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A WATER PRICING STUDY FOR THE REPUBLIC OF ZAMBIA

Appendix I

WATER USE AND WILLINGSNESS TO PAY SURVEY IN KATETE AND MUMBWA

NIVA
Nairobi and Oslo, September 1983
David G. Browne, Economist

LIST OF CONTENTS

P R E F A C E

The Norwegian Institute for Water Research (NIVA) was in March 1981 engaged by the Norwegian Agency for International Development (NORAD) to undertake a Water Pricing Study for the Western Province of Zambia.

The report including the recommendation for a new water tariff structure for Western Province was presented in October 1981.

The Department of Water Affairs, however, felt that a National Study was required in order to establish a National Water Tariff Structure.

NORAD agreed to finance the extension of the Study and a Contract between NORAD and NIVA was signed in September 1982.

The same Project Team as for Western Province was used. However, the team was extended by one water engineer.

The Project Team consisted of:

Mr. David G. Browne, Agricultural and Water Resources Economist
Mrs. Mette Jørstad, Social-anthropologist
Mr. Torbjørn Damhaug, Water Engineer
Mr. Svein Stene Johansen, Project Manager

The two latter are permanently employed by NIVA, the two other persons hired as sub-consultants.

The Project Team visited Zambia in August-December 1982 and had discussions with relevant authorities at central, provincial and local levels. The team also met members of the Department of Water Affairs (DWA) staff as well as many water consumers.

In order to provide data for the main report and NIVA's recommendations to the Zambian Government, socio-economic surveys covering various topics which have a bearing on consumer's ability and willingness to pay were carried out by the economist and the social-anthropologist. Both surveys

are based on the same questionnaires and methodology. These surveys were ment to be independent studies at the responsibilities of the authors. The result of the surveys are presented as Appendix I and II to the main report.

Svein Stene Johansen
Project Manager

1. INTRODUCTION

1.1 Purpose

In order to provide data for this report the consultants carried out a socio-economic survey covering various topics which have a bearing on consumers' ability and willingness to pay for alternative levels of water service.

1.2 Questionnaires

The questionnaires used in the survey were based on those prepared by Lottie and Associates for their socio-economic work in Northern and Luapula provinces. The consultants modified and added to the original questionnaires in order to increase their usefulness for this report. The intention was to enable the consultants to use the earlier data in addition to their own in order to obtain a wider sample. This has been done where possible.

Unfortunately, due to the limited amount of data presented in Lottie's report the scope for comparison was restricted.

The final questionnaires were presented to DWA and NORAD in the Work Plan (October 1982). Two different questionnaires were used for different groups of consumers. A "high service questionnaire" was designed for consumers having their own house connection or their own individual standpipe. These people are referred to throughout this report as "high service consumers". In order to avoid confusion it should be noted that "high service consumers" are not synonymous with "high cost housing" residents since all consumers having their own tap fall into the "high service" category. In practice there is a close correlation between "high service" and "high and medium cost housing" since all such houses have their own taps while few low cost houses do. While there are in

fact no low cost houses in the survey sample which fall into the "high service" category, any low cost houses with their own connections would have been categorized as "high service".

The second questionnaire - "the low service questionnaire" was designed for (a) consumers who use public standpipes and (b) consumers who use traditional sources, for example hand dug wells and streams. Most of the questions were appropriate for both of these consumer categories but there were a few questions which were only put to one or other of the two consumer groups. In this report the term "low service" consumers refers to both those who use public standpipes and those who use traditional sources. Where appropriate the survey results are analysed separately. Again it should be noted that the term "low service" refers to the level of water service and is not synonymous with low cost housing. However, most "low service" consumers will live in low cost or informal housing.

1.3 Survey in Katete and Mumbwa.

The economist directed the surveys in Katete and Mumbwa, which were undertaken in late November and early December, 1982.

Five enumerators in Mumbwa and nine enumerators in Katete were recruited and trained in order to complete the surveys in the limited time available. The enumerators were all secondary school students who had just completed form four or form five. Although their overall performance was extremely satisfactory it became clear that a few individuals had misunderstood one or two questions, consequently a few responses to certain questions have had to be ignored in the analysis.

1.4 Sampling.

Representative samples were obtained in both survey areas, by informal stratified sampling. In Mumbwa 70 households were interviewed in the formal housing areas, 50% (35) of whom use public standpipes, the other 50% having their own connection. Although more than 50% of all consumers use public standpipes the consultants felt justified in interviewing as many high service consumers since any possibility of financial viability will depend primarily on this group. In addition 21 households living in informal shanty areas, currently using traditional source supplies, were also interviewed.

Within every consumer category further stratification was undertaken on a geographical basis. The township was informally divided up into areas and the percentage of the total sample required from every area was determined on a proportional basis. Within every sub area enumerators were free to choose their own starting point and direction in which they would move but then had to interview every fifth house. If no one capable of answering questions was present they had to conduct an interview at the next house. A summary of the sampled households is shown in Table 1.1.

Table 1.1 - Breakdown of the Mumbwa Survey Sample

Low Service		High Service	
Area	Number of interviews	Area	Number of interviews
Malata	21	Yards - GRZ	7
Council compounds	10	Low density - GRZ	8
Departmental areas	4	Teachers' compound	5
		Council medium cost	10
		Malata	2
		Central township - private	3
Total	35	Total	35

The procedure followed in Katete was similar within the township area, where a total of 80 interviews were conducted, 39 in high service areas and 41 in low service areas. The former consisted of 31 interviews in the main township area and 8 at Katete stores, which is located six kilometres from the boma. The latter consisted of 25 interviews in the low cost housing areas within the main township, 10 low service interviews at the stores, and six interviews at farms located very close to the boma. These six

interviews are hereafter referred to as the boma farms consumer group. All consumers in Mumbwa receive their water from the DWA operated supply. In Katete the DWA scheme is restricted to the boma area and consumers living at the stores receive their water from a smaller council operated scheme.

Twenty two rural households living east of Katete stores at distances ranging from 5 - 10 kms from the stores were also interviewed. Table 1.2 presents the overall summary of the interviews conducted in the Mumbwa and Katete areas.

Table 1.2 - Sample Summary

	Number of households interviewed in :					
	High Service	Low Service Township			Town ship total	Rural
		Low cost town ship	Town ship farms	Shanty		
Mumbwa	35	35	-	21	91	-
Katete	39	35	6	-	80	22
Total	74	70	6	21	171	22

The number of responses used in the analysis of particular questions was often lower than the above figures due to (i) enumerators accidentally omitting questions, (ii) refusal to answer or non response by the interviewee, (iii) misunderstanding leading to unusable answers.

1.5 Category of Housing

Housing in Zambia is generally categorised into high, medium and low cost and in designing water supplies very different design consumption criteria are used for these different housing categories. Furthermore it is probable that the willingness and ability to pay for water of the residents of the different housing categories is rather different. Hence the

enumerators recorded the housing category of every interviewee. This proved simple for most high and low cost houses but sometimes uncertainty existed as to whether or not certain borderline houses were medium cost. Hence the interviewers were instructed that whenever they were unsure they should categorise a house as medium/high or medium/low. Hence five housing categories were recorded, namely high, medium/high, medium, medium/low, and low. Rural housing was categorised by the walls and roofing materials. The housing category summary is presented in Tables 1.3 and 1.5.

Table 1.3 - High Service Housing Categories (number of houses in sample)

	House category				
	High	High/ medium	Medium	Medium/ low	Total
Katete - Boma	4	6	19	2	31
- Stores	4	-	4	-	8
- Total	8	6	23	2	39
Mumbwa - Yards GRZ	-	7	-	-	7
- Low density GRZ	8	-	-	-	8
- Teachers compound	-	5	-	-	5
- Council area	-	-	-	10	10
- Malata	-	2	-	-	2
- Central township: private	3	-	-	-	3
- Total	11	14	-	10	35

As would be expected high cost houses tend to be larger. Table 1.4 presents the average number of rooms found in the surveyed houses.

Table 1.4 - Average Number of Rooms in the Surveyed Houses

	High cost houses	Medium/ high cost houses	Medium cost houses	Medium/low cost houses
Katete	7.5	9.0	6.4	6.0
Mumbwa	8.9	6.3	-	5.8

Thus apart from the medium/high cost category in Katete it appears that high cost houses have approximately eight rooms and medium cost houses have approximately six rooms. The medium/high cost anomaly in Katete can probably be ignored. Firstly it is based on a sample of only three, and in at least one case the enumerator put it in the medium/high category because it was large but he did not feel it justified a high cost rating. If these three houses are put together with all medium category houses in Katete the average only increases to 6.6 rooms.

Table 1.5 - Low Service Housing Categories

	Township				Rural		
	Medium	Medium/ low	Low	Infor- mal	Mud walls/ thatched roof	Brick walls/ thatched roof	Brick walls/ C.I. roof
Katete - Township	-	10	24	1	-	-	-
- Boma farms	1	1	-	-	-	4	-
- Rural	-	-	-	-	13	2	7
Mumbwa - Formal T/ship	-	-	35	-	-	-	-
- Shanty	-	-	-	21	-	-	-

1.6 Sex of Interviewees.

In order to ascertain if there was any correlation between the sex of the interviewee and (i) willingness to pay for water and (ii) attitudes to the existing water supply, the sex of the interviewees in Katete township were recorded. The totals were:

High Service		Low Service	
Male interviewees	21	Male interviewees	16
Female interviewees	13	Female interviewees	24
Husband/wife together	1	Not recorded	1
Not recorded	1		

2. HIGH SERVICE SURVEY

2.1 Family Size.

The number of adults and children in the sample households were investigated and the results are presented in Table 2.1. Persons of 15 years or less were categorised as children.

Table 2.1 - Average Size of High Service Consumer Households

	Number of house-holds in sample	Total children	Total adults	Total persons	Average child-ren per house-hold	Average adults per house-hold	Average persons per house-hold
Katete	38	179	155	334	4.71	4.08	8.79
Mumbwa	35	144	130	274	4.11	3.71	7.83
Total	73	323	285	608	4.42	3.90	8.33

It can be seen that the overall average size of high service households is approximately eight persons of whom just over half are children. The average size in Katete is slightly larger than in Mumbwa. Children represent similar proportions of the total population in the two townships, 53.6% in Katete and 52.5% in Mumbwa.

2.2 Level of Water Service

All 35 high service households interviewed in Mumbwa have their own multiple tap house connection. However in Katete only 32 out of 39 enjoy

this level of service. The other seven households rely on a single tap connection. Of these,three were at the main township and four were at the stores. Thus while 90% of the households interviewed in the main township area supplied by DWA, enjoyed multiple tap connection, 50% of the households interviewed at the stores supplied by the smaller council supply, relied on a single tap connection.

2.3 Installations.

Consumers having their own house connection were questioned as to what water supply facilities they possessed. The responses are summarised in Table 2.2. It can be seen that all 66 respondents had a water supply in their kitchen, a flush toilet and a bathroom and/or shower. Hence all interviewees with their own house connection were genuinely enjoying a high level of water service whenever service was continuous and pressure was adequate.

Table 2.2 - Water Installations Possessed by High Service Interviewees

(Number of households)

	Total responses	Outside tap, kitchen tap, b'room tap, flush toilet and shower	Outside tap, kitchen tap, b'room tap and shower	Kitchen tap, bathroom tap, and flush toilet	Outside tap, kitchen tap, flush toilet and shower	Kitchen tap, flush toilet & shower
Katete	32	9	14	4	4	1
Mumbwa	34	20	14	-	-	-
Total	66	29	28	4	4	1

2.4 Leakage.

The number of interviewees having at least one leaking tap was investi-

gated. The leakage from most faulty taps was then measured in order to determine its overall significance. It was found that the situation was similar in the two townships. In Katete 12 consumers out of 39 (31%) possessed at least one leaking tap while in Mumbwa the corresponding figure was 9 out of 35 (26%).

In Katete the average leakage from houses where the rate of leakage was known was 332 litres/day. While in Mumbwa the figure was 318 litres/day. The average leakage loss per high service house, (when all houses without leaks were included), was 102 litres/day in Katete and 82 litres/day in Mumbwa. Hence it is estimated that leaking tap losses represent approximately 5 - 6% of the total consumption of high and medium housing category residents.

Care should be exercised in drawing any firm conclusions as to the amount of water that is being lost. For example in Katete one out of the 10 houses that is losing water due to leaking taps, accounts for approximately 65% of the loss from all 10 houses. Thus if this house had not been included in the sample the overall average loss would have been reduced from 102 litres per consumer to about 37 litres. On the other hand if one more such house had been included the average leakage of the sample would have been about 162 litres.

Nevertheless it is believed that the figures resulting from the survey are valid. Firstly in Mumbwa there is no single tap where losses represent an undue proportion of total losses and a slight alteration in the sample would not have resulted in any significant change in the figures. Secondly the results in the two surveyed townships are remarkably similar.

The leakage figures are summarised in Tables 2.3 and 2.4.

Table 2.3 - Number of Interviewed Households having Leaking Tap(s)

	No leaking taps	One leaking tap	Two leaking taps	More than two leaking taps	Total
Katete	27	10	2	0	39
Mumbwa	26	8	1	0	35
Total	53	18	3	0	74

Table 2.4 - Quantity of Water Lost from Leaking Taps

	Number of taps with measured leakage	Total leakage (litres/day)	Average leakage per faulty tap (litres/day)	Average leakage per connection (including houses without leakages) (litres/day)
Katete	10	3321	332	102.2*
Mumbwa	6	1908	318	81.8**

* In Katete 12 out of 39 houses had leakages hence the overall loss per sample house = $332 \times \frac{12}{39}$ litres

** In Mumbwa 9 out of 35 houses had leakages hence the overall loss per sample house = $318 \times \frac{9}{35}$ litres

It should be noted that the above figures do not include leakage from

toilets which was not investigated. Surveys in Europe have shown that this can be extremely high. It is probable that charging for water on a quantity used basis will encourage consumers to take action quickly to eliminate or at lease reduce leakage losses.

The consultants' survey tends to support this hypothesis although (i) the sample was rather small, and (ii) the average calculated loss was actually higher in Katete where water is charged for on a quantity used basis. The major leakage in Katete was of very recent origin and would have doubled the consumer's monthly bill if it was not fixed quickly. Hence the householder intended to fix it immediately. When this house was excluded from the sample, losses in Mumbwa were more than double those in Katete.

2.5 Water Use

The purposes for which consumers used water were investigated and the results are summarised in Table 2.5.

Table 2.5 - Summary of Purposes for which High Service Consumers Use Water.

	Number of Households Using Water for :					
	DCBW only	DCBW plus gard-ening	DCBW plus animal water-ing	DCBW plus gardening & animal watering	DCBW plus other use	Total
Katete	17	9	6	6	1	39
Mumbwa	7	27	-	1	-	35

DCBW = Drinking, cooking, bathing, washing and cleaning

As one would have expected all interviewed high service households used water for drinking, cooking, bathing, washing utensils and washing clothes. In addition 15 out of 39 consumers in Katete (38.5%) and 27 out of 35 consumers in Mumbwa (80%) use water for gardening. The reason for the significant difference was not proven, but it is suggested that the charging for water on a quantity used basis in Katete is the most important factor. The figures in both townships and the overall figure of 56.8% support the belief that gardening is an important use of the water from township supplies in Zambia.

2.6 Consumer Complaints.

The complaints that interviewees made about their water supply are summarised in Table 2.6. The results for Katete stores and the main township area have been separated since the level of complaints around the stores was lower than around the boma.

Table 2.6 - Consumer Complaints

	Poor colour or taste (no. of complaints)	Intermittent pressure (no. of complaints)	Low pressure (no. of complaints)	Consumers without any complaints
Katete stores	0	3	1	4
Katete boma area	5	31	26	0
Katete total	5	34	27	4
Mumbwa	27	21	18	2
Overall total	32	55	45	6

Since a number of interviewees made more than one complaint the number of complaints considerably exceeds the sample number of households, which

was 38 in Katete (31 in the main township area and 7 at the stores) and 35 in Mumbwa. While consumers in the stores area were reasonably content with the supply (four out of seven had no complaint), every single interviewee in the main township area complained about the intermittent service and most, 26 out of 31, complained about low pressure, i.e. there was a unanimous feeling that the supply was too unreliable. However, very few consumers considered that the colour and/or taste of the water was unsatisfactory.

In contrast most consumers in Mumbwa complained about the colour and/or taste, (these were not separated on the questionnaire but the major complaint was that the water was slightly brown in colour at times), but only 60% and 50% respectively complained about an intermittent service and low pressure.

2.7 Storage.

The number of consumers who frequently store water at their homes was examined and not surprisingly there was a correlation between water storage and the unreliability of the supply, i.e. the number of consumers who store water in Katete was considerably higher (over 90% in the main township area) than in Mumbwa (43%) where the consumers consider the service to be more reliable. The results of the storage investigation are shown in Table 2.7.

Table 2.7 - Consumer Storage of Water in Katete and Mumbwa

	Number of consumers who store water	Average quantity stored (litres)	Number of households storing up to 20 litres	20-40 litres	40-100 litres	100-200 litres	over 200 litres
Katete stores	5 out of 8	205	1	-	-	-	3
Katete main t'ship area	28 out of 31	67	6	10	8	1	3
Katete total	33 out of 39	84	7	10	8	1	6
Mumbwa	15 out of 35	320	3	5	1	1	3

In the Katete boma area the average amount of water stored was around 67 litres but the overall Katete figure was over 80 litres due to 3 businessmen at the stores keeping drums of water. Table 2.7 shows that most, 25 out of 32, store less than 100 litres at a time, and an average figure of 60-80 litres would probably be representative of the whole township. However, the Mumbwa average of 320 litres is unlikely to be representative of all those who store water in Mumbwa. This high figure is due to the presence in the sample of 3 interviewees who store very large quantities of water. If these three were excluded the average would drop to 42 litres.

2.8 Employment

The number of persons in a household having full time employment was investigated. Whereas some households only having a low level of water services had no regular source of income (cf. Section 3.16), every single family in the high service sample had at least one person in permanent employment. Hence all the families in the high service sample have a regular source of income from which they can pay regular water rates. The actual employment details are summarised in Table 2.8. It can be seen that while all families have at least one member in full time employment, 78% of all households (85% in Katete and 71% in Mumbwa) are dependent on one person for their major or only source of income.

Table 2.8 - Number of Persons having Permanent Employment

Household having:	Katete (number	Mumbwa of	Total households)
One person in full time employment	31	25	56
One person in full time employment and one in temporary employment	2	0	2
Total depending on one person for regular income	33	25	58
Two persons in full time employment	6	9	15
Three persons in full time employment	0	1	1
Total	39	35	74

2.9 Incomes

In order to provide basic data for the ability to pay for water exercise, interviewees were questioned about their sources and level of income. While direct questioning of people about their incomes is usually surrounded by difficulty it is believed that reasonable results have been obtained in this survey. The major failure of the high service interviews was the inability to obtain answers from five businessmen at Katete stores who refused to divulge their incomes. It is believed that the inclusion of these answers would have increased the overall average income of the Katete sample.

The summarised results of 68 high service consumers' responses are presented in Table 2.9.

Table 2.9 - High Service Incomes in Katete and Mumbwa

	Number of households in sample	Average Income Mean (K/mth)	Median (K/mth)	Total Employment (K/mth)	income from Business/ Agric. (K/mth)	Percentage from employment
Katete	34	462	350	12244	3464	77.9%
Mumbwa	34	559	450	14710	4300	77.4%

Hence it appears that the average income in Mumbwa is somewhat higher than in Katete. The difference between the interviewed samples is probably less than the K100 difference shown in Table 2.8. Firstly as mentioned above five businessmen in Katete refused to reveal their incomes. Secondly, three households in Katete received unquantified income from sources other than employment, business and agriculture.

The distribution of income which probably gives a better idea of the income situation in the two townships is presented in Table 2.10.

Table 2.10 - Distribution of Income of Higher Service Households in Katete and Mumbwa

	Number of households earning :								
	less than K200 per month	K200-299 per month	K300-399/ month	K400-499/ month	K500-599/ month	K600-699/ month	K700-799/ month	K800-999/ month	Over K1000/ month
Katete	3	7	9	7	2	1	0	1	4
Mumbwa	2	4	9	4	4	3	3	2	3
Total	5	11	18	11	6	4	3	3	7

It can be seen that 40 out of 68 households (59%) earn between K200 and K500 per month, that only five out of 68 households (7%) earn less than K200 per month, and that 23 households (34%) earn over K500 per month. If the generally acknowledged maximum acceptable water rate of between 3% and 5% of cash income were applied a rate of K10 would be affordable by 93% of medium and high housing category residents, a rate of K15 could be afforded by over 76% of consumers and a rate of K20 could be afforded by only 50% of consumers. The consultants believe that these figures suggest that the highest flat rate that should be charged for any domestic consumer category should be K15.

It would be possible to charge different flat rates in high and medium cost housing areas. Quantified evidence showing that average incomes in high cost housing areas are significantly higher than those in medium cost housing areas would strengthen the case for recommending such a policy.

In Katete there was no discernible difference between the incomes of households living in high cost and in medium cost houses. This was due, at least in part, to the refusal of five of the higher income interviewees to divulge their incomes. There was a noticeable difference at the lower income end of the scale, whereas 36% of medium cost housing residents had an income of less than K300 only 16% of all higher cost housing residents (high-medium and high combined) had an income of less than K300 per month.

In Mumbwa where more complete data for high cost housing residents existed there was a marked difference in the average income of residents of high cost housing and other high service consumers. The figures are shown in Table 2.11.

Table 2. 11 - Incomes of High Service Consumers in Mumbwa

Housing Category	Sample Size	Total monthly income of the group (K)	Average monthly income (K)	Monthly income of the poorest household in the group (K)
High	11	10305	937	500
Medium/high	13	5515	424	250
Medium/low	10	3190	319	170

"

It can be seen that not only is the average income of the high cost housing group more than double that of the other groups but the poorest member of the high cost housing group earns more than the average of the medium cost housing groups. Hence, on an "ability to pay" criterion, a higher water rate would appear to be justifiable.

2.10 Use by Neighbours

Householders having their own connection were asked whether or not they allow other families to take water from their connection. The results are summarised in Table 2.12.

Table 2.12 - Use of Private Taps by Neighbours

	Taps are used by neighbours	Taps are not used by neighbours
Katete	19	20
Mumbwa	5	30
Total	24	50

Hence while overall about 32% of households having their own connection allow neighbours to use their tap(s), there is a significant difference between Katete, where almost 50% of households allow neighbours to use their taps and Mumbwa, where the figure is only 14%. The difference in access to neighbours' taps in the two townships may be even greater than is suggested by the above figures, since only one of the Mumbwa households allows its tap to be used frequently by a number of other families but in Katete a few households allow regular access to more than one other family.

2.11 Present Monthly Water Bills

Consumers were asked how much they pay at present for water. In Mumbwa 32 respondents paid K5 per month, and two did not know how much

they paid. This is consistent with the present rating system in Mumbwa where most meters do not work, none are read and domestic consumers are charged a flat rate of K5 per month.

In Katete the consumers' monthly bills are theoretically based on metered consumption and the water register and monthly bills suggest that the majority of meters are working. Consequently, consumers' average monthly bills vary considerably and their own estimates of their average monthly payments are summarised in Table 2.13.

Table 2.13 - Average Monthly Consumer Water Bills in Katete (K / month)

	Number of households who pay:								
	Less than K4	K4	K5	K6	K7-9	K10-12	K13-15	More than K15	Total excl. those paying less than K4
All responses	2	12	9	4	1	5	2	1	34
Responses from metered consumers	1	10	6	4	1	5	2	1	29

The minimum charge is K4 for up to 35 m^3 per month. Hence 19 consumers use more than 35m^3 per month. The two consumers who pay less than K4 only pay K1 per month. They are both single tap/individual standpipe connections according to the interview data. However, it is not clear whether the consumers really have their own personal standpipes but are

only charged communal rates or whether communal standpipes are so close to consumers that they consider them to be their own. When they are excluded from the analysis 10 metered consumers (35%) use $35m^3$ or less per month. The average monthly bill of the 19 consumers who use more than the basic $35m^3$ per month is K9.63 per month, which represents an average usage of approximately $66m^3$ per month. The median monthly bill of all consumers and of metered consumers alone, is K5 which represents an average monthly use of just over $40m^3$ per month. The average mean monthly bill of all 34 consumers is K7.2. The average mean monthly bill of the 29 metered consumers is K7.7 and their average mean monthly use, (assuming that the average monthly use of those consuming $35m^3$ or less per month is $30m^3$), is approximately $53m^3$.

Since 50% of consumers with house connections in Katete allow neighbours access to their tap, their own use may be lower than that suggested by their monthly consumption figures. However the quantity of water carried away will only represent a small percentage of total use. For example the average taken away daily from those houses permitting use by neighbours is unlikely to exceed 100 litres. Since 50% of households do not allow access to others the overall average taken away from all house connections is unlikely to exceed 50 litres per day or $1.5m^3$ per month.

It should also be noted that the above consumption figures and resulting bills are probably lower than they would be without the existing supply constraint in Katete. Discussions during the field work suggested that consumption in Katete could immediately increase significantly if the supply constraint was relaxed.

2.12 Attitudes to Present Level of Water Rates

Interviewees were asked whether they considered the present water rates to be low, normal or high. In some ways this was a rather poor question because respondents are hesitant to say that they consider charges for any publicly provided service to be low - even if they consider it to

be so. However, the results which are presented in Table 2.14 are believed to provide a useful insight into consumers' attitudes, to present rates, i.e. that they consider them to be perfectly acceptable. 50% of respondents in both townships said that they consider the rates to be normal, and other 50% said that they consider them to be high. Bearing in mind the nature of the question the consultants believe that far less than 50% of consumers really consider the rates to be high.

Table 2.14 - Consumers' Attitude to Present Water Rates

(number of responses)

	Consider rates to be low	Consider rates to be normal	Consider rates to be high
Katete	0	18	17
Mumbwa	1	18	17

It is interesting to note that there was no discernible relationship whatsoever in Katete between a consumer's attitude to the present level of rates and his present level of rates/consumption. For example, not one of the three consumers whose present average monthly bill exceeds K12 considers the rates to be high. Of the 13 consumers whose bill exceeds the present median bill of K5 per month, only six consider present rates to be high, i.e. a similar proportion to that of the whole sample.

2.13 Metering

Interviewees were asked whether or not they had a meter and whether or not it was working. The results are presented in Table 2.15.

Table 2.15 - Number of Meters and Working Meters

	Number of consumers having a meter	Number of consumers without a meter	Number of consumers claiming meter was working	Number of consumers claiming meter was not working	Number of consumers who said they did not know if meter was working
Katete	29	6	29	0	0
Mumbwa	26	9	23	2	1

The initial results of this question were rather surprising since the numbers of meters supposedly working were much higher than expected. Although the metering situation in Katete is better than in most townships, to find all the meters working was unlikely. In Mumbwa it is known that the vast majority of meters do not work and yet respondents claimed that most were working. Hence the survey completely failed to fulfill the intended objective of this question. However, a first follow up investigation in Mumbwa suggested that many consumers believed that their meter was working simply by dint of fact that it existed. It is illuminating to know that many people have absolutely no idea of whether or not their meters are working. Of course in the situation that exists in Mumbwa, where their monthly rates are not dependent on accurate meter readings, there is no need for consumers to know whether their meters are working. In

Katete the water register and billings suggest that a high proportion of meters are working but time did not permit this to be checked. The few meters inspected by the consultants were working.

2.14 Preferred Water Rating Method

Consumers were asked whether they thought water rates should be based on the quantity of water used or should be fixed irrespective of quantity consumed. The results are summarised in Table 2.16.

Table 2.16 - Preferred Water Rating Method

	Number of consumers preferring rate to be based on quantity used	Number of consumers preferring fixed rates
Katete	19	20
Mumbwa	7	28

Whereas approximately 50% of consumers in Katete said that they believed it is better to charge on a quantity used basis, only 20% of those interviewed in Mumbwa shared this view. Most consumers in Mumbwa who preferred fixed rates seemed to believe that they would personally have to pay more if the present fixed rating system in Mumbwa was to be changed to a charging system based on quantity used. However, the hypothesis which follows from this : that high use consumers will generally believe that fixed rates are 'fairer' did not hold in Katete where seven of the 13 highest user consumers said that they believed rates should be based on the quantity of water used. Hence it is surmized that a major reason for the greater appeal of flat rates in Mumbwa is that people prefer what they are used to. Another possible reason is that use by neighbours is extremely low in Mumbwa. In places where people with connections allow

neighbours access to their tap they may prefer metering since it strengthens their case for levying rates from those who use their connection.

The Katete result suggests that even if charging on a quantity used basis in townships which have recently experienced flat rates only was to meet with some initial unpopularity, there would not be any widespread opposition in the longer term.

There was no discernible relationship between consumers' view of the present level of water rates and their preferred rating method. For example, in Katete of the 19 consumers who preferred charging on a quantity used basis, one considered present rates low, eight considered them normal and 10 considered them high. Of the 20 consumers who preferred fixed rates, two failed to give their view of the present level of rates, 10 considered them to be normal and 8 considered them to be high.

Consumers were then asked whether or not they considered water meters to be a good idea. It was hoped that their answers to this question would back up their preferred rating method answers. To a large extent they did but a few interviewees were inconsistent. The responses are presented in Table 2.17.

Table 2.17 - Attitude to Water Meters

	Number of consumers believing water meters are a good idea	Number of consumers believing water meters are not a good idea	Meters are a good idea and water should be charged on a qty. used basis	on a flat rate basis	Meters are not a good idea and water should be charged on a qty used basis	on a flat rate basis
Katete	23	16	18	5	1	15
Mumbwa	16	19	7	9	0	19

Approximately 80% of consumers were entirely consistent in their answers i.e. they believed that either (i) water meters were a good idea and that water should be charged for on a quantity used basis, or (ii) water meters are not a good idea and that water should be charged for on a flat rate basis. One person put forward the strange view that water should be charged for on a quantity used basis but that water meters are not a good idea. A total of 14 persons said that water meters are a good idea but that water should be charged for on a flat rate basis. Some of them may have been inconsistent but some were apparently arguing that while water meters are a good idea in general that they themselves preferred to be charged flat rates.

2.15 Willingness to Pay

In addressing this question it must be stressed that only a very limited reliability can be placed on the results of any willingness to pay investigations other than on those based on historical payment data. This does not usually exist and there was no such data available for townships in Zambia. Hence although care was taken to ensure that the willingness to pay study was as soundly based as possible, the inherent unreliability of such surveys should not be forgotten.

Ideally the survey would have attempted to determine (i) the maximum monthly flat water rate that consumers were prepared to pay and (ii) their maximum willingness to pay for water charged for on a quantity used basis, i.e. the maximum basic charge and maximum rate per cubic metre that they were prepared to pay.

However, in setting up the survey it was obvious that a number of difficulties existed. For example the inability of most consumers to grasp the concept of a cubic metre, meant that there was little point in attempting to determine willingness to pay for water charged for on a quantity used basis. Hence the willingness to pay questions related to the maximum amount that an interviewee would be willing to pay monthly for water. The actual questions related to the maximum monthly flat rate that the consumer would

be willing to pay but it is thought that some interviewers did not always stress the flat rate concept and simply asked a consumer what would be the most that he would be prepared to pay monthly for water, without mentioning the pricing method.

A summary of consumers' responses concerning the maximum monthly flat rate that they would be willing to pay is presented in Table 2.18.

Table 2.18 - Maximum Willingness to Pay Monthly Flat Water Rates

	Number of consumers willing to pay										
	Less than K 2	K2-3.5	K4	K5	K6	K7	K8	K10	K15-18	Median	Mean
Katete	1	6	5	5	4	3	4	5	3	6	6.65
Mumbwa	0	1	0	33	0	0	0	1	0	5	5.05

It can be seen that the present long standing flat rate of K5 in Mumbwa has conditioned the attitude of the people so that virtually all interviewees claimed that this represented their maximum willingness to pay for water. However, in Katete where water is presently charged for on a quantity used basis there was a wide range of answers. The average willingness to pay in Katete was K 6.65 per month and the median was K6. However the results again suggested that people often relate their maximum willingness to pay with what they are paying at the moment.

In order to determine whether sex has any bearing on an interviewee's willingness to pay for water, (for example the fact that the women would be the ones who would have to carry the water home if the consumer did not have a house connection may lead to a difference between the sexes in their willingness to pay for water), the willingness to pay figures for Katete

have been analysed with respect to sex. The results are presented in Table 2.19.

Table 2.19 - Maximum Willingness of Men and Women to Pay for Water in Katete

	Number of interviewees willing to pay a monthly maximum rate of :											
	Total sample	Less than K 2	K2-3.5	K4	K5	K6	K7	K8	K10	K15-18	Median	Mean
Men	21	1	4	4	4	2	1	0	4	1	K5	K5.87
Women	13	0	1	1	1	2	2	4	1	1	K7	K7.31

It would appear that women's willingness to pay for water is slightly higher than that of men.

2.16 Willingness to Pay More for a Better Service

Consumers were asked if they were prepared to pay more for a better service, usually interpreted as a continuous supply. 58 out of 72 respondents (80%) said that they would be happy to pay more if the service improved. Furthermore 21 of the 58 respondents were willing to pay a lot more than they pay at present. Hence it can be concluded with a high level of confidence that improved services should enable DWA to increase prices and revenues.
The summarized results of consumers willingness to pay for a better service are shown in Table 2.20.

Table 2.20 - Willingness to Pay for a Better Water Supply Service

	Number of consumers				
	Willing to pay more for a better service	Willing to pay much more	Willing to pay a little more	Not stated	Unwilling to pay more for a better service
Katete	25	9	14	2	12
Mumbwa	33	12	21	0	2
Total	58	21	35	2	14

The 14 consumers who were unwilling to pay more were asked for their reason. Two interviewees did not give a reason and the responses of the other 12 are shown in Table 2.21.

Table 2.21 - Reasons for Consumer Unwillingness to Pay More for a Better Water Supply Service

(number of consumers)		
Satisfied with present service	Unable to afford more	Own well available as an alternative supply
5	6	1

Hence 10% of all consumers would not want to pay more for a better water supply service because they regard the existing supply as satisfactory while the other 10% are unwilling to pay more because they claim that they could

not afford higher rates.

2.17 Alternative Approach to Consumers' Willingness to Pay

The consultant's experience in assessing consumer willingness to pay for water suggested that the direct question of "what is the maximum that you are willing to pay for water" usually underestimates the real ability and willingness to pay. Firstly a few consumers may wonder whether their answers could influence future rates. Secondly and more importantly consumers may not really be aware of their own willingness when answering a single direct question and their "instant" responses will be highly influenced by what they are paying at present. This hypothesis is also supported by the results of willingness to pay for an improved service which showed a significant willingness to pay higher rates, whereas the initial direct willingness to pay question usually resulted in answers close to the consumers' present monthly bill.

Consequently the quantification of consumer willingness to pay was tackled by an alternative approach which the consultants believe has yielded better results in which a higher degree of confidence can be placed. After an interviewee had stated his maximum willingness to pay for water, the enumerator then asked if the rates were to be fixed at a figure which exceeded his originally stated figure by K2 - 3 whether the interviewee (i) would pay or (ii) would refuse to pay and wait to be disconnected. If the respondent said they would pay the question was asked again with the rate further increased. This process was repeated until the interviewee said they would no longer be willing to pay. The results of this exercise are presented in Table 2.22.

Table 2.22 - The Rate Levels at which Consumers in Katete Would Refuse to Pay

Rate level at which consumers claimed they would cease paying monthly rates	All high service interviewees	High cost housing residents	Other high service interviewees	Male interviewees	Female interviewees
	(number of consumers)				
K32	1	0	1	0	1
K30	3	3	0	1	1
K26	1	0	1	1	0
K25	1	1	0	0	1
K20	11	1	10	9	2
K19	1	0	1	0	1
K17	1	0	1	0	1
K16	1	0	1	1	0
K15	5	1	4	2	3
K10	1	0	1	0	0
K 8	4	0	4	1	2
K 7	1	0	1	0	1
K 5	4	0	4	4	0
less than K5	0	0	0	0	0
T o t a l	35	6	29	19*	13*

* These figures do not total 35, since the sex of two of the interviewees was omitted, while one interview was conducted with the husband and wife together.

The figures in Table 2.22 have been translated into a maximum willingness to pay for water and are presented in Table 2.23.

Table 2.23 - Maximum Willingness of Consumers in Katete to Pay for Water. Estimated by the Cut-Off Point Approach

Rate level at which consumers would just be willing to pay regular monthly rates	All high service consumers	High cost housing residents	Other high service interviewees	Male interviewees	Female interviewees
	(Number of consumers)				
K30	1	0	1	0	1
K28	3	3	0	1	1
K25	1	0	1	1	0
K24	1	1	0	0	1
K18	12	1	11	9	3
K15	2	0	2	1	1
K14	5	1	4	2	3
K 9	1	0	1	0	0
K 7	4	0	4	1	2
K 6	1	0	1	0	1
K 4	4	0	4	4	0
T o t a l	35	6	29	19	13
Median (K)	18	25	15	18	15
Mean (K)	15.37	23.33	13.72	14.79	16.38

The mean willingness to pay of all 35 high service respondents was K15.37 per month, while the median was K18. An analysis in which interviewees living in high cost houses were separated from other high service interviewees tended to support the hypothesis that high cost housing residents have a greater willingness to pay than consumers living in medium cost houses. The results are presented in the third and fourth columns of

of Table 2.23. The high cost housing interviewees mean willingness to pay for water was K23.33 per month compared to K13.72 for other high service interviewees. The respectively median values were K25 and K15 per month.

A further analysis was undertaken to investigate whether there is a significant difference in the willingness to pay for water between men and women. The results are presented in the last two columns of Table 2.23. The mean willingness to pay of 19 male respondents was K14.79 per month, and the corresponding figure for 13 female respondents was K16.38. Given the size of the sample it cannot be said that womens' willingness to pay is significantly higher than that of men. In fact, the median of the male respondents, K18, was higher than that of the women, K15. One interesting feature of the figures is that all four respondents with the lowest willingness to pay were men. The conclusion is that the evidence of the survey suggests that within the high service consumer group, there is no major difference between the sexes in their willingness to pay for water.

A similar willingness to pay for water investigation was undertaken in Mumbwa except that it was not possible to carry out an analysis between the sexes because the sex of the interviewee was not recorded. The figures relating to the price levels at which consumers would refuse to pay are presented in Table 2.24. The translation of these figures into a maximum willingness to pay for water is presented in Table 2.25.

The overall mean willingness to pay is K23.49 but this includes one interviewee with a very high and possibly unrealistic claim concerning his willingness to pay. When this respondent is excluded from the analysis the mean is reduced to K20.94. This is considerably higher than the corresponding figure in Katete, i.e. K15.37 but can nevertheless be said to be of the same order of magnitude. The overall median willingness to pay, K18, is the same as that in Katete.

Table 2.24 - The Rate Levels at which Consumers in Mumbwa Would Refuse to Pay

Rate level at which consumers would cease paying regular monthly rates	All high service inter-viewees	High Cost housing residents	Medium/ high cost housing residents	Medium/ low cost housing residents
	(Number of consumers)			
K120	1	1	0	0
K 50	1	1	0	0
K 40	4	2	1	1
K 35	3	2	1	0
K 30	4	1	3	0
K 25	2	0	1	1
K 20	4	0	3	1
K 18	1	1	0	0
K 15	10	2	2	6
K 14	1	0	1	0
K 10	3	1	1	1
K 5	1	0	1	0
less than K5	0	0	0	0
T o t a l	35	11	14	10

The analysis by housing category shows that the mean willingness to pay of high cost housing residents is K33.64 (median K32) or K26 where the interviewee with the dubious willingness to pay claim is excluded. The respective mean figures for medium/high and medium/low cost housing residents are K20.14 and K17. The mean for all medium cost housing residents is K18.83.

Hence (i) the willingness to pay of the residents of the different categories of housing increases as the class of housing increases, as one

Table 2.25 - Maximum Willingness of Consumers in Mumbwa to Pay for Water Estimated by the Cut-Off Point Approach

Rate level at which consumer would just be willing to pay	All high service consumers	High cost housing residents	Medium/ high cost housing residents	Medium/ low cost housing residents
	(Number of consumers)			
K110	1	1	0	0
K 45	1	1	0	0
K 35	4	2	1	1
K 32	3	2	1	0
K 28	4	1	3	0
K 24	2	0	1	1
K 18	4	0	3	1
K 16	1	1	0	0
K 14	10	2	2	6
K 12	1	0	1	0
K 9	3	1	1	1
K 4	1	0	1	0
Total	35	11	14	10
Median (K)	18	32	18	14
Mean (K)	23.49	33.64	20.14	17
Mean (K) excluding the interviewee with the highest willingness to pay	20.94	26.00	-	-

would have expected, and (ii) the ratios of the willingness to pay of the different resident groups in the two townships is similar, although the willingness to pay in Mumbwa is greater for all groups. For

example, the high cost housing residents mean willingness to pay in Katete is K9.61 higher (70%) than the medium cost housing residents mean. In Mumbwa the difference is K15.31 (83%) or K7.67 (42%) depending on whether or not the interviewee with the very high willingness to pay is included.

2.18 Determination of Appropriate Monthly Charges based on the Survey Data

Table 2.26 shows the number of consumers who would be willing to pay for water at various price levels and the subsequent revenue that would be generated in Katete.

Table 2.26 - Monthly Revenue Generated in Katete at Different Price Levels

Price (K/month)	Total number of consumers paying for water	Total high service revenue (K/mth)	Number of high cost housing residents paying for water	Revenue from high cost houses (K/mth)	Number of medium cost housing residents paying for water	Revenue from medium cost houses (K/mth)
30	1	30	0	0	1	30
28	4	112	3	84	1	28
25	5	125	3	75	2	50
24	6	144	4	96	2	48
18	18	324	5	90	13	234
15	20	300	5	75	15	225
14	25	350	6	84	19	266
9	26	234	6	54	20	180
7	30	210	6	42	24	168
6	31	186	6	36	25	150
4	35	140	6	24	29	116

Table 2.26 shows that total high service revenue can be maximised if a rate of K14 was to be charged. This price would exclude 10 consumers (28%) from the service. However since none of these could be included without dramatically reducing the revenue a rate of K14 would seem to be appropriate unless very little weight is given to the financial criterion.

The revenue from the high cost housing consumers alone would be maximised if a rate of K24 per month was charged. However this would exclude 2 consumers (33%) from the service. They would both be included if the price were reduced to K14 and since this would only reduce revenue marginally a price of K14 for high cost housing areas would seem appropriate.

The revenue from medium cost housing areas would be maximised if a rate of K14 was to be charged. This rate would exclude nine consumers (35%) from the service but since these could only be included by accepting a dramatically reduced level of revenue the rate of K14 per month again seems appropriate.

Table 2.27 shows the number of consumers who would be willing to pay for water at various price levels and the subsequent revenue that would be generated in Mumbwa.

Table 2.27 - Monthly Revenue Generated in Mumbwa at Different Price Levels

Price (K/ month)	Total No. of con- sumers paying for water	Total high service revenue (K/mth)	No. of high cost housing residents paying for water	Revenue from high cost houses (K/mth)	No. of medium cost housing residents paying for water	Revenue from medium cost houses (K/mth)
45	2	90	2	90	0	0
35	6	210	4	140	2	70
32	9	288	6	192	3	96
28	13	364	7	196	6	168
24	15	360	7	168	8	192
18	19	342	7	126	12	216
16	20	320	8	128	12	192
14	30	420	10	140	20	280
12	31	372	10	120	21	252
9	34	306	11	99	23	207
4	35	140	11	44	24	96

Table 2.27 shows that total high service revenue in Mumbwa would be maximised if a rate of K14 was to be charged. This price would only exclude five consumers (14%) from the service. Again the price reduction necessary to include these consumers in the service would mean dramatically reduced revenue. Hence a rate of K14, the same as recommended in Katete, would again seem to be appropriate. However, it would be possible to argue for a higher rate for high cost housing residents in Mumbwa since revenue would be maximised if the monthly rate were to be set at K28 and a rate of K14 would lead to the loss of over 25% of potential revenue from high cost housing residents. However K28 would be politically inappropriate at present, even if most high cost housing residents would be prepared to pay it. Furthermore the revenue at a rate of K14 would be as great as at a rate of K20. Hence it is recommended that a rate of K14 is adopted in the high cost housing areas in Mumbwa. This rate is also appropriate for the medium cost housing areas.

Hence the conclusion of the survey is that if water rates are to be based on a flat rate system a price of K14 would be appropriate in both townships surveyed and in both high and medium cost housing areas despite a significantly higher willingness to pay in the high cost areas. This price would be willingly paid by 80% of high service consumers and would lead to an immediate doubling of revenue in both townships.

3. LOW SERVICE SURVEY

3.1 Family Size

The number of persons in the sample households was investigated and the results are presented in Table 3.1.

Table 3.1 - Average Size of Low Service Consumer Households

	Number of households in sample	Total children	Total adults	Total persons	Average children per h'hold	Average adults per h'hold	Average persons per h'hold
Katete - rural	20	91	81	172	4.55	4.05	8.60
- township	41	164	114	278	4.00	2.78	6.78
- Total	61	255	195	450	4.18	3.20	7.38
Mumbwa - shanty	21	114	113	227	5.43	5.38	10.81
- formal township	33	146	94	240	4.42	2.85	7.27
- Total	54	260	207	467	4.82	3.83	8.65
Total	114	515	402	917	4.52	3.53	8.04

It can be seen that the overall average size of low service households is approximately eight persons of whom over half (56%) are children, (15 years or less). The average size in Mumbwa is slightly higher than in Katete but the most significant feature of the results is that the average family size in the rural area and especially in the shanty area is higher than in the formal township areas. In the formal township areas the average family size is approximately seven persons (6.78 in Katete and 7.27 in Mumbwa). In

the rural area the average is 8.6 persons and in the shanty area the average is nearly 11 persons per household. Another significant feature of the results is that whilst children only represent just over half of the population in the shanty and rural areas they represent approximately 60% of the population in the formal township areas, 59% in Katete and 61% in Mumbwa. It is possible that this is partly due to township families accommodating children of their relatives so that the children can attend school in the township.

3.2 Existing Source Used by Low Service Consumers

In Mumbwa all 35 interviewees resident in formal low cost housing use public standpipes provided by DWA and all 21 interviewees resident in shanty areas use traditional sources i.e. hand-dug wells and streams.

The rural consumers in Katete use traditional sources but the picture in Katete township is less straightforward and while most township residents use public standpipes, a few use wells. The number of households using different sources in the township are shown in Table 3.2.

Table 3.2 - Existing Source Used by Low Service Consumers in Katete Township

	Number of sampled households using	
	Public standpipes	Traditional sources
Main township	23	2
Boma farms	4	2
Stores	9	1
Total	36	5

3.3 Water Containers

Interviewees were asked what containers they used for carrying water home. The summarised results are presented in Table 3.3.

Table 3.3 - Containers Used for Carrying Water Home

	Number of families using :				
	Buckets	Drums	Drums and buck-ets	Buckets plus other	Other
Katete - rural	17	1	-	3	1
- township	37	2	1	1	-
- Total	54	3	1	4	1
Mumbwa - shanty	13	-	-	-	-
- township	10	-	-	1	1
- Total	23	-	-	1	1

It can be seen that 83 out of 88 households use buckets for carrying water home and 77 of them rely solely on buckets. Only four households take water home in large containers i.e. drums.

This question has not provided any useful insight into consumers water use, other than to show that if a family is to use a considerable amount of water, many journeys to the tap/source must be made daily since usually only 10 - 20 litres is carried home at a time.

3.4 Water Carriers

Interviewees were asked which people in the family regularly carry water home. The summarised results are shown in Table 3.4.

Table 3.4 - Number of People who Carry Water Home Regularly

	Number of families with only one regular water carrier	Number of families with more than one regular water carrier
Katete - rural	6	16
- township	27	12
- Total	33	28
Mumbwa - shanty	11	10
- township	255	10
- Total	36	20

In the townships 52 out of 74 families (70%) rely upon one regular carrier for their water. Furthermore the percentages in the two townships are similar, 69% in Katete and 71% in Mumbwa. In nearly all such households the regular water carrier is the wife.

In the rural area only 6 out of 16 households rely on one regular water carrier i.e. in 62.5% of families the task is shared with other family members, usually children. In the shanty area 11 out of 21 families rely on one regular carrier, i.e. in 48% of families the task is shared with other family members. The reason for this increasing concentration of the burden on one person as the level of urbanisation increases was not investigated. There is only a very weak link with the obvious factor of family size and it is hypothesized that a number of unidentified factors such as the level of school attendance may be responsible.

3.5 Consumption by Low Service Consumers

Low service consumers were asked how much water they carried home. The summarised results are presented in Table 3.5.

Table 3.5 - Quantity of Water Carried Home by Low Service Consumers

	Sample Size (No. of h'holds)	Total No. of h'hold members	Total qty.of water consumed (l/d)	Average Quantity of water consumed (litres/person)	
				Mean	Median
Katete - rural	20	172	2349	13.66	13.07
- township incl. boma farms:					
- public standpipes consumers	34	222	3040	13.69	12.50
- traditional source consumers	5	42	585	13.93	15.00
- township combined	39	264	3625	13.73	12.50
Katete - overall	59	436	5974	13.70	12.50
Mumbwa - shanty traditional source consumers	21	227	1645	7.25	14.00
- formal township area, public standpipe users	33	240	2885	12.02	10.00
Mumbwa - overall	54	467	4530	9.70	10.60

Table 3.5 shows that the per capita use at home for all categories of consumer in Katete is between 13.5 and 14 litres. The median figures are slightly lower than the per capita mean figures, but are sufficiently close that the mean figures can be accepted as being reasonably representative of the survey sample. The similarity of the consumption of users of public standpipes and township residents using traditional sources is striking, as is the similarity between the water use of rural and township families. When use at the source is included (c.f. section 3.6) the per capita consumption of the rural sample is even slightly above that of the township samples. Although the accuracy of use at the source is so dubious that one cannot conclude that rural consumers use more water than

low service township consumers, one can say with confidence that overall per capita use in the townships is no higher than in the sample rural area.

The similarity of per capita use of the public standpipe and township traditional source consumers is consistent with the consultant's experience in a wide range of African countries, that as soon as consumers have to carry water they are unlikely to consume more than 15 litres per capita per day at home.

Section 3.6 shows that most consumers do not use much water at the standpipe. It is therefore suggested that as long as township residents continue to use public standpipes their per capita use may remain as low as 15 litres per day, (excluding wastage at the tap). Hence designs based on a consumption criterion of 30 or even 40 litres per day are possibly misguided unless they include the high level of wastage that seems to be inevitable at communal standpipes in Zambia. Furthermore individual connections should, by increasing the water consumption of low use consumers, significantly increase the benefits of a supply. They should therefore be encouraged wherever consumers have the ability to pay for them.

The results in Mumbwa are not so consistent. The mean per capita use from public standpipes in the formal township area is almost two litres (12%) lower than in Katete. The fact that the median value is also 2.5 litres lower suggests that the use in the Mumbwa sample is a little lower than use in Katete.

The most noticeable feature of the Mumbwa figures is the very low per capita consumption in the shanty area. The figure of 7.25 litres per capita is lower than one would expect in any situation where obtaining water was not too difficult or burdensome. It therefore requires a certain amount of interpretation. It is interesting to see that the median family per capita consumption is 14 litres per day, i.e. close to the Katete figures. The apparent anomaly is explained by the fact that the five largest shanty households have very low per capita consumption. The apparent very low use figures of the largest families is probably due in

part to actual use being less, but the low level of consumption is possibly exaggerated by enumerator error. When interviewing one person in a 30 member household it can be extremely difficult to obtain accurate data on how many people normally fetch and how many times per day each carrier goes to the source.

When the five largest shanty households are excluded from the analysis the mean per capita consumption of the other 16 shanty families is 12.22 litres/day. Hence it is concluded that the consultant's survey suggests that a design figure of between 12 and 15 litres for home consumption would be appropriate for both Katete and Mumbwa.

Table 3.6 presents the distribution of per capita use in the different survey areas.

Table 3.6 - Distribution of the Home Water Use of Low Service Consumers

(number of families using :)

	Less than 5/L/p/d	5-10 L/p/d	10-15 L/p/d	15-20 L/p/d	20-25 L/p/d	over 25 L/p/d	Total
Katete - rural	3	4	4	4	3	2	20
- t'ship traditional source consumers	0	2	0	1	1	1	5
- t'ship public standpipe consumers	4	7	9	7	4	3	34
- overall t'ship	4	9	9	8	5	4	39
Mumbwa - shanty	6	3	3	7	2	0	21
- formal t'ship	3	12	7	2	5	4	33
- overall t'ship	9	15	10	9	7	4	54
Complete Survey	16	28	23	21	15	10	113

It can be seen that within every major group, Katete rural, Katete township and Mumbwa township, there is a reasonably even distribution of per capita use, with the peak number of families occuring at about the 10 litre mark.

3.6 Purposes for which Water is Used at the Source and at Home

Interviewees were asked (i) for which purposes they carried water home and (ii) for which purposes they used water at the source. It had been intended that the answers would be used to guesstimate by what percentage use at home should be increased in order to calculate total use. In Mumbwa all consumers did most of their washing at home and little water was used at the source. In Katete township only 2 out of 41 consumers did much washing at the source. Hence it can be concluded that overall per capita water use in both townships is only slightly higher than the per capita home use figures calculated above. However, in the rural areas 9 out of 22 consumers wash most of their clothes at the source. In addition five of those households also wash their utensils there. If it is assumed that the latter's use at the source represents 60% of the water carried home while the use of consumers who only wash their clothes at the source represents 40% of the water carried home, then use at the source for the whole rural sample is approximately 20% of water carried home. This would increase total per capita use to 16.4 litres/day. The extremely tenuous nature of both the assumptions and the results must be stressed.

The summarised results of the purposes for which water was carried home are shown in Table 3.7.

Rather unsurprisingly all interviewees carry water home for drinking, cooking, bathing, washing utensils and washing clothes, although as mentioned above a number of rural families do a considerable part of their washing at the source. Table 3.7 shows that animal watering does not represent a major use of water carried home. In Mumbwa only three households, all living in the shanty area, out of a total sample of 55 carry

Table 3.7 - Purposes for Which Water is Carried Home

	Drinking cooking washing & cleaning only	Drinking cooking washing cleaning & gardening	Drinking cooking washing cleaning & animal watering	Drinking cooking washing cleaning gardening & animal watering
Katete - rural	10	1	1	1
- township	28	6	5	-
Mumbwa - shanty	16	1	3	-
- township	25	10	-	-
- total	41	11	3	-

water home for animals. In Katete two out of 13 rural households and five out of 39 township households do so. Furthermore the amounts given to livestock are usually very small, sometimes just to poultry.

The major non domestic use for which water is taken home is for gardening. Eleven households in the Mumbwa sample, two in the Katete rural sample and six in the Katete township sample carried water home for watering vegetables etc. There is no data on how much water was used for this purpose. However, it is interesting to note that only families living close to their source/standpipe took water home for gardening. For example all 10 households who did so in Mumbwa township lived within 70 metres of their communal standpipe while in Katete township five out of six households who did so lived within 25 metres of their standpipe/ source.

3.7 Distance to Standpipe/Water Source

Interviewees were asked how far they had to travel from their home to their communal standpipe/traditional water source. The results are summarised in Table 3.8.

Table 3.8 - Average Distance from Home to Standpipe/ Water Source

	Number in sample	Average distance (metres)
Katete - rural	22	370
- boma farms traditional source users	2	250
- formal township " " "	3	30
- total " " " "	5	120
- boma farms standpipe users	4	700
- formal township standpipe users	32	60
- total township standpipe users	36	130
- boma farms overall	6	550
- formal township overall	35	55
- Katete township overall	41	130
Mumbwa - shanty	21	500
- formal township	35	55
- township overall	56	220

The main features of the analysis are :

(i) the average distance that the rural consumers in Katete travel to their traditional source is 370 metres.

(ii) the average distance that traditional source consumers living within Katete township travel to their water source is 120 metres but this figure disguises the fact that the average distance travelled by the consumers living in the formal

township area is only 30 metres and that the two boma farms residents travel an average of 250 metres.

(iii) the average distance that public standpipe users living within Katete township travel to their tap is 130 metres, i.e. similar to the average of traditional source users. Again the figure disguises the difference between the consumers living in the formal township area, 60 metres, and the boma farms residents, 700 metres.

(iv) the average distance for the 35 formal township residents is 55 metres compared to 550 metres for boma farms residents. The overall average for all township area dwellers is 130 metres.

(v) six of the 35 formal Katete township residents live 100 metres or more from their standpipe. If they are excluded from the analysis the average distance for the other 29 households is only 22 metres i.e. most formal township residents in Katete live very close to their standpipe.

(vi) the average distance to the traditional source for the 21 shanty residents in Mumbwa is 500 metres. Only three of these families travel less than 200 metres to their source.

(vii) the average distance for the 35 formal township residents is 55 metres,as in Katete. Only three of these households has to travel more than 70 metres for water. If they are excluded from the analysis the average for the other 32 households is only 29 metres, i.e. most formal township residents in Mumbwa live very close to their standpipe.

3.8 Single Journey Time

Table 3.9 summarises the time taken by the respondents in making one return journey to their standpipe/water source.

Table 3.9 - Average Return Journey Time for Water Collection

	Number in sample	Average return journey time - incl. queuing (minutes)
Katete - rural	22	37
- boma farms	6	39
- formal township	35	5
- township overall	41	10
Mumbwa - shanty	21	31
- formal township	35	5
- township overall	56	15

It can be seen that within both formal township areas the average journey time is five minutes. In the other areas (rural, boma farms and shanty) the average journey time is between 30 and 40 minutes. Table 3.10 presents the distribution of journey times.

Table 3.10 - Distribution of Single Return Journey Time

	Number of households having a single return journey time of :						
	5 mins or less	6-10 min.	11-20 min.	21-30 min.	31-45 min.	46-60 min.	over 60 min.
Katete - rural	1	3	3	4	4	6	1
- boma farms	-	-	1	1	3	1	-
- formal t'ship	26	4	3	2	-	-	-
Mumbwa - shanty	3	2	4	5	1	5	1
- formal t'ship	25	7	3	-	-	-	-

It can be seen that within the rural and shanty survey groups there is a relatively even spread of times up to 60 minutes. It was reported that the longest journey times in the shanty area are partly due to queueing. However, within the formal township areas there is a major concentration of journey times of five minutes or less, 26 out of 35 in Katete, and 25 out of 35 in Mumbwa fall into this category. Within the two townships combined only eight households out of 70 have a return journey time that exceeds 10 minutes.

3.9 Total Time Spent Collecting Water

Table 3.11 summarises the time that the survey households spend daily collecting water.

Table 3.11 - Total Time Spent Collecting Water

	Number in sample	Average time spent per family collecting water (mins. per day)
Katete - rural	22	180
- boma farms	6	180
- formal township	35	30
- overall township	41	52
Mumbwa - shanty	21	150
- formal township	35	25
- overall township	56	72

It can be seen that the average time spent daily collecting water by the rural, boma farm and shanty populations is considerable, viz three hours

for the first two groups and over 2.5 hours for the latter. Meanwhile township families only spend about one sixth of this time on average, 30 minutes per household per day, in Katete, and 25 minutes in Mumbwa.

Table 3.12 presents the distribution of total journey times.

Table 3.12 - Distribution of Total Time Spent Collecting Water

	Number of families spending :				
	15 mins. or less per day	16-60 mins./ day	61-120 mins./ day	121-240 mins. per day	over 240 mins. per day
Katete - rural	-	7	4	6	5
- boma farms	-	2	-	2	2
- formal t'ship	24	7	1	3	0
Mumbwa - shanty	1	7	6	2	5
- formal t'ship	15	19	-	1	-

It can be seen that most households in the formal township areas only have to devote a very limited amount of time to collecting water. 39 out of 70 households (56%) spend 15 minutes or less daily collecting water and only five out of 70 households spend more than one hour per day.

However, in the rural, shanty and boma farms areas approximately two out of every three households spend more than one hour daily collecting water. In the boma farms 66% of households, in the rural area 50% of households, and in the shanty area 33% of households, spend more than two hours daily collecting water. Five families in the Katete rural area (23%), five families in the Mumbwa shanty area (24%), and two families in the boma farms area (33%) spend more than four hours per day

collecting water. Hence water collection represents a major labour requirement for at least 28% of the households surveyed outside the formal township areas.

3.10 Average Number of Journeys to Collect Water

Due to (i) the similarity between average daily per capita usage, (ii) the fact that most families carry water in buckets, and (iii) the limited differences in average family size between the different consumer groups, one would expect a close relationship between the different groups' average single journey time and their average time spent collecting water, i.e. the average number of journeys per household within every group should be reasonably similar. Table 3.13 presents the relevant data. It can be seen that the average number of journeys made by families in every group is approximately five per day, with a minimum figure of 4.62 and maximum of 6.00.

Table 3.13 - Average Number of Journeys

	Average single journey time (mins/day)	Average time spent collecting water (mins/day)	Average No. of journeys per day
Katete - rural	37	180	4.86
- boma farms	39	180	4.62
- formal township	5	30	6.00
- overall township	10	52	5.20
Mumbwa - shanty	31	150	4.84
- formal township	5	25	5.00
- overall township	15	72	4.80

3.11 Attitudes to the Work Involved in Carrying Water

Interviewees were asked whether they thought that the time they had to spend carrying water every day was acceptable or too much. The results are summarised in Table 3.14.

Table 3.14 - Attitude to Work Involved in Carrying Water

	Number of families stating :	
	Work is too much	Work is acceptable
Katete - rural	16	6
- boma farms	6	-
- formal township	8	25
Mumbwa - shanty	11	10
- township	6	29

Hence it can be seen that : (i) 16 out of 22 rural families (73%) and 11 out of 21 shanty families (52%) feel that the work involved is too much, and (ii) in contrast only 14 out of 68 families in the two formal township areas (21%) feel that the work involved is too much. Bearing in mind the difference in work involved in the rural/shanty areas and in the formal township areas this result could have been expected. However, the people within particular categories who claimed that the work was too much were not always those with the greatest daily work load. In the Katete rural area the six respondents who said that the work was acceptable included one household in the 60 - 120 minutes daily work load category and two in the 120 - 240 minutes category. In Katete township the three households with the highest time devoted to carrying water said that the

time involved is too much but the other five complainants spend no more than 30 minutes per day. No one in the Mumbwa shanty group spending less than 60 minutes per day complained that the work was too much but the six complainants in the Mumbwa formal township group were not especially burdened, since they spend from 15 up to 50 minutes per day collecting water. While the average time spent by these six households is 30% above the township average, only three of the eight families spending more than 30 minutes per day were complaining.

Although men play very little, if any, part in carrying water for domestic use there was no discernible correlation between an interviewee's attitude to the work involved and his/her sex. For example, in the Katete formal township area where 23 women and 11 men were interviewed five women (22%) and three men (27%) believed that the work involved was too much.

3.12 Use of Time Saved by a Closer Supply

Interviewees were asked what they would do with the time they would save if a standpipe/other source was provided closer to their home. It is felt that the answers have a limited value. The fact that no one said they would spend more time in leisure activities for example beer drinking, suggests that people were constrained in their answers. In the rural sample answers were evenly divided between agriculture and household activities. But 9 out of 10 respondents who answered the question in the Mumbwa shanty area said they would devote the time saved to agriculture. Examination of the more articulate responses suggests that during much of the year the benefit of the time saved would be rather limited but that it would be valuable to those persons engaged in agriculture during periods of peak labour demand.

3.13 Consumer's Attitude to their Traditional Sources

Consumers were asked whether or not they were happy with their existing traditional source supply. The answers are summarised in Table 3.15.

Table 3.15 - Attitude to Existing Traditional Source

	Number of interviewees who were happy with their existing traditional source	Number of interviewees who were not happy with their existing traditional source
Katete - rural	5	15
- township	1	4
Mumbwa - shanty	0	20

It can be seen that only one out of 24 township (including informal area) residents using traditional sources were happy with their water supply. Shanty residents would be extremely happy if the township supply was extended to close by their homes.

3.14 Complaints

Interviewees were asked directly what complaints they have with their existing water supply. The results are summarised in Table 3.16.

Table 3.16 - Consumers' Complaints of their Existing Supply

		Numbers of households complaining that :					
		Number of h' holds sampled	Distance is too far	Water is in sufficient	Colour or taste poor	Queueing is too long	Did not specify any complaints
Katete	- rural	22	12	6	12	12	1
	- boma farms	6	5	4	3	-	-
	- formal t'ship	35	7	10	5	9	11
Mumbwa	- shanty	21	14	9	19	8	-
	- formal t'ship	35	10	5	27	21	-

It should be noted that many households mentioned more than one complaint. The main features of the results are :

(i) as would be expected from the results of section 3.7, high proportions of the rural (55%), boma farms (83%), and shanty (67%) populations felt that their source was too far.

(ii) the complaints in all the different Katete consumer groups are spread over different supply characteristics but most consumers are not very happy with the supply.

(iii) the major complaint in Mumbwa in both the township and shanty areas is the colour of the water from the township supply and shallow wells respectively. A number of the township water supply consumers who complained about the colour said that it was only poor sometimes.

(iv) All residents living in one part of the shanty area complained that they had to queue for a long time.

(v) township residents complaints concerning both queueing and distance seem to arise from higher expectations, i.e. they can compare service they receive with that enjoyed by other people having their own house connection. For example the average distance of those complaining that their standpipe was too far from their house was 110 metres. Five of these households live only 20 - 30 metres from their communal water point and their complaints reflect their wish for their own taps. By contrast, only two of the 14 shanty dwellers complaining about distance lived within 200 metres of their source.

3.15 Alternative Source for Existing Communal Standpipe Consumers

Interviewees were asked what would their alternative water source be if they were denied access to standpipes. The summarised results are shown in Table 3.17.

Table 3.17 - Alternative Source for Existing Communal Standpipe Consumers

	Number of responses				
	Stream	Well	Dam	From other connections *	No alternative
Katete - boma farms	3	0	0	1	0
- formal township	0	15	0	6	0
- overall township	3	15	0	7	0
Mumbwa - formal township	0	0	9	0	26

* either from other standpipes which had not been closed or from neighbours with their own individual connection.

The major feature of Table 3.17 is that whereas all communal standpipe users in Katete have an alternative source available if they could not obtain water from their standpipe, 26 out of 35 respondents in Mumbwa felt that they had no viable alternative.

3.16 Employment

The number of households with a regular source of income from employment was investigated and the results are summarised in Table 3.18. The major features are :

(i) in the Katete rural survey area only three out of 20 rural households (15%) have a member in full time employment and can rely on wages for cash income. Another nine have members who obtain temporary employment. These families cannot rely on wages for their cash needs throughout the year. The remaining eight households depend entirely on agriculture, remittances, etc. for their cash income.

Table 3.18 - Employment in Low Service Households

Katete	Rural area	Boma farms	Other t'ship	Overall t'ship	Total
Households having:	(number of households)				
One person in full time employment	1	5	27	32	33
One person in full time employment and two in temporary employment	1	-	-	-	1
Two persons in full time employment	1	-	-	-	1
Total having regular employment	3	5	27	32	35
One person in temporary employment	6	1	5	6	12
Two persons in temporary employment	2	-	1	1	3
Three persons in temporary employment	1	-	-	-	1
No employment	8	-	1	1	9
Total without regular employment	17	1	7	8	25

Mumbwa	Formal t'ship area	Shanty	Total
Households having:	(number of households)		
One person in full time employment	26	9	35
One person in full time employment and one person in temp. employment	2	2	4
Two persons in full time employment	4	0	4
Total having regular employment	32	11	43
One person in temporary employment	1	9	10
Two persons in temporary employment	0	1	1
Total without regular employment	1	10	11

(ii) in Katete township 32 out of 40 households (80%) have at least one person in full time employment/business. Seven other families obtain temporary employment. Thus only one family has no source of cash income from employment or business.

(iii) in the formal low cost housing area in Mumbwa 32 out of 33 families (97%) have at least one member in full time employment.

(iv) in the shanty area in Mumbwa only 11 out of 21 families (52%) have a member in full time employment and thus a regular source of income from employment.

Hence most (88%) households resident in the formal housing areas in townships have a regular source of cash income from employment from which they can pay regular water rates. However if a piped water supply were to be introduced to the shanty area in Mumbwa, where nearly 50% of families have to rely on spasmodic income, regular water rates might present a significant proportion of the population with a cash flow problem. However, it should be noted that Section 3.17 shows that average incomes in the shanty area are similar to those in the formal township area. In the Katete rural area monthly water rates could present a major problem to a population largely dependent on cash from seasonal agricultural production and temporary employment.

3.17 Incomes

Income data was collected from low service consumers but as has been mentioned earlier this type of data collected during a single interview survey has a limited reliability. The major limitation relates to income from agriculture due to its seasonal nature. Interviewees claimed agricultural income figures for the previous month and previous year were compared taking seasonal variations into account. Nevertheless the rural income figures should be treated with extreme caution.

The summarised results of 102 low service consumers' responses are presented in Table 3.19.

Table 3.19 - Low Service Consumer Monthly Incomes in Katete and Mumbwa

	Number of h'holds in sample	Average income Mean (K/mth)	Median (K/mth)	Notes
Katete - rural	20	57.50*	31	* This figure excludes the income from two large farms whose enumerated incomes are open to serious doubts. If they were included the mean would increase to K178.55.
- boma farms	6	84.00*	48	* This figure excludes the income from one large farm whose enumerated income is open to serious doubts. If it was included the mean would increase to K270.
- formal township	22	144.55	100	
- total township	28	133.33*	90	* This figure increases to K147.86 if the large boma farm is included.
Mumbwa - shanty	21	156.76	105	
- formal township	33	149.85	134	
- total township	54	152.53	122	

The major features of Table 3.19 are : (i) that despite the lower level of regular employment in the Mumbwa shanty area, the average income is similar

to that in the formal township area, (ii) that the mean income levels in the two formal township areas are similar, (iii) the mean figure for the overall township is significantly higher in Mumbwa than in Katete if the large boma farm consumer is excluded from the analysis, and (iv) the median income figures for both the overall and formal township areas are approximately K30 higher (30%) in Mumbwa than in Katete. The distribution of income is shown in Table 3.20.

Table 3.20 - Distribution of Income of Low Service Households in Katete and Mumbwa

	Number of households earning : (K / month)								
	Less than 50	50-79	80-99	100-129	130-159	160-199	200-299	300-499	500 and over
Katete - rural	12*	0	2	0	1	1	2	0	2
- boma farms	3	1	0	0	0	0	0	1	1
- formal t'ship	1	3	3	6	5	0	3	1	0
Mumbwa - shanty	2	5	1	4	1	3	2	2	1
- formal t'ship	1	0	3	12	6	6	4	1	0

* eight of which are less than K10 per month

It can be seen that the rural population can be divided into two main groups. The first consisting of 60% of the total having extremely low incomes, and another 30% with reasonable incomes. In addition two families have high incomes. The distribution of the boma farms households is also split between the majority with low incomes and a minority with high incomes. The distribution of the low cost formal housing residents in Katete township is more even but with a concentration in the range K80-K160 per month. The distribution of low cost formal housing residents in Mumbwa is reasonably similar but concentrated in the range K100-K200. In the shanty area of Mumbwa incomes are evenly spread over a wide range and there is no concentration within any narrow range.

It is possible that average incomes are slightly higher than the above figures suggest. This is due to the fact that only income from wages, business and agriculture was quantified. Hence minor income sources such as remittances have not been included. Eleven rural families, seven families in Katete township, four shanty families and two families in Mumbwa township had such minor sources of income. However the overall under-estimation is unlikely to exceed 10% and may well be under 5%.

If the generally acknowledged maximum acceptable water rate of between 3% and 5% of cash income were applied, a rate of K4 would be affordable by 50 out of 55 interviewees (91%) resident in the formal low cost housing areas in the two townships, but any rate much above K5 would exclude a significant proportion of low cost housing families and would therefore be unacceptable. For example a rate of K6.50 would represent more than 5% of the income of 29 (53%) low cost housing families. Hence the consultants recommend that K4 / month represents the highest rate that should be charged for communal standpipe access.

3.18 Disease Awareness

Low service consumers were asked whether they knew what causes diarrhoea, (a water borne/water washed disease) and scabies, (a water washed disease). The objective of the question was twofold. Firstly simply to determine the level of consumer awareness of the causes of the diseases and hence the value of (a) pure water and more importantly (b) sufficient water for adequate washing. Secondly to determine whether any correlation could be found between awareness of the health value of water and willingness to pay for piped water. However, there was no discernible link in the survey results between disease awareness and consumers' willingness to pay.

The summarised results of the interviewees' awareness of the causes of diarrhoea and scabies are shown in Table 3.21.

It appears that while most members of the survey sample (75%) have a reasonable idea of the causes of diarrhoea, the causes of scabies are poorly

Table 3.21 - Low Service Consumers' Awareness of the Causes of Diarrhoea and Scabies

	Diarrhoea		Scabies		
	Number of interviewees having a reasonable idea of the causes	Number of interviewees having little idea of the causes	Number of interviewees having a reasonable idea of the causes	Number of interviewees having the wrong idea of the causes	No. of interviewees having little idea of the causes
Katete - rural	18	2	4	14	2
- township	16	13	3	6	15
- total	34	15	7	20	17
Mumbwa - shanty	20	1	5	7	2
- formal t'ship	23	9	13	3	5
- total	43	10	18	10	7
Overall total	77	25	25	30	24

comprehended, with only 32% of respondents having any notion of the causes. In fact the true percentage may have been even lower since this question was left blank on some interview forms although it is probable that "don't know" should have been filled in on some of them. The level of awareness of the causes of disease seems to be higher in Mumbwa than in Katete, with 81% having some idea of the causes of diarrhoea compared to 69% in Katete, and with 51% having some idea of the causes of scabies compared to 16%. However the difference in the awareness of the causes of scabies is possibly exaggerated. While the answer was left blank on only four Katete interview forms, it was left blank on 18 Mumbwa interview forms. As mentioned above it is probable that the real answer on many of the blank forms was "don't know". The most surprising result for which the consultants can offer no explanation is that disease awareness was higher in the Katete rural sample than in Katete township. In addition while the knowledge of scabies was better in the formal housing

area in Mumbwa than in the shanty area, the reverse was true for diarrhoea.

3.19 Simple Well Equipment Preference

Interviewees were asked, if their only source was a well, would they prefer that it was equipped with a handpump or with a windlass and bucket. The results are presented in Table 3.22 from which it can be seen that an overwhelming preference was expressed for a handpump. The reasons given for this preference are summarised in Table 3.23.

Table 3.22 - Simple Well Equipment Preference

	Number of interviewees who preferred a:	
	Handpump	Windlass & bucket
Katete - rural	17	1
- township	25	1
Mumbwa - shanty	10	3
Total	52	5

Table 3.23 - Reasons for Handpump Preference

	Katete rural	Katete t'ship	Mumbwa shanty	Total
Easier to operate/ less effort	7	4	-	11
Saves time	3	1	-	4
Cleaner/safer water	5	8	4	17
No risks to children/ nothing can drop in*	-	-	3	3

* where the emphasis was on dirt falling in, the response has been allocated to "cleaner/safer water".

It can be seen that those who gave reasons for prefering a handpump stressed cleaner water and less effort.

The four respondents who preferred windlass and bucket did so on the grounds that handpumps break down more easily. In addition where there is a problem with the windlass and bucket the local people can easily fix it. They believed that handpumps could remain unrepaired for a long time. Despite the sound reasoning behind many peoples' preference for handpumps the few people arguing in favour of a windlass and bucket were more convincing. It is hypothesized that the large majority favouring handpumps was largely due to the fact that there is very limited experience of handpumps among the respondents. Those currently using hand-dug wells are mainly using buckets. They therefore know the disadvantages - i.e. extra work, less pure water, etc., but are not so familiar with the problems of handpump breakdowns.

3.20 Present Water Rates

In Mumbwa shanty area and Katete rural area no one pays since they are using natural sources and their own hand dug wells. In the formal housing area of Mumbwa township all 35 respondents are using communal standpipes. Mumbwa council gave up collecting rates from communal standpipes some years ago. Most interviewees said that they are not supposed to pay and in fact do not pay for water. Nevertheless a few respondents claim to be paying varying amounts. This may be due to the fact that the questionnaire does not bring out the fact that they are being charged by a neighbour for using his tap. In one or two cases the answer may simply be complete rubbish. It is interesting that non collection by Mumbwa council has resulted in many people believing that they are not supposed to pay for water 'because they are using communal facilities'. Of course in practical terms their view in Mumbwa is correct but it is

contrary to government policy. A few people said they didn't know why they don't pay rates.

Katete council has been more conscientious in collecting from communal standpipe users. Their objective is to collect from all consumers but like most other councils find that they are unable to fulfill it due to the difficulty of enforcement etc. The contrast with Mumbwa is revealed by the summarised results of interviewees' responses to the question of whether they pay at present, shown in Table 3.24.

Table 3.24 - Rate Payment by Low Service Households in Katete Township

	Formal township	Boma farms	Total t'ship
Total number of h'holds in sample	35	6	41
Use natural sources	3	2	5
Use communal standpipes	32	4	36
Number of consumers who said that:			
They are supposed to pay and claim to do so	24	1	25
Employers pay on their behalf	0	2	2
They should pay but they don't	4	0	4
They don't know whether or not they are supposed to pay but they do not	2	0	2
They believe they are not supposed to pay and they do not	1	1	2
No response	1	0	1
Total	32	4	36

It can be seen that 31 out of 36 consumers using communal standpipes recognise the fact that they should be paying for water i.e. in a township where the council at least tries to collect the revenue from communal standpipe consumers, the vast majority are aware that they should be paying water rates. 25 of the 31 interviewees who recognise that they should be paying for water claimed that they are paying but there was insufficient time to check whether they really are paying. It is probable that some of them are in arrears. It is also interesting to note that four of the 31 interviewees who recognise that they should be paying for water rates brazenly do not pay. Furthermore even if everyone who claims to pay rates actually does so at least nine out of 36 consumers (25%) do not pay at all.

Only 19 of the 25 interviewees who claimed to be paying knew how much they paid. It is hypothesized that the ignorance of the six other respondents is due either to (i) absent husbands being responsible for the family's financial affairs or (ii) interviewees having claimed falsely that they actually pay rates when in practice they manage to escape doing so. 18 of the 19 who know how much they pay said they pay K1 per month which accords with the official price. The other interviewee claimed to pay K5. This is either an error or the standpipe which he was using is recorded as his own individual standpipe.

3.21 Willingness to Pay for Handpumps

When rural consumers were asked how much they would be willing to pay as a regular monthly rate for a handpump, the usual reaction was, why should we pay? The rural people see no reason why they should pay monthly rates for handpumps and the general view is that they should be free. Nevertheless some said that they would be willing to contribute to the cost of repairs occasionally.

Table 3.25 summarises the interviewees' responses to the question of whether or not the community would collect repair fees in case of breakdowns.

Within the township areas 30 out of 37 respondents said that the community would collect the money for the repair fees but there was not

one constructive suggestion of how this could be done. In the rural area over 50% of the people felt that their only responsibility would be to report the breakdown to the government or to the "people concerned" who would be expected to come and fix it without payment.

Table 3.25 - Community Responses to Handpump Breakdowns

	Number of interviewees who said:			
	Community would collect	Would report to come and fix	Would not collect	Other responses
Katete - rural	9	11	-	-
- township	22	-	3	-
Mumbwa - shanty	8	-	1	3

Among the four who would not contribute, two simply stated that they personally would not contribute but one of the others said that the problem was that some would always refuse and the result would be that collection would be unsuccessful. It is believed that this respondent is correct as are the three listed under "other" who basically said that the people would talk about the problem.

It is concluded that a willingness to pay repair fees exists, provided they are reasonably low. Unfortunately the consultants do not believe that it will be possible to introduce any single method of collection that will be successful on a wide scale.

3.22 Willingness to Pay for Continued Standpipe Access

Existing communal standpipe users were asked what would be the maximum monthly water rate they would be willing to pay for continued standpipe access. The responses of Katete interviewees are summarised in Table 3.26.

Table 3.26 - Maximum Willingness of Consumers in Katete to Pay for Continued Standpipe Access

Maximum willingness to pay (K/month)	K1	K1.50	K2	K3	K5
Number of responses	11	1	5	5	2

It is important to remember that interviewees' responses to this type of question will be conditioned by the rate they are paying at present. Since they are currently paying K1 per month it is hypothesized that despite (i) the fact that only 50% (12/24) of respondents claimed that they would be willing to pay K2 and (ii) an average willingness of K1.98 per month, that the majority would be willing to pay K2-3 per month for continued access. This hypothesis is tested in section 3.24.

In Mumbwa the continued access willingness to pay question was mistakenly put by some enumerators and the absolute answers are of limited value. However one useful result was that the average willingness of those 21 households who did not see a viable alternative source available to them (cf. section 3.15) had an average willingness to pay four times that of those nine households who said they could use a dam if denied access to communal standpipes. Although the misunderstandings involved in the continued access question meant that no firm conclusions could be reached it did appear that a certain willingness to pay for water existed. This was confirmed by further questioning, the analysis of which is presented in section 3.24.

3.23 Traditional Source Consumers' Willingness to Pay for Public Standpipe Access

Consumers using traditional sources at present were asked how much they would be willing to pay for access to a public standpipe close to their home. The results are summarised in Table 3.27.

Table 3.27 - Traditional Source Consumers' Willingness to Pay for Public Standpipe Access

	Number of interviewees willing to pay: (K/month)				
	K0	K0.1-0.5	K0.6-1.0	More than K 1	Average (K)
Katete - rural	2	6	5	4	0.94
- township	0	0	3	0	1.00

	Number of interviewees willing to pay: (K/month)			
	Less than K2	K2	More than K2	Average (K)
Mumbwa - shanty	5	5	5	2.10

The figures for Katete township are not very meaningful since the sample is so small and because, as has been discussed earlier, interviewees' maximum stated willingness to pay is conditioned by what they know the existing rate to be.

The major features of the analysis are :

(i) the low willingness of rural consumers to pay for communal standpipe access. In a situation where most consumers were unhappy with their existing supply almost half of the interviewees were unwilling to pay anything over 50 ngwee/month for public standpipe access.

(ii) the high willingness of Mumbwa shanty residents to pay for communal standpipe access. 67% of interviewees claimed that they would be willing to pay K2 per month and the overall mean willingness to pay was K2.1 per month.

Later in the interview after respondents had been asked how much they would be willing to pay for their own connection, they were asked, if the

rates charged for individual connections were to exceed their willingness to pay, how much would they pay to use a shared standpipe. Clearly this question is very similar to the above question of how much would they be willing to pay for access to a communal standpipe. However the answers to the second question were higher than those to the first question. Unfortunately this was not discovered in the field and the reasons for the difference can only be guessed. There are two main possibilities : (a) having just been talking about individual connection rates interviewees were thinking in terms of higher prices, (b) some interviewers brought out a difference between access to a communal standpipe which could be 100 metres from the home and shared standpipes which are within a few metres of the three or four consumers who are intended to use them. The consultants' feeling is that it is unlikely that emphasis was put on the public/shared standpipe difference.

The average answers to the second question were:

Katete township	K1.5 (up from K1)
Katete rural	K1.9 (up from K0.94)
Mumbwa shanty	K2.59 (up from K2.1)

In Mumbwa seven respondents were willing to pay more than K2 (up from five), six were willing to pay K2 (up from five), and three were unwilling to pay as much as K2 (down from five). In Katete rural area 14 out of 17 interviewees were willing to pay K1 (up from eight).

3.24 Low Service Consumer's Basic Supply Preferences

Low service interviewees were asked whether they would prefer to use a reliably functioning standpipe close to their home for which they would have to pay K2-3 per month or a free shallow well equipped with a handpump. The results are summarised in Table 3.28.

The main conclusions are (i) that virtually all rural people would prefer a free well equipped with a handpump, (ii) overall at least 84%

Table 3.28 - Low Service Consumers' Supply Preferences

		Prefer to pay K2-3 per month	Prefer free wells equipped with handpumps	Not sure	Total
		(number of responses)			
Katete	- rural	1	20	-	21
	- boma farms currently using natural sources	1	-	-	1
	- boma farms currently using public standpipes	-	1	3	4
	- formal t'ship currently using natural sources	-	1	-	1
	- formal t'ship currently using public standpipes	24	3	1	28
	- overall township	25	5	4	34
Mumbwa	- shanty	11	4	-	15
	- formal township	32	3	-	35
	- overall township	43	7	-	50

(69/82) of all township residents would prefer to pay K2-3 monthly for a properly functioning public standpipe. The reasons why the calculated figure of 84% is qualified by "at least" is that a few of the respondents in the shanty area did not answer the question since they said that they would prefer their own connection. It is probable that these persons would prefer to pay K2-3 for public standpipe access to a free well equipped with a handpump. The area figures were, Katete formal township 86% (24/28), Mumbwa formal township 91% (32/35), and Mumbwa shanty area 73% (11/15).

It is noteworthy that over 90% of formal township residents who are today using communal standpipes say that they would prefer to pay K2-3 for access rather than to switch to a free well. This supports the consultant's hypothesis in Section 3.22.

3.25 Conclusions for Low Service Rates

1. It is probable that there would be widespread resistance to paying monthly rates for wells equipped with handpumps. It is considered that any attempts to charge consumers regularly would meet with failure. Furthermore while a willingness to contribute towards repair costs does exist, it is considered unlikely that collection by government would prove successful.

2. Within the township areas there is an ability and expressed willingness to pay monthly water rates for communal standpipe access of around K2 per month. The major problem relates to the administrative capability to collect these rates in view of the collection problems discussed in the Main Report. It appears clear that the low nationwide level of collection from communal standpipes is due to the fact that consumers are able to "get away" without paying and is not due to a basic inability and unwillingness to pay the existing rates.

3. If Mumbwa shanty is typical of urban shanty areas the comments made above with respect to formal township areas also apply to shanty areas. Median incomes and hence the ability to pay are somewhat lower than in the formal township areas but nevertheless the willingness to pay, in Mumbwa shanty at least, is as high as in the township areas. Unfortunately the collection problems facing the authorities will be even more difficult to overcome.

4. The willingness of rural consumers to pay for access to communal standpipes is higher than their willingness to pay for wells equipped with handpumps. However it is still much lower than in the poorer township areas. This is probably largely due to the much lower incomes and ability to pay. Furthermore virtually all rural people would prefer a free well equipped with handpump to a public standpipe for which rates would be charged. It is concluded that only a minority of rural households would be willing to pay any realistic rate for the service. In addition the problems of collection would be insurmountable until there is an improvement in administrative efficiency.

3.26 Existing Communal Standpipe Users' Wish for Their Own Connection

Communal standpipe users in the formal township areas were asked whether or not they would like their own connection. The results are presented in Table 3.29.

Table 3.29 - Communal Standpipe Consumers Wish for their Own Connection

	Number of respondents who would like their own connection	Number of respondents who did not want their own connection
Katete	28	5
Mumbwa	32	3

It can be seen that overall 88% of consumers currently using standpipes would like to have their own connection. The figures for Katete and Mumbwa separately were 85% and 91% respectively. The answers to this type of question must be treated with caution since although some respondents will base their answer on whether or not they think they can afford a connection, others may say yes in the sense they would to the question of whether or not they would like an expensive car. The vital question of effective demand is therefore tackled in Section 3.28.

3.27 Traditional Source Users Higher Service Supply Preference

Interviewees who currently obtain their water from traditional sources were asked whether they would prefer to have their own connection or to have access to a public standpipe. The results are presented in Table 3.30.

Table 3.30 - Traditional Source Users Higher Service Supply Preference

	Mumbwa shanty	Katete t'ship	Katete rural
Number of respondents who would prefer to have their own connection	8	0	11
Number of respondents who would prefer to have access to a public standpipe	11	4	7
Number of respondents who wanted neither	1	1	0
Number of respondents equally happy with both	0	0	1
T o t a l	20	5	19

As was discussed in Section 3.27 answers to this type of question must be treated with caution. The expressed high desire of rural consumers for their own connections would not represent effective demand. The latter is discussed below.

3.28 Low Service Consumers Willingness to Pay Monthly Rates for Their Own Connection

All interviewees were asked how much they would be willing to pay as a regular monthly water rate for their own connection. Interviewers were supposed to put two separate questions : (i) how much would they be willing to pay monthly for their own individual standpipes, and (ii) how much would they be willing to pay monthly for their own house connection. Unfortunately the interview sheets often only show one answer. It is not always possible to determine to which question the answer applies. Where this has occurred the answer has been assumed to apply to the house connection question. Consequently there may be a minor underestimation in the estimated figures of the average willingness to pay for house connections. The results are summarised in Table 3.31.

Table 3.31 - Willingness to Pay Monthly Water Rates

	Number of respondents willing to pay (K/month)							
	Less than K3	K3-4.5	K5	K5-8	More than K8	Average (K)	Average (K) where distinction was clear	
							House connection	Individual standpipe
Katete - rural	15	3	1	3	0	2.37	2.37	1.06
- township	0	5	8	0	1	4.78	4.25	2.50
Mumbwa - shanty	4	3	6	1	1	4.33	5.00	2.66
- t'ship	5	8	9	4	6	5.67	7.50	3.60

The main features of Table 3.31 include :

(i) where interviewees made a clear distinction between their willingness to pay for (i) an individual standpipe and (ii) for a house connection, the figure for the latter was approximately double that for the former.

(ii) the willingness of rural consumers to pay was very limited. The average willingness to pay was K2.37 per month and 68% of households were unwilling to pay K3 per month.

(iii) in all other survey areas the consumers expressed a willingness to pay present day rates. Even in the shanty area the average willingness to pay was K4.33 per month and 47% of interviewees (8/17) were willing to pay at least K5 per month. In Katete the average was K4.78 and 64% (9/14) were willing to pay K5 or more per month. In Mumbwa the average was K5.67 and 59% were willing to pay K5 or more per month.

It was believed that the answers to the open question of how much are

you willing to pay could underestimate the true willingness to pay. A major reason for this is that consumers' responses will be partly influenced by what they are paying today. This hypothesis was put to the test by asking low service interviewees whether they would be willing to pay K5-8 per month for their own connection. The results are summarised in Table 3.32.

Table 3.32 - Willingness of Low Service Consumers to Pay K5-8 Monthly for Their Own Connection

	Katete rural	Katete t'ship	Mumbwa shanty	Mumbwa formal t'ship
Number of respondents who were:				
- Willing to pay K5-8 monthly	8	15	11	30
- Unwilling to pay K5-8 monthly	14	14	9	5
- Not sure	-	3	1	-
Total	22	32	21	35

Those interviewees who were unwilling to pay K5-8 monthly rates for their own connection were asked why. Apart from four interviewees in formal township areas who said that their existing communal standpipe was so close to their home that they had no need of their own connection, all those who answered the question said that they could not afford K5-8 per month.

Table 3.32 suggests that a considerable willingness to pay monthly rates exists among todays low service consumers. Within the formal township areas approximately 50% in Katete and 85% in Mumbwa claim that they would be willing to pay K5-8 for their own connection.

This raises the question of why aren't there a larger number of connections today when many consumers who do not have them are apparently willing to

pay existing rates. This question was not formulated until the socio-economic survey analysis revealed the apparently high willingness of low cost housing residents to pay water rates. Hence it was not tackled in the field.

The consultant's hypothesis is as follows : although Table 3.32 suggests that the direct willingness to pay question did in fact underestimate the true level of willingness to pay, it could be argued that the question of "would you be willing to pay K5-8 per month" may overestimate the willingness to pay. This is due to peoples' propensity to answer yes when a question requiring a yes or no answer is put to them. However, even if Table 3.32 does overestimate the willingness of low service consumers to pay water rates, it is clear that the willingness to pay is still high and many consumers who would be willing to pay existing rates do not have their own connection.

It is believed that there are three main reasons why this apparent willingness to pay monthly rates has not been translated into more house connections. Firstly the implementation capacity of DWA in many townships to provide new connections is extremely limited and sometimes borders on non-existent. Secondly the willingness to pay for new connections is far below the level of today's connection fees. (cf. Section 3.29). Thirdly most of the housing in the low service formal township areas belongs to the government and councils, thus complicating the connection issue.

Table 3.32 also shows that even in the Mumbwa shanty and Katete rural areas 52% and 36% respectively of respondents claimed that they would be willing to pay existing monthly rates for their own connection. The consultants believe that although the rural figure should be treated cautiously it does suggest that within the Katete rural survey area more consumers would be willing to pay K5-8 monthly for their own connection than would be willing to pay K2-3 for communal standpipe access.

However, Section 3.29 shows that the real dampening influence on the effective demand for house connections in the shanty and rural areas will probably be the connection fee.

3.29 Willingness to Pay Connection Fees

Low service consumers were asked how much they would be willing to pay to be connected to a piped water supply, bearing in mind that they would subsequently have to pay monthly rates. Some consumers with a low willingness to pay monthly rates answered the question but in nearly all cases their willingness to pay connection fees did not exceed K10. Consequently the analysis has been restricted to those respondents who claimed that they were willing to pay rates of K5+ per month. The results are summarised in Table 3.33. Katete township is excluded because the question was not properly understood by some enumerators and/or by many interviewees.

Table 3.33 - Low Service Consumers Willingness to Pay Connection Fees

	Number of respondents willing to pay :					
	Less than K10	K10-19	K20-29	K30-49	K50-70	Over K 70
Katete - rural	0	5	1	1	1	0
Mumbwa - shanty	7	1	0	1	0	1
- formal t'ship	5	2	10	7	5	1

It can be seen that the willingness to pay connection fees even by those consumers willing to pay monthly rates of K5+ is rather limited. In Katete rural area the majority were unwilling to pay connection fees exceeding K15. The mean and median maximum connection fee figures for these rural consumers were K22 and K15 respectively.

In the Mumbwa shanty area the majority of those willing to pay monthly rates of K5+ for their own connection were unwilling to pay a connection

fee as low as K10. The mean figure was K18. This low level of willingness to pay is possibly partly due to many shanty dwellers being ignorant of the real costs of a new connection.

In the formal Mumbwa township area five respondents were unwilling to pay a connection fee of K10 but 23 out of 30 were willing to pay K20 or more. The mean and median figures were K28 and K25 respectively. From the interview forms it was not always clear whether the connection fee willingness to pay related to an individual standpipe connection or to a house connection. In those cases where a clear distinction had been made the willingness to pay for a house connection was almost double that for an individual standpipe. Since a few of the other responses may relate to individual standpipes it is probable that the mean willingness to pay for a house connection is slightly higher than the calculated figure of K28, i.e. perhaps K30. Based on those 20 responses where the distinction was clear this would suggest that the mean willingness to pay for connection fees for individual standpipes is just over K15.

Hence it can be concluded that the current connection fee of K100 would deter nearly all low service consumers who are willing to pay the monthly bills associated with a higher service from taking up their own connection.

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