Plans for Lusaka and the Copperbelt (see Map F) urban centers should be developed - Study Data Sheets 03 and 04.

(iii) All communities with excessive water production and overcapacity water works should install additional service connections and employ experts to advise on optimum utilization of oversized facilities. The GRZ should suspend the authorization for the construction of new plants unless these shortcomings are removed or minimized.

(iv) A comprehensive plan should be drafted for rural water supply development - see Study Data Sheet 05 - and for appropriate rural excreta disposal.

(v) Hydrogeological activity, including drilling, should be accelerated so as to produce much-needed data on groundwater for both urban and rural water supply development - Study Data Sheet 06 - and hydrological surveillance should be increased as a basis for more realistic surface water utilization.

(vi) Water quality standards, should be adopted and enforced by the Ministry of Health (MH) - Study Data Sheet 07.

(vii) The DWA should encourage local councils to develop complete as-built water supply and sewerage plans and records and should complete such files for systems not operated by local councils.

(viii) The DWA should prepare design criteria, standard designs and drawings for water supply and sewerage facilities including treatment, storage and pumping plant for use throughout the Nation.

(ix) The DWA should prepare general terms of reference for consulting firms for the guidance of local councils and

carefully scrutinize the special provisions of those proposed by local councils in the employment of consultants for water supply and sewerage activities.

(x) Studies should be made of leakage and wastage in urban water systems - Study Data Sheet 08.

(xi) Intermittent water supplies should be checked by the DWA to ascertain the reasons so that corrective action can be taken.

(xii) Strengthening of environmental health activity in the MH should be supported by assigning a WHO sanitary engineer to assist the public health engineer - Study Data Sheet 09 - and in collaboration with DWA.

D. Organization and Management

3.23 Technical responsibility for rural water supply sewerage service in Zambia is divided between the DWA-MRD and the BB-MPTW. The urban city, municipal and town councils - generally operate their own facilities.

3.24 Proposals were made in 1969 to establish a state water supply authority and subsequently there have been proposals to re-organize the DWA, but to date no significant action has been taken. DWA has taken over from BB the operation and maintenance of water systems for which the latter had been delegated responsibility.

3.25 Although the DWA produces reasonably adequate annual reports expeditiously, there is no comprehensive national data collection and retrieval system relative to water supply and sewerage. Hence, meaningful planning is difficult because of incomplete knowledge of existing services.

3.26 The accounting system of the DWA does not produce complete, usable financial information relative to the activities of the department. Ministry of Planning and Finance annual reports are available, but do not, of course, provide consolidated information relative to water supply and sewerage expenditures. The latest report of that ministry was for 1965.

3.27 Budgets, both recurrent and capital, are subject to drastic across-the-board cuts due to national revenue fluctuations, caused principally by variations in the copper revenues.

3.28 Recruitment of expatriates, a difficult process under any conditions, handicapped by unwieldy and ineffective procedures at the national level and lack of proper liaison between the DWA and PSC.

3.29 Local authorities have their individual problems of recruitment; Chingola municipality, for example - population 100,000 - had no technical staff except for an engineer seconded from a consulting firm on a temporary basis.

3.30 Other local authority problems relate to revenue collection metering and system operation and maintenance in general - due to lack of funds and staff. The water supply and sewerage systems of the smaller places are not financially viable, although those of the cities, municipalities and some of the township councils do produce a surplus of revenues in excess of costs of operation and maintenance and debt service.

3.31 Correction of institutional problems will require implementation of actions, most of which have already been recognized by the GRZ as necessary. The mission's suggestions are as follows:

(i) Give DWA, or WAC responsibility for all water supply and sewerage activity in the nation, except institutional systems which would remain with BB.

(ii) Give DWA operating and maintenance responsibility for township and rural council water and sewerage systems. The cities (3) and municipalities (5) would continue to operate their own systems.

(iii) Strengthen DWA and the Provincial Water Engineers and give them approval powers for all new schemes by local authorities whether financed by loans or otherwise.

(iv) Give DWA (WAC) the responsibility of developing a comprehensive data collection and retrieval system - Study Data Sheet 10.

(v) In reorganizing the DWA - improve its accounting system to produce needed fiscal information; strengthen its personnel administration so as to facilitate recruitment of department personnel and permit assistance to local councils in recruiting key technical personnel; improve procurement and stores procedures so as to insure the availability of needed materials, parts and equipment; and strengthen equipment management so as to improve communications through better mobility.

3.32 The GRZ (MPF) should permit the DWA a reasonable degree of flexibility in the use of available funds when making necessary budget cuts. The present system is too rigid and cumbersome, and as a result needed projects are often delayed.

3.33 The financing of all water supply and sewerage system operations should be on the basis of acceptable utility principles so that charges are made, to the extent possible - consistent with political constraints and welfare considerations - to cover operating and maintenance expenses, debt service and a reasonable portion of capital investment requirements. Some rural places may not be able to pay for water supply and sewerage services, but the people who can, should pay.

3.34 The operators of systems - cities, municipalities or DWA - should administer metering, billing and collection so that all revenues that are due are collected.

3.35 The organizational structure currently contemplated by the GRZ for DWA is considered generally satisfactory - as outlined in Annex 26.

3.36 Estimates made in 1972 by DWA indicated that losses resulting from undertaking development projects on the basis of inadequate water resources data could cost Zambia a multiple of the proposed organizational realignment cost of K 300,000 per year - made up principally of staff housing and vehicles.

3.37 The proposed (by DWA) staff increases - 1972 to 1976 are summarized below together with existing staff and vacancies:

Type of Staff	Number of Staff Existing, 1974	Number of Staff Additions, 1972-76	Number of Staff Vacancies 1974
Superscale	10	1	2
Professional	28	11	14
Technical	143	86	61
Administrative and Executive	9	9	-
Clerical, Secretarial etc.	44	32	8

3.38 Provincial housing increases for staff (1972-1976) proposed by DWA were estimated as follows:

Type	Number of Units
High	101
Medium	21
Low	38

3.39 Additional vehicle requirements - 1972-1976 amounted to 66 landrovers plus 104 trucks (mostly five-ton) compared with 1973 vehicles totalling 72 landrovers and 56 trucks.

3.40 Between 1968 and 1971, the work load of the DWA-according to various measures-increased by nearly 200 percent, although the professional and technical staff increased by less than five percent. Although this speaks well for the staff, the cost was inadequate technical supervision and possibly inferior results.

3.41 It is strongly recommended that steps be taken to staff, equip and provide adequate facilities for the DWA to accomplish its tasks. It should be given sufficient stature so that it can deal directly with:

- Personnel Division
- Central Tenders Board
- Ministry of Finance
- Other Ministries and Authorities

For this reason, the existing proposal to make it a Water Affairs Commission should be reconsidered.

3.42 Reorganization assistance can be provided by the Organization and Methods Unit (Cabinet Office - Personnel Division). In the provision of such assistance, comparisons might well be made with the National Water Resources Commission of Ethiopia, the Executive Organ of which is being provided with organizational and management assistance by UNDP.

3.43 The reorganized DWA or Zambia Water Affairs Commission (ZWAC), as it could be called, should have basic responsibility for all aspects of water resources in Zambia, but should allow specified local authorities to operate and maintain their own water supply and sewerage systems when they have the staff and competence to do so.

E. Legislation

3.44 The Water Act, Chapter 312, of the Laws of Zambia, has no provision for the control of abstraction of underground water or from the Zambezi River and parts of the Luapula and Luangua Rivers. Nor does it have provisions to control the discharge of wastes into surface or underground waters.

3.45 The Water Act, currently being reviewed by a special committee, should be modified so as to modernize it and make it a usable instrument for the administration, conservation and protection of the water resources of Zambia.

3.46 A consultant to WHO has studied the water law in 1974, but there remains doubt if this study led to results. Study Data Sheet 11 on the use of a short term specialist in water law has, therefore, been included in the Study Data Sheets attached to this report.

IV. DEVELOPMENT PROPOSALS

4.01 The missions development program proposals presented in this chapter take into account the facts that: (1) Zambia's position as regards water supply is relatively good in the urban areas, but is lagging in the rural areas; (2) urban sewerage development is not equal to that of water supply; and (3) rural excreta disposal arrangements are minimal and totally inadequate.

4.02 Hence, mission recommendations are focused on the correction of these imbalances, taking cognizance of not only financial but other problems which face the Nation in accomplishing reasonable water supply and sewerage programs to serve more people more effectively and economically.

4.03 Proposals provide goals up to the end of the Fourth NDP (1986) with alternatives in the urban sector, the achievement of which will depend on the reduction of constraints and on the future economic condition of the country. Costs are estimated on a per capita basis based on 1973 constant prices. Inflationary effects must be taken into account by GRZ in formulating the third and fourth NDP's by including reasonable inflationary factors into estimates of expenditures. The inflation factors used in this report are shown in footnote (3) on page 25.

A. General Setting

4.04 The GRZ has no long-range development plan for water supply and sanitation, although the SNDP provides, under DWA, K 11.3 million for national water supplies and K 6 million for a rural water supply program started in 1974 (Annex 28).

4.05 In the 1974 estimates of GRZ provisions for general loans from MLGH to urban authorities, K 5.2 million are alloted for water supply and sewerage schemes. The BB of MPTW has K 580,000 allocated for sewerage schemes. DWA has K 2.1 million budgeted for national water supplies and K 440,000 for the rural water supply program in 1974 (Annex 28). At the provincial level, about K 1 million are budgeted for rural water supplies.

4.06 The SNDP seeks to continue the building up of the country's economic and social infrastructure. The Plan assumes an average price of copper of K 740 per metric ton and a population growth of 2.9 percent per annum.

4.07 The impact of variations in mineral revenues on total revenue is strikingly brought out in a historical tabulation - 1968-1973, (Annex 29) which shows fluctuations from K 186 million in 1969 to K 27 million in 1971. Consequently, success of NDP's is largely dependent upon a favorable copper price; otherwise significant external assistance must be considered.

B. Program Proposals

4.08 In the following, program goals are proposed with one alternative for urban water supply and two for urban sewerage. No alternatives are provided for rural water supply and excreta disposal.

Water Supply

4.09 The long-term water supply development program for Zambia proposed by the mission suggests the following targets (see Annexes 30 and 34).

Item	Proposed Program Goals (1000's of population served) 1974-76	1977-81	1982-86
Urban Water Supply			
Additional population served Total	450	730	770
By house connections	270	560	950
By standpipes	180	170	-180 (due to upgrading)
Rural Water Supply			
Additional population served Total	260	380	400
By house connections	60	60	100
By standpipes	60	100	200
By wells - boreholes	140	220	100

4.10 The cost (1973 constant prices, estimates in current prices in brackets), of the proposed program is as follows:

Period	K Millions /3 Urban	Rural	Total
1974-1976	7.7 (9.6)	7.6 (9.6)	15.3 (19.2)
1977-1981	37.5 /1 (63.8)	10.3 (17.6)	47.8 (81.4)
1982-1986	30.0 /2 (75.0)	12.8 (32.0)	42.8 (107.0)

/1 Includes K24.4 million for expansion of sources, treatment, pumping and storage.

/2 Includes K10.7 million for expansion of sources, treatment, pumping and storage.

/3 The assumed price increases are: 1974: 12%, 1975: 10%, 1976 and thereafter: 8%.

4.11 In terms of population served, the results of the proposed water supply development program would be as follows:

Type	Year	Total (000,000)	Served	
			Number (000,000)	%
Urban	1973	1.6	1.2	75
	1976	1.9	1.7	86
	1981	2.6	2.4	90
	1986	2.5	3.2	90
Rural	1973	3.0	1.9	61
	1976	3.1	2.1	68
	1981	3.3	2.5	77
	1986	3.4	2.9	85

4.12 Two alternatives are suggested relative to urban water supply - a preferred or proposed (summarized above) and minimum plan. The accomplishments of each are outlined in tabular and graphic form in Annexes 30 and 31. The results are condensed below:

Year	Proposed Plan		Minimum Plan	
	% Population Served	% House Connections	% Population Served	% House Connections
1973 (actual)	75	45	75	45
1976	86	52	75	47
1981	90	59	78	50
1986	90	71	80	56

4.13 It is recommended, in each program, that expansion of sources, treatment facilities, pumping and storage are not necessary during the balance of the SNDP, except for ongoing projects. During this period, urban systems should be improved by extending reticulation systems, modernizing treatment plants to their full capacities and reducing leakage and wastage.

4.14 The estimated costs (in 1973 prices) of the alternative urban water supply plans (See Annexes 32 and 33) will be as follows:

K Millions

Period	Proposed Plan STPS	1/ Ret. Syst.	Total	Minimum Plan STPS	1/ Ret. Syst.	Total
1974-1976	—	7.7	7.7	—	4.2	4.2
1977-1981	24.4	13.1	37.5	18.3	10.6	28.9
1982-1986	10.7	19.3	30.0	6.1	14.1	20.2
Total	35.1	40.1	75.2	24.4	28.9	53.3

1/ Sources, Treatment, Pumping Storage

Estimates of costs in current prices are as follows:

K Millions

Period	Proposed Plan STPS	1/ Ret. Syst.	Total	Minimum Plan STPS	1/ Ret. Syst.	Total
1974-1976	--	9.6	9.6	--	5.3	5.3
1977-1981	41.5	22.3	63.8	31.1	18.0	49.1
1982-1986	26.8	48.2	75.0	15.2	35.3	50.5
Total	68.3	80.1	148.4	46.3	58.6	104.9

1/ Sources, Treatment, Pumping and Storage.

4.15 In both plans, the development expenditures for urban water supply in the Fourth NDP would be less than in the Third NDP, because extension of STPS is concentrated more in the Third Plan. Average annual development expenditures would be as follows (estimates in current prices in brackets):

Plan	Annual Expenditure - K Million Proposed	Minimum
2nd	2.6 (3.2)	1.4 (1.8)
3rd	7.5 (12.7)	5.8 (9.9)
4th	6.0 (15.0)	4.0 (10.0)

4.16 The chart (page 3 of Annex 32) shows that a maximum expenditure, probably necessitating external financial assistance, will be incurred during the period 1979-1983 for the proposed plan. The same is true of the minimum plan (Annex 33), but to a lesser degree.

4.17 The single plan (Annex 34) proposed for rural water supply development is summarized below:

	Percentage Population Served			
End of Year	Wells and Boreholes	Stand Pipes	House Connections	Total
1973	41	11	9	61
1976	44	13	11	68
1981	49	16	12	77
1986	49	21	15	85

Sewerage-Excreta Disposal

4.18 The parallel long-range sewerage program proposed by the mission is based on the following targets:

	Proposed Program Goals (1000s) Population		
	1974-1976	1977-1981	1982-1986
Urban-Sewerage			
By water borne systems	210	470	500
By septic tanks and privies	220	540	530
By pit latrines	-90	-160	-170
Additional population served Total	340	850	860
Rural-Sewerage			
By water borne systems	80	150	150
By septic tanks and privies	50	90	80
By pit latrines	170	290	290
Additional population served Total	300	530	520

Note: Negative figures result from upgrading.

4.19 The cost (1973 constant prices) of the proposed program would be as follows (cost in current prices in brackets):

Period	K Millions		
	Urban 1/	Rural	Total
1974-1976	14.9 (18.6)	4.7 (5.9)	19.6 (24.5)
1977-1981	34.4 (58.5)	8.6 (14.6)	43.0 (73.1)
1982-1986	35.7 (89.3)	8.5 (21.2)	44.2 (110.5)

1/ These investments are to serve additional population as well as to upgrade service.

4.20 Population served as a result of the proposed sewerage programs would be:

Type	Year	Total (000)	Served	
			Number (000)	%
Urban	1973	1,600	1,450	90
	1976	1,910	1,790	94
	1981	2,640	2,640	100
	1986	3,500	3,500	100
Rural	1973	3,035	1,150	38
	1976	3,120	1,450	46
	1981	3,270	1,980	60
	1986	3,420	2,500	73

4.21 Due to the complexity of sewerage, its cost, and the need for flexibility, three plans for urban sewerage are presented - ideal (maximum) proposed (intermediate) and minimum. These are shown in tabular and graphic form in Annex 35, and are summarized below:

Program-Type of Service	Percentage of Urban Population Served by 1973	1976	1981	1986
Proposed - Water borne	58	60	60	60
- ST or AP	7	17	34	40
- PL	26	17	6	0
Total	91	94	100	100
Minimum - Water borne	58	48	50	58
- ST or AP	7	29	44	42
- PL	26	17	6	0
Total	91	94	100	100

The ideal program would provide 70 percent of the urban population with water-borne sewerage, by 1986 (See Annex 35).

Note: ST or AP - Septic Tank or Aqua Privy
PL - Pit Latrine

4.22 The estimated costs 1973 constant prices (current prices in brackets), of these plans (Annex 36) are summarized below:

Period	Proposed Total	Proposed Per Year	Ideal Total	Ideal Per Year	Minimum Total	Minimum Per Year
1974-1976	14.9(18.6)	5.0(6.3)	18.0(22.5)	6.0(7.5)	8.6(10.8)	2.9(3.6)
1977-1981	34.4(58.5)	6.9(11.7)	32.0(54.4)	6.4(10.9)	20.1(34.2)	4.0(6.8)
1982-1986	35.7(89.3)	7.1(17.7)	42.9(107.3)	8.6(21.5)	31.7(79.2)	6.3(15.7)

Each program entails successively higher average annual expenditures.

4.23 The single proposed rural excreta disposal development plan (Annex 37) contemplates the following targets:

Type of Service	Percentage of Population Served 1973	1976	1981	1986
Water-borne systems	4	6	11	15
Septic tanks or aqua privies	1	3	4	7
Pit latrines	33	37	45	51
Total	38	46	60	73

C. Technical Assistance Program

4.24 The external technical assistance program outlined in the eleven pre-investment program study data sheets is summarized below:

Item		Estimated Cost US$ (000) Foreign	Local	Total
01	Operation & Maintenance Training	46	86	132
02	Recruitment	-	-	-
03	Lusaka - Master Plan	854	382	1,236
04	Copperbelt - Master Plan	1,454	452	1,906
05	Rural Water Supply	334	284	618
06	Hydrogeological	72	68	140
07	Water Quality Standards	6	8	14
08	Leakage-Wastage	420	430	850
09	Environmental Health	90	18	108
10	Data and Info System	57	83	140
11	Water Act	10	-	10
	Total	3,343	1,811	5,154
	Estimated total in current prices	4,800	2,600	7,400

4.25 This program will probably extend over a five-year period 1975-1979 and will require an input of K1.22 (US$1.8) million (about K1.8 million in current prices) on the part of the GRZ. It may be expected that the major portion of the work (about 75%) will be done during the remainder of the SNDP and the balance from 1977 to 1979.

D. Operation and Maintenance Cost

4.26 Consideration also must be given to the cost of operation and maintenance (Annex 38). Estimated future costs of these functions (based on 1973 prices) are summarized below (current costs in brackets):

	K Millions					
	1974-1976		1977-1981		1982-1986	
Item	Total	AAv.per Yr.	Total	Av.per Yr.	Total	Av.per Yr.
Water Supply	24.1(30.1)	8.1(10.1)	55.9(95.1)	11.2(19.0)	85.8(214.5)	17.2(43.0)
Sewerage	13.3(16.6)	4.4(5.5)	27.9(47.4)	5.6(9.5)	38.0(95.0)	7.6(19.0)
Total	37.4(46.7)	12.5(15.6)	83.8(142.5)	16.8(28.5)	123.8(309.5)	24.8(62.0)

It is apparent that the cost of operation and maintenance is of major significance in comparison with proposed development costs, and that tariffs must, if possible, be adequate to cover all costs.

E. Composite Program

4.27 A composite picture of the total program is as follows (current costs in brackets):

	K Millions		
Item	1974-1976	1977-1981	1982-1986
Development			
Water Supply	15.3 (19.2)	47.8 (81.4)	42.8 (107.0)
Sewerage	19.6 (24.5)	43.0 (73.1)	44.2 (110.5)
Technical Assistance	2.5 (3.1)	2.5 (4.3)	2.5 (6.3)
Operation & Maintenance	37.4 (46.7)	83.8(142.5)	123.8 (309.5)
Total	74.8 (93.5)	177.1(301.3)	213.3 (533.3)

4.28 Possible sources of finance are outlined below (current costs in brackets):

Agency	K Millions 1974-1976	1977-1981	1982-1986
Central Government			
Development	24.4 (30.6)	45.4 (73.3)	43.5 (108.8)
Technical Assistance	1.0 (1.3)	1.0 (1.7)	1.0 (2.5)
Operation & Maintenance	2.0 (2.5)	4.0 (6.8)	6.0 (15.0)
Local Authorities			
Development	3.5 (4.4)	13.6 (23.2)	17.4 (43.5)
Operation and Maintenance	35.4 (44.2)	79.8(135.7)	117.8 (294.5)
External			
Development	7.0 (8.7)	31.8 (54.0)	26.1 (65.2)
Technical Assistance	1.5 (1.8)	1.5 (2.6)	1.5 (3.8)
Total	74.8 (93.5)	177.1(301.3)	213.3 (533.3)

4.29 The foregoing is based on the proposed program outlined on previous page. If the program is too demanding on resources in the future, it can be reduced according to the alternatives provided. It is of course obvious that GRZ input will depend on the state of the economy and the demands of other sectors of the Nation.

February 25, 1975

Form No. 386 (11-69) | INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 01

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY AND SEWERAGE

1. NAME OF PROPOSED STUDY: TRAINING PROGRAM FOR OPERATION & MAINTENANCE STAFF OF WATER SUPPLY AND ~~SEWERAGE FACILITIES.~~

2. PURPOSE:

To assist in establishing training facilities required to cope with the extreme shortage of staff needed for operating and maintaining water supply and sewerage systems.

3. SCOPE:

(a) To study the present situation regarding available staff and to assess future demands;
(b) To outline curricula for one (water supply) or several (leak survey practice, sewage networks and disposal) training subjects;
(c) To suggest the most appropriate school for introduction for the training program
(d) To prepare equipment and staffing lists;
(e) To assist in recruiting full-time and/or part-time lecturers including preparation of job descriptions.

The program should offer instruction both by class lectures and by demonstrating practical operation at existing works and plants in Zambia.

4. BACKGROUND:

(a) Related Studies	(b) Other Available Data	(c) Expected Data Problems
The Department of Water Affairs, Ministry of Rural Development, drafted school programs and relevant documentation is in their files.	Data on required number of operators and maintenance staff should be supplied by the Ministries of Rural Development and of Local Government and Housing.	No complete record of existing treatmen plants is available, thus complicating proper drafting of curricula for course special treatment processes etc.,

5. TIMING:

(a) Duration and Phasing of Study		(b) Desired Starting Date
(1) Preparatory study by one expert	3 months)	1 July 1975
(2) Establishing school & training facilities inc.planning design, supervision of construction, advice on purchase of equipment	24 months)	1 Jan 1976
~~(3) Recruitment of lecturing/instructing staff~~	~~30 months)~~	~~1 April 1976~~

6. COMMENT ON POTENTIAL STUDY SPONSORS:

No potential sponsor has been identified yet. Informal contracts have been made to the British High Commission for technical aid. The Government might also explore other bilateral financing.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description No specific project will result from the establishment of the training program. Still numerous urban and rural schemes, both in existence and planned for future erection, will benefit from this School either delegating their staff to attend courses, or by recruiting operators trained in the programme.

(b) Estimated Investment (US$ equivalent)

(c) Financing Need and Potential Source
External aid component (expertise) will require bilateral or multi-lateral funding.

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent):

Study cost estimate US $ 30,000 (in 1973 prices)

Sheet Prepared by: G. Bachmann
Dept. or Agency: PIP/EH/WHO
Date: 6 November 1973

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: This project has already been given priority by Government but earlier attempts failed. Priority Ranking - I.

Sheet Revised by:	P. Bierstein
Item(s) Revised:	
Dept. or Agency:	PIP/EHE/WHO
Date:	November 1974

Form No. 386.01 (11-69) | INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 01

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:	Expert(s) on Water Supply & Sewerage Operation for preparatory study, advice in establishing school facilities, recruitment of staff (three or four visits to the country).	1	7
	Total:	1	7
(b) Local Professional Staff :	Engineers	1	12
(c) Local Supporting Staff :	Secretary	1	12

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	21,000	24,000	45,000
(b) Equipment :	20,000	60,000	80,000
(c) Other (Travel, non-prof. staff, etc.):	5,000	2,000	7,000
(d) Total :	46,000	86,000	132,000

3. OTHER COMMENTS

Supplement Prepared by:	G Bachmann
Dept. or Agency:	PIP/EH/WHO
Date:	6 November 1973
Supplement Revised by:	P, Bierstein
Item(s) Revised:	
Dept. or Agency:	PIP/EHE/WHO
Date:	

(11-69) 386 INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 02

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY

1. NAME OF PROPOSED STUDY: PROVISION OF PROFESSIONAL STAFF

2. PURPOSE: To enable the Department of Water Affairs at national and provincial levels as well as local Authorities to fill vacant professional and technical posts which in the near future cannot be filled by Zambian nationals.

3. SCOPE: In the Department of Water Affairs alone there are 77 vacancies (as of) out of 181 authorised posts. The situation is paralielled at the Local Authority level. It is proposed that professional and technical staff be provided or seconded by bilateral agencies.

4. BACKGROUND:

(a) Related Studies: The Dept. of Water Affairs has made considerable effort to fill the existing vacancies. About 20 supper-scale & professional posts presently vacant are identified by job descriptions, the latter following the format prescribed by the Govt.

(b) Other Available Data: Up-to-date information should be obtained prior to each recruitment action so as to keep up with the actual situation.

(c) Expected Data Problems: ---

5. TIMING:

(a) Duration and Phasing of Study: Professional and technical staff for periods of two to five years.

(b) Desired Starting Date: 1 April 1975

6. COMMENT ON POTENTIAL STUDY SPONSORS:

Bilateral assisting organisations.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: The result of this assistance would be general strengthening of the ability of the water supply and sewerage sector to operate effectively.

(b) Estimated Investment (US$ equivalent): ----

(c) Financing Need and Potential Source: ----

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent): ----

Sheet Prepared by: P. Bierstein
Dept. or Agency: PIP/EH/WHO
Date: November 1974

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY:

The shortage of professional and technical manpower is a major constraint and should have highest priority

Sheet Revised by:	
Item(s) Revised:	
Dept. or Agency:	
Date:	

Form No. 386.01 (11-69) | INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 02.

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:			
(As listed below under 3)			
	Total:		
(b) Local Professional Staff :			
(c) Local Supporting Staff :			

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :			
(b) Equipment :			
(c) Other (Travel, non-prof. staff, etc.):			
(d) Total :			

3. OTHER COMMENTS

Professional and technical staff required for periods of from two to five years

1 Senior Water Engineer

Vacancies that should be filled by expatriates:

Senior water engineer	= 1	Senior Hydrogeologist	= 1
Water Engineers	= 9	Hydrogeologist	= 2
Mechanical Engineer	= 1	Hydrologists	= 1
Chemist	= 1		

Chief Engineering Assistant = 1
Chief Drilling Superintendent = 1
Senior Mechanical Superintendent = 4

Supplement Prepared by:	P. Bierstein
Dept. or Agency:	PIP/EH/WHO
Date:	November 1974
Supplement Revised by:	
Item(s) Revised:	
Dept. or Agency:	
Date:	

FORM NO. 386 (11-69) | INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 03

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY AND SEWERAGE

1. NAME OF PROPOSED STUDY: WATER SUPPLY AND SEWERAGE - LUSAKA

2. PURPOSE: Preparation of a phased master plan for development of water supply and sewerage in Lusaka including preliminary engineering and feasibility studies for initial phase.

3. SCOPE: (a) The study should cover the city of Lusaka water sypply and sewerage systems including suburban areas, districts under the Squatters Up-grading Program (IBRD), and other areas having a development potential within the City boundaries.
(b) The master plan should have a planning horizon of the year 2000.
(c) Study should include complete investigation of leakage and other water losses an investigation of the Lusaka aquifer and operation of existing treatment plants.
(d) Study should include managerial and financial aspects.

4. BACKGROUND: (a) Related Studies	(b) Other Available Data	(c) Expected Data Problems
1) Govt. of Zambia study for IBRD on upgrading squatter areas (with major impact on water supply development) 2) Studies of Water Supply Development.	City's Water Supply Department has numerous consumption and demand figures. City development plans, town planning documents.	Water consumption at present is far above normal although difficult to identify by per capita figures. Metering is a problem.

5. TIMING: (a) Duration and Phasing of Study	(b) Desired Starting Date
Phase 1 - completion of records, survey of network and treatment capacity, repairs program	10 months
Phase 2 - hydrogeological studies	20 months 1 July 1975
- Master Planning	28 months
Phase 3 - preliminary engineering and feasibility studies	8 months

6. COMMENT ON POTENTIAL STUDY SPONSORS: Preliminary network survey commissioned by City. Offer for technical assistance for hydrogeological study, engineering and management work by FRG. Other bilateral agencies may also be approached.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):
(a) Description (1) Lusaka Water Supply extension (phases 3 & 4) after thorough network rehabilitation
(2) Lusaka Sewerage & Sewage disposal extension.
(b) Estimated Investment (US$ equivalent)
(1) US$10-15 mill.
(2) US$ 5-7 mill.
(c) Financing Need and Potential Source
substantial external capital assistance needed. Contracts to IBRD dating back to 1968-69

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent):
Total cost estimate - US$ 1,100,000
(in 1973 prices)

Sheet Prepared by: G Bachmann
Dept. or Agency: PIP/EHE/WHO
Date: 5 November 1973

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: The project is of high priority due to present network and water production deficiencies and in view of rapid growth of the city. Priority ranking - I

Sheet Revised by:	
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Date:	

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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 03

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:			
Subcontract	Sanitary Engineers	3	90
	Hydrogeologists	2	30
	Management Expert	1	12
	Financial Anal st	1	4
	Total:	7	136
(b) Local Professional Staff :	Engineers, Hydrogeologists, Chemist	6	150
(c) Local Supporting Staff :	Surveyors, Draughtsmen, Drillers Laboratory Technician	12	360

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	816,000	300,000	1 116 000
(b) Equipment :	28,000	10,000	38 000
(c) Other (Travel, non-prof. staff, etc.):	10,000	72,000	82,000
(d) Total :	854,000	382,000	1 236 000

3. OTHER COMMENTS

Supplement Prepared by:	G. Bachmann
Dept. or Agency:	PIP/EHE/WHO
Date:	5 November 1973
Supplement Revised by:	
Item(s) Revised:	
Dept. or Agency:	
Date:	

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PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 4

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY AND SEWERAGE

1. NAME OF PROPOSED STUDY: PRE INVESTMENT STUDIES FOR URBAN CENTER OF COPPERBELT

2. PURPOSE: Preparation of phased master plans for development of water supply and sewerage including preliminary engineering and feasibility studies for initial phases for urban areas of the Copperbelt.

3. SCOPE: Studies should include Ndola (pop. 216 000) Kitwe (311 000) Mufulira (130 000) Luanshya (116 000) Chingola (194,000) and their environs; master plans should have a horizon of the year 2000.

Surveys of gronndwater potential to augment surface water resources and of water pollution.

Studies should include managerial and financial aspects.

4. BACKGROUND:

(a) Related Studies
(1) Numerous studies on Copperbelt (mining, industry, urban development)
(2) "Copperbelt Water Resources Survey" 1971 by Sir A. Gibb/Govt. of Zambia
(3) City of Ndola communicated to AFRO/WHO need for consultantship in long-range sewerage planning.
(4) Ndola commissioned leakage pre-study

(b) Other Available Data
Hydrological, groundwater & water quality data available with Dept. of Water Affairs and local authorities.

(c) Expected Data Problems
Water consumption figures are conflicting in available records. Water wastage well recognised but has not been studied. Metering is a problem.

5. TIMING:

(a) Duration and Phasing of Study

Phase 1- Network and plant survey	14 months
Phase 2 -Groundwater & pollution studies	20 months
Phase3 -Organizational studies	6 months
Phase 4 -Engineering & feasibility studies	16 months
Total duration	36 months

(b) Desired Starting Date
1 October 1975

6. COMMENT ON POTENTIAL STUDY SPONSORS: In view of the scope of work, the possibility should be explored of including the project in the UNDP Programme as soon as there is an opportunity. Otherwise bilateral assistance must be sought.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description
(1) Extension/modernisation of networks and treatment plants.
(2) Water resources development.

(b) Estimated Investment (US$ equivalent)
(1) US$ 15-20 million
(2) US$ 6 -10 million

(c) Financing Need and Potential Source
Substantial external aid will be needed; no details discussed yet.

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent):
Total cost estimate US$ 1.67 million (in 1973 prices)

Sheet Prepared by: G. Bachmann
Dept. or Agency: PIP/EHE/WHO
Date: 5 November 1973

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: The Copperbelt Province being the area of the country's most important natural resource (copper) is bound to receive long-range planning including infrastrucural elements.
Priority ranking - I

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Dept. or Agency:	
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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 04

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:			
Subcontract	Sanitary Engineers	5	162
	Hydrogeologists	2	60
	Chemist/Bacteriologist	1	6
	Management & Finance Expert	1	8
	Total:	9	236
(b) Local Professional Staff :	Engineers Hydrogeologists, Chemist	5	180
(c) Local Supporting Staff :	Surveyors, Draughtsmen, Drillers Laboratory Technicians	10	360

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	1 416 000	360 000	1 776 000
(b) Equipment :	30 000	20 000	50 000
(c) Other (Travel, non-prof. staff, etc.):	8,000	72 000	80 000
(d) Total :	1 454 000	452 000	1 906 000

3. OTHER COMMENTS

Supplement Prepared by:	G. Bachmann
Dept. or Agency:	PIP/EHE/WHO
Date:	5 November 1973
Supplement Revised by:	P. Bierstein
Item(s) Revised:	
Dept. or Agency:	PIP/EHE/WHO
Date:	November 1974

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PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 05

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY

1. NAME OF PROPOSED STUDY: RURAL WATER SUPPLY PROJECT

2. PURPOSE: To strengthen activities in the development of rural water supply; to assist in developing and adapting appropriate methods and techniques; to suggest adequate institutional infrastructure for the planning, design, construction, operation and maintenance of rural water supplies.

3(a) SCOPE: Development of rural water supplies on a province-wide basis; first choice is given to the Southern Province; planning period should cover 20 years divided into appropriate phases of development.

(b) Field studies are required to identify the hydrogeological situation, to assess the present range and types of water supply in villages with respect to technical efficiency, water quality health requirements, seasonal migration of rural population and use of water for livestock and irrigation.

(c) Analyses should be carried out relative to rural population and population growth rates, migration and nomadism, general and specific water consumption figures, organization, finance and water rate policy.

4. BACKGROUND: (a) Related Studies	(b) Other Available Data	(c) Expected Data Problems
Current Intensive Development Zones programme of Govt. should form part of project studies. Previous studies of well-point supplies in Barotse (i.e. Western) Province should be evaluated and updated.	Existing data should be obtained from recent drilling logs and from ongoing drilling works. Hydrogeological sounding and siting for specific drilling activities will have to be included in project schedule.	Collection of population and other field data may pose problems due to remote situation and difficult accessibility of rural districts.

5. TIMING: (a) Duration and Phasing of Study		(b) Desired Starting Date
Phase 1 - Collection of field data	6 months	
Phase 2 - Hydrogeological surveys & siting	12 months	
Phase 3 - Engineering, economic & organizational studies and development plans.	18 months	1 July 1975

6. COMMENT ON POTENTIAL STUDY SPONSORS: The project may be considered as a continuation of the rural water supply programme presently assisted by the USSR in the Eastern Province. Similarly bilateral agencies should be approached for assistance in the Western and later on in other provinces (Northern, Luapula, Northwestern).

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: Valuable experience in rural water supply - technical, financial and organizational will be gained by Govt. and Province authorities. Immediate benefit will accrue to 50,000-100,000 rural pop. likely to be served for the first time by an organized water supply.

(b) Estimated Investment (US$ equivalent): US$ 5 - 8 million

(c) Financing Need and Potential Source: External financial aid will be needed for expertise and equipment

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent):

Total cost estimate US$ 570,000 (1973 prices)

Sheet Prepared by:	G. Bachmann
Dept. or Agency:	PIP/EHE/WHO
Date:	6 November 1973

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY:

Rural water supply is given top priority by Govt. Improvement can only be accomplished by a province-wise approach. Other provinces may follow.

Priority ranking - II

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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 05

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:	Sanitary and Drilling Engineers Hydrogeologists, Organization; Management and Finance Experts, Sub-Contract.	6	48
	Total:	6	48
(b) Local Professional Staff	: Engineers, Hydrogeologist, Administration & Management Officers	4	80
c) Local Supporting Staff	: Surveyors, Drilling Superintendents, technicians	20	480

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	288,000	160,000	448 000
(b) Equipment :	40,000	20,000	60,000
(c) Other (Travel, non-prof. staff, etc.):	6,000	104,000	110,000
(d) Total :	334,000	284,000	618,000

3. OTHER COMMENTS The study should include, or be specifically coordinated with a drilling programme.

Supplement Prepared by:	G. Bachmann
Dept. or Agency:	PIP/EHE/WHO
Date:	6 November 1973
Supplement Revised by:	P. Bierstein
Item(s) Revised:	
Dept. or Agency:	

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PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 06

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY

1. NAME OF PROPOSED STUDY: STRENGTHENING OF HYDROGEOLOGICAL ACTIVITY IN THE DEPARTMENT OF WATER AFFAIRS

2. PURPOSE: There is an urgent need for intensified hydrogeological activity in view of current Five Year Plan targets - Rural Water Supply development - and urban and rural water supplies to be augmented in subsequent planning periods.

3. SCOPE: (a) Assist in the development of nation-wide hydrogeological data collection and record systems on a long-range (10 years) basis.

(b) Current field work requires increase in staffing (more crews) and equipment (modern sounding techniques).

(c) Analyses required of existing logs, including assessment of drilling and siting economy.

(d) Alternatively, the establishment of a testing team should be considered to investigate the potential of aquifers by special rig and test-pump set, since present exploratory drilling and test-pumping practice is inadequate.

4. BACKGROUND:

(a) Related Studies	(b) Other Available Data	(c) Expected Data Problems
Report by E.H.Wessel, UN Interreg. Adv. Dec.1972 (inc.UNDP draft Prodoc.)	A.Navarro's (OTC Adv.) mission Oct.1973.	Collection and evaluation of drilling data; mapping.
Groundw.Res.of Gr.Ndola by P.Hadwen May 1972.	Southern Province Water Res. Survey, 1968.	
Copperbelt Water Res. Survey by Sir A.Gibb, Dec.1971.	High & Low Water Years in Zambia, 1972.	

5. TIMING:

(a) Duration and Phasing of Study		(b) Desired Starting Date
Study of present situation; workplan	3 months)	
Purchase of drilling & sounding equipment	10 months)	1 October 1975
Training; inception of field work	8 months)	
Total duration	15 months)	

6. COMMENT ON POTENTIAL STUDY SPONSORS: Under an ongoing aid programme, the USSR carries out drilling work in the Eastern Province including training of drilling staff. Recent contacts indicated the USSR's willingness to expand the programme. The Government should approach other potential sponsor countries for their support so as to achieve full coverage of all provinces.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: The programme, if started in time, would largely contribute to accomplishing the K6 mill. (equiv.to US$9.5 mill.) Rural Water Supply prog. inc. in the 1972-76 Development Plan. Long-range water supply development -both urban & rural-would indisputably warrant more efficient operations in hydrogeology since availability of surface water resources is limited in Zambia.

(b) Estimated Investment (US$ equivalent): Purchase of equipment US$120,000

(c) Financing Need and Potential Source: Cost for expert advice and special equipment should be covered under UNDP and/or bilateral aid.

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent):

Total cost estimate - US$140,000 **(in 1973 prices)**

Sheet Prepared by: G. Bachmann
Dept. or Agency: PIP/EH/WHO
Date: 7 November 1973

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: In view of the extended groundwater resources development necessary for the supply of the population with safe water, this is a priority project. Priority ranking - II

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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 06

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:	Hydrogeologist	1	12
	Drilling Engineer	1	10
	Total:	2	22
(b) Local Professional Staff :	Hydrogeologist, Water Engineer (expatriates)	2	24
(c) Local Supporting Staff :	Clerical, Draughtsman	2	24

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	66,000	48,000	114,000
(b) Equipment :	6,000	20,000	26,000
(c) Other (Travel, non-prof. staff, etc.):			
(d) Total :	72,000	68,000	140,000

3. OTHER COMMENTS Purchase of drilling equipment may be provided as a second phase.

Supplement Prepared by: G. Bachmann Dept. or Agency: PIP/EH/WHO Date: 7 November 1973	
Supplement Revised by:	
Item(s) Revised:	
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Date:	

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PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 07

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY

1. NAME OF PROPOSED STUDY: INTRODUCTION OF DRINKING WATER QUALITY STANDARDS AND ORIGIN OF SURVEILLANCE SYSTEM

2. PURPOSE: Present practice of water quality control is inadequate due to shortage of analysis facilities and absence of water quality standards. Establishment of such standards and their subsequent application is required as a first approach to developing a regular surveillance system.

3. SCOPE:
(1) Establish standards applicable by a nation-wide surveillance system to be developed during the Third and Fourth NDPs (1977-81-86);
(2) Inspection of laboratories, assessment of methods used in water analysis;
(3) Study of previous analysis sheets;
(4) Study of present analysis equipment and suggestion of alternative or additional apparatus needed.
(5) Collaboration with the Department of Water Affairs should be established.

4. BACKGROUND:

(a) Related Studies: "A Guide to Standards of Quality for Public Streams Affected by Mining Industry Effluents, Part A - Potability" by G. Armstrong-Smith

(b) Other Available Data: Numerous analysis sheets; DWA files re: water pollution, Helsinki Rules etc.

(c) Expected Data Problems: Water sampling from boreholes and testing of samples has not been done regularly.

5. TIMING:

(a) Duration and Phasing of Study

Phase 1 - Field and laboratory studies	2 months
Phase 2 - Drafting of Water Quality Standards inc discussions	1 month
Total	3 months

(b) Desired Starting Date: 1 January 1976

6. COMMENT ON POTENTIAL STUDY SPONSORS: Potential sponsor could be UNDP as soon as funds will be available, and WHO the executing agency since the objective of the study is a WHO routine task. Ministry of Health jointly with Ministry of Rural Development would be the government agencies responsible.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: The study is most likely to bring out that activity in water quality control must be enforced by both staffing and monitoring facilities based on a long-range programme.

(b) Estimated Investment (US$ equivalent): US$ 0.5 million

(c) Financing Need and Potential Source: Foreign funding needed - say 70%

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent): US$ 14,000 (in 1973 prices)

Sheet Prepared by: G. Bachmann
Dept. or Agency: PIP/EHE/WHO
Date: 9 January 1974

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: Water quality control is meaningless without firm standards to be achieved, maintained and monitored. Priority ranking - III

Sheet Revised by:	P. BIERSTEIN
Item(s) Revised:	
Dept. or Agency:	PIP/EHE/WHO
Date:	NOV 1974

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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 07

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:			
	Expert on Water Quality Standards	1	2
	Total:	1	2
(b) Local Professional Staff :	Water Chemist/Bacteriologist	1	3
) Local Supporting Staff :	Laboratory Technicians(part time)	2	6

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	6,000	6,000	12,000
(b) Equipment :	..	..	..
(c) Other (Travel, non-prof. staff, etc.):	..	2,000	2,000
(d) Total :	6,000	8,000	14,000

3. OTHER COMMENTS

Supplement Prepared by:	
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PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 03

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY

1. NAME OF PROPOSED STUDY: STUDY ON LEAKAGE AND WASTAGE IN URBAN WATER SUPPLY SYSTEMS

2. PURPOSE: The study is urgently required to identify wastage of water and excessive water losses, and to propose a programme of remedial measures so that water supply systems will serve design populations and both capital and recurrent expenditures can be economised.

3. SCOPE: (a) City municipality and township systems; period 3 years.
(b) To investigate the occurrence, scope, location, frequency and cause of leaks in urban networks; to identify the occurrence, scope, quantity and reason for extreme water consumption due to wastage in operating water storage, treatment and distribution facilities.
(c) To study the problem of inadequate metering practice; to complete, and update during the course of leakage survey, network plans and records.
(d) To train operation and maintenance staff in leak detection techniques.
(e) To draw up a repair and rehabilitation programme for each system studied.

4. BACKGROUND:

(a) Related Studies: Informal studies have been made by the Dept. of Water Affairs. Two cities, Lusaka and Ndola recently commissioned preliminary investigations of the problem by experts *.

(b) Other Available Data: Communities covered by this study provide basic data relating to their area of supply.

(c) Expected Data Problems: Problems will arise in obtaining precise production and delivery data, due to deficiencies in metering practice, and in distribution system.

5. TIMING:

(a) Duration and Phasing of Study:
Phase 1 - Collection of data workplan — 4 months
Phase 2 - Specialist field work, repair programme — 22 months

(b) Desired Starting Date: 1 January 1976

6. COMMENT ON POTENTIAL STUDY SPONSORS: Canadian technical assistance has been discussed informally, other bilateral aid may be sought.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: The project will result in repair and rehabilitation projects based on the studies of the community systems selected. The project should be considered as a model to be followed by routine surveys in other townships through permanent survey teams under the Dept. of Water Affairs.

(b) Estimated Investment (US$ equivalent): US$ 3 - 5 million

(c) Financing Need and Potential Source: Need for external financing should only arise for expertise and purchase of special detection & metering equipment

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent): Total cost estimate - US$ 830,000 (in 1973 prices)

Sheet Prepared by: G Bachmann
Dept. or Agency: PIP/EHE/WHO
Date: 7 November 1973

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: The project has already been given high priority. The Govt.'s policy in approving loans for community water supply developments shouldbe based on successful leak & wastage studies. Priority ranking - III

Sheet Revised by:	P Biersteiner
Item(s) Revised:	
Dept. or Agency:	PIP/EHE/WHO
Date:	Nov 1974

* A consultant was provided by the African Development Bank through WHO who in ~ visited Lusaka and the Copperbelt. A report including draft terms of reference for these studies was prepared

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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 08

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:	Water Supply Engineer, Team Leader (specialised in water supply operation and maintenance)	1	24
	Water supply engineer (leak detection)	3	72
	Meter foremen	2	24
	Total:	6	120
(b) Local Professional Staff :	Engineers, engineering assistants	6	150
(c) Local Supporting Staff :	Surveyors, Draughtsmen, Mechanics	12	300

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	360,000	300,000	660,000
(b) Equipment :	50,000	10,000	60,000
(c) Other (Travel, non-prof. staff, etc.):	10,000	120,000	130,000
(d) Total :	420,000	430,000	850,000

3. OTHER COMMENTS

Supplement Prepared by:	G. Bachmann
Dept. or Agency:	PIP/EHE/WHO
Date:	7 November 1973
Supplement Revised by:	P. Bierstein
Item(s) Revised:	
Dept. or Agency:	PIP/EHE/WHO

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PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 09

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY AND SEWERAGE

1. NAME OF PROPOSED STUDY: STRENGTHENING OF ACTIVITY IN ENVIRONMENTAL HEALTH

2. PURPOSE: The Ministry of Health wishes to intensify activity in the field of environmental health as laid down in the Ten Year National Health Plan 1972-1981 (published 1 February 1972). There is a considerable need for external assistance in achieving this plan objective.

3. SCOPE: (a) Study should relate to promotion of environmental health in urban and rural areas of the country by assisting the Public Health Engineer planned to be appointed as head of the Division of Environmental Health; study period - 3 years.

(b) Field investigations of drinkwater, sewerage, sanitation, solid wastes disposal, water and stream pollution conditions including other environmental impact aspects;

(c) Evaluation of water, liquid and solid wastes analyses available, initiation of additional analytic work;

(d) Organization of control and monitoring systems for subsequent operation by the Ministry of Health; co-ordination with related activities by other ministries.

4. BACKGROUND:

(a) Related Studies	(b) Other Available Data	(c) Expected Data Problems
Ten Year National Health Plan, 1972-1981; Government Printer, 1972	Annual Reports & statistics, Ministry of Health and DWA	none

5. TIMING:

(a) Duration and Phasing of Study	(b) Desired Starting Date
Three years - one sanitary engineer; phasing to be formulated in Job description	1 January 1976

6. COMMENT ON POTENTIAL STUDY SPONSORS: Sponsorship should be sought from bilateral or multilateral assistance agencies, with WHO as executing agency.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: No immediate project follow-up expected, however, study will result in an organized monitoring system of water supply/sanitation and related conditions in the country.

(b) Estimated Investment (US$ equivalent)

(c) Financing Need and Potential Source

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent): US$108,000 **(in 1973 prices)**

Sheet Prepared by: G. Bachmann
Dept. or Agency: PIP/EH/WHO.
Date: 9 January 1974

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: Need for the study is warranted by the establishment of a Division of Environmental Health as planned by the Ministry of Health. Priority ranking - III.

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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 09

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:	Sanitary Engineer	1	36
	Total:	1	36
(b) Local Professional Staff :		-	-
(c) Local Supporting Staff :		-	-

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	90,000	-	90,000
(b) Equipment :	-	-	-
(c) Other (Travel, non-prof. staff, etc.):	-	18,000	18,000
(d) Total :	90,000	18,000	108,000

3. OTHER COMMENTS

Supplement Prepared by:	
Dept. or Agency:	
Date:	
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Dept. or Agency:	
Date:	

FORM No. 386 (11-69) | INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 10

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY AND SEWERAGE

1. NAME OF PROPOSED STUDY: WATER SUPPLY AND SEWERAGE DATA AND INFORMATION SYSTEM

2. PURPOSE: To develop a comprehensive data and information recording, retrieval and reporting system relative to water supply and sewerage operations in Zambia.

3. SCOPE: (a) Review of existing information and reporting practice relative to water supply systems - rural and urban - and sewerage/sanitation facilities.

(b) Based on this review, additional field investigation should be made on operation, maintenance, equipment, the workshops and spare part situation.

(c) Analyses should be made of present practice, viz. in finance, budget, planning, design, construction, keeping of records, drawings etc.

(d) On the basis of the foregoing, procedures and forms should be developed for routine reports and keeping up to date of records as part of a system usable for both urban and rural water supply installations and urban sewerage schemes. Design criteria should be established to be applied in future layouts, plans and engineering design work.

4. BACKGROUND: (a) Related Studies	(b) Other Available Data	(c) Expected Data Problems
There is a basic reporting practice in connection with the Dept. of Water Affairs annual reports, which is not comprehensive enough for operation and planning requirements.	Data on water supplies, sewerage schemes, housing figures and similar items were collected in the 1969 Census, however, no updating has been undertaken since.	Reliability of available data must be questioned.

5. TIMING: (a) Duration and Phasing of Study (b) Desired Starting Date

Phase 1 - Preparatory studies by expert(s), identification of problems, field trips, plan of implementation	3 months)	1 April 1976
Phase 2 - Selection & purchase of equipment, office installation	8 months)	
Phase 3 - Inception of system, instruction of staff	3 months)	
Total duration	12 months)	

6. COMMENT ON POTENTIAL STUDY SPONSORS: The expert component of the project could possibly be financed by UNDP inter-regional funds, providing one or two short-term consultants in advisory capacity.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: The whole of water supply/sewerage activities in Zambia would benefit from the System; results will be improvement of departmental operations, planning, design, supervision of works, plant operation as well as facilitating budget and funding procedure.

(b) Estimated Investment (US$ equivalent): not applicable

(c) Financing Need and Potential Source: Financing of expert(s) activity possibly by UNDP or bilateral aid.

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent):

Total cost estimate - US$140,000
(in 1973 prices)

Sheet Prepared by: G. Bachmann
Dept. or Agency: PIP/EH/WHO
Date: 7 November 1973

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: Subject is most important to the success of planning, designs and management of water supply and sewerage/sanitation systems in Zambia. Priority ranking - III

Sheet Revised by:	
Item(s) Revised:	
Dept. or Agency:	
Date:	

Form No. 386.01 (11-69) | INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 10

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:	Expert on data and information systems	1	10
	Engineer on planning and design criteria	1	4
	Total:	2	14
(b) Local Professional Staff	Water supply engineer (expatriate)	2	24
	administrative officer	4	36
(c) Local Supporting Staff	Technicians, office staff		

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	42,000	48,000	90,000
(b) Equipment :	10,000	20,000	30,000
(c) Other (Travel, non-prof. staff, etc.):	5,000	15,000	20,000
(d) Total :	57,000	83,000	140,000

3. OTHER COMMENTS

Supplement Prepared by: G. Bachmann	
Dept. or Agency: PIP/EH/WHO	
Date: 7 November 1973	
Supplement Revised by:	
Item(s) Revised:	
Dept. or Agency:	
Date:	

FORM NO. 386 (11-69) | INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

PREINVESTMENT PROGRAM - STUDY DATA SHEET

No.: 11

Area:	Country:	Sector(s):
EAST AFRICA	ZAMBIA	WATER SUPPLY

1. NAME OF PROPOSED STUDY: STRENGTHENING THE WATER ACT OF ZAMBIA

2. PURPOSE: There is need for improving the Water Act (Chapter 312 of the Laws of Zambia) which has been recognized and a committee has undertaken the task. In order to expedite the process it is considered that specialized professional assistance is needed.

3. SCOPE: (a) Review the existing act (Chapter 312)
(b) Consider action and suggestions already made by the committee.
(c) Prepare an up-to-date draft, discussing and finalising it with the committee.

4. BACKGROUND:

(a) Related Studies	(b) Other Available Data	(c) Expected Data Problems
1. The Helsinki Rules on the Uses of the Waters of International Rivers (1966) ECA - 15-25 June 1970 2. Committee Notes	Order to Provide for the Establishment of a National Water Resources Commission (in Ethiopia) Order No.75 of 1971, 27 October, 1971	None

5. TIMING:

(a) Duration and Phasing of Study	(b) Desired Starting Date
Three months	1 July 1975

6. COMMENT ON POTENTIAL STUDY SPONSORS: Only one short-term consultant is needed; UNDP or a bilateral agency should be approached.

7. PROJECT(S) EXPECTED TO RESULT FROM STUDY (if known):

(a) Description: No project

(b) Estimated Investment (US$ equivalent): none

(c) Financing Need and Potential Source: US$9,000 - UNDP or bilateral

8. ORDER OF MAGNITUDE OF STUDY COST (US$ equivalent): US$9,000 **(in 1973 prices)**

Sheet Prepared by: T. R. Jacobi
Dept. or Agency: PIP/EH/WHO.
Date: 2 January 1974

9. STAFF'S COMMENT ON PRIORITY RANKING OF STUDY: Water Act needs improvement as a basic means of sector development - Priority ranking - IV

Sheet Revised by:	
Item(s) Revised:	
Dept. or Agency:	
Date:	

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PREINVESTMENT PROGRAM - STUDY DATA SUPPLEMENT

No.: 11

(to be filled in when possible)

1. TENTATIVE STAFFING	Type of Specialist	Number on Team	Total Man-Months
(a) Foreign Professional Staff:	Water Law Specialist	1	3
	Total:	1	3
(b) Local Professional Staff :	Legal consultation - intermittent	-	-
(c) Local Supporting Staff :	Typist (part-time)	-	-

2. TENTATIVE STUDY BUDGET (US$ equivalent)	Foreign Currency	Local Currency	Total
(a) Professional Staff Costs :	9,000	-	9,000
(b) Equipment :	-	-	-
(c) Other (Travel, non-prof. staff, etc.):	1,000	-	1,000
(d) Total :	10,000	-	10,000

3. OTHER COMMENTS

Supplement Prepared by:	
Dept. or Agency:	
Date:	
Supplement Revised by:	
Item(s) Revised:	
Dept. or Agency:	
Date:	