4.4 Socio-Economic Survey

The principal objective of the socio-economic survey was to collect, at the provincial level, additional information related to the current water use situation that was not available at the central government agencies in Lusaka. This information included the performance of the regional economy, inventories of social infrastructure and housing for all urban townships, and details of regional and urban development plans. Questionnaire survey forms were sent to the nine provincial Offices of the President and to the Regional Development Planning Units. The questionnaire form is included in the Appendix.

Unfortunately, in spite of several phone calls and visits to the provincial capitals, the local consultant did not receive any completed replies to the questionnaire survey. In an attempt to collect at least some of the information required, the local consultant visited the following government departments in Lusaka :

- Central Statistics Department
- Ministry of Local Government and Housing
- Ministry of Health
- Ministry of Education
- National Commission for Development Planning

These visits resulted in collection of some parts of the information requested related to national economic performance and to the inventory of health and educational facilities in the provinces. However, in general, this section of the current water use survey was very disappointing and some possible reasons for the poor level of response to the questionnaire survey are outlined below.

The amount of information requested in the questionnaire was substantial and would have had to be collected from various departments and agencies within the provincial government organisation. Although the local consultant contacted all the provincial Planning Units or Offices of the President, and confirmed with either the Permanent Secretary or the Chief Regional Planner that the questionnaire had been received, it appears that the volume of information was either too great or that the data was not readily available. When contacted by the consultant, all of the Planning Units cited the lack of manpower, funds and transport to collect so much information as the main reason for failure to complete and submit the questionnaire.

In the absence of any completed questionnaires, analysis of socio-economic data has not been undertaken as part of the current water use survey. For further information on the socio-economic conditions related to current water use, refer to the Supporting Report on Socio-Economy.

4.5 Field Survey Trips

There are considerable communication difficulties in Zambia which the make the collection of information and the undertaking of any kind of nation-wide survey a lot harder than might be anticipated. These difficulties include, but are not limited to, faulty telephone and facsimile lines, unreliable postal services and difficulties in contacting personnel responsible at the local level. In order to attempt to overcome these difficulties, both the local

consultant and members of the Study Team made various field survey trips throughout Zambia. The main objectives of these field trips were to encourage and assist the personnel concerned to provide the information required, to deliver questionnaires when the mailed copy had failed to reach its destination and to collect the completed forms.

The local consultant made three long field survey trips as part of the current water use survey, as well as other follow-up visits to try to locate missing questionnaires. The three main field trips are listed in Table 4-4.

Table 4-4 List of Field Survey Trips

Town / District	DWA	PPU	DOA	L/A	Irrigated Estates
Field Trip No.1 - Eastern Province					
Nyimba	✓				
Petauke	✓				
Katete	✓				
Chipata	✓	✓		✓	
Field Trip No.2 - Copperbelt Province					
Ndola	✓	✓	✓	✓	
Luanshya				✓	Mpongwe Develop.
Mufulira				✓	
Kalulushi				✓	
Kitwe				✓	
Chingola				✓	
Chililabombwe				✓	
Field Trip No.3 - Central, Northern & Luapula Provinces					
Kabwe	✓	✓	✓	✓	
Kapiri-Mposhi				✓	
Mkushi	✓				
Serenje	✓				
Solwezi	✓	✓	✓	✓	
Mansa	✓	✓	✓	✓	
Mwense	✓				Mununshi Banana
Kawambwa	✓				Kawambwa Tea
Mporokoso	✓				
Kasama	✓	✓	✓	✓	Zambia Coffee
Mpika				✓	

Notes : DWA - Department of Water Affairs PPU - Provincial Planning Unit
DOA - Department of Agriculture L/A - Local Authority (Council)

In addition to the above field trips by the local consultant, members of the Study Team also made survey field trips to assess the current level of water use in Zambia. These field trips included a week long visit to the Copperbelt, where water supply projects were inspected and the questionnaire forms discussed and completed for ZCCM operated schemes and the Kitwe City Council scheme. Also, the Study Team visited Southern Province and, in particular, inspected the facilities and had meetings with the management of Nakambala Sugar Estates near Mazabuka and the municipal council operated water supply scheme at Livingstone.

The effectiveness of these field survey trips varied depending on the information required and the capabilities of the organisations involved. For example, the visits to DWA

Provincial Water Engineers and Officers-in-Charge at individual water supply schemes, together with the Study Team attendance at the CMMU meetings, resulted in almost 100% response rate for the DWA water supply project questionnaire forms. The meetings and site inspections of the ZCCM projects in Copperbelt and the council operated schemes at Kitwe and Livingstone resulted in similarly useful results. However, for the case of the socio-economic survey, the visits to six of the nine provincial Planning Units failed to produce a single completed questionnaire form. The probable reasons for this were outlined above.

CHAPTER 5 RESULTS OF THE SURVEY

5.1 Existing Water Rights

An indication of the level of current water demands can be obtained from the existing water right records for surface water abstraction held by the Water Development Board (WDB) of the Ministry of Energy and Water Development (MEWD). The local consultant undertook the survey of these existing records on behalf of the Study Team and the results of the survey were input to computer database. The process of collecting the data from the water rights records and the analysis of the database revealed the following.

5.1.1 Number of Existing Records

The water rights issued recently for the abstraction of surface water in Zambia are numbered as high as 5200; however, the actual number of record files held in the WDB Registry is a lot lower than that figure. The system of water right administration by the WDB has been in place since long before independence and some of the records, for example, those for the water users that have now become ZCCM and Zambia Railways, are around 50 to 60 years old. One possible reason for the large difference between the water right numbers and the actual number of files is that it seems that the older records that were no longer active were archived some years ago. The records of the older water rights that are still in use, however, are still to be found in the Registry filing cabinets. This possibility that the records older than a certain date, or numbered lower than a certain value, were archived is supported by the data in Table 5-1 which shows that there are only 117 files for the water rights numbered less than 1000 and only 411 for those between 1000 and 2000. The definition of valid and invalid in the context of the existing water rights records is described in Section 5.1.3 below.

Table 5-1 Number of Valid and Invalid Water Rights

Water Right No.	Valid	Invalid	Total
0 - 999	33	84	117
1000 - 1999	100	311	411
2000 - 2999	257	520	777
3000 - 3999	328	178	506
4000 - 4999	16	-	16
5000 +	5	-	5
TOTAL	739	1093	1832

The other important observation from the above table that is not so easy to explain is why the water right numbers have reached as high as 5200 when it appears that there are only 16 records for the water rights numbered between 4000 and 5000, and only 5 for those above 5000. This situation can be explained in part by referring to the procedure for water right application that is described below. The main reason would appear to be a lack of resources and a deterioration in the WDB administrative system in recent years that has resulted in very few new water rights being issued, in spite of the continuing allocation of water right numbers whenever an application is received.

5.1.2 Procedure for Water Right Application

An understanding of the procedure employed by the WDB when dealing with a water right application is necessary to fully grasp the situation of the existing records. This procedure, as explained to the local consultant, is as follows :

i) The applicant fills in an application form and submits it to the WDB.
ii) A 'water right' number is allocated to the application at the time it is submitted - the number and application are noted in the register even though a record file is not opened.
iii) The application is reviewed by the WDB technical staff and a temporary permit (water right) may be given, pending the approval of the Water Board.
iv) The procedure for consideration of the water right application by the Water Board is followed - advertisement, public inquiry, field inspection, etc.
v) Depending on the outcome of the Water Board's consideration, the water right may be awarded, rejected or deferred (pending further information from the applicant or from WDB technical staff). If awarded, the water right may have an expiry date, or it may be awarded for perpetuity.
vi) If the water right has an expiry date, the applicant must apply for renewal and the Water Board will again consider the application. Failure to apply for renewal may result in the loss of the water right.

Problems have arisen with the above process in recent years because of the shortage of funds and the low priority given to the water rights system within the water resources sector - what little funds have been made available to the DWA have been used for the operation and maintenance of the township water supply schemes. According to the 1992 and 1993 Annual Reports of the Water Development Board, the major constraints to the activities of the WDB have been financial shortcomings for both the day to day operation of the WDB Secretariat and Technical staff, and for the meetings, field inspections and public inquiries of the Water Board itself. Within the funding for 1993, the Water Board was able to make only one visit each to North Western and Central provinces to consider water right applications. 1992 was slightly better, with meetings in Northern, Copperbelt, Central and Southern provinces; however, in 1991, no public inquiries were held and only temporary permits could be granted during that year.

For the reasons outlined above, it is apparent that a considerable backlog of water right applications has built up over recent years, resulting in the situation where the water right numbers are considerably higher than the actual number of record files. These administrative difficulties, and the fact that it is now not possible to differentiate between a temporary permit and an actual water right, make meaningful analysis of the existing water rights records very difficult indeed.

5.1.3 Validity of Records

The subject of the validity and accuracy of the existing water right records should also be discussed. The survey identified records as valid only if the file in the WDB Registry contained a current water right certificate. If the certificate had expired, or if the file contained no certificate, the water right has been classified as invalid. This categorisation of validity gives no indication of whether water is actually being abstracted by the water right

holder. For example, there is no way of knowing whether the holder of an invalid expired water right is still abstracting, awaiting renewal of his water right; or whether the holder of a valid current water right has started abstraction, or continues to abstract, since the date of award of the water right.

With regard to the accuracy of volume of water abstracted, there is currently no requirement to monitor abstraction and therefore no way of knowing the actual volume of water being pumped from rivers. This problem has been addressed in the proposed revisions to the Water Act with the introduction of legislation which will require the installation of a metering unit on all water right applicants' pumping facilities. However, the analysis based on this survey of existing records can only assume that the actual amount abstracted is equal to the volume authorised in the water right application.

5.1.4 Distribution of Water Rights

Approximately 1830 water right records were found and the relevant data input to the database. This number represents the total number of water rights granted, whether currently valid or not. As there is no way of telling from the files whether a water right is being utilised, or whether the amount being abstracted actually corresponds to the amount stated on the certificate, the following analysis is based on the assumption that all water rights (whether 'valid' or 'invalid') are being fully utilised. It should also be remembered that, as water rights are granted for the peak abstraction (not an average value), the total volumes for each river basin or province presented in the following tables can be considered as the maximum theoretical values.

The distributions of water rights by province and by river basin are shown in Tables 5-2 and 5-3 respectively. A more detailed breakdown of the distribution of water rights by district is given in Table 5-4. The province with the highest abstraction volume is the Copperbelt, followed by Central and Southern Provinces. These three provinces account for over 6.5 million m^3/day, or nearly 70% of the total surface water abstraction in Zambia, with around 800 water rights at an average value of over 8,200 m^3/day. The tables show that the number of water rights, and the volume of surface water abstracted, are not evenly distributed across the country; and that the regions with higher concentrations of population have a greater number of granted water rights. This highlights the requirement for water corresponding to the development of both industry and agriculture along the heavily populated 'line of rail'. One noticeable exception to this observation is Northern Province which has a larger number of relatively small water rights, around 460 rights averaging less than 2,700 m^3/day, mainly on the Chambeshi and Luapula basins. These areas have relatively abundant surface water resources and consequently there are a large number of smaller farms. However, because of the distance from markets and the poor transportation network, there is currently little demand for increased agricultural activity.

In terms of the distribution by river basin, it is readily apparent from Table 5-3 that the Kafue river basin is subject to the heaviest demands in terms of both number of water rights and volume of water allocated - nearly 670 water rights totalling 5.3 million m^3/day, or more than 50% of the national total. However, it should be remembered that the number of water rights quoted for the Zambezi basin are for the tributaries and the length of the Zambezi that lies wholly within Zambia. Allocation and administration of water rights on the length of the Zambezi river that forms the border between Zambia and Zimbabwe (including

Lake Kariba) are the responsibility of the Zambezi River Authority (ZRA) - data for such records have not been made available. This arrangement leads to the situation where, for example, the town council of Mongu must hold a water right for its township water supply scheme, whereas towns such as Livingstone, Senanga and Siavonga are exempt.

Table 5-2 Distribution of Water Rights by Province

Code	Province	Total WR			Valid WR			
		No.	Total Volume	Average Value	No.	%	Volume	%
10	Lusaka	218	645,918	2,963	92	42.2	423,752	65.6
20	Copperbelt	375	2,778,931	7,410	126	33.6	971,754	35.0
30	Central	230	1,852,924	8,056	118	51.3	479,917	25.9
40	North Western	67	151,215	2,257	24	35.8	91,572	60.6
50	Western	6	8,950	1,492	2	33.3	600	6.7
60	Southern	189	1,930,088	10,212	70	37.0	1,225,659	63.5
70	Luapula	184	866,815	4,711	81	44.0	700,299	80.8
80	Northern	464	1,247,408	2,688	194	41.8	657,313	52.7
90	Eastern	82	40,059	488	27	32.9	27,530	68.7
99	Unknown	17	29,969	1,763	5	29.4	6,280	21.0
		1832	9,552,277	5,214	739	40.3	4,584,676	48.0

Units : m^3/day

Table 5-3 Distribution of Water Rights by River Basin

Code	River Basin	Total WR			Valid WR			
		No.	Total Volume	Average Value	No.	%	Volume	%
1	Zambezi	229	592,908	2,589	84	36.7	124,669	21.0
2	Kafue	669	5,296,425	7,917	249	37.2	2,803,343	52.9
3	Luangwa	286	1,543,791	5,398	127	44.4	285,307	18.5
4	Luapula	304	940,045	3,092	137	45.1	725,584	77.2
5	Chambeshi	255	966,752	3,791	105	41.2	461,878	47.8
6	Tanganyika	76	194,965	2,565	32	42.1	169,645	87.0
99	Unknown	13	17,391	1,338	5	38.5	14,250	81.9
		1832	9,552,277	5,214	739	40.3	4,584,676	48.0

Units : m^3/day

5.1.5 Analysis of Water Right Data

Although Table 5-3 above gives a breakdown of the distribution of water rights by main river basin, it is more difficult to determine the precise location of the point of abstraction without detailed examination of each individual water right record. For this reason, the distribution by sub-basin can only be estimated, based on the district of the water right holder. This estimated distribution was then used in the analysis of actual water use in the current water balance presented in Chapter 5 of the Main Report.

Table 5-4 Distribution of Water Rights by District

Code	District	Total WR No.	Total WR Volume	Valid WR No.	Valid WR %	Valid WR Volume	Valid WR %
11	Lusaka Urban	83	282,449	33	39.8	242,856	86.0
12	Lusaka Rural	134	358,469	58	43.3	175,896	49.1
13	Luangwa	1	5,000	1	100.0	5,000	100.0
10	LUSAKA	218	645,918	92	42.2	423,752	65.6
21	Ndola Urban	65	803,504	32	49.2	425,214	52.9
22	Ndola Rural	92	73,819	32	34.8	28,477	38.6
23	Chililabombwe	4	28,536	1	25.0	0	0.0
24	Chingola	44	1,019,398	14	31.8	181,914	17.8
25	Mufulira	29	298,857	6	20.7	20,319	6.8
26	Kalulushi	17	30,670	5	29.4	9,792	31.9
27	Kitwe	74	375,664	22	29.7	214,872	57.2
28	Luanshya	50	148,483	14	28.0	91,166	61.4
20	COPPERBELT	375	2,778,931	126	33.6	971,754	35.0
31	Kabwe Urban	15	100,710	3	20.0	77,300	76.8
32	Kabwe Rural	66	213,848	32	48.5	50,385	23.6
33	Mumbwa	10	211,476	7	70.0	210,675	99.6
34	Mkushi	110	658,186	64	58.2	126,777	19.3
35	Serenje	29	668,704	12	41.4	14,780	2.2
30	CENTRAL	230	1,852,924	118	51.3	479,917	25.9
41	Solwezi	27	83,098	10	37.0	47,403	57.0
42	Mwinilunga	18	44,828	10	55.6	39,169	87.4
43	Zambezi	4	14,110	1	25.0	2,000	14.2
44	Kabompo	6	2,338	1	16.7	50	2.1
46	Kasempa	12	6,841	2	16.7	2,950	43.1
40	NORTH WEST	67	151,215	24	35.8	91,572	60.6
51	Mongu	3	5,800	1	33.3	500	8.6
54	Kaoma	2	2,850	1	50.0	100	3.5
56	Seshcke	1	300	0	0.0	0	0.0
50	WESTERN	6	8,950	2	33.3	600	6.7
61	Livingstone	17	8,854	8	47.1	3,620	40.9
62	Namwala	3	1,403	1	33.3	5	0.4
63	Mazabuka	84	1,620,114	30	35.7	1,194,826	73.7
64	Monze	9	8,451	6	66.7	7,816	92.5
65	Choma	34	116,117	12	35.3	7,654	6.6
66	Kalomo	33	157,766	12	36.4	9,465	6.0
68	Gwembe	8	7,383	1	12.5	2,273	30.8
69	Sinazongwe	1	10,000	0	0.0	0	0.0
60	SOUTHERN	189	1,930,088	70	37.0	1,225,659	63.5
71	Mansa	98	716,943	42	42.9	683,120	95.3
72	Nchelenge	2	560	2	100.0	560	100.0
73	Kawambwa	33	88,464	16	48.5	4,682	5.3
74	Mwense	41	54,607	16	39.0	9,787	17.9
75	Samfya	10	6,241	5	50.0	2,150	34.4
70	LUAPULA	184	866,815	81	44.0	700,299	80.8
81	Kasama	201	933,538	87	43.3	442,838	47.4
82	Kaputa	1	1,400	0	0.0	0	0.0
83	Mbala	76	194,965	32	42.1	169,645	87.0
84	Mporokoso	87	30,956	37	42.5	11,890	38.4
85	Luwingu	34	18,370	17	50.0	7,850	42.7
87	Isoka	11	8,128	0	0.0	0	0.0
88	Chinsali	27	23,972	10	37.0	16,640	69.4
89	Mpika	27	36,079	11	40.7	8,450	23.4
80	NORTHERN	464	1,247,408	194	41.8	657,313	52.7
91	Chipata	49	18,898	17	34.7	10,139	53.7
93	Lundazi	4	520	1	25.0	200	38.5
94	Chadiza	11	2,220	2	18.2	791	35.6
95	Katete	10	5,900	4	40.0	4,700	79.7
96	Petauke	8	12,521	3	37.5	11,700	93.4
90	EASTERN	82	40,059	27	32.9	27,530	68.7

Units : m^3/day

5.2 Present Water Supply Situation

5.2.1 Proposed Changes to the Water Supply Sector

At this moment in time, the two principal water supply undertakers in Zambia are the Department of Water Affairs (DWA) and local authorities such as the city, municipal or district councils under the Ministry of Local Government and Housing (MLGH). However, the water supply sector is currently in a state of change with the proposals being made by the inter-ministerial Programme Co-ordination Unit (PCU). Implementation of the recommendations made in the National Water Policy of November 1994 and the Proposed Strategy and Institutional Framework for the Water Supply and Sanitation Sector in Zambia presented by the PCU in February 1995 will lead to significant changes in the water sector. In the future, it is expected that the responsibility for water supply will be separated from water resources management, and so those schemes that are currently operated by DWA will be handed over to local authority control.

It is also proposed that all water supply bodies will eventually become commercially viable water and sanitation utilities (CU's) - either as individual water supply and sanitation companies (like Lusaka and Chipata Water and Sewerage Companies), or on a regional basis as Council Owned Regional Companies (CORC's). Consequently it can be seen that the restructuring of the water supply and sanitation sector will probably lead to considerable change within the sector over the three year period covered by the PCU Plan of Action from January 1995 to December 1997. The Current Water Use Survey undertaken as part of this National Water Resources Master Plan Study has assessed the water supply situation within Zambia as it stands in the latter half of 1994.

In addition to the DWA and the local authorities, ZCCM manages water supply projects in several towns in Copperbelt and Central Provinces and ZESCO also has small scale water supply schemes at some of its hydropower generating facilities. Of the total of 85 water supply projects identified, 46 are operated by the DWA, 25 by the councils, 9 by ZCCM, 3 by ZESCO, and 2 by the water and sewerage companies of Lusaka and Chipata. The province with the greatest number of water supply projects is Copperbelt with a total of 20 schemes; 7 of which are council controlled, 7 operated by ZCCM and the remainder managed by DWA. Table 5-5 shows the breakdown of number of projects by Province.

Table 5-5 Number of Water Supply Projects by Province

Province	No. of Projects	Urban Population	
		1990 Census	1995 Projection
Lusaka	4	829,473	1,040,000
Copperbelt	20	1,112,637	1,236,000
Central	9	213,198	253,000
North Western	7	54,320	62,000
Western	7	75,741	83,000
Southern	14	211,984	236,000
Luapula	7	83,126	91,000
Northern	10	118,301	130,000
Eastern	7	82,750	94,000
TOTAL	85	2,781,530	3,227,000

5.2.2 Responses to Questionnaire Survey

Questionnaires were sent to all managing bodies of water supply projects, either by mail or facsimile or delivered by hand. The overall level of response was very good at almost 85%, with 72 replies received from the 85 projects identified. However, the response from council operated projects was lower than average, with only 16 replies received from a total of 25 councils. The results are summarised in Table 5-6 below.

Table 5-6 Response to Current Water Use Questionnaire Survey

Managing Body	No. of Projects	No. of Replies	Response Rate
DWA	46	45	98%
Council	25	16	64%
ZCCM	9	8	89%
ZESCO	3	2	67%
Water Co.	2	1	50%
TOTAL	85	72	85%

The response rate for both DWA and ZCCM controlled water supply projects was particularly good because of the high level of cooperation offered to the Study Team. Questionnaire forms were distributed to DWA Provincial Water Engineers (PWE's) at two meetings organised by the Community Management and Monitoring Unit (CMMU) in June and August 1994. In spite of difficulties with transportation and availability of data, replies were eventually returned. The return rate for DWA operated projects can be considered to be 100% as the status of the Chavuma project is not known. (The border town of Chavuma was also not included in the DWA 'Operation and Maintenance of Township Water Supplies' Report dated October 1993.)

With regard to ZCCM operated water supply projects, the Study Team visited the Copperbelt at the beginning of June 1994 and inspected the water treatment plants at Luanshya and Nkana (Kitwe) Divisions - questionnaire forms from these and other projects were completed during the visit or returned shortly after. The only ZCCM operated project for which a reply was not received was Nampundwe mine of the Kabwe Division in Central Province.

Of the local authority managed schemes, only those at Kitwe and Livingstone were visited by the Study Team. In general, responses were received from all the city and municipal council operated projects, with the exception of Mufulira. Kalulushi Municipal Council does not operate an independent water supply scheme but is served by under ground water from ZCCM Chibuluma Mine. For the smaller district council controlled township projects, the level of response was not so good with only 9 replies received from a total of 16 councils. Missing data includes the provincial capitals of Solwezi and Mongu, as well as the towns of Kafue and Chongwe in Lusaka Province, Pemba and Kalomo in Southern Province and Mbala in Northern Province.

There are two private water companies in Zambia, namely Lusaka Water and Sewerage Company (LWSC) and Chipata Water and Sewerage Company (CWSC). LWSC were able to provide data on current levels of water supply and allowed the Study Team to visit both the old Lusaka WTW (groundwater supply - 100,000 m^3/day) and the Iolanda WTW at Kafue (surface water supply - 110,000 m^3/day). However, CWSC failed to reply to the

questionnaire survey in spite of visits and reminders by both the local consultant and DWA staff acting on behalf of the Study Team. The current water supply situation in Chipata is therefore not known.

The Study Team visited the recently rehabilitated ZESCO water supply scheme at Namulundu (Kafue) Gorge. Water is taken from the head race tunnel of the Kafue Gorge HEP Station and treated to serve the township which developed during the construction of the dam and power station. The other ZESCO scheme which responded to the questionnaire was Musonda Falls in Northern Province. No reply was received from the ZESCO project at Itezhi-Tezhi Dam.

The location of the water supply projects in Zambia was shown in Figure 5-1. The projects are listed in Table 5-7 in the following section, where the survey results are analysed and interpreted.

5.2.3 Analysis of Survey Results

Table 5-7 on the following two pages shows a list of the 85 existing water supply projects in Zambia, categorised by province and managing body. A total of 72 replies were received to the questionnaire survey and details of the population served and the quantity of water supplied are included in the table.

These figures are taken directly from the replies to the questionnaire survey, although corrections have been made in some cases. Consequently, the accuracy of some of the data for both population and water volume may be questioned and the problems associated with the accuracy of data provided are discussed later. Based on the survey results, the average volume of water per capita population served in litres/capita/day (lcd) has been calculated. These figures give an indication of the per capita water consumption of the population, although interpretation of the results is difficult as there is no data available on water system losses such as leakage or consumer wastage. Also, in areas such as the Copperbelt, the same water supply system serves both domestic and industrial users and, with very little metering of consumers, the actual amount of water supplied to domestic consumers is not known.

Based on the type of managing body, the water supply bodies currently providing water to urban areas in Zambia can be divided into three main categories. The average per capita volume supplied for each of the categories has been calculated and the results are discussed below :

1. Council operated schemes (including the private companies of Lusaka and Chipata). Larger water supply schemes throughout the country, operated by the local councils under the MLGH. 16 replies analysed with a range of values for the volume of water supplied per head of population from only 100 lcd in Chingola and Luanshya to around 250 lcd in Ndola, Kitwe and Livingstone. The average value of per capita volume supplied for the 16 schemes was 200 lcd. It must be remembered, however, that the data for both population served and total volume of water produced are only estimates, as given in the survey replies.

Table 5-7(1) Water Supply Projects by Province (Sheet 1 of 2)

PROVINCE	CODE	PROJECT	MANAGING BODY	POPULATION SERVED	QUANTITY m^3/day	PER CAPITA lit./cap./day
LUSAKA	111	Lusaka	LWSC	900,000	190,000	211
(4 projects)	121	Chongwe	Council	---	---	---
	122	Kafue	Council	---	---	---
	131	Luangwa	DWA	1,100	550	500
COPPERBELT	211	Ndola	Council	600,000	147,000	245
(20 projects)	231	Chililabombwe	Council	25,000	4,175	167
	241	Chingola	Council	218,000	22,000	101
	251	Mufulira	Council	---	---	---
	261	Kalulushi	Council	---	---	---
	271	Kitwe	Council	222,000	54,550	246
	281	Luanshya	Council	120,000	12,400	103
	231	Chililabombwe	ZCCM	28,000	10,000	357
	232	Konkola Town	ZCCM	3,000	1,000	333
	241	Nchanga	ZCCM	100,000	45,000	450
	251	Mufulira	ZCCM	110,000	48,000	436
	261	Kalulushi Chib.	ZCCM	30,000	11,000	367
	271	Nkana	ZCCM	146,000	81,800	560
	281	Luanshya	ZCCM	90,000	33,000	367
	221	Masaiti	DWA	2,000	1,125	563
		Kamfinsa	DWA	6,000	2,670	445
		Kasumbalesa	DWA	200	50	250
		Mokambo	DWA	500	80	160
		Sakania	DWA	200	50	250
		Tshisenda	DWA	150	30	200
CENTRAL	311	Kabwe	Council	120,000	33,000	275
(9 projects)	321	Chibombo	Council	1,000	120	120
	323	Kapiri-Mposhi	Council	8,000	N/K	---
	311	Kabwe	ZCCM	50,000	16,000	320
	332	Nampundwe	ZCCM	---	---	---
	322	Chisamba	DWA	8,996	3,416	380
	331	Mumbwa	DWA	16,000	1,934	121
	341	Mkushi	DWA	12,154	800	66
	351	Serenje	DWA	14,000	1000	71
NORTH -	411	Solwezi	Council	---	---	---
WESTERN	421	Mwinilunga	DWA	6,200	1,911	308
(7 projects)	431	Zambezi	DWA	5,800	1,600	276
	432	Chavuma	DWA	---	---	---
	441	Kabompo	DWA	4,758	2,088	439
	451	Mufumbwe	DWA	1,452	134	92
	461	Kasempa	DWA	2,148	873	406
WESTERN	511	Mongu	Council	---	---	---
(7 projects)	513	Namushakende	DWA	3,098	177	57
	521	Lukulu	DWA	2,965	600	202
	531	Kalabo	DWA	14,400	888	62
	541	Kaoma	DWA	7,150	1,614	226
	551	Senanga	DWA	8,300	1,429	172
	561	Sesheke	DWA	7,610	915	120

Note : Data taken from the replies to the Current Water Use questionnaire survey

Table 5-7(2) Water Supply Projects by Province (Sheet 2 of 2)

PROVINCE	CODE	PROJECT	MANAGING BODY	POPULATION SERVED	QUANTITY m^3/day	PER CAPITA lit./cap./day
SOUTHERN (14 projects)	611	Livingstone	Council	80,000	20,000	250
	631	Mazabuka	Council	39,430	5,600	142
	635	Namalundu Gorge (Kafue)	ZESCO	5575	800	143
	641	Monze	Council	21,990	5,540	252
	651	Choma	Council	21,000	8,640	411
	653	Pemba	Council	---	---	---
	661	Kalomo	Council	---	---	---
	671	Siavonga	Council	20,000	3,600	180
	621	Namwala	DWA	10,000	N/K	---
	662	Zimba	DWA	15,000	600	40
	672	Chirundu	DWA	180	45	250
	681	Gwembe	DWA	4,800	400	83
	691	Sinazongwe	DWA	1,000	56	56
	622	Itezhi-Tezhi	ZESCO	---	---	---
LUAPULA (7 projects)	711	Mansa	Council	45,000	6,480	144
	721	Nchelenge	DWA	2,680	1,210	451
	722	Chienge	DWA	300	36	120
	731	Kawambwa	DWA	6,250	1,440	230
	741	Mwense	DWA	2,760	1,580	572
	751	Samfya	DWA	6,900	1,700	246
		Musonda Falls	ZESCO	500	106	212
NORTHERN (10 projects)	811	Kasama	Council	49,795	12,000	241
	831	Mbala	Council	---	---	---
	891	Mpika	Council	13,200	1,500	114
	821	Kaputa	DWA	1,780	74	42
	832	Mpulungu	DWA	6,354	1,150	181
	841	Mporokoso	DWA	1,500	430	287
	851	Luwingu	DWA	7,500	1,100	147
	871	Isoka	DWA	10,000	800	80
	872	Nakonde	DWA	9,900	731	74
	881	Chinsali	DWA	3,280	1,447	441
EASTERN (7 projects)	911	Chipata	CWSC	---	---	---
	921	Chama	DWA	3,000	23	8
	931	Lundazi	DWA	10,000	900	90
	941	Chadiza	DWA	4,000	900	225
	951	Katete	DWA	2,500	200	80
	961	Petauke	DWA	11,237	647	58
	962	Nyimba	DWA	5,000	162	32

Note : Data taken from the replies to the Current Water Use questionnaire survey

2. ZCCM operated schemes. 8 replies received for ZCCM projects providing mine township water supplies (and some industrial water for use in the production process). Relatively well maintained and operated water supply schemes. Average per capita volume supplied calculated as 400 lcd. Seemingly large per capita volume supplied is probably due to industrial water use combined with increased leakage and wastage. Comparison with the Copperbelt council operated schemes is useful. The Copperbelt cities and towns developed solely as a result of the mine operations, but have since expanded into major urban conurbations. The mine operated schemes mainly serve the ZCCM townships, leaving resposibility for the remaining population to the councils. One exception is Kalulushi where the only source of water is the ZCCM Chibuluma mine and in other towns, ZCCM often assist the council with repairs and maintenance to the aging treatment and pumping facilities. As a consequence of the continued urban growth of the Copperbelt municipalities and the lack of investment over the last twenty years, the supply capacity of the council projects now falls far short of the actual water demand.

3. DWA operated schemes. Water supply to smaller townships and villages / border posts, either from surface water supply or from groundwater boreholes. The water supply schemes of ZESCO can also be included in this category based on the size of population served and the quantity of water provided. Response to the questionnaire survey was good for these smaller schemes, with 45 replies received for the DWA projects and 2 for the ZESCO schemes. However, because the schemes range widely in size, both in terms of population served and quantity of water supplied, it is not as easy to generalise on the level of water supply.

   The DWA schemes can be divided into surface water and groundwater supplied projects as shown in Table 5-8. Based on data given in the DWA 'Operation and Maintenance of Township Water Supplies' report dated October 1993 and the 1990 census population data, the average per capita volume supplied has been calculated and compared to the results from the questionnaire replies. Although there are some noticable variations, in general the values calculated from the DWA report are around 10% lower than those from the questionnaire survey. Considering that the population has increased since 1990, and that it is possible that the level of supply has dropped since 1993, the actual per capita volume supplied is probably lower again, especially when leakage and wastage are taken into consideration. The accuracy of both methods of analysis must be questioned, however, as results of over 500 lcd were obtained for some projects. This level of water supply is obviously unrealistic, and the data provided for quantity of water supplied is either too high, or the estimate of population served is inaccurate. Using the data for quantity pumped from the DWA report, the average per capita volume for all 45 water supply projects was 188 lcd. The average figure for the 12 groundwater projects was 150 lcd although projects ranged from only 20 or 30 lcd to over 250 lcd. For surface water supplied projects, whether from rivers, lakes or direct from springs, the average value was around 200 lcd with individual projects ranging from 40 to 60 lcd to over 400 lcd.

Table 5-8 DWA Water Supply Projects

PROVINCE	CODE	PROJECT	SOURCE	POPULATION 1990 Census	QUANTITY m^3/day	PER CAPITA lit./cap./day
LUSAKA	131	Luangwa	Zambezi R.	1,606	470	293
COPPERBELT	221	Masaiti	Kafulafuta R.	2,140	1,000	467
		Kamfinsa	Dam/surface	(6,000)	2,200	(333)
		Kasumbalesa	Groundwater	(200)	33	(165)
		Mokambo	Groundwater	(500)	67	(134)
		Sakania	Groundwater	(200)	50	(250)
		Tshisenda	Groundwater	(150)	50	(333)
CENTRAL	322	Chisamba	Groundwater	2,972	270	91
	331	Mumbwa	Dam/ground	11,015	2,200	200
	341	Mkushi	Dam/surface	7,804	800	103
	351	Serenje	Dam/surface	8,265	1,000	121
NORTH - WESTERN	421	Mwinilunga	Surface	6,342	1,670	263
	431	Zambezi	Zambezi R.	5,941	770	130
	432	Chavuma	Surface	1,798	- - -	
	441	Kabompo	Kabompo R.	5,005	1,670	334
	451	Mufumbwe	Groundwater	4,860	145	30
	461	Kasempa	River	4,151	1,150	277
WESTERN	513	Namushakende	Groundwater	1,771	300	169
	521	Lukulu	Groundwater	3,129	900	288
	531	Kalabo	Luanginga R.	7,209	1,170	162
	541	Kaoma	Groundwater	9,165	1,500	164
	551	Senanga	Zambezi R.	7,727	1,330	172
	561	Sesheke	Zambezi R.	5,390	1,200	223
SOUTHERN	621	Namwala	Namwala R.	3,772	1,000	265
	662	Zimba	Dams/surface	1,351	500	370
	672	Chirundu	Zambezi R.	2,072	270	130
	681	Gwembe	Dams/surface	2,013	370	184
	691	Sinazongwe	Lake Kariba	2,006	33	16
LUAPULA	721	Nchelenge	Lake Mweru	14,498	830	57
	722	Chienge	Surface	1,900	220	116
	731	Kawambwa	Spring	3,882	150	39
	741	Mwense	River	3,695	500	135
	751	Samfya	L. Bangweulu	12,718	1,500	118
NORTHERN	821	Kaputa	Surface	2,936	550	187
	832	Mpulungu	L. Tanganyika	2,739	1,110	405
	841	Mporokoso	River	4,818	830	172
	851	Luwingu	River	4,664	1,170	251
	871	Isoka	Spring	8,596	1,330	155
	872	Nakonde	River	4,493	770	171
	881	Chinsali	River	7,509	1,330	177
EASTERN	921	Chama	Groundwater	3,474	330	95
	931	Lundazi	Lundazi R.	5,590	570	102
	941	Chadiza	Dam/river	3,031	670	221
	951	Katete	Groundwater	7,165	150	21
	961	Petauke	Groundwater	8,148	500	61
	962	Nyimba	Dam/river	1,684	500	297

Note : Data taken from DWA report on 'Township Water Supplies' Oct. 1993 and from 1990 Census

5.2.4 Access to Water Supply - Coverage of Major Water Supply Schemes

Access to safe water supply is one of the fundamental goals of the government's "Social Sector Rehabilitation and Development Programme". According to the 1991 "Study of the Water Supply and Sanitation Sector", 70% of Zambia's urban population have access to safe and adequate drinking water supply. As discussed elsewhere in this Master Plan study, the situation in rural areas is considerably worse. Based on the replies to the current water use (CWU) questionnaire survey, the situation of water supply coverage in the major towns and municipalities is discussed below.

Table 5-9 Population Served and Estimated Coverage for Major Towns and Municipalities

Town / City	1990	1995	CWU Survey - Population Estimates				Estimated
	Census	Projection	Served	Piped	Comm.	Total	Coverage
Lusaka	769,353	967,970	900,000	500,000	400,000	1,200,000	75%
Ndola	334,531	338,375	600,000	450,000	150,000	620,000	97%
Chililabombwe	48,055	50,656	25,000	17,000	8,000	87,000	64%
ZCCM (Konkola)			28,000	28,000	---	(80,000)	
Chingola	142,379	154,140	218,000	206,000	12,000	---	100%
ZCCM (Nchanga)			100,000	100,000	---		
Mufulira	124,746	130,658	---	---	---	---	84%
ZCCM (Mufulira)			110,000	110,000	---		
Kalulushi	31,474	36,628	---	---	---	---	82%
ZCCM (Chibuluma)			30,000	20,000	10,000		
Kitwe	288,592	320,666	222,000	156,000	66,000	400,000	92%
ZCCM (Nkana)			146,000	134,400	11,600		
Luanshya	118,143	126,214	120,000	118,800	1,200	200,000	100%
ZCCM (Luanshya)			90,000	90,000	---		
Kabwe	161,456	194,556	120,000	---	---	200,000	85%
ZCCM (Kabwe)			50,000	20,000	30,000		
Livingstone	76,875	84,833	80,000	60,000	20,000	100,000	80%
Kasama	48,045	53,513	49,800	35,800	14,000	---	93%
Chipata	52,213	59,711	---	---	---	---	---

In Table 5-9 above, coverage is defined as the ratio of the population served to the total population of the municipality, both figures as estimated from the questionnaire replies. If no data was provided for the total population, the figure for the 1995 base projection has been used to calculate the coverage. It should be noted, however, that the population estimates from the questionnaire survey are considerably higher than the 1990 Census results, and indeed, higher than the 1995 population projected by the Study Team. This is probably due to the fact that the water supply bodies have no way of knowing the actual population that is served. Population is estimated from the amount of water supplied which is calculated from the raw water pumping figures and includes significant losses such as leakage and wastage. In particular, the population estimates for Ndola, Chingola and Luanshya are considerably higher than the census and projection results - Ndola by about 78% and the combined totals of ZCCM and council projects for Chingola and Luanshya by 106% and 67% respectively.

However, the survey results can be used to give an indication of the coverage provided by the water supply body. From the above table, it can be seen that, for the 12 major towns and municipalities, water supply coverage is reasonably high with an average of 86% of the population served. The proportion served by piped water to homes is also quite high at an average of 70% of total population, although the range varies from as low as 40% for the population served by the ZCCM groundwater supply at Kabwe to 100% for the ZCCM schemes at Chingola, Mufulira and Luanshya. The remainder of the population covered by water supply are served only by access to communal stand pipe facilities.

Whilst these results for supply coverage are reasonably encouraging in terms of the proportion of the urban population that has at least some access to a safe water supply, the adequacy of that supply is far from satisfactory. Some of the council operated schemes, including Copperbelt's second largest city of Kitwe, can only supply water on a part-time basis because of the delapidated state of the treatment, pumping and storage facilities. In nearly all cases, a shortage of chemicals and spares for pumps and other electrical equipment means that the standard of water treatment is inadequate. Other major problems include leakage in the distribution system and storage reservoirs, and wastage by consumers through broken or leaking taps, toilets and standpipes.

5.2.5 Water Supply Situation in Cities and Municipalities

Table 5-10 shows the current water supply situation in the major cities and municipalities, as reported by the managing bodies in the questionnaire survey carried out as part of the Current Water Use Survey. The table also shows the population projections and predicted domestic and manufacturing water demands for the target years of 2005 and 2015. The data for water demands is taken from other sectors of the Master Plan study - domestic water demands are based on population projections multiplied by per capita consumption of 180 litres/capita/day; while predicted manufacturing demands are based on a study team survey. Water demands for the mining sector are excluded because it is assumed that the mining organisations will continue to meet their demands from independent supply systems. Losses from the water supply system are estimated to be 25% of total demand, although the current level of losses and wastage is thought to be considerably higher - perhaps as high as 50 or 60% of the total volume of raw water pumped.

The difference between the calculated future demands and the current volume of water supplied as reported in the questionnaire survey is shown in the table as the 'balance'. This deficit gives an indication of the future water requirement for each of the 3 cities and 7 municipalities. From this table it can be seen that the municipalities likely to experience a shortfall in water supply are Lusaka, Ndola, Kalulushi, Luanshya, Kabwe and Livingstone; with the capital city Lusaka needing to increase its domestic and industrial water supply capacity by a factor of four by the year 2015.

As discussed in the previous section, the current situation in many cities is already far worse than suggested in the table, with towns like Kitwe and Ndola already experiencing serious water shortages. These shortages are caused by problems with the operation and maintenance of existing facilities rather than inadequate supply of raw water. Low levels in the Kafue in the dry season do give problems at raw water intake and water level control weirs are required. Another factor in the Copperbelt is that most towns (with the exception of Ndola) are supplied by both the local authority and ZCCM, with ZCCM often having to

assist the councils with emergency repairs and maintenance. Rehabilitation projects are planned for Kitwe and Ndola.

The following difficulties in the assessment of current water supply have become apparent in the course of the questionnaire survey :

- No metering either of bulk water supplies, for example at the water treatment works, or of individual consumers. Estimates of water volume supplied are as stated in questionnaire replies received from the water supplier. It is assumed that these values are based on pump ratings and number of hours pumped, although records of pumping are not usually kept.

- Population supplied. No records of the numbers of consumers are available. Even if the number of legitimate connections is known, the number of consumers per connection is highly variable depending on the type of connection.

- Leakage losses. The figures for future water demand make no allowance for leakage losses within the distribution system. Based on the current situation as reported, it appears that leakage and distribution losses are considerable. According to the data provided, many of the water supply schemes are providing an average of over 400 litres per capita per day for every consumer.

Typical problems reported in the questionnaire replies include inadequate and obsolete pumping equipment, shortage of spares and funds for maintenance, shortage of chemicals for water treatment, and deterioration of pumping mains, storage reservoirs and distribution systems.

Table 5-10 Current Water Supply Situation and Future Projections for Major Cities and Municipalities

	Lusaka	Ndola	Kitwe	Chilila-bombwe	Chin-gola	Mufu-lira	Kalu-lushi	Luan-shya	Kabwe	Living-stone
1990 Census	769	335	289	48	142	125	31	118	161	77
Current Supply	190.0	147.0	136.4	34.2	67.0	48.0	11.0	45.4	77.5	20.0
Year 1995										
Population	968	388	321	51	154	131	37	126	195	85
Domestic	174.2	69.9	57.7	9.1	27.7	23.5	5.5	22.7	35.0	15.3
Industrial	90.6	27.9	24.1	4.0	11.8	10.4	2.6	9.8	10.2	7.7
Total	264.8	97.8	81.8	13.1	39.6	33.9	8.1	32.5	45.3	22.9
System Losses	66.2	24.5	20.5	3.3	9.9	8.5	2.0	8.1	11.3	5.7
Req'd Supply	331.0	122.3	102.3	16.4	49.5	42.4	10.1	40.7	56.6	28.7
Balance	-141.0	24.7	34.1	17.8	17.5	5.6	0.9	4.7	20.9	-8.7
Year 2005										
Population	1483	507	383	54	175	139	48	139	273	100
Domestic	267.0	91.3	69.0	9.8	31.5	25.0	7.2	25.1	49.2	18.0
Industrial	126.9	39.1	33.6	5.6	16.5	14.5	3.7	13.7	14.5	10.6
Total	393.9	130.4	102.6	15.4	48.0	39.5	10.9	38.8	63.7	28.6
System Losses	98.5	32.6	25.7	3.9	12.0	9.9	2.7	9.7	15.9	7.2
Req'd Supply	492.4	163.0	128.3	19.3	60.0	49.4	13.6	48.5	79.6	35.8
Balance	-302.4	-16.0	8.1	14.9	7.0	-1.4	-2.6	-3.1	-2.1	-15.8
Year 2015										
Population	2181	635	440	56	190	142	60	148	369	113
Domestic	392.5	114.3	79.2	10.1	34.3	25.5	10.9	26.6	66.4	20.4
Industrial	177.3	46.5	36.7	5.5	17.0	13.9	4.4	13.8	18.6	11.4
Total	569.8	160.8	115.9	15.6	51.3	39.4	15.3	40.4	85.0	31.8
System Losses	142.5	40.2	29.0	3.9	12.8	9.9	3.8	10.1	21.3	8.0
Req'd Supply	712.3	201.0	144.9	19.5	64.1	49.3	19.1	50.5	106.3	39.8
Balance	-522.3	-54.0	-8.5	14.7	2.9	-1.3	-8.1	-5.1	-28.8	-19.8

Units : Population - thousands
Water supply - 1000 m^3/day

Note : 1. Current water supply volume taken from questionnaire survey of water suppliers.
2. Current supply for Copperbelt towns and Kabwe is the combined total of ZCCM and council operated projects.
3. Predicted domestic demand based on population projections and per capita consumption of 180 litres/capita/day.
4. Predicted manufacturing demand based on Study Team survey.

CHAPTER 6 CONCLUSIONS

The Current Water Use Survey was undertaken between June and August 1994 by the local consultant, Rankin Engineering, under sub-contract to the JICA Study Team. In this period, the consultant successfully completed a survey of the existing water rights records and input the relevant information to computer database. Questionnaire survey forms were sent to the managing bodies of all water supply projects and data from the replies received was also input to database. The consultant continued to collect the survey forms and input the data after the sub-contract period because of delays in the return of the questionnaires. Field survey visits were made to assist the collection of data and to verify the results received. Analysis and interpretation of the data collected during the current water use survey has been undertaken and the results used in the current and future water balances presented in the Main Report.

The main conclusions are as follows :

1. Existing water rights records. The actual number of water right records is significantly less than is indicated by the numbering system, although it is difficult to accurately assess the precise number because of the disordered state of the Water Board registry. Likewise, the current status of the water rights and the actual amount of water being abstracted is not known as there is no requirement to monitor the volume pumped. As elsewhere in Zambia, the main problems facing the Water Board are shortage of funds for day to day operations, transport, field inspections, meetings and public inquiries; a lack of computer and other office equipment; and no training or human resource development opportunities.

   From the 1830 water right records evaluated and input to database, it was seen that the provinces with the highest volume of allocated water rights are Copperbelt, Southern and Central provinces, which account for 70% of Zambia's total surface water abstraction. In terms of river basin, the Kafue is subject to the heaviest demands - nearly 670 water rights totalling 5.3 million m^3/day, or more than 50% of the national total. The survey of existing water rights highlighted the necessity for water for urban, industry and agriculture requirements along the heavily populated 'line of rail'.

2. Domestic water supply projects. 72 replies to the questionnaire survey were received from the 85 water supply projects identified. This represents an overall response rate of almost 85% which, considering the communication and transport difficulties in Zambia, is very good. Based on the questionnaire replies, it became clear that the main problem facing the majority of water suppliers is the poor condition of treatment plants, pumping equipment and distribution systems rather than a shortage of raw water resource. The most common difficulties quoted in the questionnaire survey include inadequate and obsolete pumps, shortage of spares and funds for maintenance, and deterioration of pumping mains, storage reservoirs and distribution networks.

   The other main conclusion from the results of the survey, is that the level of leakage and wastage for nearly all the schemes is very serious indeed, with perhaps as much as 50 or 60% of the volume of raw water pumped being wasted in some cases. According to the data provided by the managing bodies for water volume supplied

and population served, some of the schemes are pumping enough water to provide over 400 litres of water per capita population. While the accuracy of this data is difficult to verify, it is obvious that losses must be considerable as it is known that most, if not all, of the council operated schemes are not able to satisfy water demand and some are forced to operate on a part-time basis in order to conserve supplies.

Of the main water supply managers, the schemes operated by ZCCM in the Copperbelt are the best maintained and provide the highest level of supply coverage, although they are also providing double the per capita volume at 400 lcd on average compared to the council and DWA schemes. Whether this is due to industrial usage or increased wastage because of ready availability is not clear. The council operated schemes, including Lusaka Water and Sewerage Company, vary considerably in the quantity of water supplied and some are pumping only about 100 lcd although the volume that reaches the consumers is even lower. Others such as Kitwe and Livingstone are only able to provide water supply during part of the day.

Appendix Current Water Use Survey Forms

No. _____

Current Water Use Survey By JICA Study Team

1. Water Right No. and Date of Issue : No. _____ Date : _____

2. Name of User : _____

3. Point of Abstraction of Water Located in _____ District _____ Province

4. Water Abstracted From _____ River which is a Tributary of _____River which is a Tributary of _____ River.

Main Stream [Zambezi Main R., Kafue R., Luangwa R., Chambeshi R., Luapula R., Lake Tanganika]

5. Amount of Water Right : _____ m3/day

6. Point of Return : _____ District _____ River.

7. Amount to be Returned : _____ m3/day

8. Intake Facilities :

(1) Dam : Height _____ m, Length _____ m, Storage Capacity _____ m3

(2) Weir : Height _____ m, Length _____ m, Max.Intake Rate _____ m3/day

(3) Furrow : Cross-Section [H _____ m, W _____ m], Length _____ m

(4) Pump : Suction Lift _____ m, Max.Pumpage _____ litre/s

(5) Others : _____

9. Purpose :

(1) Industrial Use [Products & Output _____]

(2) Generating Electric Power [_____ kW]

(3) Domestic [Population Served _____ person]

(4) Livestock [Kind & Number _____]

(5) Fish Farming [Area of Fish Pond _____ ha]

(6) Irrigation [Total Area to be Irrigated; _____ ha]

Maize[__ ha], Wheat[_ ha], Paddy Rice[__ ha], Solgum[__ ha], Millet[__ ha], Sunflower[__ ha], Soybean[__ ha], Other Beans[____ ha], Ground Nuts[__ ha], Seed Cotton[__ha], Tobacco[__ha], Coffee[__ha], Citrus[__ha], Banana[__ha], Vegetables[__ ha], Flowers[__ ha], Meadow Grass[__ ha], Pasture grass[__ha], Others(_____)[__ha]

Form YEC/CWU/1a

CURRENT WATER USE SURVEY

SURVEY OF DOMESTIC WATER SUPPLY PROJECTS

QUESTIONNAIRE FORM

Please complete the following questionnaire in as much detail and as accurately as possible. When multiple choice answers are shown, please circle the description(s) which most closely match the situation at the water supply project concerned. Please provide any additional information in the sections marked 'Other' or on a separate sheet of paper if necessary. Your assistance in the compilation of this Current Water Use Survey is gratefully acknowledged.

A. All Domestic Water Supply Projects

1. Name of Water Supply Project : _____
2. Township : _____ 3. District : _____ 4. Province : _____
5. Grid Reference (1 : 50,000 map) if known : _____ [ ][ ]

6. Type of Managing Body : (01) - DWA (02) - Council [ ][ ]
(03) - Mining Company (04) - Private Company
(05) - Other : _____
7. Population Served : _____ 8. Total Population : _____

9. Source of Water Supply : (01) - Surface Water (river) [ ][ ]
(02) - Groundwater (borehole)

10. Design capacity of project : _____ m3/day
11. Current amount of water supplied : _____ m3/day
12. Projected future capacity of project : _____ m3/day

13. Type of water treatment facility (if any) : [ ][ ]
(01) - None (02) - Sedimentation
(03) - Slow filter (04) - Rapid filter
(05) - Pressurised filter (06) - Aeration
(07) - Other : _____
14. Type of chemical treatment (if any) : [ ][ ]
(01) - None
(02) - Chlorine
(03) - Aluminium Sulphate
(04) - Other : _____

15. Current state of operation of water supply project : [ ][ ]
(01) - Full-time operation (24 hours)
(02) - Part-time operation
(03) - Not operational
16. If the project is only operated on a part-time basis, state the average hours of operation per day :
From : _____ hrs To : _____ hrs

17. Reasons for part-time operation :

(01) - Inadequate power supply
(02) - Insufficient chemicals for treatment
(03) - Lack of spares
(04) - Lack of skilled labour
(05) - Insufficient funding
(06) - Part-time operation adequate to meet demand
(07) - Other : _____

18. General condition of facilities :

(01) - Good condition, regular maintenance
(02) - Fair condition, reasonable maintenance
(03) - Poor condition, little or no maintenance
(04) - Other comments : _____

19. Distribution system :

(01) - Piped water supply to homes Population served : _____
(02) - Communal piped water supply Population served : _____

20. Secondary water use (in addition to domestic water) :

(01) - Irrigation water _____ m3/day
(02) - Industrial water _____ m3/day

21. Water tariff structure :

(01) - Flat rate - all consumers
(02) - Metered rate - major consumers only
(03) - Metered rate - all consumers

22. Planned rehabilitation works : (1) Yes (2) No
If Yes, please describe : _____

23. Planned expansion of project : (1) Yes (2) No
If Yes, please describe : _____

B. Surface Water Supplied Projects

If the answer to Q.9 above was (01) - Surface Water, please complete the following sections:

24. Water Right No. : _____ 25. Date of Issue : _____
26. Name of Water Right Holder : _____

Source of Water Abstraction :
27. Tributary : _____ 28. River : _____ 29. Main Basin : _____
30. Amount of Water Right : _____ m3/day

Point of Return :

31. Tributary : _____ 32. District : _____ ☐☐

33. Amount to be Returned : _____ m3/day

34. Type of Intake Facility : ☐☐

(01) Dam (02) Weir

(03) Pump (04) Other

Dam : 35. Type of dam : _____ 36. Height : _____ m

37. Length : _____ m 38. Capacity : _____ m3

Weir : 39. Type of weir : _____ 40. Height : _____ m

41. Length : _____ m 42. Max Intake Rate : _____ m3/day

Pump : 43. Type of pump : _____ 44. Suction Lift : _____ m

45. Power : _____ kW 46. Max Pumping Rate : _____ litre/sec

47. Other : _____

48. Name of Facility : _____

49. Condition of Intake Facility : ☐☐

(01) - Good condition, regular maintenance

(02) - Fair condition, reasonable maintenance

(03) - Poor condition, little or no maintenance

(04) - Other comments : _____

C. Groundwater Supplied Projects

If the answer to Q.9 above was (02) - Groundwater, please complete the following sections :

50. Site name of well field / wells : _____

51. Grid reference of well field (if known) : _____

52. Total number of production wells : _____

53. Total groundwater production rate : _____ m3/day

D. Any Additional Information

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Form YEC/CWU/2a

QUESTIONNAIRE ON GOVERNMENTAL IRRIGATION PROJECT

1. General

1.1 Project Name:_____

1.2 Project Category
- [] Smallholders Irrigation Project
- [] Medium Scale Irrigation Project
- [] Large Scale Irrigation Project
- [] other category:_____

1.3 Location and Location Map of the Project
- Province:_____ District:_____
- River Basin:_____
- Identification of Project Area and Facility on Project Map or 1:50,000 Map.

(Map has to show Location of Intake, Canal, Pipeline, Road, Drainage, Power line to the Project Area, and Project Boundary, etc.)

1.4 Project Area

Area	Planned	Present
- Gross Project Area:	_____ha	_____ha
- Net Farming Area :	_____ha	_____ha
Irrigated Area	_____ha	_____ha
Rainfed Area	_____ha	_____ha
Fish Pond,if there	_____ha	_____ha

1.5 Executing Agency
- Constructed by:_____
- Owned by:_____
- Managed by:_____
- Funded by:_____

1.6 Construction Year
- Started in:19___ Completed in:_____(If not completed yet, mention completion schedule.)
- Commencement Year:19___([]:fully, []:partly)
- Full Commencement Year:_____(In case of partly or not commenced yet at present stage.)

1.7 Beneficiaries
- Farmers:_____families at present stage.
- Company:_____companies (_____workers) at present stage.

In case not full commencement, please mention figures in full scale commencement.
- Farmers:_____families in full scale.
- Company:_____companies (_____workers) in full scale.

2. Water Sources

2.1 Kind of Water Sources: []:Surface Water []:Groundwater

2.2 Water Right
- Water Right No.:_____, Issued Date:_____
- Amount of Water Right:_____cu.m/day
- Catchment Area at Intake Point:_____sq.km

2.3 Intake Facilities
- Dam: Height:_____m, Length:_____m, Storage Capacity:_____m^3
- Weir:Height:_____m, Length:_____m, Max.Intake:_____m^3/sec
- Pump:Actual Head:_____m, Max.Pumpage:_____m^3/sec

2.4 Groundwater
- Borehole Record No.(DWA):_____, Depth:_____m,
Number of Boreholes:_____, Total Yield:_____cu.m/day

3. Water Demand and Availability (Monthly Average)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall (mm)													
Potential Evapotranspiration (mm)													
Water Demand at Present Stage (MCM)													
Water Demand at Full Scale Stage (MCM)													
Monthly River Flow (MCM)													

3. Water Service other than Irrigation, if any

3.1 Purpose:_____
3.2 Capacity:_____cu.m/day

4. Irrigation Facilities

4.1 Conveyance Facility
- Canal Size:B___m,H___m, Length:_____m, [ ]lined, [ ]none
- Pipeline Size:ø___mm, Length:_____m

4.2 Irrigation Method and Irrigated Area

[]Furrow Irrigation	_____ha
[]Basin Irrigation	_____ha
[]Sprinkler Irrigation	_____ha
[]Center Pivot Irrigation	_____ha
[]Drip Irrigation	_____ha
[]Rainfed (Non-irrigation)	_____ha
Totol	_____ha

4.3 Planned Farming

Crops	Irrigated		Non-irrigated	
	Cropped Area (ha)	Yield (t/ha)	Cropped Area (ha)	Yield (t/ha)
Wet Season Crops				
Maize				
Sunflower				
Soyabean				
Cotton				
Groundnuts				
Tabacco (B)				
Tabacco (V)				
Vegetables				
Dry Season Crops				
Wheat				
Barley				
Vegetables				
Perennial Crops				
Sugarcane				
Tree Crops				
Coffee				
Fruits				
Other Crops				
Flower				
Total				

4.4 Actual Farming

Crops	Irrigated		Non-irrigated	
	Cropped Area (ha)	Yield (t/ha)	Cropped Area (ha)	Yield (t/ha)
Wet Season Crops				
Maize				
Sunflower				
Soyabean				
Cotton				
Groundnuts				
Tabacco (B)				
Tabacco (V)				
Vegetables				
Dry Season Crops				
Wheat				
Barley				
Vegetables				
Perennial Crops				
Sugarcane				
Tree Crops				
Coffee				
Fruits				
Other Crops				
Flower				
Total				

4.5 Irrigation Water

- Annual Requirement: _____MCM
- Peak Requirement: _____lit/sec/ha

4.6 Irrigation Services

- Farm Households involved: _____households
- Population involved:_____persons
- Irrigation Fee: _____K/ha/year
- Total Operation & Maintenance Cost o Project: _____K/year

4.7 Cattle Breeding
- Breeding: _____heads
- for Sale: _____heads/year

4.8 Fish Culture
- Producing Species: _____
- Annual Production: _____t/year

4.9 Problems on Irrigation, if any;

_____
_____
_____
_____
_____
_____

4.10 Problems on Farming, if any;

_____
_____
_____
_____
_____
_____

END OF QUESTIONNAIRE

SOCIO-ECONOMIC SURVEY
QUESTIONNAIRE
TO PROVINCIAL GOVERNMENT OFFICES

Please fill out the following tables referring to the 1992 (and/or the latest year) statistical records. Or, correct the information beforehand filled out in the tables, in the case that it is different from the fact. If the space provided in the following tables is insufficient, please attach extra supplementary sheets to complete your reply.

Q1. PERFORMANCE OF REGIONAL ECONOMY IN PROVINCE

Economic Sector	Production or Sales Amount (K1000)	Value Added (K1000)	Number of Workers *1	Total Wage Payment*2 (K1000)
Year 1991				
Agriculture, Forestry and Fishery				
Mining & Quarrying				
Manufacturing				
Electricity, Gas & Water				
Construction				
Wholesale & Retail Trade				
Hotels & Restaurants				
Transport & Communication				
Financial Institution				
Real Estate & Business Service				
(Adjustment)				
Total				
Year 1992				
Agriculture, Forestry and Fishery				
Mining & Quarrying				
Manufacturing				
Electricity, Gas & Water				
Construction				
Wholesale & Retail Trade				
Hotels & Restaurants				
Transport & Communication				
Financial Institution				
Real Estate & Business Service				
(Adjustment)				
Total				

Note: *1 Including managing staff
*2 Including the wages for managing staff

Q2. INVENTORY AND DISTRIBUTION OF URBAN TOWNSHIPS

The number of centres and their names in the following tables were quoted from Information and Research Division of Central Statistics Office. Please correct them if you find some errors, and fill out blanks. Illustrate respective townships on the District administrative boundary map attached.

1. Large Urban Areas (LUAs)*1

No	Name of Urban Area	LA *2	Population (Resident)	Coverage (%) of Water Supply System*3				Sewage	Refuse Collection
				Piped	Communal	Others*4	ME*5		
1									
2									
3									
4									

2. Small Urban Townships (SUTs)*6

No	Name of Township	LA *2	Population (Resident)	Water Supply System Coverage *3				Sewage	Refuse Collection
				Piped	Communal	Others*4	ME*5		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Note:
- *1 Identified as urban area where population is more than 50 thousand.
- *2 Fill out the number of the following type of Local authority
  1) City council 2) Municipal council 3) Urban council 4) District council
- *3 Fill out percentage of people supplied by each category of water supply system.
- *4 Including deep well, shallow well, springs, etc.
- *5 Fill out the number of the following managing entity type of water supply undertaker
  1) MEWD 2) MOH 3) City council 4) Municipal council
  5) Urban council 6) District council 7) Zambia Railway 8) ZESCO
  9) NGOs
- *6 Identified as urban area where population is between 5000 and 50,000.

Q3. INVENTORY OF SOCIAL INFRASTRUCTURE PRIVATE ESTABLISHMENTS IN TOWNSHIPS

Please fill out the following table in which inventory of social infrastructure is summarized by township. If the space provided is insufficient, please attach extra supplementary sheets to complete your reply.

1. Educational and Medical Facilities

No.	Name of Township	Number of Educational Facilities			Number of Medical Facilities		
		Primary.	Secondary	College/ University	Hospital	Clinic with Bed	Clinic w/o Bed
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

2. Administration and Private Establishments

No.	Name of Township	Number of Administrative Offices*1	Number of Hotels	Number of Restaurants	Commercial Area (ha)	Industrial Area (ha)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Q4. INVENTORY OF HOUSING UNITS BY TYPE

Please fill out the following table in which inventory of housing units is summarized by township. If the space provided is insufficient, please attach extra supplementary sheets to complete your reply.

1. Inventory of Housing Units
   Fill out the number of units. If the number is not identified, please fill out percentage distribution within a township.

No.	Name of Township	Low Cost Housing	Medium Cost Housing	High Cost Housing
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

2. Unit Prices of a Typical Residential New Building
   Costs in below table are estimated at 1994 current prices.

Item	Low Cost Housing	Medium Cost Housing	High Cost Housing
Average Floor Area (sq. m.)			
Unit Cost (K1000/sq.m.)			
Total Cost (K1000)			

Note: Please attach respective rough plans and specifications of building materials

Q5. REGIONAL AND URBAN DEVELOPMENT PLANS

Please list up project titles and their abstract below, in the case that the Provincial Government Office has formulated some projects. Please attach those development abstracts, if available.

Examples of development plans related to the National Water Resources Master Plan:

1) Comprehensive Regional Development Plan
2) Sectoral Development Plans
   - Agricultural development plan
   - Livestock development plan
   - Industrial development plan
   - Tourism development plan
   - Water development plan