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FOR

THE REPUBLIC OF ZAMBIA

VOLUME TWO

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10 RECOMMENDED TARIFFS AND THEIR FINANCIAL IMPLICATIONS

10.1 Calculation Base

In order to present financial projections of actual cash flows the rate of inflation must be estimated. At present inflation in much of the developed world has fallen to well below 10%. It seems likely to remain below this figure for some years unless a major unforeseen crises occurs. Since inflation in Zambia is partly influenced by worldwide inflation, the consultants would suggest that a fugure of 10% may be appropriate for the 1980's. However, such projections are beyond the scope of the consultants and accurate answers elude even those with access to the most sophisticated models. Therefore, any estimates for the period of the analysis of this study would be pure guesswork. Hence it is considered more appropriate to express all costs, financial analyses, water rate recommendations, etc. in 1983 prices. Consequently all figures in this report are expressed in 1983 values unless it is explicitly stated otherwise.

It is further assumed that augmentations for which studies have been undertaken commence operating and yield revenue from 1983. This obviously does not accord with the real situation. However, the methodology adopted will lead to the formulation of an appropriate level of tariffs and to an accurate assessment of the financial performance of the township supplies providing that the major assumptions adopted in the study, in particular that rates increase roughly in line with inflation, are reasonable. Furthermore calculations based on, for example, the various augmentations coming into operation at various points in time during the 1980's, would add considerably to the arithmetic, would be dependent on similar assumptions and would not increase the accuracy of the conclusions.

The costs of, and revenue from, connections is excluded from the overall financial analyses since the net costs, i.e. total costs of connection less revenue, will be low. The connection fees are expected to cover the costs of connection in high and medium cost areas. In low cost areas it is expected that councils will be responsible for the costs of connecting council properties. Consequently the subsidy cost of private connections in low cost areas to DWA will be small. It would be negligible compared to the capital costs of necessary augmentations and small relative to feasibility study cost errors.

In order to determine the financial implications of any pricing policy, assumptions have to be made regarding consumption criteria, family size, the division of population and water between different consumer categories and the proportion of expected rates and delivered water that will actually be paid for. The figures used in this Section explicitly and implicity are discussed in Appendices E, F, G and H.

10.2 The Need to Keep Water Rates in Line with Inflation

In examining the question of water rates the phenomenom of inflation and the conflict which it causes must not be ignored. Frequently water rates are allowed to fall behind inflation. This may occur because governments try to use publicly provided services as one of the instruments in "the fight against inflation". However the more usual reason for failing to keep water rates in line with inflation is that often when an increase is proposed it is considered politically inappropriate to increase the rates at that particular point in time. For example, councillors insist that the consumers could not afford to pay the increases now and suggest delays. Unfortunately often no later time is appropriate either. In the face of this well-intentioned opposition many governments lack the political determination to back unpopular measures. However, if rates do get out of line with inflation the financial viability of the supply will be undermined. In addition the rates will be out of line with government's policy goals provided that they were rationally determined in the first place. The result will be that either larger subsidies are required or the service will eventually deteriorate. There is nothing wrong in principle with subsidisation and as is discussed in this report subsidisation of the township water supplies is considered both necessary and appropriate. However, subsidies should be planned and sanctioned with the knowledge of their extent and implications, and not arise by default by failing to increase prices in line with inflation. In fact, in the Zambian context where it is government policy to limit increases in subsidies, a deterioration in the quality of service would be possible. Consequently if government implements a water pricing policy that is based on a certain rationale it is important that the water rates are regularly revised in order to maintain the real value of the rates originally determined.

In order to determine the optimal period before water rates are revised it

is necessary to trade off the need to keep them in line with inflation with practicality and political considerations. The former would suggest very frequent increases but the latter suggest tempering enthusiasm for constant increases. It is proposed that increases every two years would be suitable for DWA water supplies. They may also need to be revised, though much less often, for incremental cost changes. Consequently when the two yearly inflation increase is being investigated, the planners should also examine whether marginal cost alterations justify additional changes in the rates.

Even if there is no local political opposition to rate increases, or if that opposition is overcome, the process of increasing water rates takes time both for DWA and councils. Councils have the ability to set their own rates, but increases are subject to central government approval before they can be implemented. More than one financial secretary suggested to the consultants that central government is now granting requests to increase rates, which are supported by a reasoned argument, more easily than they did a few years ago. It is possible that this is a reflection of the overall financial situation and of a policy to reduce public sector subsidisation. Nevertheless the process from when the council staff propose the increase, to the council and government approval stages, to implementation takes time. Hence, calculations of necessary rate increases should allow for this delay.

The second time related problem is that if rates are set to achieve a given objective at the time of implementation, continuing inflation will mean that revenue will fall short of achieving this objective within months of the new rate coming into force. One possible solution, given the fact that rate increases can only be introduced periodically, is that the new rates should be selected to achieve the desired objective at some point in the future. The intention would be to ensure that the revenue surplus over the financial target during the early part of the new rates' life, would to some extent balance the probable deficit during the latter part of its life. Hence if increases every two years are deemed feasible, rates might be set to achieve the agreed finarcial objective based on probable costs one year after the new rate is introduced.

As discussed in Section 10.1 all rate recommendations made in this report are expressed in 1983 prices. Therefore, the reader can estimate the recommended rates for any particular year by applying the probable

inflation from 1983 to the base figures.

10.3 Pricing Uniformity

An important national water pricing question is whether a uniform pricing structure should be adopted for all townships or whether rates should be based on the economic/financial characteristics of individual township water supplies.

The Western Province study recommended that, with one major exception, a uniform rating structure should be adopted. This meant that although the basic pricing policy recommended by the consultants encompassed the idea that rates should be related to costs and the actual rate structure depended upon the cost structure of the overall programme, the water rates within an individual township were not so closely related to the costs of the water supply. Consequently the efficiency criterion which strictly requires that different prices are charged at different supplies depending on the marginal costs of the supply would have been contravened in some townships. The following factors influenced the recommendation:

(a) it is administratively simple and practical
(b) it is equitable that consumers in different towns with similar levels of income pay identical water rates.
(c) future cost data, are not sufficiently precise to justify a policy which would depend on reasonably accurate cost figures for both construction and operation.
(d) a uniform rate can be set to match whatever economic criteria is appropriate for DWA supplies as a whole.
(e) a uniform rate need not seriously contravene economic criteria since although the cost structures of the different township supplies are different all their marginal costs are low in comparison to their costs.

Identical rate charges were recommended for most of the townships. The one exception to a uniform pricing policy related the fact that metering and charging on a quantity consumed basis was recommended for Lukulu and Namushakende. Hence the recommendation was that there should be just two rate structures for the eight supplies under study.

The consultants still believe that there is considerable merit in having

different water rates which reflect the widely varying costs of production. In the longer term this could discourage major water users from locating in areas where water production costs are highest. In the shorter term it is especially important to discourage wastage in townships where production costs are high.

While water rates at schemes presently operated by DWA are reasonably uniform, there are major differences in the price of water at supplies operated by councils. It is a tenable view to accept these differences in price at supplies operated by different authorities but to require uniformity at supplies run by DWA. But there are two other possible policies. The first would be that all urban and township supplies should adopt a uniform policy. The second which the consultants favour would be to allow different prices in different townships related to the supply costs. While approximately 50 water supplies are currently being operated by DWA, the decentralisation policy suggests that such supplies will eventually be taken over by district councils when they have adequate manpower resources. A completely uniform policy now would mean that the councils at high cost supplies would inherit facilities whose revenue bore little resemblance to costs.

However, despite tending to favour a differential pricing policy in theory, the consultants recommend a uniform pricing policy for the short/medium term, largely for practical reasons. The following factors were considered decisive:-

(i) it is recognised that equity, ability to pay and political criteria cannot be ignored and they will act as constraints on the different rates that could be charged in different townships

(ii) while DWA continues to run many disparate supplies the disadvantages of a large number of different prices would outweigh its advantages

(iii) most DWA officials interviewed by the consultants strongly felt that DWA should have a uniform pricing policy

(iv) the most urgent pricing change required in DWA's rates is a large increase. A differential pricing policy would complicate the issue, increase the opposition and delay the necessary price increase.

If DWA continues to run township water supplies for a considerable period in the future it is hoped that a limited differential pricing policy would

be introduced. However, this question should only be examined after the general level of rates has been brought into line with the consultants' recommendations, or with governments' modification to these, and after a pattern of regular two yearly rate increases to keep rates in line with inflation has been established.

10.4 Basis for the Pricing Recommendations

The cost of producing water, ignoring the capital costs of major augmentations which DWA could not hope to recover, i.e. the costs of operation and maintenance and of minor augmentations is around 30n/m^3 (cf. Section 3.9) This means that the cost of water supplied is around 36n/m^3 due to leakage and other losses. However Appendix H suggests that leakage is only part of the water produced for which DWA will be unable to collect revenue. It is estimated that revenue will only be collected for 51% of all water produced. Hence, in order to cover all operation and maintenance and limited augmentation costs, DWA would need to charge 60n/m^3.

For a typically 7 person family living in high/medium cost housing and consuming 250 l.c.d. a rate of 60n/m^3 would represent a monthly rate of about K32. The socio-economic survey showed that only a minority would be willing to pay this figure. For a typical 7 person household living in low cost housing and consuming 100 l.c.d. from their own connection, a rate of 60n/m^3 would represent a monthly rate of about K13 per month, again well above the average willingness to pay.

Hence it is recommended that the major criteria in determining DWA's rates should be consumers' maximum willingness to pay for water. Table 10.1 summarises average ability and willingness to pay (cf. Chapter 5)

Table 10.1

Summary of Average Ability and Willingness to Pay for Water

	Ability to pay (K/month)	Willingness to pay (K/month)
For individual connections:-		
High cost housing	20	25
Medium cost housing	12.5	15
Low cost housing	5	-
For communal point access :-		
Low cost housing	3	2
Informal housing	1.75	2.10

10.5 Proposed Tariffs

It is considered impratical to charge different rates in medium and high cost housing and the following rates are proposed as the maximum flat rates that should be levied in providing consumers with the "design criteria" consumption.

High and medium housing cost families	- K15 per month
Low cost families with own connection	- K 6 per month
Communal standpipe consumers	- K 2 per month

These represent rates of approximately 28n/m^3 for house connection consumption and 23.5n/m^3 for communal standpipe consumption.

However, as was discussed in Chapter 6, it is recommended that all major consumers are metered immediately and that universal metering is adopted as soon as DWA develops the necessary technical and administrative capability to handle the problems of metering. The following rates are recommended :-

High and medium cost domestic, institutional industrial and commercial consumers.	- K10.50 for the first 35m^3/month and K0.50/m^3 for additional consumption
Low cost domestic consumers	- K4.00 for the first 20m^3/month K0.30/m^3 for the next 15m^3/month and K0.50/m^3 for additional consumption

The former rates were based on the following rationale:-

(i) the minimum charge for metered consumption should be well below any flat rate charges,

(ii) high and medium cost domestic consumers who restrict their consumption to approximately 66% of their design consumption should only have to pay the minimum monthly rate.

(iii) for this inital consumption a unit rate of 30n, i.e. the cost of producing the actual consumption, is considered appropriate.

(iv) hence the minimum monthly rate allowing for 35m^3 per household should be K10.50. per month.

(v) for consumption above this the rate should be considerably higher.

The proposed rates mean that high/medium cost domestic consumers who use their design consumption would have to pay K19.25/month. This is below the average willingness to pay of high cost domestic consumers. Those not willing to pay this rate must simply restrict their consumption, but even the minimum monthy rate of K10.50 allows 170 l.c.d. which should be more than enough for all domestic use.

The proposed rates also mean that large users will pay 50n/m^3 for most of their consumption. They will, therefore, be an important source of revenue and will more than pay DWA's recurrent costs of supplying them with water.

The recommended rates for low cost domestic consumers were based on the following rationale:-

(i) the minimum charge for metered consumption should be well below any flat rate charges,

(ii) low cost domestic consumers who restrict their consumption to just below their design consumption should only have to pay the minimum monthly rate,

(iii) for this initial consumption a concessionary rate of 20n/m^3 is considered appropriate,

(iv) hence the minimum monthly rate for consumption up to 20m^3/month should be K4,

(v) consumption above 20m^3/month and up to the amount allowed to other consumers, i.e. 35m^3/month, should be charged at the rate applicable to other consumers i.e. 30n/m^3,

(vi) for excessive consumption above 35m^3/month, low cost consumers should pay the same as other consumers, i.e. 50n/m^3.

The proposed tariff structure represents a compromise between the conflicting criteria:-

(i) it meets social criteria to the extent that the recommended prices should not lead to the exclusion of any consumers from the supply because they cannot afford the rates. Even the poorer township consumers are not being asked to pay much more than 2% of their monthly cash incomes,

(ii) it accords with economic criteria at all supplies other than those where there is considerable spare capacity, to the extent that the price of additional consumption and marginal costs are both high.

Charging rates to meet long term marginal costs in full would not be socially or politically possible.

(iii) it accords with the financial criterion to the extent that revenue should cover a very significant proportion of recurrent expenditure. The recommended policy also takes political reality and the need to facilitate its implementation and administration into account. For example, the one national uniform policy is based on these factors rather than on economic and financial criteria.

While the recommended prices imply substantial capital subsidies they will still appear high from the view-point of many consumers. It is strongly recommended that the actual demand for water at these prices should be carefully monitored to ensure that a realistic pricing policy is being followed.

10.6 Reduced Rates at Unreliable Supplies

The problem of unreliability and the fact that this will increase consumer resistance, (especially of unmetered households), to paying their monthly rates is discussed in Section 11.15.It would be impratical to attempt to tackle inequity within a particular town, arising from area supply differences, by differential water rates. However, it would be feasible to charge lower rates to all consumers in townships where the supply is especially unreliable. DWA would determine in which towns the level of service fell below a certain acceptable level. The consultants suggest that in such towns unmetered consumers should be charged the minimum rate applicable to metered consumers, i.e. high/medium cost households would pay K10.50 instead of K15, and low cost households would pay K4 instead of K6. While this type of proposal is no substitute for improving reliability and while major inequities, particularly within individual townships will remain, it is considered to be a move in the right direction.

10.7 Projected Revenue from Typical DWA Supplies

10.7.1. Supplies with Major Augmentations

Tables 10.2 and 10.3 present projected revenues in 1983 and 1988 respectively at supplies with major augmentations (i.e. where there is no supply constraint throughout the period 1983-8), when domestic consumers are charged flat rates. The numbers of consumers in the different supply categories and institutional demands were based on the projected demands of the typical

supplies combined with the consumption criteria and division of water projections presented in Appendices F and G.

The revenues for every consumer category were estimated by multiplying the proposed flat rates, i.e. K15, K6 and K2 for high cost, low costI and low cost II categories respectively, by the estimated number of consumers in the group. The income from institutional/other consumers was estimated by multiplying demand by an overall price of 45n/m^3. This was based on their obtaining 25% of their total demand at 30n/m^3 and the remainder at 50n/m^3. Finally all incomes were reduced to allow for non collection of expected revenue, by 10% for high/medium cost, low costI and institutional/other consumers and by 50% for low cost II consumers. The resultant figures are shown in Tables 10.2 and 10.3 as the incomes from the different consumer categories at the different supplies. The last two columns show total monthly and annual incomes at the different "typical" supplies. It can be seen that the income of the typical overall average DWA township supply is expected to increase from just over K37,000 in 1983 to over K51,000 by 1988. DWA's total income, based on 50 supplies is therefore expected to increase from around K1.87 million in 1983 to K2.58 million in 1988.

Tables 10.4 and 10.5 present projected revenues in 1983 and 1988 respectively at supplies with major augmentations when all consumers, other than low cost II are metered.

The numbers of consumers are assumed to be the same as in Tables 10.2 and 10.3. The revenues are based on these numbers combined with the consultants' consumption criteria and the proposed metered water rates. It can be seen that while revenue from high/medium cost consumers increases, the revenue from low cost consumers decreases. The latter assumes that low cost consumers will heed the incentive built into the proposed rates to restrict consumption to the level of their consumption criteria. Overall revenue is only 5-6% higher than when flat rates are charged, due to the restrictive effect that metering is expected to have on consumption.

Supplies where no, or only limited, augmentations are made will fail to meet all consumer demands. Consequently separate revenue calculations have been made for these situations. These are presented below.

10.7.2 Supplies with Limited Augmentations

The average typical supply will meet virtually all (97%) demands in 1983, but will only provide 70% of the water demanded by 1988. Nevertheless, it is suggested that the same flat rates should be charged as in the major augmentation situation. This will mean that the revenues at supplies with limited augmentations where flat rates are charged. will be the same as those shown in Tables 10.2 and 10.3 in 1983 and 1988, respectively.

The consultants' calculations show that while income from low cost II consumers will remain unchanged, overall revenue at the typical overall average supply which is universally metered, will fall by approximately 3.6%. While the particular characteristics of the selected large, medium and small schemes mean that this figure will vary between different typical supplies, from 0-7%, it would be pedantic to build in these minor differences into the calculations, and the overall reduction in revenue will be applied to all supplies.

The corresponding overall revenue reduction in 1988 is estimated at 30%, although it is only by chance that this figure equals the percentage by which capacity fails to meet demand. Again, although the figure will vary between the different typical supplies, from 28% to 35% the overall percentage reduction in revenue will be applied to all supplies.

The projected total revenues at schemes with limited augmentations for both the flat rate and universal metering situations are shown in Tables 10.6 and 10.7 for 1983 and 1988, respectively.

10.7.3 Supplies without Augmentations

Typical supplies without augmentations will fail to meet demands even in 1983. The overall average shortfall is estimated at 35%. By 1988 this will have increased to over 53%. This means that the supply will be very unreliable. It is, therefore, considered that the revenue projections should be based on the rates proposed for particularly unreliable supplies. It has been estimated that in 1983 revenue at supplies with flat rates would be approximately 65% of what it would have been in a supply constraint free situation. The corresponding figure for 1988 is 60%.

If supplies without augmentations are metered, the revenue would be similar to that where flat rates are charged. This is because the supply constraint is such that the average consumer's consumption will be restricted to, or even below, the quantity allowed for the minimum charge.

The projected total revenues at schemes without augmentations for both the flat rate and universal metering situations are shown in Tables 10.6 and 10.7 for 1983 and 1988, respectively.

10.7.4 Summary of Total Revenue for the Alternative Situations

Table 10.6 and 10.7 summarise total expected revenues for the different augmentation situations, for the different supply categories, for both flat rate and metered rating structures, for 1983 and 1988, respectively.

It can be seen that based on the assumptions of this report that the revenues in the metered and unmetered situations will be similar, the difference is under 6% in the major augmentation situation and 2% in the limited augmentation situation. Given the level of imprecision in financial projections of this type, differentiating between the two situations may not always be justified, and the rounded average incomes shown in the last column of every augmentation situation could be used for some purposes.

Table 10.2

Revenue from Typical Supplies in 1983 with Flat Rates for Domestic Consumers

Supply Category	Number of domestic consumers			Institutional/ other consumption (m^3/day)	Income (K/annum) from				Total income (K/month)	Annual income (K/annum)
	High/ medium cost	Low cost I	Low cost II		High/ medium cost	Low cost I	Low cost II	Institutional/ other		
Large supply	204	274	542	138	2754	1480	542	1676	6452	77424
Medium supply	102	137	271	69	1377	740	271	838	3226	38712
Small supply	36	48	95	24	486	259	95	292	1132	13584
Overall average supply	98	132	261	67	1323	713	261	814	3111	37332
Total annual revenue										1866600

Table 10.3

Revenue from Typical Supplies in 1988 with Flat Rates for Domestic Consumers

Supply Category	Number of domestic consumers			Institutional/ other consumption (m^3/day)	Income (K/annum) from				Total income (K/month)	Annual income (K/annum)
	High/ medium cost	Low cost I	Low cost II		High/ medium cost	Low cost I	Low cost II	Institutional/ other		
Large supply	284	380	752	192	3834	2052	752	2332	8970	107640
Medium supply	142	190	376	96	1917	1026	376	1166	4485	53820
Small supply	50	66	132	34	675	356	132	413	1576	18912
Overall average supply	136	183	362	92	1836	988	362	1118	4304	51648
Total annual revenue										2582400

Table 10.4

Revenue from Typical Supplies in 1983 with Metered Rates for Domestic Consumers

Supply Category	Income (K/month) from				Total income (K/month)	Total income (K/annum)
	High/ medium cost consumers	Low cost I consumers	Low cost II consumers	Institutional/ other consumers		
Large supply	3534	1060	542	1676	6812	81744
Medium supply	1767	530	271	838	3406	40872
Small supply	624	186	95	292	1197	14364
Overall average supply	1698	511	261	814	3284	39408
Total annual revenue						1970400

Table 10.5

Revenue from Typical Supplies in 1988 with Metered Rates for Domestic Consumers

Supply Category	Income (K/month) from				Total income (K/month)	Total income (K/annum)
	High/ medium cost consumers	Low cost I consumers	Low cost II consumers	Institutional/ other consumers		
Large supply	4920	1470	752	2332	9474	113688
Medium supply	2460	735	376	1166	4737	56844
Small supply	866	255	132	413	1666	19992
Overall average supply	2356	708	362	1118	4544	54528
Total annual revenue						2726400

Table 10.6

Summary of Total Revenue in 1983 for the Alternative Situations

(K/month)

Supply Category	Full augmentation			Limited augmentation			No augmentation		
	Flat rates	Metered rates	Overall rounded average	Flat rates	Metered rates	Overall rounded average	Flat rates	Metered rates	Overall rounded average
Large supply	6452	6812	6630	6452	6570	6510	4191	4191	4190
Medium supply	3226	3406	3320	3226	3285	3260	2095	2095	2090
Small supply	1132	1197	1160	1132	1154	1140	735	735	730
Overall average supply	3111	3284	3200	3111	3166	3140	2019	2019	2020
Total annual revenue			1920000			1884000			1212000

Table 10.7

Summary of Total Revenue in 1988 for the Alternative Situations

(K/month)

Supply Category	Full Augmentation			Limited augmentation			No augmentation		
	Flat rates	Metered rates	Overall rounded average	Flat rates	Metered rates	Overall rounded average	Flat rates	Metered rates	Overall rounded average
Large supply	8970	9474	9220	8970	6587	7780	5382	5382	5380
Medium supply	4485	4737	4610	4485	3293	3890	2691	2691	2690
Small supply	1576	1666	1620	1576	1158	1370	945	945	940
Overall average supply	4304	4544	4420	4304	3161	3730	2582	2582	2580
Total annual revenue			2652000			2238000			1548000

10.8 Revenue from Consumers Using Communal Points

The collection rates from consumers using communal facilities are estimated as follows:-

low cost II consumers	- 50%
informal housing consumers	- 0%

These figures may appear rather pessimistic but they represent an improvement on the current situation. The resulting revenues for the full augmentation situations are shown in Tables 10.2 and 10.3 under revenue from low cost II consumers. It is assumed that these revenues will be the same in the limited augmentation situations.

However in the without augmentation situations the unreliability of the service will be such that the lower rates for unreliable supplies, i.e. K1 for communal consumers, are recommended. Hence revenues from communal facilities will only be 50% of those in the full and limited augmentation situations.

Table 10.8 expresses the revenues from communal point consumers in the different augmentation situations as percentages of the total "overall rounded average revenues" shown in Tables 10.6 and 10.7.

Table 10.8
Revenue from Communal Standpipe Consumers
(expressed as percentages of total revenues)

	Full augmentation	Limited augmentation	No augmentation
1983	8.2%	8.3%	6.4%
1988	8.2%	9.7%	7.0%

It can be seen that based on the consultants' "probable" projection consumers who use communal facilities will only contribute about 8% of total expected revenue. If the level of successful collection from low cost II consumers was increased to 90%, the communal point consumers' contribution would increase to over 13.5% of total revenue. In the unlikely event that 50% of potential revenue was also collected from informal housing residents, the revenue from consumers using communal facilities would increase to

approximately 25% of total revenue. Hence it can be concluded that revenue from communal point consumers will always make a relatively minor contribution to total revenue. The consultants expect it to remain below 10%, provided that a "reasonable" revenue collection performance is maintained at individual connections.

In other words a totally free communal standpipe policy would in practice, probably result in a loss of total revenue of less than 10%, i.e. its financial effect would be very limited.

10.9 Unit Revenues

Tables 10.9 and 10.10 present estimates of:-

(i) total revenues
(ii) revenues from individual connections
(iii) total production
(iv) production for individual connections
(v) average revenue per m^3 of water production
(vi) average revenue per m^3 of water produced for individual connections,

for the typical overall average supply in 1983 and 1988 respectively.

It can be seen that the average unit revenue is around 15n/m^3 of water produced. The average unit revenue from water produced for individual connections consumers, i.e. their consumption and the associated leakage, is 24n/m^3.

10.10 Cost of Collection

Section 14.7 suggests that one man should be able to read the meters, bill and collect the money from a total of just under 300 metered individual connection consumers and a similar number of communal standpipe consumers. This means that at the consultants' "typical" township supplies the following number of men will be required to perform the billing and collection tasks:-

		1983	1988
Large supplies	-	2 men	3 men
Medium supplies	-	1 man	2 men
Small supplies	-	1 man	1 man
Overall average supply	-	1 man	2 men

Table 10.9

Unit Revenues at the Typical Overall Average Supply in 1983

	Total income (K/annum)	Income from individual connections (K/annum)	Total water produced (m^3/annum)	Total water produced for individual connections (m^3/annum)	Average revenue of water produced (n/m^3)	Average revenue of water produced for individual connections (n/m^3)
Major augmentation	38400	35270	693	397	15.2	24.3
Limited augmentation	37680	34550	672	385	15.4	24.6
No augmentation	24240	22670	448	257	14.8	24.2

Table 10.10

Unit Revenues at the Typical Overall Average Supply in 1988

	Total income (K/annum)	Income from individual connections (K/annum)	Total water produced (m^3/annum)	Total water produced for individual connections (m^3/annum)	Average revenue of water produced (n/m^3)	Average revenue of water produced for individual connections (n/m^3)
Major augmentation	53040	48700	963	552	15.1	24.2
Limited augmentation	44760	40420	672	385	18.2	28.8
No augmentation	30960	28790	448	257	18.9	30.7

At small supplies the one man will be under-employed, but since it is believed that billing and revenue efficiency requires a man specifically allocated to the tasks, his full cost should be allocated to the cost of collection.

The average cost an office worker is around K2100 per annum, including the costs of benefits (cf. Section 3.6). If an allowance of 33% of the cost of labour is added for overheads (occasional transport, stationery, etc.), the annual cost of collection at typical townships will be:-

		1983	1988
Large supplies	-	K5600	K8400
Medium supplies	-	K2800	K5600
Small supplies	-	K2400	K2500 (assuming lower overhead costs)
Overall average supply	-	K2800	K5600

10.11 Costs of Metering

Table 10.11 presents the annual costs of meter provision, replacement and maintenance at the different typical supplies when (i) only major consumers are metered, (ii) all high/medium cost domestic users are metered, and (iii) all individual connections are metered. The figures are based on an annual cost of K25 per meter. Table 10.12 presents the total costs of metering and revenue collection, i.e. the addition of the figures in Table 10.11 and Section 10.10.

Table 10.11

Cost of Metering (K/annum)

Supply Category	Only major consumers are metered		All high/ medium cost domestic consumers are metered		All domestic consumers are metered	
	1983	1988	1983	1988	1983	1988
Large supply	500	700	5600	7800	12450	17300
Medium supply	250	350	2800	3900	6225	8650
Small supply	100	125	1000	1375	2200	3025
Overall average supply	250	350	2700	3750	6000	8325

Table 10.12

Total Costs of Metering and Revenue Collection (K/annum)

Supply Category	Only major consumers are metered		All high/ medium cost domestic consumers are metered		All domestic consumers are metered	
	1983	1988	1983	1988	1983	1988
Large supply	6100	9100	11200	16200	18050	25700
Medium supply	3050	5950	5600	9500	9025	14250
Small supply	2500	2625	3400	3875	4600	5525
Overall average supply	3050	5950	5500	9350	8800	13925

Based on a total of 50 typical overall average supplies the annual costs of metering are as follows:-

	1983	1988
Under universal metering	K 12,500	K 17,500
Under universal metering in high/medium cost areas	K135,000	K187,000
Under metering of major consumers only	K300,000	K416,250

The total annual costs of metering and revenue collection are therefore as follows:-

	1983	1988
Under universal metering	K152,500	K297,500
Under universal metering in high/medium cost areas	K275,000	K467,500
Under metering of major consumers only	K440,000	K696,250

10.12 Financial Performance of the Township Water Supplies

Table 10.13 presents a summary of the annual costs of typical DWA supplies in a universal metering situation. It brings together the development and operation and maintenance costs from Chapter 3 and the costs of metering and revenue collection from Sections 10.10 and 10.11. Table 10.14 compares these costs with the expected 1983 revenue from the same typical overall average supply with universal metering.

Table 10.13

Total Costs of Typical Supplies under Universal Metering - 1983 (K/annum)

Supply Category	Annual costs of development and operation and maintenance	Annual costs of metering and collection	Total annual costs	Annual costs of operation and maintenance	Total annual costs excluding development costs
Large					
no augmentation	91788	18050	109838	91788	109838
limited augmentation	103532	18050	121582	89912	107962
full augmentation	414858	18050	432908	142458	160508
Medium					
no augmentation	56080	9025	65105	56080	65105
limited augmentation	66409	9025	75434	55513	64538
full augmentation	274939	9025	283964	93339	102364
Small					
no augmentation	23446	4600	28046	23446	28046
limited augmentation	30883	4600	35483	24527	29127
full augmentation	151208	4600	155808	46334	50934
Overall average					
no augmentation	51443	8800	60243	51443	60243
limited augmentation	61028	8800	69828	51203	60003
full augmentation	258218	8800	267018	86220	95020
Medium (using diesel)					
no augmentation	75878	9025	84903	75878	84903
limited augmentation	90640	9025	99665	79744	88769
Small (using diesel)					
no augmentation	33724	4600	38324	33724	38324
limited augmentation	41868	4600	46468	35512	40112
full augmentation	162742	4600	167342	57868	62468

Table 10.14

Comparison of Total Costs and Revenue at Typical Supplies under Universal Metering - 1983

Supply Category	Annual revenue (K/annum)	Total costs (K/annum)	Percentage of costs covered by revenue (%)	Total recurrent costs (K/annum)	Percentage of recurrent costs covered by revenue (%)
Large					
no augmentation	50292	109838	45.8	109838	45.8
limited augmentation	78840	121582	64.8	107962	73.0
full augmentation	81744	432908	18.9	160508	50.9
Medium					
no augmentation	25140	65105	38.6	65105	38.6
limited augmentation	39420	75434	52.2	64538	61.1
full augmentation	40872	283964	14.4	102364	39.9
Small					
no augmentation	8820	28046	31.4	28046	31.4
limited augmentation	13848	35483	39.0	29127	47.5
full augmentation	14364	155808	8.9	50934	28.2
Overall average					
no augmentation	24228	60243	40.2	60243	40.2
limited augmentation	37992	69828	54.4	60003	63.3
full augmentation	39408	267018	14.8	95020	41.5
Medium (using diesel)					
no augmentation	25140	84903	29.6	84903	29.6
limited augmentation	39420	99665	39.6	88769	44.4
Small (using diesel)					
no augmentation	8820	38324	23.0	38324	23.0
limited augmentation	13848	46468	29.8	40112	34.5
full augmentation	14364	167342	8.6	62468	23.0

It can be seen that the revenue at the typical overall average supply will cover:-

(i) approximately 40% of costs in the no augmentation situation
(ii) approximately 54% of total costs and 63% of recurrent costs in the limited augmentation situation
(iii) approximately 15% of total costs and 42% of recurrent costs in the full augmentation situation.

Hence township water supplies will cover between 40% and 60% of their recurrent costs and in the major augmentation situation a total subsidy of 85% of all costs will be required.

Table 10.14 shows that there is a variation between scheme categories, the revenue of large schemes covers an additional 5-10% of costs in the different situations, but at small schemes it covers 10-15% less in the different situations.

The use of diesel by increasing annual costs by K20,000-25,000 at medium sized schemes and K10,000-12,000 at small schemes reduces the percentage of total costs covered by revenue by 8-13%, except in the small supply full augmentation situation where the additional diesel cost is small relative to the very high capital cost.

The use of diesel reduces the percentage of recurrent costs covered by revenue by between 8 and 17% in all situations other than small supply full augmentation where the reduction is only 5%.

This detailing of all the different supply category/augmentation situations in the 1983 full metering situation typifies the differences that will occur in other situations. Hence in order to limit the tabulation of data the description from hereon will be limited to the typical overall average supply.

Table 10.15 presents the annual costs and revenue of the typical overall average supply with universal metering in 1988. A comparison with the overall average supply in 1983 figures (cf. Table 10.14) shows that the overall 1988 revenue-cost ratio is similar. There is a slight improvement

in the no and full augmentation situations but a slight deterioration in the limited augmentation situation. About 50% of costs are covered, except in the full augmentation situation when under 20% of all costs (50% of recurrent costs) are covered.

Tables 10.16 and 10.17 present the revenues and costs of a typical overall average supply in 1983 and 1988 respectively when only major consumers are metered. It can be seen that the ratio of costs covered increases between 1983 and 1988. This is largely due to the fact that the same total amount of water is being delivered to a higher number of flat rate consumers.

It can also be seen that the ratio of costs covered in 1983 is similar in the universal and limited metering situations. It is somewhat higher in the flat rate no, and limited, augmentation situations since the major benefits of the costs incurred in metering is a better distribution of water rather than greatly increased revenue. The difference between the ratios increases in 1988 where the cost of failing to meter is a greater level of unreliability in the supply.

A feature of all the above analyses is the higher proportion of total costs that are covered by revenue in the limited augmentation situation in 1983 and 1988 under both metering conditions.

Table 10.15

Comparison of Total Costs and Revenue at the Typical Overall Average Supply in 1988 with Universal Metering

	Annual revenue (K/annum)	Total costs (K/annum)	Percentage of costs covered by revenue (%)	Total recurrent costs (K/annum)	Percentage of recurrent costs covered by revenue (%)
Overall average supply					
no augmentation	30984	65368	47.4	65368	47.4
limited augmentation	37932	74953	50.6	65128	58.2
full augmentation	54528	275734	19.8	103736	52.6

Table 10.16

Comparison of Total Costs and Revenue at the Typical Overall Average Supply in 1983 when only Major Consumers are Metered

	Annual revenue (K/annum)	Total costs (K/annum)	Percentage of costs covered by revenue (%)	Total recurrent costs (K/annum)	Percentage of recurrent costs covered by revenue (%)
Overall average supply					
no augmentation	24228	54493	44.5	54493	44.5
limited augmentation	37332	64078	58.3	54253	68.8
full augmentation	37332	264859	14.1	92861	40.2

Table 10.17

Comparison of Total Costs and Revenue at the Typical Overall Average Supply in 1988 when only Major Consumers are Metered

	Annual revenue (K/annum)	Total costs (K/annum)	Percentage of costs covered by revenue (%)	Total recurrent costs (K/annum)	Percentage of recurrent costs covered by revenue (%)
Overall average supply					
no augmentation	30984	57393	54.0	57393	54.0
limited augmentation	51648	66978	77.1	57153	90.4
full augmentation	51648	267759	19.3	95761	53.9

Table 10.18 presents the projected overall financial position and deficits facing DWA township water supply activities in 1983 and 1988 based on the above analyses and on the assumption that DWA will be operating a total of 50 supplies. The annual deficits will be between K1.3 and K1.8 million in 1983 and between K0.8 and K1.8 million in 1988 in the different no and limited augmentation situations. However, if major augmentations were made at all township supplies, the total annual deficit would be between K10.8 and K11.4 million. The recurrent deficit alone would be between K2.4 and K2.8 million. Hence the proposed price structure and levels will not allow DWA to cover its recurrent costs, i.e. DWA will fail to meet the objective of covering the operation and maintenance costs. As a broad generalisation the proposed water rates will only enable DWA to cover half of its recurrent and limited augmentation capital costs.

Table 10.18

Overall Financial Position of DWA Township Water Supplies

	Year	Level of Metering	Annual revenue (K/annum)	Total costs (K/annum)	Percentage of costs covered by revenue (%)	Total recurrent costs (K/annum)	Percentage recurrent costs covered by revenue (%)	Overall deficit (K/annum)	Recurrent deficit (K/annum)
no augmentation	1983	universal	1,211,400	3,012,150	40.2	3,012,150	40.2	1,800,750	1,800,750
limited augmentation	1983	universal	1,899,600	3,491,400	54.4	3,000,150	63.3	1,591,800	1,100,550
full augmentation	1983	universal	1,970,400	13,350,900	14.8	4,751,000	41.5	11,380,500	2,780,600
no augmentation	1988	universal	1,549,200	3,268,400	47.4	3,268,400	47.4	1,719,200	1,719,200
limited augmentation	1988	universal	1,896,600	3,747,650	50.6	3,256,400	58.2	1,851,050	1,359,800
full augmentation	1988	universal	2,726,400	13,786,700	19.8	5,186,800	52.6	11,060,300	2,460.400
no augmentation	1983	m.c.o.	1,211,400	2,724,650	44.5	2,724,650	44.5	1,513,250	1,513,250
limited augmentation	1983	m.c.o.	1,866,600	3,203,900	58.3	2,712,650	68.8	1,337,300	846,050
full augmentation	1983	m.c.o.	1,866,600	13,242,950	14.1	4,643,050	40.2	11,376,350	2,776,450
no augmentation	1988	m.c.o.	1,549,200	2,869,650	54.0	2,869.650	54.0	1,320,450	1,320,450
limited augmentation	1988	m.c.o.	2,582,400	3,348,900	77.1	2,857,650	90.4	766,500	275,250
full augmentation	1988	m.c.o.	2,582,400	13,387,950	19.3	4,788,050	53.9	10,805,550	2,205,650

Note: m.c.o. = major consumers only

10.13 Comparison of Projected Revenue with Variable Costs

The approximate percentages of revenue collection that will be required to cover the short term variable costs of a universally metered supply in the different augmentation situations, for a typical overall average supply using electricity, and for a small supply using diesel are shown in Table 10.19.

Table 10.19
Percentage of Revenue Required to Cover Variable Costs

Overall average supply using electricity:	
No augmentation	31% average over 1983-88
Limited augmentation	24% throughout
Full augmentation	24% throughout
Small supply using diesel:	
No augmentation	152% average over 1983-88
Limited augmentation	115% throughout
Full augmentation	115% throughout

It can be seen that when electricity is used, short term variable costs only require approximately one-quarter of expected revenue. However when diesel is used, the revenue fails to cover even the short term variable costs of diesel and chemicals.

10.14 Variations in the Financial Projections

10.14.1 Introduction

In examining the effect on the financial results of changing some of basic variables the analysis will be restricted to the typical overall average supply in the universal metering situation in 1988.

The main variables which will be changed are:-

(i) the proportion of bills due that will successfully be collected.

(ii) the proportion of consumers who will be living in the different housing categories.

Section 10.14.2 presents the revised overall financial position of DWA township supplies when the level of collection falls to the pessimistic scenario described in Appendix H.

Section 10.14.3 presents the revised overall financial position of DWA township supplies when the division of consumers between different consumer categories is changed from the consultants' probable figures to the optimistic and pessimistic variations described in Appendix G.

In order to keep this section to a reasonable length the consultants have restricted themselves to these variations. However the interested reader can examine more possibilities, both by using other variations of the figures from Appendices G and H and by substituting new values for any, or all, of the variables.

10.14.2 Effect on the Financial Position of a Reduced Collection Performance

Table 10.20 shows the overall financial position of DWA's township water supplies under the different augmentation/metering situations in 1983 and 1988 when revenue collection from individual connections is reduced from 90% to 60%, and from low cost II consumers from 50% to 25%. It can be seen that while total revenue falls to approximately 65% of the revenue estimated in Section 10.7, the greatest effect is on the recurrent deficit which increases by K400,000-K1,000,000 in the different situations. The broad overall average percentage of recurrent costs covered for an equal situation mix falls from around 55% to around 36%.

Table 10.20

Overall Financial Position of DWA Township Water Supplies

Resulting from the Pessimistic Revenue Collection

	Year	Level of Metering	Annual revenue (K/annum)	Total costs (K/annum)	Percentage of costs covered by revenue (%)	Total recurrent costs (K/annum)	Percentage of recurrent costs covered by revenue (%)	Overall deficit (K/annum)	Recurrent deficit (K/annum)
No augmentation	1983	Universal	794,400	3,012,150	26.4	3,012,150	26.4	2,217,750	2,217,750
Limited augmentation	1983	Universal	1,240,200	3,491,400	35.5	3,000,150	41.3	2,251,200	1,759,950
Full augmentation	1983	Universal	1,287,600	13,350,900	9.6	4,751,000	27.1	12,063,300	3,463,400
No augmentation	1988	Universal	1,014,600	3,268,400	31.0	3,268,400	31.0	2,253,800	2,253,800
Limited augmentation	1988	Universal	1,228,200	3,747,650	32.8	3,256,400	37.7	2,519,450	2,028,200
Full augmentation	1988	Universal	1,781,400	13,786,700	12.9	5,186,800	34.3	12,005,300	3,405,400
No augmentation	1983	m.c.o.	794,400	2,724,650	29.2	2,724,650	29.2	1,930,250	1,930,250
Limited augmentation	1983	m.c.o.	1,218,000	3,203,900	38.0	2,712,650	44.9	1,985,900	1,494,650
Full augmentation	1983	m.c.o.	1,218,000	13,242,950	9.2	4,643,050	26.2	12,024,950	3,425,050
No augmentation	1988	m.c.o.	1,014,600	2,869,650	35.4	2,869,650	35.4	1,855,050	1,855,050
Limited augmentation	1988	m.c.o.	1,685,400	3,348,900	50.3	2,857,650	59.0	1,663,500	1,172,250
Full augmentation	1988	m.c.o.	1,685,400	13,387,950	12.6	4,788,050	35.2	11,702,550	3,102,650

Note: m.c.o. = major consumers only

10.14.3 Effect on the Financial Projections of Variations in the Division of Consumers between Housing Categories

Table 10.21 presents the effect on total DWA revenue of variations in the division of consumers between different consumer categories when flat rates are charged in the full augmentation situation. The quantity of water taken by major institutional/industrial consumers has been kept constant. The variations of consumers in the different consumer categories have been taken from the optimistic and pessimistic variations suggested in Appendix G.

Table 10.21

Effect on Revenue of Optimistic and Pessimistic Variations in the Division of Consumers between Housing Categories when Flat Rates are Charged in the Full Augmentation Situation

Year	Division of Consumers Projection	Annual revenue (K/annum)	Percentage of costs covered by revenue (%)	Percentage of recurrent costs covered by revenue (%)
1983	Probable	1,866,600	14.1	40.2
1983	Optimistic	2,620,200	19.8	56.4
1983	Pessimistic	1,287,600	9.7	27.7
1988	Probable	2,582,400	19.3	53.9
1988	Optimistic	3,629,400	27.1	75.8
1988	Pessimistic	1,780,800	13.3	37.2

It can be seen that the percentage of total costs covered in 1983 is 19.8% and 9.7% in the optimistic and pessimistic variations respectively. The 1988 figures are 27.1% and 13.3%. The percentages of recurrent costs covered in 1983 are 56.4% and 27.7%, and in 1988 75.8% and 37.2%, in the optimistic and pessimistic cases respectively.

The main features of this sensitivity test are:-

(i) the percentage of costs covered varies directly in proportion to the change in revenue, i.e. a 40% increase in revenue leads

to a 40% increase in the percentage of costs covered.

(ii) the revenue and percentage of costs covered in the optimum variation is in all cases twice that in the pessimistic variation. Hence the financial position of DWA supplies will be sensitive to the distribution of population between housing categories.

11 RATE PAYMENT ENCOURAGEMENT

11.1 Introduction

This section tackles the problem of non-payment for individual connections. The main strategies are to adopt a strict disconnection policy, to increase reconnection fees and to introduce deposits.

11.2 Current Disconnection Situation

At present the disconnection deterrent is not used effectively. Disconnection is not used sufficiently frequently and is applied inconsistently. Although consumers are sometimes disconnected there is no strict enforcement of disconnection for all debtors. This is in part due to the possible political implications, but is also due to the inefficiency of councils in supplying DWA officers with lists of offenders.

At present council and DWA officers do not disconnect consumers before arrears are overdue for more than 3 months even though they have the right to disconnect if payments are not made within 15 days. In practice disconnections are not usually made until a consumer is at least 4 months overdue. Most DWA consumers who are actually disconnected have been in arrears for considerably longer.

Table 11.1 shows the number of disconnections that were made in 1982 up to the time of the consultants' visits, (September - November), together with 1981 figures for 10 towns. The main feature is the limited number and patchiness of disconnection at DWA supplies. For example there have been no disconnections at Mumbwa, Nyimba and Petauke for over one year and during this period arrears have increased.

11.3 Inconsistency in Disconnecting Consumers

The lack of consistency in the application of the disconnection policy between different supplies includes differences in:-

(i) the type of connections which are disconnected. Institutions are occasionally disconnected in some townships, but at other supplies it is claimed that they are never disconnected. At some schemes shared standpipes and communal water points are disconnected, at others they are not.

(ii) the frequency of disconnection. At some supplies

Table 11.1

Numbers of Disconnections

DWA Supplies	Number of disconnections in 1982	1981	Notes
Chizela	5	-	All shared standpipes.
Kabompo	10	130	Includes shared standpipes and CWPs, but no institutions.
Kaputa	0	-	
Katete	20	-	
Kawambwa	1	20	Institutions and CWPs are never disconnected.
Luwingu	47*	-	* Plus all CWPs. Includes 5 institutions.
Mkushi	6	-	
Mumbwa	0	25	
Mwinilungu	103	-	Includes a few institutions
Nchelenge	17	-	Includes CWPs and institutions
Nyimba	0	75%	
Mporokoso	69	0	Includes 4 CWPs
Petauke	0	10	
Serenje	70	-	
Siavonga	0	1	Only one illegal connection since officer says he is ordered only to report offenders to their head of department.
Council Supplies			
Chipata	300	-	
Kasama	129	110	Includes some shared standpipes. Never disconnects institutions.
Kitwe	1000	1000	
Luanshya	600	600	Quarterly exercise. No CWPs are disconnected.
Mbala	200	-	Only individual connections but no institutions
Mufulira	1200	1200	
Ndola	2000	2000	Some people are disconnected more than once so only about 1500 consumers per annum are affected.
Solwezi	26	-	

Notes: The figures for the large towns are guesstimates by the council's financial secretary/development secretary.

disconnections are made frequently, particularly at the larger urban schemes, at others there may rarely be more than one disconnection exercise in a year. For example, the officer in charge at Kawambwa reported that he only disconnects once a year based on the year's arrears. In Serenje the first exercise of the year had been conducted just prior to the consultants' visit in September. While the greater frequency of exercises at large council schemes is not unexpected the differences between DWA supplies could be reduced.

(iii) the permission that has to be obtained before disconnection can occur. In some townships DWA officers said that they cannot disconnect anyone before they provide a list to the DG/PS etc. and the administrator concerned responds positively to their request. In Mumbwa it was reported that proposed disconnections have to be approved by the finance committee. In other towns DWA simply has to inform the administration and the officers go ahead on their own initiative.

In one town the previous district governor believed that consumers should pay for their water and supported disconnection as an enforcement measure. He held a meeting at which he explained the necessity to enforce payment and said that he didn't want to see people complaining about disconnection. The present district governor is less co-operative towards DWA revenue interests so that disconnection in this town is now much more difficult. Hence, although it is generally considered that the administration should be involved there is no nationally laid down procedure to be followed. It is probable that the actual clearance procedure and the probability that objections will be raised depends largely on the personality/attitude of the district governor, etc. Hence the level of disconnection will vary significantly from one DWA supply to another, despite the fact that an official uniform policy exists.

(iv) the level of discrimination in the disconnection of domestic connections. Some officers claimed that they disconnected

consumers regardless of their position. One DWA officer in charge reported that he commenced one disconnection exercise with the district governor who subsequently paid. This set a good example to other consumers, who then knew that they had to pay or suffer disconnections regardless of their position. However, the majority of officers are hesitant to disconnect local leaders.

11.4 Institutions

In every water supply visited by the consultants, the worst payers of water rates are government institutions and departments. While there are significant differences between locations, the army, police, schools, hospitals and local "big shots" tend to be the worst culprits. The differences between location, for example of schools, may be partly dependant on the amount charged. In some towns a school may be charged a very low fixed fee of perhaps K20 per month, but in another township a similar school may be charged K200. Although it is easier for the Ministry of Education to pay the smaller sums there is only a weak link between the amount owed and the probability of payment. The personality of the headmaster is important.

Many government institutions/departments with arrears are simply rather slow to pay, but do so eventually. In some cases arrears are owed for several years and have to be written off. The officials with whom DWA/council officials have to discuss the problem are usually helpful but simply do not have the funds.

DWA and council personnel also argued that some government officials do not seem to understand the payment situation. For example cases were mentioned where institutions had not paid for some time, they later paid one monthly bill, at which point the officers responsible for paying seemed to think that they were up to date with water rate payment. If this is true, it suggests that a consumer's total current liability, i.e. the current monthly bill and accumulated arrears must be spelt out more clearly.

The problem is serious for two reasons. Firstly, it represent a serious

loss of revenue to the water undertaking, which will immediately effect the financial viability of council operated supplies. Secondly, it sets a very poor example to other consumers. Generally DWA and council officials are extremely hesitant to disconnect institutions, for (i) humanitarian reasons, (ii) because administration officials usually refuse permission to disconnect schools and hospitals and (iii) because they believe that they would only create additional problems for themselves with army and police consumers. For example, in more than one large town the result of councils disconnecting the police has been the swift impounding of "unroadworthy" council vehicles. Sometimes financial secretaries in major urban areas reported that they would be prepared to disconnect almost any consumer other than hospitals, if the arrears were to reach certain unacceptable levels. Very occasionally they have disconnected police and army consumers and this has tended to result in payment, or, at least, in part payment. But even they are always reluctant to do so and it is more difficult for officials in smaller townships to get paid by powerful consumers, or even to threaten disconnection. The individuals who they may alienate are more powerful than the water authority officials who risk getting themselves into trouble if they vigourously pursue those duties which another arm of Government has appointed them to perform. The consultants heard of specific threats made to DWA officers during the field investigations. Even though such threats are unofficial and possibly only words they do make the water supply officials responsible for disconnection feel rather insecure. One officer stated that "we are not able to exercise our legal powers because we get taken to task by . . .". Naturally this reluctance to disconnect directly leads to increasing arrears. Payment of their water bills drops down the institutions' expenditure ranking lists. Hospitals know that it is almost impossible for them to be disconnected and, hence, they are poor payers. Schools are often major culprits, but they are rarely disconnected. If this problem of non-payment by government departments is not to get worse over time, central government must give a lead to DWA and to the councils.

If the Government believes that institutions etc. should have free water a policy statement should be issued to this effect. If, on the other hand, it is decided that all consumers should be treated similarly and that all departments/institutions must pay, DWA requires high level support to enforce rate payment.

Furthermore it is desirable that Government departments set other consumers a good, rather than a poor, example. Treating all consumers similarly does not, of course, mean disconnecting a hospital as casually as disconnecting a domestic consumer, in fact disconnection of hospitals may never be possible. However, it does mean that after three months a local DWA officer in charge should be able to disconnect most other currently "protected" institutions if they fail to meet the payment criteria. The crucial elements in dealing with institutions are a tactful approach and persistence. Disconnection alone is not the answer. It appears that where councils have been more successful than others in collecting arrears from schools, police, army, etc. it is due to the treasurer, (now financial secretary), personally visiting headmasters, Ministry of Education offices, senior army and police officers, etc. and explaining the problem and, while keeping threats to a minimum, refusing to take no for an answer. In one case this simply meant sitting in an office for hours until he was paid in order to get rid of him. It must be remembered that, as with domestic consumers, it is not a case of the departments not having money, it is simply that they do not have enough for all their needs. Water bills will be high in their payment ranking list if the problem is not allowed to slip out of sight and they know that the bottom line is that disconnection is truly enforceable, whoever they are. Tact should also be extended to actual disconnection. For example, if schools are disconnected during term time a major issue is likely to be made of it with cries of deprivation of innocent children, health hazard, etc. However, if final threats are timed so that disconnection takes place early in the long holidays less political steam will be engendered. Headmasters will still find the lack of water inconvenient, personally so if they don't pay for their own individual supply, but will have time to rush around exhorting the Ministry of Education to pay. A few councils who have taken this action have found that this usually results in payment.

The fact that institutions do not pay is possibly less serious than the fact that they are major wasters of water. The AESL study pointed out that in army barracks, police camps, hospitals and schools, individual consumers are not paying for the water and waste it. Also, plumbing faults are widespread. Unfortunately, neither the authorities nor the individuals using water appear to be concerned with reducing wastage. At Arakan barracks the expected consumption would have been around 0.7 m.l.d. but was, in fact, 4.95 m.l.d. The difference was split approximately

equally between defective fitting losses and misuse due to leaving taps running, etc. "Requests to the authorities in the past to remedy this serious misuse of the water supply has apparently had no discernible effect".

Measured consumption at schools was usually more than double that which would have been reasonable. At the David Kaunda Secondary School where billings were based on assessments, they were found to represent only 15 percent of consumption.

The University Teaching Hospital lost 30 percent of its total inflow down its overflow. Losses due to faulty fittings and misuse would certainly have increased this to over 50 percent.

Although consumption at police camps is rarely projected at more than 200 l.c.d. one such camp in Kitwe recorded an average dry season usage of over 800 l.c.d.

These few examples of wastage are typical of a large number of institutions. It would seem that the only effective way to reduce this huge wastage by institutions is to meter them and to charge them on the basis of quantity used. But, for this to be effective, they must be made to pay their bills. Hence, disconnection of institutions is probably more important as part of the strategy to reduce wastage of water and consequently of government money, rather than to ensure that DWA receives payment.

11.5 The Effect of Disconnection

The fieldwork showed that in all provinces, and at all type of supplies from the large urban to the small township schemes, nearly all disconnected consumers "rushed" to pay. The vast majority found the money almost immediately and paid their arrears and re-connection fees the same day or within the following few days. On average payment is made two days after disconnection. It is estimated that less than 5 per cent of individual connections remain unconnected one month later, although the picture regarding shared or communal points is less clear.

The effectiveness of disconnection can be seen by inspecting

the consumer account records at supplies where disconnections only take place very occasionally. For example, in Luwingu where a disconnection exercise was undertaken in early/mid 1982, total revenue collected in April, May and June 1982 was approximately K2500. Total collection for the whole of 1980 and 1981 combined was only K1250. In Nyimba a major disconnection exercise was conducted in early 1981. In February and March revenue averaged almost K4000 per month compared to the average monthly collection of K1250. Virtually all consumers paid up to that date. While few consumers now have arrears stretching further back than January 1981, well under 50 per cent of consumers have made any payments at all for the period June 1981 to date. During 1982 (to November) only 33% of individual connection consumers made any payment at all.

11.6 Non-Reconnection/Illegal Reconnection

The main reason for a few consumers remaining unconnected is that they cannot afford to pay their arrears. Occasionally a consumer having started to use a neighbour's tap finds that it is an acceptable source. This may even be done by connecting a hosepipe to the neighbour's tap to provide an extra individual connection. This is acceptable if water is being charged for on a quantity used basis. But not if flat rates are being levied. In the latter case it is recommended that where neighbours are being supplied by hosepipe the same procedure is followed as is recommended for dealing with garden watering in Section 7.3.

There have also been some illegal reconnections although this subject is difficult to investigate within a short period. Within the same town one official would explain the problem while another would deny point blank that it existed. It is believed that the problem occurs primarily in the larger urban areas, but it is nevertheless recommended that district water officers check all connections that are theoretically still unconnected one month after they were disconnected.

It is proposed that DWA deal with illegal connections in the same way as Ndola council. If a consumer is found to have illegally utilised the existing connection, for example using by a hosepipe, the pipe up to his plot should be removed. If a consumer is found to have illegally provided pipes himself these should be confiscated and he should be heavily fined, (currently a consumer is liable to K200 fine in Ndola).

11.7 Current Constraints on Disconnection

Attempts by DWA to undertake disconnection exercises are often interfered with or completely aborted by the administration, either directly or indirectly. As was shown in Section 11.3 this can vary significantly between townships. Some officers reported that they were instructed to cease disconnection by district administration officials, others reported that they were instructed to do so by the PWE after the PS had become involved. This involvement of the administration often mades the smaller councils who operate their own supplies especially reluctant to undertake disconnection. However, even where the administration is extremely co-operative practical constraints on efficient disconnection often exist.

(i) DWA often has a problem of knowing who to disconnect. Since councils are currently responsible for revenue accounting, DWA officers are dependent on the council for providing for lists of defaulters. Unfortunately many councils' performance in undertaking this simple task is pathetic. Many DWA men interviewed by the consultants complained that they usually have to wait a long time for lists of defaulters. Sometimes the council promises of delivery are meaningless. Even when lists do arrive eventually, at very irregular intervals, they are poor and incomplete. Nevertheless, even under the present arrangements DWA officers can visit the council offices regularly and by working with, pushing and assisting the council clerks and officers responsible, improve the data situation. This has lead to an improvement in Serenje where is was reported that the records prior to 1979 were poor and have disappeared.

Even with the larger councils a problem of knowing who to disconnect can arise when the financial records are kept by a different department from the one responsible for disconnection. In Kitwe and Ndola the problem has been eliminated by giving the responsibility for disconnection/reconnection to the financial secretary. In Ndola plumbers are seconded from the engineering department but in Kitwe a few plumbers actually come under the financial secretary. It was reported that the present arrangements have improved efficiency considerably. When two departments were involved some people were disconnected after they had paid.

(ii) The ability of both DWA and operating councils to carry out disconnections is constrained by the availability of transport and plumbers. Often one or both may not be available when they are required. The problem at the council operated supplies may be exacerbated by the involvement of two departments engineering and financial mentioned above. For example, in Mufulira the finance department can only disconnect when the engineering department can spare plumbers from other duties.

11.8 The Need for a Strict Policy

In order to assist improved revenue collection it is vital that a strict disconnection policy for non-payment of water rates be uniformly enforced. Customers must believe that they will not be able to "get away" with not paying their bills. If this were to be achieved warnings would carry much more weight and only a small proportion of those warned would actually have to be disconnected. It can be stated categorically that disconnection is an effective method of enforcing rate payment and that revenue collection would become relatively easy if the policy was strictly enforced. Apparently although consumers do not always believe warning letters and tend to ignore them, (this may be rational in the present situation), they generally pay outstanding accounts once they see a disconnection team at work. Furthermore Section 11.5 demonstrated the speed with which most consumers pay once they are disconnected.

The above view was endorsed by virtually all officers interviewed, all except two out of more than twenty who gave their opinion felt that a stronger disconnection policy should be followed in order to bring real pressure to bear on non-payers. Many insisted that there is only very limited pressure to pay at present and compared DWA's disconnection policy with that of ZESCO. However, it is important that strictness be combined with tact and diplomacy in order to minimise the reaction from local politicians.

11.9 Act of Parliament

One possible vehicle for the necessary high level support would be an Act of Parliament authorising the disconnection of any consumer subsequent to non-payment of rates. It was reported that house eviction is supported in this way and that this is one of the reasons why rent collection is easier

than water rate collection. Although such an Act would not always solve the water authority officials' problem, it could frequently make the efficient performance his duties with regard to disconnection easier.

11.10 The Experience of Other Services

The need to, and effect of, enforcing payment is not unique to water supplies. Even though rents are easier to collect than water rates, most councils' housing accounts face the problem of non-payment of rents by tenants. House eviction notices lead to tenants rushing to pay, but political constraints often prevent councils from enforcing the law.

ZESCO is more successful than DWA and councils in collecting revenue. Although this is partly due to higher efficiency, the fact that ZESCO is able to pursue a more rigorous disconnection policy is important. This is possible because electricity is considered less of a necessity than piped water and, hence, ZESCO is more able to act unilaterally. As with DWA,disconnection is usually followed by swift payment of arrears and reconnection, i.e. it is effective.

11.11 Necessary Pre-Conditions for a Strict Policy

In order that local officers will be able to follow a strict consistent disconnection policy a number of steps must be taken to eliminate or, at least, ease the existing problems facing water supply personnel.

This report and the public information sheet prepared by the consultants should be used to convince the government and local leaders of the need for, and fairness of, the proposed strict disconnection policy. However, a number of the more practical difficulties must also be reduced or eliminated. This would entail:-

(i) an increase in implementation capacity, notably the capacity of additional transport which it is recommended NORAD should provide on the condition that the vehicles are used for disconnection/connection.

(ii) either DWA takes over the collection of rates (cf. Section 14.4)

or the councils provide DWA with up to date copies of consumer accounts and accurate lists of consumers who are due for disconnection.

11.12 Disconnection Teams

Disconnection in larger towns is generally easier than in smaller townships. Firstly, it is possible to make exemptions on various grounds in larger towns since they may not be too noticeable. In smaller places exemptions could lead to major problems of enforcement in the future.

It is also more difficult to enforce a strict disconnection policy in smaller townships due to closer interpersonal relationships, i.e. it is difficult for a man living in a very small community where he meets many of the consumers socially to make disconnections. It is, therefore, recommended that DWA consider the possibility of establishing provincial disconnection teams. This proposal would mean that officers in charge of supplies and their plumbers would not be responsible for disconnecting their friends, neighbours and acquaintences.

The teams would not be fully occupied with disconnections and so they should also be responsible for all new connections. Small teams provided with vehicles and properly equipped could represent an efficient method of operation and use of resources.

11.13 Proposed Disconnection Procedure

It is proposed that consumers are disconnected if they do not pay their bills within two months of their despatch. According to the present regulations the authority has the right to disconnect after 14 days so this proposal is not harsh to consumers. The recommended timing is as follows:-

During the first 10 days of "month two" meter readings are made of consumption for "month one".

The bills for "month one" are sent out during the middle of "month two" stating that they should be paid within 30 days.

When the bills for "month two" are sent out during the middle

of month three they will point out to consumers who still owe their "month one" bill that they are liable to be disconnected if they have not paid within 30 days, i.e. by about the 20th of month four.

Actual disconnection takes place in the two days prior to the major pay day in month four.

Thus consumers will be disconnected if they have not paid for their water within two to two and a half months of being billed.

It is proposed that the only warning that consumers should receive will be that included on their following month's bill. Once a pattern of disconnection has been established and consumers expect non-payment within this time period to lead to disconnection additional warnings should be unnecessary. They would add to administrative costs and represent a waste of resources.

11.14 Timing of Bills and Disconnection

Disconnection is undesirable from everyone's point of view, so the authority must make every effort to minimise disruptions to consumers' connections whilst, at the same time, encouraging them to pay their debts. Appropriate timing of both billing and disconnecting can assist in achieving this objective.

It is suggested that bills are sent to consumers during the third week of the month so that they have received them before pay day at the end of the month. This will increase the probability that bills are paid quickly.

There are two major alternative approaches to disconnections, to disconnect regularly every month or to conduct periodic exercises. If the former course was to be followed it would have the merit that consumers would know exactly when disconnection was due and those more than $2\frac{1}{2}$ months in arrears would automatically be disconnected. It is proposed that disconnections are concentrated in a two day period around pay day so that consumers not only want to rush to pay their outstanding bills and the

reconnection fee, but are also able to do so.

However, due to the limited resource situation, periodic disconnection exercises have considerable merit and would be the optimal strategy if the disconnection team proposal (cf. Section 11.12) is implemented. The gap between exercises should not to too large since the more frequently the exercise is done and is seen to be done the greater will be the perceived threat of warning. It is suggested that twice a year is the minimum frequency. Six monthly exercises are also convenient for the disconnection teams in most provinces.

A typical timetable for a disconnection team in a month when the majority of employees will be paid on or around the 28th (assumed to be a Thursday) could be as follows:-

20th	- Proceed to next town for disconnection exercise.
21st-23rd	- Meeting with administration and background work on location of connections. (This would result in consumers having prior notice of disconnection and a final opportunity to pay).
25th-28th	- Disconnection exercise.
29th-4th	- Reconnection exercise.
5th-10th	- Preparing new connections and late re-connections.
11th	- Return to provincial headquarters.
12th-19th	- Complete paperwork, e.g. stock cards, etc. Make one day visits to towns where disconnection exercises were undertaken 2 and 3 months earlier for late reconnections and the occasional new connection.
20th	- Proceed to the next town due for disconnection exercise

11.15 Unreliability and Rate Payment Resistance

Most of the township supplies currently provide a rather unreliable service to consumers. In some towns the people only receive water intermittently during the day and the quantity supplied is often less than that required, causing serious shortages. While the main reason for this situation is

the existing capacity constraints, other factors exacerbate the unreliability:

(a) breakdowns that are not repaired immediately due to lack of spare parts, transport, etc.

(b) lack of recurrent expenditure for diesel, oil, etc. The limited diesel supply sometimes restricts the number of pumping hours during the day.

This state of affairs causes concern but for a tariff study the main focus is on the facts that:

(a) if water is charged for on a quantity used basis unreliability will cause a significant reduction in revenue, the loss will usually be greater than the extra costs involved in supplying the extra water.

(b) if flat rate fees are charged as at present, consumers will naturally complain at paying for a service which they are only receiving in part. This will result in a resistence to paying water rates and a reduction in revenue.

Reliability should be improved by both major augmentations and by the consultants proposed limited augmentation strategy. Maximum reliability will also require that sufficient recurrent finance is always available to pay for the variable costs. It would be a most unsatisfactory state of affairs if the present situation of limited pumping hours was to continue because the water authority had, for example, to limit its monthly electricity bills. However, while unreliability provides an excuse for consumers failing to pay their rates, and while DWA must do all it can within its limited resources to improve reliability it is suggested that it is not sufficient reason for DWA to modify it disconnection policy. Every individual consumer has the choice to pay for and receive whatever service is available, or to refuse to pay and be disconeected.

11.16 A Different "Wider" View of the Problem

The problem of non-payment and increasing arrears of government departments is not unique to the water sector. For example, an Ndola councillor was quoted in the Times of Zambia (October 1982) as saying "We are owed millions of Kwacha by government and parastatal organisations. We should concentrate on collecting our money from the institutions".

It must be remembered that DWA is not only the victim of slow payment by one government department to another, but is often extremely slow to pay its own bills to other government departments. Furthermore, the slow payment by other departments to DWA is not a cause of DWA's own inability to pay its own debts on time. The reason is that Treasury is unable to provide DWA with sufficient recurrent finance to cover all its requirements. Hence, there exists a network of inter-departmental debt which is not really effecting the efficiency at which the departments operate. Consequently provided that it does not distort government spending priorities and/or disguise resource allocations, it isn't really a problem. The important thing is to make the best use of all the financial and physical resources available to government which is achieved within the water sector by maximising the use and benefits of existing supplies and by ensuring that the recurrent financial allocation is sufficient for efficient operation. The major disadvantage of allowing government departments and institutions to escape payment is that they would not take care to avoid wastage. On the one hand this is unlikely to lead to a deterioration in the present situation where (i) individual users at schools police corps, etc. have little or no incentive to avoid wastage and (ii) many institutions supplied by DWA, have little or no incentive to avoid wastage since they are charged flat rates. On the other hand this report strongly recommends that all major consumers are metered and charged on a quantity used basis, hence, unless institutions are metered, allowing them to escape payment doesn't really matter from a national point of view. However, if they are charged on a quantity used basis the whole point of metering will be lost unless payment is enforced. Even in this case there is theoretically only an accounting problem to deal with, the solution to which could help to sort out the whole network of "within Government" indebtedness. Thus obviating the need to threaten disconnection of government departments and institutions. For example, if DWA were to improve its revenue accounting it could prepare quarterly statements of bills owed by other government departments These could be submitted by Treasury which would subtract the sums owed by these departments from their expenditure allocations and add them to DWA's allocation.

11.17 Reconnection Fee

The reconnection fee has two main functions: (a) to cover the costs of reconnection and (b) to act as a deterrent. At present it is failing to fulfil these goals. DWA's reconnection fee is only K5, but the costs of disconnecting and reconnecting have been estimated at K12. Therefore,

the government's costs are higher than the fee charged. Councils have tended to increase reconnection fees in recent years, but the average is still only K10. The highest at supplies visited by the consultants was K15. Hence, although most councils are charging higher fees that DWA, most are levying rates which fail to cover their costs. Furthermore the deterrent effect of existing reconnection fees are minimal. The act of disconnection is a real deterrent since most consumers dislike being disconnected for even a few days and as was shown in Section 11.5 generally rush to pay immediately they are disconnected. But a reconnection fee which in most cases only represents a very small percentage of the arrears outstanding does not add significantly to the deterrent of disconnection. The Western Province study proposed that the present reconnection fee of K5 should be raised to K25. This represented a fivefold increase and has been supported all by officers with whom the consultants discussed it. In their response to the report DWA even suggested that this was insufficient and the reconnection fee should be K50. The consultants endorsed this proposal. Now, two years later, the financial cost of a real 1981 cost of K50 is K66 and since it is unlikely that the proposal would be enforced before 1984, a new rate of K80 for high and medium cost domestic consumers is proposed. It is felt that it would be inequitable to charge the same fee to low cost consumers because, in addition to a lower average ability to pay, their average arrears at the time of disconnection, (given equally efficient disconnection for different consumer categories),would be considerably lower than those of medium and high cost consumers. A fee of K40 is proposed. Industrial, institutional and commercial consumers should be charged higher fees because their arrears will usually be far higher than those of domestic consumers. Sometimes the costs of disconnecting/reconnecting will also be higher. It is proposed that the reconnection fee should be K80 plus 10 per cent of the arrears outstanding. This would mean that small shops would only be paying a little more than domestic consumers, but major consumers might have to pay considerably more.

It may be argued that all the above proposed reconnection fees are too high, but it is believed that since disconnections are caused by guilty consumers, there is no reason why reconnection fees should not be used as a source of revenue. Indeed, if they are to add significatly to the deterrent of disconnection they should contribute towards increasing revenues. It may also be argued that higher reconnection fees would further penalise poorer consumers, who have fallen into arrears due to their inability to pay their

rates. But this is partly taken care of by charging lower fees to low cost consumers. Furthermore consumers with individual house connections who fall into arrears may not have enough money for all their requirements, but they do have some money. The purpose of higher reconnection fees would, therefore, be to promote their monthly water rates in their payment ranking list to a higher position than they currently hold. Well before DWA and councils start charging higher reconnection fees the proposed increases must be widely publicised so as to deter consumers from needing to be reconnected.

11.18 Condition for Reconnection

Generally DWA does not reconnect a consumer until he has paid reconnection fees in full, although very occasionally exceptions are made. For example, it was reported in Mumbwa that if the consumer paid 50 per cent of the arrears and promised to pay the sum outstanding in three monthly instalments that he could be reconnected. In the larger urban areas most councils are prepared to reconnect if the consumers pay 50 per cent/75 per cent of the arrears and he, or his employer, signs an agreement regarding the sum outstanding. If a consumer breaks the agreement he is supposed to be disconnnected within one month. It is believed that the concession allowing reconnection before a consumer has paid all his bills has considerable merit. It means that the consumer is not deprived of the water supply service and DWA/councils recover their arrears. It is proposed that DWA officers in charge of supplies should be allowed to use their initiative in deciding the terms on which a particular reconnection can be made, subject to the following limitations, (i) that at least 40 per cent of the sum outstanding be paid immediately, (ii) that the remaining sum be paid over a maximum period of 3 months, (six months if the consultants reconnection fee proposal is implemented), (iii) that the consumer signs an agreement regarding the payment of the remaining sum and (iv) that if the consumer does not fulfil his agreement totally he is disconnected immediately and is not reconnected until he has paid all his outstanding debts and a second reconnection fee.

11.19 Deposits

Most of the larger councils demand a water deposit from new consumers, DWA could introduce a similar deposit system to back up the proposed

stricter policy of disconnection. It would mean that consumers would have to place a cash deposit in order to cover any subsequent non-payment of rates. The size of the deposit should be related to a customers probable monthly bill and would represent so many month's consumption. It would probably be necessary to charge one fixed deposit for every major consumer category. For example in Mufulira deposits of K10, K40 and K60 are demanded from low cost,high cost and commercial consumers respectively. However, it would be possible to base the deposits of major consumers on their estimated consumption. Wherever a consumer has to be disconnected the authority would simply be able to recover part or all of the amount owed from the deposit. The consumer could be refunded any surplus if he moved and would have to make up the deposit in full if he wished to be reconnected.

The proposal has some merit and has considerable support from DWA officers in charge of supplies who see it as a method of reducing the debt problem. However, the consultants are hesitant to endorse the proposal, especially while the councils continue to be responsible for revenue collection and accounting. The main reasons are:-

(i) a deposit system would add to the administrative load of personnel whose present performance is not very efficient.

(ii) it would still not solve the problem of disconnection. Would DWA be able to disconnect consumers once their deposits had been "used up"? Could institutions be disconnected?

(iii) It has been shown that disconnection is a sufficient incentive to make debtors come running to pay their bills. The real need is for a more efficient system of the disconnection. If this was strictly enforced the need for deposits would be reduced. Nevertheless deposits could play a useful role in backing up efficient disconnection especially if the councils improved their revenue accounting and the handing over of money to DWA or if DWA took over revenue collection. It would reduce the loss incurred by the water authority from people who move leaving unpaid bills.

Hence, it does present a good policy for the larger councils and could be appropriate for DWA to adopt as a support measure but not as the basic cure for non-payment.

For deposits to play a worthwhile role they must represent several months bills. It is recommended that a minimum of 3 months and a maximum of 6 months would be appropriate. As regards new consumers the size of the deposit would be less significant than the cost of connecting. Furthermore, it would be easy to obtain their deposits, they would not be connected until they had paid them. But the size of the deposit and the method of paying for existing consumers must be appropriate in the sense that they can be afforded, but are still large enough to pay a useful role. The consultants recommend the following:-

(i) all deposits should represent approximately 4 months consumption for every consumer, where consumers are charged on a quantity used basis the monthly average for the previous year should be calculated.

(ii) consumers should be billed 25 per cent of the required deposit for a period of 4 months.

(iii) non payment would be treated in the same way as any other arrears.

(iv) Publicity should be given to the introduction of deposits at least 6 months before. Consumers should have the opportunity to start paying their deposits immediately if they believed that they could not afford to pay monthly water bills of approximately double their usual size for the proposed 4 month period.

It is emphasised that this proposal should not be introduced until revenue accounting improves.

12 STRATEGIC QUESTIONS

12.1 Identification of Low Cost Improvements to Ease Major Supply Constraints

The consultants' field visits combined with a reading of other consultants' reports suggested that the strategy being proposed by many consultants is not the most appropriate one for Zambia in the mid 1980s. This should not necessarily be interpreted as a criticism of those consultants since their brief is usually to propose and design facilities required to enable a particular township supply to provide all the townships requirements for a 5, 10, 15 or 20 year period. This results in proposals costing several hundred thousand, if not millions, of Kwacha. During periods, such as the present, when finance is extremely scarce, this means that nothing is done at most townships where augmentations are urgently required. In contrast the consultants found that at some supplies minor investments could significantly increase the quantity, and/or improve the quality, of the water available. In some cases the increase in capacity may still fail to supply today's peak requirements. In others the period for which the investment would allow all demands to be met may be quite short. But the crucial factor is that it would represent an improvement and allow a higher proportion of present and future demand to be satisfied. Furthermore the total period required for planning and implementing most of these proposals would be very short.

It is, therefore, contended that when there isn't much money available for water supply development there may be considerable merit in a piecemeal approach. The application of limited development finance for small augmentations could lead to significant improvements at many supplies even though the solution proposed would be sub-optimal in a situation where more resources were available.

The Technical Report presents a list of potential improvements at a few schemes visited by the study engineer. It shows the proposed components of augmentations recommended for three townships together with approximate estimates of (i) cost and (ii) effect of the improvement.

This concept of maximising the effectiveness of a limited sum of money by identifying low cost improvements which would ease major supply constraints at existing township supplies was endorsed by DWA personnel with whom the consultants discussed the problem. It is, therefore, strongly recommended that

the idea is further pursued by a donor funded study which should be part of an aid package which also includes finance of between K1 million and K2 million for carrying out the augmentations suggested by the study, which could be supervised by the study team engineers.

12.2 The Dubious Water Supply Strategy Conclusion of the Northern Sector Study*

The Northern Sector Socio-Economic Study concluded that both the willingness to pay, and the generally accepted "ability to pay" criteria of 3-5% of estimated cash incomes, suggested that a high percentage of consumers could pay K2-3 per month for communal standpipes. In addition a significant proportion of those who didn't have their own connection could have afforded K5-8 for their own tap. These findings are consistent with those of the present study, provided that the unserved sample expressing the willingness to pay K2-3 for communal standpipe access is peri-township rather than rural. The study did not make it clear exactly what sample expressed the willingness to pay K2-3 for communal standpipe access.

Lottie concluded that since there was a sufficient expressed willingness to pay, and a sufficient estimated ability to pay for communal standpipes in the villages surrounding the townships, that "the recommendations must be to include the adjoining villages around the townships in any new piped systems." The consultants would agree that if "surrounding villages" means "shantys" i.e. informal extensions of the townships, the ability and willingness to pay would justify this recommendation, although there must be very serious reservations on whether the rates could actually be collected. However, if surrounding villages means rural consumers living 2-3 kms. from the townships, the consultants disagree with the proposal to extend the piped system. The present study shows a marked reluctance by rural people to pay for communal standpipe access. Piped supplies should not be extended to rural villages unless the government is prepared to subsidise all capital costs and most of operational costs. The implicit assumption of the Lottie study, that additional extensions would to some extent be financially viable is considered incorrect for rural villages.

The Northern Sector study argued that since real incomes of the lower income groups have not increased in recent years, and there is no evidence suggesting

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*Revision and Updating of Detailed Designs, Rural Townships - Northern Sector. Population, Social-Economic aspects and Water Demand. Lottie and Associati - May 1982

increases in the near future, there is no reason to believe that there will be any major shifts in real incomes/housing conditions over the next few years. The consultants agree but they find the conclusion rather dubious. "The guiding principle for new supply schemes must be to extend services to people presently without water rather than to increase the level of service for households already supplied". Firstly, the Northern Sector study itself estimates that 30% of households currently without their own connections would be willing to pay K5-8 per month for their own connection. Secondly, as discussed above,the financial viability of extending township supplies it doubtful. Thirdly the proposal contradicts the view advanced by a number of DWA personnel during the consultants' fieldwork, and which has been verified in this report, that the only way to increase long term financial viability will be to increase the proportion of consumers paying rates for individual connections.

Of course, it can be argued that supplying potable water to people presently using traditional sources should take precedence over improving the level of service of those already supplied. However, the case must be argued primarily on social grounds and the ability to pay will have little to do with it if:

(i) in the rural areas the true willingness to pay is as low as the consultants'studies have shown and;

(ii) in the informal housing areas the probability of successful rate collection is as poor as the consultants believe it to be.

The elevation of the social criteria over all other criteria cannot be endorsed. The appropriate supply strategy may vary between different locations, but in general the encouragement of individual connections may represent the best use of resources at many township supplies.

13 ORGANISATION

13.1 Introduction

In discussing the DWA's provincial structure and problems with PWEs it was clear that they were merely a repetition of those found in Western Province. Hence this chapter concentrates on the important question of who should be responsible for township water supplies. It commences by discussing decentralisation, its potential problems and effects to date. It goes on to discuss the short, medium and long term responsibility for operating township water supplies in the light of the current moves to decentralisation and councils' limited resources.

13.2 Decentralisation

The Local Administration Act 1980 established district councils and committees with wide ranging administrative and financial responsibilities. For example, their specific functions include: "to provide and maintain supplies of water, and for that purpose to establish and maintain waterworks and water mains". Furthermore a council "may impose fees or charges for ..... any service provided by the council". In addition the "council shall cause to be prepared and shall adopt annual estimates of revenues and expenditures for approval by Parliament". Hence the Local Administration Act intended that district councils should be responsible for all aspects of water supplies.

The councils will be supported by district secretariats under district executive secretaries. It is intended that every council will have nine secretaries, one of whom, the development secretary, will be responsible for engineering. Thus the councils should have adequate professional and sub-professional support, but it may be difficult for councils in some parts of the country to obtain and keep highly competent staff. Although the intention is to standardise, it is inevitable that promotions will be to, rather than from the larger councils. Hence smaller, isolated councils will tend to have the less able staff. For example some development secretaries may not be the qualified, experienced personnel really required.

Although the staff will provide information and advice, the actual decisions will be made by the councillors. Officers in charge of water supplies usually said that they would be happy to be responsible to the district governor/

district executive secretary rather than to the provincial water engineer. However they generally stressed that instructions from professionally unqualified men could lead to problems if decisions were made which were based on an insufficient understand of, and sympathy for, technical problems. Hence the attitude of the governor/executive secretary will be vital in the success of technical services,and the success of decentralising water supplies will depend very much on the character of the individual council leaders. DWA officers have a preference for taking instructions from civil servants. They cited various problems which could occur, including non technical ones, for example for recurrent finance, if disconnection exercises were opposed but the transfer of compensatory sums for subsequent revenue losses from the general fund to the water undertaking account were not authorised.

There are a number of advantages of decentralising services such as water supplies:-

(i) if district councils become more independent they may be able to take rational decisions which are more appropriate to local needs and resources.

(ii) if responsibilities are localised it will be more difficult for the men in charge of a supply to blame central government, i.e. actions to improve service and remedy complaints will have to be taken locally.

(iii) if recurrent finance is distributed locally and central government remits council grants on time, officers in charge of water supplies may save time and have their recurrent financial problems eased. They can argue locally for the necessary funding and point to specific results of insufficient money. They will also be able to pay local bills for example to ZESCO on the spot thus avoiding reliance on a district headquarters.

Furthermore council officers reported that government is open to suggestions from those affected by decentralisation. It is therefore likely that amendments to decentralisation legislation would be enacted when it is shown that they would be beneficial. Therefore, in principle decentralisation should help to improve the efficiency of the provision of services provided that:-

(i) the necessary technical competence is available.

(ii) sufficient finance is made available for purchasing all necessary inputs and

(iii) the council leaders always take full cognizance of the advice of their technical staff and do their utmost to support them.

13.3 Other Potential Problems for the Water Sector Arising from Decentralisation

(i) Overstaffing.

Decentralisation might make it even more difficult than it is at present to tackle the over-manning problem in the water sector by rendering some of the excess workers redundant. Although Government is always loath to sack workers it might be possible under centralised operation to improve the situation after studies such as the consultants' Western Province report, have quantified the financial effects of the overmanning. Under a decentralised set-up it will be even more difficult. Firstly the Prime Minister has pledged that jobs must not be lost. During their visit in 1981 the consultants heard of a case where one local authority employee had been sacked and an investigation was requested. Secondly the decisions to make men redundant will have to be made locally, even if they have to be endorsed centrally. It will, therefore, be even more difficult for district councils to sack a man than it is for distant ministries to take impersonal decisions to sack unfamiliar employees. Councils will be political bodies and even after having inherited all the existing workers, they may be under pressure from their people to increase unnecessary imployment.

(ii) Financial Control

Prior to decentralisation small councils ran up debts and got themselves into unsatisfactory positions even when they had limited budgets and responsiblities. If and when services such as water supplies are decentralised their budgets will greatly increase. It is vital for the long term interest of public service consumers that the district councils run their activities on a sound financial basis. If they do not they could soon develop serious liquidity problems which would probably be reflected in the resources available for operating their services such as water supply.

At present the financial procedures within the water sector are dominated by considerations of control, i.e. to prevent dishonesty, rather than by the requirements of planning. It is possible that the changes in local administration will, at least in the short term, exacerbate this shortcoming Clearly control is necessary but so is data for planning.

13.4 Determination of Water Rates After Decentralisation

Although there is still considerable uncertainty as to how the Act would work in practice, the intention is that the district councils should run the water supplies and be responsible for rate collection. However, it is less clear whether councils will have the power to determine the rating policy and tariff structure. The Act gives the councils the power to pass their own by-laws to govern their own destinies. Any charges levied by the councils "shall be regulated by by-laws or imposed by resolution of the Council with the approval of the Minister". Thus in general the councils will impose charges based on by-laws which they themselves have passed. In theory they will, among other things, determine their own water rates. This may mean that the larger councils who have operated their own water supplies for many years will be able to implement proposed price increases quickly without reference to Lusaka. However councils inexperienced at running water supplies might, at least in the early years until they have understood the difficult conflicting issues involved, impose a totally inappropriate rating policy. This is very likely to happen if Central Government dispalys limited interest in the question of water rates. One reason is that the councils will be political bodies and might base decisions on considerations of short term popularity, whereas the serious implications may not be felt for some time. Another is that the Act stipulates that all receipts should be paid into a general fund and that all payments should be made out of the same fund. Thus a disastrous financial performance of the water undertaking could be masked by other profitable activities or alternatively be lost in a larger financial mess. On the other hand one attribute of decentralisation is that water revenues will no longer be sent to Lusaka and simply become a small element in Central Government revenue. They will remain with the authority responsible for the supply which will thus find the financial viability of their water undertaking, at least in part, dependent upon their own revenue collection performance. If district councils are left to formulate their own rating policies the only control on the establishment of realistic pricing policies would be donor insistence that certain conditions relating to water rates be put on future loans/grants for water supplies. The legal agreements for such loans concerning the operation of the water supplies would, of course, be entered into by the Government of Zambia. It would then have to ensure that the local authorities responsible for the supplies abided by the conditions

of the loan. In this way the councils would be pressurised to adopt sound water rating policies.

However Central Government can impose appropriate water rating structures on the councils, or at least modify the councils own proposals. The act states that the councils' by-laws (a) must not conflict with other law, (b) have to be confirmed by the Minister (c) can be amended or revoked by the minister. Thus Government could determine water pricing policy at the national level and it is hoped that this will occur, so that this present revenue study will be both relevant and useful. It should be stressed that the consultants' concern relating to lack of central government involvement stems from an uneasiness that inexperienced councils may not increase rates in line with inflation or other rational criteria. It is unlikely that these councils would increase rates too high since it is probable whatever the respective roles of central and local government in determining water rates, that approval from the centre will be required for rate increases, as is the case at present. In contrast it may be beneficial for larger councils operating urban water supplies to be able to implement rate increases without such approval since their staff are sufficiently well aware of all the issues involved to make rational decisions. A reasonable requirement would be that they should, at the same time, submit to Lusaka the background data, revenue and cost projections etc. on which the increase was based.

It may not be possible or even desirable for some councils to run services such as water supplies in such a way that revenues fully cover all costs. For example it may be possible for shortfalls to be made up by Central Government grants for which there is provision in the Act and which may be no more in real terms, than Government is currently providing for the same services through DWA. However, it is vital that the councils fully understand their water rating policy and its implications and properly enforce it. If they do not the financial situation of services will inevitably become unsatisfactory and this could lead to a deterioration in the services themselves.

13.5 The Effect to Date of Decentralisation on Water Supply Operation

In discussing the effect of decentralisation a few officers reported that district water officers are starting to become answerable to the district executive secretary as well as to their historical boss, the provincial water engineer. In addition decisions are increasingly being taken locally. However, the decentralisation process is planned to take several years and to date has had little effect on DWA and council water supply operations. Furthermore it is expected that funding for water supplies now being operated by DWA will continue to be provided by DWA headquarters for some years to come. There is still some uncertainty surrounding the final outcome of the role of DWA and similar organisations and individuals are unsure of what their own position will be.

13.6 Short Term Responsibility for Township Water Supply

The question of who should run township supplies was investigated in the field. Almost all DWA officers felt that DWA should continue to operate all the supplies for which it is currently responsible. However, they did not feel as strongly on this question as on the issue of split responsibility (cf. Section 14.4) under which councils are responsible for revenue collection. The involvement of more than one agency was strongly opposed. Council officers were divided between those who thought DWA should continue to run the water supplies and those who felt that their council should take over its local water supply .

It is clear that although DWA could be better staffed, it is well staffed with skilled manpower compared with most councils, which do not yet run their own township water supply. It also has a much higher level of the necessary knowhow. Councils are mainly administrative/political bodies, many of which do not have the technical staff and competence to operate, maintain and administer water supplies on their own. In the past the councils have found it extremely difficult to attract the right staff and it is unlikely that the situation will change overnight. Even councils as large as Chipata and Mongu have found it preferable to hand over the operation of their water supplies to DWA. There is, therefore, little chance that most of the smaller councils could take over efficient operation of their water supply

in the immediate future. In general, schemes handed over by DWA to councils have not been well run and councils continue to ask DWA for assistance Some DWA officers believe that in these circumstances handing over any more supplies to councils would be a disaster. They pointed out that councils have failed to operate small relatively easy to run schemes. Even if such dismissals as "councils always fail" are exaggerated it is clear that all but the largest 15-20 councils are not well equipped to run water supplies at present. Consequently any take overs at present are likely to lead to a deterioration in the condition of the supply and in the service provided.

So why did some council personnel believe that they should take over their local water supply? The main reason is that they are attracted by the lure of the revenue from water rates and concentrate their attention on this potential income rather than on the costs involved. They do not fully appreciate the costs and problems involved until they actually take over a water supply. They rarely address themselves seriously to the question of whether or not they could run the supplies better than DWA. Some are so divorced from reality as to argue that councils should take over water supplies so that the "revenue could benefit those who pay more directly" i.e. they believe that running water supplies at the present level of rates is a highly profitable activity. Council personnel who do appreciate the real costs involved have little interest in their council taking over the supply since they realise that DWA is, under present circumstances, the best agency to run township water supplies. Generally the more aware an individual is of the real situation the more likely he is to doubt the value of transferring water supplies to the councils. The consultants found that some senior council personnel who had intuitively felt that councils should take over the water supplies in order to provide an additional source of revenue for the councils changed their minds after discussing the probable figures with the consultants.

A typical picture for a council taking over a medium/small township supply could be as follows:-

Salaries/wages incl. ZNPF and housing costs	=	K25.000
Other direct costs (repairs, replacements electricity, diesel, and chemicals	=	K15.000
Indirect costs (clerical staff, transport etc)	=	K10.000
		K50.000

The indirect costs would only be debited to the water undertaking if proper cost accounting was performed. Typically current revenue collection is only about K5000-K10,000 per annum. Hence councils taking over an average DWA water supply must be aware that revenue may cover as little as 10 per cent of the costs that they would incur. The financing of the difference would require an average increase in total council income (government funding and commercial activities) of between 5 percent and 10 percent. Hence, itis strongly recommended that under the present circumstrances councils should not be encouraged to take over township water supples from DWA. They should not become responsible for any additional supplies until they have acquired the necessary technical staff and fully understand the financial implications. The former is unlikely to occur until the present move to decentralisation has advanced considerably. Hence, DWA should continue to run the township water supplies for which it is now responsible until that point is reached.

13.7 Medium Term Responsibility for Township Water Supplies

It would be preferable, as is recommended for the short term, that just one organisation should be completely responsible for a water supply since this would minimise the problems of supervision and co-ordination. If both councils and DWA are involved in major roles there is always the possibility that each will blame the other for inefficiencies. Unfortunately the intentions of the 1980 Local Administration Act combined with the technical limitations of most councils suggest that this may not be possible. As has been discussed above, it will be necessary for DWA to continue playing a significant role in water supply operation for some time yet. However, the appropriate level of council involvement prior to their taking over in the longer term is less clear cut. The main alternative roles for DWA/Councils are:-

(A) the continuation of the present situation whereby DWA would continue to operate and maintain the supplies, but the administration and financial aspects would remain divided between the councils and DWA. As is discussed in Section 14.4 this is unsatisfactory and the consultants strongly urge that a scheme is administered by a single organisation so that the opportunities for a lack of co-ordination are minimised.

(B) DWA continues to have total responsibility for operation and maintenance but also takes over billing and revenue collection. The consultant favoured this alternative as the optimum short term solution, but it contradicts government decentralisation intentions for the longer term.

(C) the councils take over the responsibility for the administration and all financial aspects of the water supplies but DWA continues to operate and maintain the supplies. DWA could bill the councils on one of five alternative bases:

(i) a fixed annual sum agreed in advance which is expected to cover all DWAs costs.
(ii) a fixed annual sum agreed in advance which will only cover a part of DWAs costs
(iii) its actual monthly costs
(iv) on a bulk metered basis
(v) on a percentage of revenue basis. The present 90 percent would appear to be a suitable figure.

The major merit of the latter, (C), would be as a stage on the decentralisation path. It would permit the councils full administrative financial responsibility before they take operational responsibility. In this case it is recommended that DWA should bill the councils either on the basis of (i) or (iii) listed above. This would mean that any subsidies required would have to be funded by the councils out of their general revenue funds. Since it is likely that revenue will continue to fall far short of costs such subsidies will be required. Since councils would probably be unable to afford to pay these out of present revenue sources it will be necessary that the decentralisation process is accompanied by significant financial transfers from central to local government. Consequently unless this happens the councils will be unable to assume financial responsibility for the water supplies. Whatever level of subsidisation is required, finanacial responsibility would provide the councils with a real incentive to carry out their billing and collection functions effeciently. If they are given the responsibility for billing all water consumers they will have certain advantages that DWA would not have. For example they could simply add water rates to rents for all council house tenants. This would be particularly useful for collecting water rates from communal point consumers. It would be

possible for some councils to take over the full financial and administrative responsibility for the water supply from DWA while others, who do not feel they are yet competent to do so, remain uninvolved. In the latter case DWA should be completely responsible for all aspects of the supply including billing and revenue collection. Hence while some township supplies would be financed through the machinery of local government others would still be dependant on DWA for financing their operation and maintenance. However, if decentralisation is followed through all councils would, in time, take over from DWA. Once councils have demonstrated that they have successfully assumed financial responsibility and all recurrent and capital expenditures are being funded through the machinery of local government it would be rational for councils to take over technical responsibility provided that they have the requisite technical competence.

13.8 Long Term Responsibility for Township Water Supplies

When decentralisation has reached the point where the machinery of local government is capable of administering services efficiently it may be appropriate for DWA to relinquish control of township water supplies to the district councils. This would need to be accompanied by the transfer of many DWA local staff to the councils.

The crucial point is that the council together with the staff transferred from DWA must be capable of operating and maintaining the scheme efficiently. This means that it may be appropriate for different councils to take over their local water supply at different points in time depending on the local situation. In fact, if the present move to decentralise gathers momentum councils capable of operating their water supply efficiently must be positively encouraged and assisted by DWA to take over their local water supply in order that the provision of water dovetails with the organisation of other council services. It would not matter that the councils do not have the capability to plan and develop augmentations.

If township water supplies are taken over by councils, DWA's present role in the sector would be dramatically changed. Its major contribution would be the planning and design of new supplies and augmentations and liaising with consultants. The number of staff exployed in the township water supply section would only represent a small fraction of the present establishment,

but they would mostly be professional staff and technicians.

13.9 Should DWA Take Over Additional Township Supplies from Councils?

Having discussed the question of whether or not councils should be encouraged to take over DWA operated schemes and recommended that schemes should not be passed over by DWA at present, the natural follow up was to ask whether the government should encourage DWA to take over some of the more poorly run council supplies. It transpired that DWA staff were evenly divided on this question. The case for taking over some additional supplies could be summarised as follows:-

(i) since only schemes currently being run poorly would even be considered for transfer the DWA, the handover would mean that such schemes would be better run by definition.
(ii) the little maintenance that is being done on a few council run schemes is only being undertaken with DWA assistance
(iii) some councils have got no idea of how to run a water supply. DWA staff with their better knowledge would improve the operation and maintenance even if they were only able to devote a small amount of time to the newly taken over supplies.

The case against taking over can be summarised as follows:-

(i) DWA should not take over any more supplies until it is capable of running the ones it is already responsible for more efficiently. This can only possibly be brought about by government allocating more manpower, transport and recurrent funds to DWA.
(ii) DWA should not take on extra responsibilities without being provided with the additional resources necessary to run the additional supplies properly.
(iii) since supplies should eventually be run locally DWA should not take over any more supplies even if it is considered inappropriate for many of DWA's existing schemes to be handed back to councils at present.

The consultants believe that the disadvantages of DWA taking over additional supples at present outweigh the advantages. Hence, it is recommended that the status quo should be maintained at present, i.e. in general DWA should not

take over more supplies but neither should they hand over supplies they are currently operating to the councils. The crucial phrase in this recommendation is "at present". The move to decentralise is likely to include water supplies and it would be inappropriate for the water supply sector to be out of line with the overall government structure.

13.10 Transport and Spare Parts

This section concentrates on immediate requirements and is therefore phrased in terms of DWA continuing to be responsible for township water supplies. However, the main conclusions are valid whatever organisational structure is adopted.

The poor recurrent financial situation (cf. Section 2.11.3) is reflected in the availability of transport and spare parts. At 13 out of 16 DWA supplies where the consultants collected details of existing transport the officer in charge had no operational vehicle at his disposal unless he was able to borrow one from the boma. Officers' descriptions of their transport situation ranged from poor to critical. PWEs have transport but typically they may possess 2 landrovers and 2 lorries in working order to cover the requirements of all their township water supplies, rural water supply development and other activities. This means that transport is a constraint on virtually all DWA's activities and choices frequently have to be made as to which of a number of transport needs take priority, and which tasks have to be delayed or even left undone for lack of transport. Even at the council run supplies where the water undertaking may have six or more operational vehicles the availability falls short of requirements, and the consultants only visited one water supply (Luanshya) where the officer in charge/town engineer said that he had sufficient transport for all his needs.

Under present arrangements MSD (Mechanical Services Dept.) is responsible for repairing major breakdowns of government vehicles. Unfortunately MSD sometimes lacks the necessary spares and the funds required to purchase them. Hence DWA may be deprived of vehicles for some time by a factor outside its control. This problem could be alleviated if donors giving vehicles to DWA also provide an appropriate selection of spare parts at the same time.

DWA should store these spares and only hand over particular parts to MSD when the latter has identified the spares required for a DWA vehicle under repair in the MSD workshop.

The spare part situation for water supply plant and equipment is also extremely poor. This is partly the result of the recurrent financial difficulties described in Section 2.11.3 but is also due to (i) the even greater foreign exchange constraint, (ii) the lack of standardisation and (iii) slow procurement by DWA and poor dealer service.

Most officers in charge of supplies reported that they have no store and virtually no spare parts. Even provincial offices have very few spares. When a part is required it has to be acquired from Lusaka. If the agent does not have the necessary item in stock it may have to be imported. Hence the lack of spare parts can cause serious delays in making repairs. Although these delays rarely lead to a supply being non operational for more than a few days it is possible that unless the spare part situation is tackled seriously the reliability of township water supplies could deteriorate as existing components age. Even today delays can mean that a supply is operating below its full capacity for some time.

However although the need for an improved stock of spare parts is obvious to all DWA personnel, it is extremely difficult for the organisation to build up its stock under the present recurrent financial situation and the serious foreign exchange and procurement constraints.It is constantly stretching its allocations just to meet urgent day to day requirements.

It is, therefore, proposed that NORAD or another donor should be requested to provide the necessary funding to build up an appropriate stock. The cost would be only a fraction of the cost of funding new township supplies, but would be extremely beneficial inasmuch as it would assist in prolonging the life of existing supplies. DWA should prepare a "shopping list" of items it requires with emphasis on those items which, experience has shown, take longest to obtain. Prior to receiving the new spares DWA should prepare appropriate stock listsfor (i) individual supplies, (ii) provincial offices, and (iii) DWA headquarters, and implement proper stock-taking procedures such as minimum stock levels, etc. This clearly does not represent the long term solution, but a greater proportion of donor aid aimed at solving current problems now could be extremely beneficial.

The consultants proposals that donors should be requested to provide stocks of spare parts for vehicles and water supply plant and equipment is in line with the idea behind the consultants' proposed limited augmentation strategy, i.e. making the most of existing resources and equipment in order to minimise expenditures on complete replacements.

13.11 Rural Organisation.

Theoretically over 2 million rural people have access to potable water. Unfortunately the actual number to whom potable water is available is unknown due to the fact that an unknown number of rural supply points are no longer functional. However, ambitious targets are still pursued. For example, it was the government's intention to supply an additional 400,000 people during the Third National Development Plan period through 2,500 wells and well points, 1000 boreholes and 200 piped village water supplies. In order to ensure that such development efforts are not wasted it is necessary to efficiently maintain the large number of existing and planned supplies. Unfortunately at present maintenance of rural water supplies is poor. Theoretically the responsibility rests with district councils, but they are unable to perform effectively, due to their lack of skilled manpower, financial and transport resources. DWA's responsibility is confined to developing rural water supplies, although sometimes officers in charge do what they can to help the rural people. But again lack of resources means that they are not able to do very much. Therefore, maintenance of rural water supplies is sometimes non existent, and even when breakdowns occur repairs take a long time and are often not done at all. For example in many areas there is often no technical competence backed by adequate transport to undertake simple tasks such as removing broken handpumps. Subsequently the supply is abandoned. Hence it is vital that more resources are provided for the maintenance of rural water supplies. Again in line with the theme of making the most of existing assets it is suggested that development of new rural supplies should be temporarily reduced until a higher proportion of existing supplies are well maintained. The resources and finance saved by a reduced development programme should be devoted to the improved maintenance programme. It is further recommended that supplies that are still working and those where only minor repairs are required should receive priority over supplies where rehabilitiation is required.

It is recommended that DWA's present role in rural water supply maintenance

should be recognised, i.e. while councils are responsible for maintenance, the limited maintenance that is undertaken is sometimes done by DWA's district officers providing informal assistance. Whether or not the actual responsibility for rural supply maintenance is officially transferred to DWA is less important than that DWA receives additional resources for either (i) maintaining rural water supplies or (ii) providing assistance to councils to maintain rural water supplies.

14 BILLING AND REVENUE COLLECTION

14.1 The Existing Billing, Collection and Revenue Accounting Arrangements

The local DWA office is supposed to read meters and to provide the council's treasurer's department with the details. The council is supposed to bill the consumers based on the arrears from the previous month and the current months consumption/flat rate. The P.W.D. 272 form (see overleaf) presents all the necessary information and is not over-complicated. It is, therefore, adequate to fulfil its role. A council clerk invoices consumers on a wide variety of forms. Stocks of pre-numbered invoices are often exhausted long ago and frequently stencilled non-numbered invoices are substituted.

In discussions of the problems of billing and revenue collection, the lack of invoice forms and accounting machines were often mentioned. Clearly it is important that a billing clerk always has a supply of invoice forms, although it does not matter whether or not they are pre-numbered. The clerk can number them consecutively as he issues them. It is more important that the details are filled in properly in the consumer ledger. At large council supplies with several thousand consumers, it is useful that accounting clerks are assisted by accounting machines. But at most DWA supplies they are not necessary. It is, however, suggested that revenue clerks are provided with the simplest type of cheap electronic calculators.

Payment is generally received in cash at the council offices and is accounted for by a licensing officer. A general receipt is issued by the licensing office and the sum entered onto a daily cash collection sheet for posting to the cash book. Details of receipt numbers and amounts received are entered onto ledgersheets maintaned for individual consumers.

There is nothing wrong in principle either with the paperwork involved, (although this does vary between councils), and in the agency agreement whereby the councils keep 10 percent of the revenue collected as their fee for their billing and collecting role. Unfortunately the system does not work very well in practice.

The biggest problem is clerical sloppiness rather than a basically poor

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.....TOWNSHIP WATER SUPPLY STATEMENT OF CONSUMPTION AND PAYMENTS FOR.....19.....

Occupier	Arrears Brought Forward	Current Month's Consumption					Payments		Arrears Carried Forward	Other Payments	
		Meter Reading		Quantity	Account Number	Amount	Receipt Number	Amount		Amount	State Whether Connection or Meter Test Fees
		Present	Previous								

accounting procedure. For example when billings are missed the omissions are not necessarily reflected on the following month's invoices. Subsequent attempts to reconcile debtors' invoices and receipts can be impossible.

The major system fault is that there is no standard procedure for writing off bad debts. Bad debts are written off haphazardly and arrears are often dropped without explanation. Since councils are poorly informed of intended house evacuations large sums have to be written off, even though many of the people moving are doing so on council/government transfers. A large part of the outstanding debt may never be collected and often little pressure is put on debtors to pay. But apart from the weakness of the lack of standard procedures for writing off bad debts the problem is again mainly due to sloppiness. Inadequate supervision of junior staff means that errors are not detected until it is too late to take corrective action.

The problems relating to revenue collection and the council's performance are of real concern to many DWA officers in charge of supplies. A recent letter from one officer to his district executive secretary expressing disappointment with the council made the following points:-

(i) there is laxity in collection by the council.

(ii) the council does not pass on 90 percent of the money collected to DWA as it should, they spend it on other things.

(iii) when we disconnect due to non payment we are sometimes told by the council that the consumer should be reconnected because the outstanding bill has been settled, but this is not always true if the consumer concerned has a friend within the council.

(iv) even when consumers pay and are issued with receipts, it is not always shown in the receipt book. Consequently if a consumer loses his receipt he may be faced with a claim for bills that he has already paid because it would be difficult to trace his payment in the receipt duplicates.

(v) there are no proper records of who is paying what, the books show many consumers are not paying,but very few warning letter copies are received by DWA

(vi) less than 50 percent of expected revenue is actually collected.

This letter and all consultants' field visits showed that there is a need for:-

(i) an increase in clerical efficiency of billing and revenue collection.

At present many of the council staff involved are rather uninterested. The effect of this on collection is two-fold. Firstly they will not be overconcerned whether or not consumers pay. The result is that consumers soon realise that paying is almost semi-optional in the short term and consequently revenue falls. Secondly they may send some bills rather spasmodically so that a consumer suddenly may receive a bill for several months water bills. Even a conscientious consumer may not pay such a bill promptly simply because he cannot afford to. An increase in efficiency requires incentives which are currently completely missing.

(ii) the enforcement of a strict policy of disconnection (cf. Section 11.8) so that those who are trying to carry out collection efficiently are not severely handicapped.

The consultants believe that since there is nothing inherently wrong with the present system of billing and collection a significant part of the blame for the poor current performance rests with the agency agreement. Nevertheless a number of other consultants have repeated the argument presented below in favour of retaining the present system despite admitting that:-

(i) inadequate liaison leads to some consumers not being billed, to collection not being enforced and to arrears not being notified to DWA and

(ii) insufficient incentives exist for councils to rigorously pursue collection and debts.

In favour of the existing agency agreement they argue that:-

(i) councils' personnel will be experienced in similar work through their involvement in the collection of rents, licenses, etc.

(ii) documentation requirements of billing and collection can be absorbed with the council's treasury department.

(iii) the work required is not full time, but has peaks which one man may not be able to cope with, but the council has greater flexibility.

(iv) sound internal control requires the separation of cash collection from the keeping of billing and debtor records. The council staff position makes this possible.

(v) the main existing problems can be overcome by improved liaison between the staff of the council and DWA.

The present consultants reaction is as follows:-

(i) the tasks involved are basically simple and DWAs personnel could perform them equally well given a short training period.

(ii) one man could perform the tasks, furthermore this means that the responsibility is not split between clerks and everyone knows where praise or blame should go.

(iii) the separation of cash collection from billing and accounting may be the ideal but in the situation under consideration the "second best", i.e. something that actually works, has more merit.

(iv) to say that all that is required is improved liaison is simply a dismissal of the problem.

Hence the consultants of this report disagree with the consultants who have repeated the above argument in favour of the agency agreement. If revenue collection is to be improved it should be done by DWA and Section 14.4 presents the consultants' argument. The consultants only reservation on billing, collection and revenue accounting being taken over by DWA relates to the possibility of it being outdated very soon by decentralisation. However, as long as the picture remains cloudy, what is best for the existing situation is recommended.

14.2 Modification of the Agency Agreement

Those consultants who have argued in favour of the continuation of the agency agreement have also suggested that it should be modified. The present consultants while having strong reservations about the continuation of the agreement, agree that if councils do continue collecting water rates on behalf of DWA, modifications would represent an improvement over the present situation.

There are two separate questions to examine. Firstly the level of councils' commission and secondly the structure of those payments. If the level of the commission is too high DWA's income would be unnecessarily reduced. If it is too low the councils would have no incentive to do the job properly, and the present situation of inadequate control and below expected collection would continue. The consultants believe that no one rate of commission could provide a reasonable incentive to councils and at the same time not deprive DWA of an unfairly high percentage of their income. However, it is suggested that this problem of reconciling the conflicting interests could be overcome by a two tier commission system. This would involve the councils

receiving commission at a certain rate on the first part of potential collection, but receiving a higher rate on collection above a certain pre-determined level. The former would be aimed at covering the councils' costs of collection. The latter would provide an incentive to the councils' to maximise collection, i.e. to improve their efficiency of collection. It is suggested that the present rate of commission, 10 percent, would be suitable for the first tier and that a rate of between 20 percent and 33 percent would be appropriate for the second tier. It is proposed that the council and DWA in every township should together estimate the maximum revenue that could be obtained if 100 percent collection from individual connections was to be achieved. It is proposed that the higher rate of commission should commence at a point representing 60 percent of maximum possible collection. Thus if a council was to achieve 90 percent collection, the maximum collection that could realistically be achieved, and the inducement commission rate was set as high as 33 percent, the council would effectively receive an overall rate of almost 18 percent. A similar arrangement could also be appropriate for collection from communal standpipe consumers except that the point at which the higher rate of commission should start should be much lower, possibly at the point representing 10 percent of maximum possible collection.

A restructuring of the agency agreement may provide a greater incentive to councils to put a greater effort into improving their revenue collection performance. However, it will not do anything to solve another current problem, that of remittance.

14.3 Remittance Problem

Most councils who collect water rates on behalf of D.W.A. are extremely slow to remit the money. Some have always failed to hand over all the revenue to D.W.A. The main reason is that the cash collected goes into the councils' accounts before onward transmission to D.W.A. Unfortunately before it is passed on it is used for urgent council expenditure. This problem of councils failing to remit revenue is not unique to D.W.A. and other bodies on whose behalf councils collect revenue are similarly affected.

The result is that both the pattern of, and total, remittances received by D.W.A. are often very different from that of the actual collection of water rates. In effect many councils have treated water rates due to D.W.A. as short term interest free financing. It remains in the councils books but many councils say that they cannot repay their debt until their financial position improves. The seriousness of the problem varies from place to place but several councils, for example Mumbwa, have failed to hand over any water revenue to D.W.A. for several years. The consultants estimate that on average the councils have been handing over just under half the money collected.

While it is true that councils have serious liquidity problems they take advantage of the fact that D.W.A. is unable to bring real pressure to bear on them to hand over the revenue. For example in 1982 Mkushi council which has failed to hand over any revenue directly to D.W.A. for some years found K6000 to pay an unpaid ZESCO bill after the electricity supply to the water scheme had been disconnected. D.W.A. has been hoping to get positive support from the administration at national and local levels but so far no positive results have been achieved. One solution would be for councils' liabilities to be deducted from their government grants prior to transmission from Lusaka. At present this could only be done with the councils' permission. Hence if the remittance problem is regarded as truly serious it would be necessary to investigate what steps would have to be taken in order that deductions could be made as a matter of course by the Ministry of Finance. Alternatively the local administration could order the council treasurer to pay outstanding debts as soon as a council receives its grant.

14.4 Revenue Collection by DWA

The existing arrangement whereby DWA is responsible for the operation of water supplies but where councils collect revenue on an agency basis is widely criticised. Shared responsibility combined with inefficient communication means that problems and frustration arise. It is important that co-operation improves or one organisation takes over the responsibility for all aspects of a supply. A few council officials believed that councils should take over the operation of township water supplies but visits to supplies run by councils, (with the notable exceptions of the larger township/urban supplies), suggested that his would not be a good idea until decentralisation has progressed to the point where the district councils have greater technical competence.

There is a widespread feeling within DWA that the organisation should take over revenue collection and it has already started doing so in a very small way. For example it was reported that DWA has been collecting in Namwala for over one year and in Mporokoso from early 1982. Some council officials interviewed opposed the suggestion that they should pass over the responsibility for collecting water rates to DWA since it would mean a loss of revenue but others were keen for councils to terminate their involvement in billing and rate collection. They felt that it would be rational for councils to hand these functions back to DWA. Some even mentioned that it would alleviate the pressure on them to spend DWA money on other urgent expenditures.

Hence the consultants recommend that as long as DWA is responsible for operating the supplies it should also be responsible for revenue collection. This would mean that:-

(i) the existing problem of getting councils to hand over 90 percent of the revenue collected would disappear. At present this involves DWA in considerable correspondence even when they get the money.

(ii) DWA would no longer be dependent on the councils to provide lists of defaulters. Their own books would yield the necessary data on the current arrears situation. They would be able to ensure that the erring consumers were constantly aware of their arrears and DWA would be able to identify consumers due for warnings and disconnections at

all times, i.e. one of the current constraints on DWA's ability to apply consistent disconnection policy, the lack of feedback from the councils, would disappear. Even if the political sensitivity continued to make disconnections a tricky problem, accurate up to date arrears data would certainly ease the disconnection problem and should lead to improved, if still below expected, revenue.

(iii) it can be claimed that DWA would collect revenue and keep the revenue accounts more efficiently than councils do because they would have a greater incentive. Since the councils only have the right to keep 10 per cent of the amounts they collect, water rate collection is an unimportant source of income, and the level of efficiency with which they collect makes little difference to their income. One council treasurer in discussion with the consultants stated that his job was only to collect the money not to chase it. DWA would be keeping all the revenue collected and although under present arrangements they would be passing it all on to the Treasury, high collection would be psychologically encouraging as well as providing a strong argument for increased recurrent funds to improve the efficiency of operation, which in turn could lead to additional revenue.

It can be argued that failure by councils to hand over money collected to DWA doesn't really matter provided that they are using the money for legitimate expenditures, as they are doing. The retention of DWA's money by councils simply means that one arm of government is slightly more liquid than it would otherwise have been and provided it does not distort resource allocations, no harm is being done. As far as DWA is concerned it does not affect the resources available for current operation and maintenance, since DWA remits all money received from councils to Treasury and cannot spend it. It can, of course, be argued that future operation and maintenance allocations may depend on revenue collection. However, this is rather dubious and furthermore could be overcome by Treasury judging revenue collection on the sum actually collected, rather than by the remittances it receives.

Therefore in supporting the proposal that DWA should take over the collection from councils, the consultants believe that the emphasis of the argument should be placed on the need to improve the level of collection and DWAs requirement for accurate arrears data, rather than on the fact that councils frequently fail to hand over the sums that they do collect.

It should be noted that this is not the first time that the suggestion that DWA should be responsbile for collection has been put in writing. The minutes of the Zambia/NORAD meeting of 25.1.82 stated that "DWA in general will collect the rates from consumers directly without involving the district councils. NORAD stated that the agency will assist with this by training of personnel". The same minutes stated that in order to make sure that funds collected from consumers were retained for the operation and maintenance of the respective schemes it was agreed that DWA should try to make arrangements for a special deposit or account for each district within the Ministry of Agriculture's accounting system so these funds would not revert to Central Government. This approach cannot be endorsed, since it would create a new precendent in government accounting. As discussed above the aim of taking over collection should not be to increase operation and maintenance funds from money collected since government could take these into account in approving recurrent expenditures. The aim should be to increase collection for government both directly through increased efficiency, and indirectly through permitting more efficient sanctions. Thereby demonstrating the value of water supplies to the community in order to influence Treasury to approve the sums required for efficient operation.

14.5 Pre-Conditions for DWA Taking Over Collection

The practical problem that has arisen when DWA has been considering taking over collection itself is the lack of banking facilities in some towns. DWA does not like employees to keep money in their offices without safe deposits. However, the problem of banking should not pose an insuperable problem. An increasing number of townships now have banking facilities and where they are still lacking it should be possible to make alternative arrangements. For example to use the safekeeping facilities of the district secretary's office whenever receipts exceed a pre-determined level.

Merely taking over the responsibility for revenue collection will not automatically lead to improved efficiency since the calibre of the personnel actually billing, collecting the revenue and keeping the books would be similar to that of council employees. It is necessary for their bosses i.e. officers in charge, provincial engineers and head office staff to supervise and encourage their efforts and for them to start their work properly trained for it. This means that they not only know what they are supposed to be doing but also the reasons behind their different tasks. This

may sound obvious, but questions to council clerks on why they are doing certain things sometimes received strange answers.

14.6 Proposed Assistance

It is recommended that a donor be requested to provide one training officer for a period of at least six months in order to assist DWA prior to, and during, the take over period.

His terms of reference would be:-

(i) to visit all DWA supplies to identify which member of staff would be most suitable as the billing and revenue clerk.

(ii) where no suitable candidate exists or where a suitable individual cannot be spared from his present duties recommend a suitable man for a transfer from another supply or from provincial headquarters.

(iii) design the precise revenue accounting procedures, forms, and ledgers required, (it is unlikely that any major alterations to existing procedures and forms would be required).

(iv) give training courses in Lusaka for groups of trainees.

(v) travel to every supply to check on performance and to provide further on the job training.

(vi) estimate the maximum workload that a billing and revenue clerk should be expected to perform and based on consumer projections estimate when additional clerks will be required at every supply.

14.7 Input Required for Billing, Collecting and Revenue Accounting

It is recommended that at most supplies one man, would be responsible for all billing, collection and revenue accounting. This would, according to some officers interviewed, place an impossible work load on the clerk responsible. However, examination of the tasks involved show that it could be possible and the existing attitudes possibly arise from the low productivity of many clerks today. For example, at a supply where there are 250 metered individual connections and 250 communal consumers, which represents a slightly heavier than average current workload, the time input required would be:-

Billing	- 250 bills involving calculation of last month's consumption and amount owed, plus recording of arrears, at 6 minutes per bill.	= 25 hours
	250 flat rate communal bills plus recording of arrears, at 2 minutes per bill.	= 8.33 hours
Collecting	- taking the money and writing receipts for 500 consumers at 3 minutes per consumer	= 25 hours
Revenue Accounting	- transferring the figures to the main revenue ledger and calculating outstanding balances. 250 metered consumers at 6 minutes per consumer.	= 25 hours
	250 flat rate consumers at 5 minutes per consumer.	= 20.83 hours
	TOTAL	=104.16 hours.

It is suggested that the bills are written during the third week of the month and that the revenue office is closed during this period so that the clerk can prepare the bills without interruption. During the rest of the time he will be available to receive revenue and will be working on the ledger in between customers.

Meter reading could be done by the same clerk or by another worker. The input required would be very limited since it is estimated that one man should be able to read at least 100 meters per day. A maximum of 2-3 days work should suffice in most townships. If the clerk was to read meters it would be necessary for the revenue office to be closed for a fixed 2-3 day period every month.

Hence a total of 124 man hours per month should be sufficient to cover all the billing and revenue collection tasks in a township with 250 individual connections and 250 registered communal consumers. Allowing for holidays, sickness, etc. one man should average at least 140 hours per month. Hence one man should be able to handle just over 280 metered individual connection consumers and a similar number of registered communal point consumers.

14.8 Stricter Procedures if D.W.A. Does Not Take Over Collection

As mentioned above the consultants only reservation of D.W.A. taking over revenue collection is the possibility that this could be soon outdated by advancing decentralisation. If this or any other reason prevents D.W.A. from taking over revenue collection it is vital that laid down financial procedures for passing the money on, whether this be to D.W.A., to the council's water fund, or to the Ministry of Finance be established and strictly followed. At present there is no procedure being universally followed by the councils for passing on the money that they have collected as D.W.A.'s agents. If it is decided that water rates should be submitted to the Ministry of Finance it does not matter whether this is done through D.W.A. or through the machinery of local government. What does matter is that a fixed procedure is followed and that D.W.A. knows exactly how much is being collected in water rates. If the rates are to be passed into the council's funds as is suggested by the decentralisation intentions, it is vital that proper accounting procedures are followed. If the income from rates simply gets lost in other council money it may be impossible to tell how much money is being raised from the water rates. In this case rational pricing policies, and future planning and evaluation of the township water supplies' performances would have to be based on guesswork.

14.9 Deductions from Council and Government Employees

The consultants support the procedure followed by many councils of deducting a council employee's water rates from his monthly salary. This means that rates from those with individual connections would be received much sooner, and the problem of non payment would be minimised. In the case of C.W.P. consumers it is probably the only genuinely effective way of ensuring that they pay for their water consumption.

If D.W.A. takes over responsibility for revenue collection it would be desirable, in order to minimise the problems of collection for councils to continue making water rate deductions from all employees without meters and from those using communal facilities, and to remit the money to D.W.A. as a monthly lump sum. However, the problem of remittance may still remain. It is, therefore, suggested that councils be requested to continue making deductions for a limited trial period. D.W.A. would then judge whether or not if felt the remittance performance was good enough for the arrangement to continue or

whether it would bill council employees in the same way as other consumers.

The question of whether it would be possible to extend the principle of deducting at source from other government employees was examined. It appears that there is no real problem in principle, but in practice it would be extremely cumbersome for ministries such as education to deduct teachers' water rates from their salaries and to remit the money to D.W.A. The main case against this procedure is that it may take a very long time for the money to reach D.W.A. In the meantime consumers (teachers) who have paid their water bills may be facing disconnection .

However if it were possible to work out a system whereby communal point consumers had their rates deducted at source, delays in remitting the money to D.W.A. would be less important. There is not much likelihood that D.W.A. would disconnect communal standpipes, especially if workers could show the water rate deductions on the pay slips. From D.W.A.'s point of view receiving the money after a long delay is better than not getting it at all which is generally the case today. Where salary payments are computerised it should not be beyond the realm of possibility to organise the appropriate deductions.

The point was made to the consultants in discussion that the money may be deducted but never reach D.W.A. That would be unsatisfactory but it is suggested that it would still represent an improvement on the present situation, since the left hand of government keeping money which belongs to the right hand should cause less concern than consumers completely escaping paying for services which they receive from the government.

15 RURAL WATER SUPPLY PRICING POLICY

The consultants believe that rural water supplies must be free. The main reason is that the consumers are not willing to pay for government provided supplies. The ability of rural people to pay for water is extremely limited. Section 5.4.1. suggests that the median income of rural households is K 30 per month. Furthermore the lower interquartile figure is only K 10 per month. Therefore, based on the generally accepted criterion that people should not be expected to spend more than 5% of their cash income on water rates, the maximum ability of the median rural household to pay would be K 1.50 per month. The corresponding figure for families at the lower end of the interquartile range would be 50 ngwee per month. Using the more desirable 2½% criterion the amounts would be 75 ngwee and 25 ngwee per month respectively. The consultants suggest that overall ability to pay estimates should be based on families at the lower end of the interquartile range. Consequently the maximum monthly fee that rural people should be able to pay would be 50 ngwee per month, though 25 ngwee would be more desirable.

Hence it is not surprising that the willingness of rural consumers to pay for shallow wells and well points is very low. In addition to their low ability to pay, the people do not usually perceive a high need for improved supplies while their nearby traditional sources are still available. They are therefore unwilling to pay anything more than token rates. They appreciate improved supplies, but generally do not feel that the improvement is worth paying for. Hence, they tend to prefer their free traditional, if inferior sources unless the new supplies are free or virtually so. It is therefore probable that there would be widespread resistance to paying monthly rates for wells equipped with handpumps and that any attempt to charge consumers regularly would meet with failure. However, it is possible to discern a limited willingness of consumers of a rural supply which has broken down, to contribute towards the cost of repair. However, it is not believed that the money could be collected efficiently. In some areas the willingness to contribute would not be universal. For example in the Katete survey 50 per cent of rural interviewees said that the most that they should be expected to do was report the breakdown to "the people concerned". In addition it is unlikely that a satisfactory collection procedure could be successfully adopted on a wide scale. Attempts to obtain contributions from consumers prior to repair may only lead to

suspicion of whether or not the repair team would actually turn up within a reasonable time period. Attempts to collect money after the repair had been effected, may face the problem of a sudden decline in willingness to pay. This is not to say that it could not be collected, but rather that the costs involved would not justify to exercise.

The socio-economic survey in Katete suggested that the willingness of the 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 extremely low. In a situation where most consumers were unhappy with their existing supply almost half of the interviewees claimed that they were unwilling to pay anything exceeding 50 ngwee/month for public standpipe access. Furthermore, virtually all rural people interviewed would prefer a free well equipped with handpump to a public standpipe for which rates were 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 impose a tremendous administrative problem. It is, therefore, suggested that if rates were levied there would be two possible outcomes:

(a) the people continue to use the supplies but the authority finds that it is unable to collect rates.

(b) in the unlikely event of rate collection being successfully enforced the consumers would simply revert to using their traditional sources. Consequently the improved supplies would be unutilised and all investments would have been wasted.

Since supplies will either (a) be free in practice or (b) be unused, the practical policy is to make them free from the start and the Government should have no expectations that revenue will ever be raised from rural supplies. Although this policy is recommended primarily on practical grounds there are a number of additional reasons where they should be free. The argument is very similar to that put forward for free communal points in townships.

(a) rural water supplies should be regarded as a social service and if they are worth constructing in the first place the financial criterion should play a secondary role.

(b) if the Government considers social criteria as an important determinent of policy it may elevate certain goods above the market price and there is a strong case for regarding rural water supplies as such a "merit want".

(c) rural consumers will only receive a low level of service from improved supplies. In many cases the improvement over the existing water supply situation will only be very marginal and it is reasonable for the consumers to be unwilling to pay. They will only use small quantities of water and will still have to carry it home.

(d) the supplies are intended for the ordinary rural people who have a very limited ability to pay for water.

(e) Governments' development policy goals often encompass redistributing income to rural areas. Although free water supplies are not a very efficient way of achieving this goal they should have some redistributional effects.

(f) the marginal costs of rural wells are low, both in the short and longer terms. Even a large part of the operation and maintenance costs are fixed. Thus a free policy accords with an economic efficiency criterion.

(g) even if the people were willing to pay something for the improved supplies and the administrative problems and collection difficulties were overcome, the costs may not justify the effort. The revenue collected may well be exceeded by the cost of collection, let alone cover the costs of operation and maintenance. For example, if a supply was to be used by 15 families who each contribute K0.50 per month, the monthly collection would only total K7.50. If the water supply authority was to employ collectors on bicycles who spent one day per month at a supply point his monthly cost would be at least K100 per month or at least K4.50 per supply point, i.e. at least 60% of the revenue. Moreover it is possible that the costs could exceed K7.50 per supply point. Even if collection costs were covered it is unlikely that any profit would be made after all the clerical costs etc. were met. Thus the major argument against free water supplies, that the authority must meet certain financial targets has no relevance in this case. Another way to explain the problem is to say that the effective demand for water is so low that the demand schedule lies entirely below the

marginal cost curve.

Thus if Government has limited funds for water it must restrict the number of supplies which it constructs rather than attempt to increase available funds by charging for rual water supplies.

Consequently the relevant question regarding the rural water supply programme that must be considered by the authorities and donors does not relate to pricing, but solely to benefits. Will the benefits expected from the rural water supplies justify the investments and the continuing costs of operation and maintenance bearing in mind that no revenue will be raised?

This leads on to further questions. Is the NORAD policy of financing rural water supplies in Western Province misguided? The grants given for the supplies will saddle the Zambian Government with the continuing costs of operation and maintenance for as long as the supplies are operating. In 1981 the consultants found that personnel working on the project were convinced that many of the supplies that have been built have led to little change compared to the previously existing water supply situation and that few, if any, real benefits have been achieved. The consultants were able to accept this view after visiting only a small sample of the wells constructed to date. However, it would be over-pessimistic to condemn the whole rural water supply situation out of hand, There are sites where the construction of improved supplies would genuinely benefit the local community. However there is a need to improve scheme selection. It must be based on accurate descriptions of the water supply situations of the proposed sites and on estimates of need, etc.

APPENDIX A

BACKGROUND TO WATER PRICING POLICY

APPENDIX A. BACKGROUND TO WATER PRICING POLICY

A.1 Introduction

Water supplies can be financed in a variety of ways: at one extreme by government development and continuing recurrent grants to pay for all the capital and operation and maintenance costs. At the other extreme by water charges which cover all running costs and which repay the full capital costs over time. The appropriate policy for DWA township water supplies will lie somewhere between these extremes and the appropriate lever of subsidisation will depend partly on the way in which the authorities regard water supplies, for example, whether they regard them as public utilities or as social services. Historically water supplies in Zambia have been regarded as public utilities which should cover their costs, but in the more recent past government has implicitly tended to view the smaller township water supplies and communal facilities in particular, as social services. Consequently as was mentioned in Section 2.1 the present policy is that the smaller township supplies are only required to cover their operation and maintenance costs with government subsidising part, if not all, of the capital costs.

The major problem in determining the optimum water pricing policy is that the three major functions of water rates described in detail below, (Sections A2, A3 and A5), usually conflict and reconciliation may be a complex task involving trade offs between the financial, economic and social objectives. The decisions involved are largely political and they should be guided by, and consistent with, Government's high level objectives. An understanding of the major functions of, or major criteria for determining, water rates is, therefore, necessary so that these inherent conflicts and the problems and consequences of alternative pricing strategies can be properly comprehended.

A.2 The Economic Criterion

A.2.1. Introduction to the Economic Criterion

The economic function of pricing policy is to influence consumer behaviour so that economically sound investment resource allocation decisions are made and efficient use of resources is achieved, i.e. so that capacity is expanded

at the appropriate rate and that capacity is as fully used at possible. Economic theory shows that this can be done by basing the price of water on the on the marginal cost of production, ie. by charging consumers a price for the water which reflects the costs of supplying that additional water. Theoretically consumers will then adjust their consumption so that the incremental cost of producing additional water is equal to the incremental value of that water to them. If price exceeds marginal cost demand will be unnecessarily restricted and the level of under utilisation will be greater than it should have been i.e. a greater part of the investment than is necessary will be wasted for some time. If price is less than marginal cost the quantity of water demanded will increase and the capacity will soon become a constraint. Augmentation which cannot be justified on economic grounds will be needed. The extent to which price can be used to give an effective signal to the consumer of the real resources being used and an indication to the planners of the effective demand is dependent upon the price elasticity of demand for water. Little data exists on these elasticities in Zambia. However, it is probable that there will be a sufficient degree of price elasticity to make this a feasible objective of policy.

Township water supplies have high fixed capital cost elements with significant economies of scale, so that marginal cost can be below average cost. Furthermore a large element of the operation and maintenance costs will be fixed. Hence over a considerable operational range unit costs of the supplies will fall with increasing utilization, and the marginal costs will be low until consumption approaches capacity. Therefore the economic criterion is likely to suggest a low price until demand approaches capacity. However when augmentations are required and many or all components of the supplies have to be replaced or augmented, marginal costs will increase dramatically. An economic criterion would suggest a high price based on this high marginal cost prior to such augmentations being required. This would ensure that these augmentations are not demanded until they are economically justified. In particular a surcharge on large consumers may be appropriate at this time. Although the long run marginal costs of large urban supplies are often high and increasing and exceed average cost because more distant and more expensive sources must be used for new augmentations, it is unlikely that the long run marginal costs of DWA township water supplies will increase significantly above average costs since it will often be possible to increase the supply from the existing or new nearby sources. Hence although existing data does not enable one to estimate

the long run marginal costs of the DWA township water supplies, it is guessed that they could be similar to the average cost of the 1980's (in real terms). In any case where the long run marginal cost exceeds the average cost the high price suggested by the economic criterion should easily satisfy the financial criterion and a large financial surplus may be generated.

A.2.2. Problems Associated with the Economic Criterion

Theorectically it is fine to say that "if a price equal to marginal cost is charged and consumers deomonstrate their willingness to pay this price it means that they value marginal consumption at least as much as the cost of producing that unit. Consequently the market mechanism will signal to the authorities when an augmentation to the supply is justified". In practice it is not this easy. As was mentioned in Section A.1 and as is shown by the following sections the efficiency criterion may conflict with the financial and social criteria. However as is demonstrated later in this chapter it is often possible to reconcile these conflicts to some extent, and there are often other problems associated with marginal cost pricing which are more intractible.

Firstly, there is the theoretical problem of definition and the practical problem of measurement, i.e. it is extremely difficult to ascertain what marginal cost is. The problem of definition arises from the indivisibilities inherent in water supplies, and there are a number of alternative approaches to marginal cost which are ignored in this report. A cursory examination of comparing alternative methods was made by the consultants but it was clear that a more sophisticated approach than that which has been adopted did not produce any useful results. Firstly most of the data used is so approximate that any marginal analysis has to be treated with care. Secondly the costs of future augmentations which are required for some of the alternative approaches to marginal costing such as "average incremental cost"* are completely lacking. Consequently this report will restrict itself to the most simplistic concepts of marginal cost.

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*For an outline of this and other approaches to marginal cost see "Alternative Concepts of Marginal Cost for Public Utility Pricing: Problems of Application to the Water Sector". World Bank Staff Working Paper no. 259 IBRD Washington May 1977.

(a) the short run marginal cost which is equal to the short run variable costs of production provided that the supply is not up against capacity. Typical costs will be quantified for DWA supplies and are very low in most townships i.e. given an adequate supply and a labour force to operate it there are few extra costs associated with actually using the supply.

(b) the long run marginal cost which takes into account the costs of future augmentations. An attempt is made to quantify these costs based on the costs of augmenting existing supplies estimated by various consultants in feasibility studies prepared since 1977, updated to 1983.

Theoretically the short run marginal cost should be charged until demand reaches capacity. At this point price should be increased so as to ration supply. Price should be increased until long run marginal cost is being charged and the supply is fully utilised. At this point further investment is justified but once the investment has been made the efficiency criterion would suggest dropping the price to short run marginal cost since the only real costs now involved are the costs of operation and maintenance. Although this strategy leads to an efficient use of resources when the supply is operating below capacity and provides an accurate signal for justifying new capacity, it is impractical for a real life situation since the "lumpiness" of water supply investments would lead to vast fluctuations in prices,whereas for practical purposes it is desirable to maintain a stable structure with gradual increases in price. Secondly even if a problem of vast fluctuationtions in price did not exist the efficiency criterion may require frequent price increases. It is unlikely that it would be possible to obtain political acceptance for this. In addition the revision of the tariff structure may itself be a difficult and costly exercise and a policy based primarily on marginal cost criteria may conflict with the need for a system that is easily understood and easy to administer.

Thirdly a strict efficiency criterion would require temporal changes in price, for example higher prices during peak demand periods.

Fourthly marginal cost pricing does not take externalities into account, and

finally the market price marginal cost needs to be corrected for market distortions if accurate resource allocation decisions are to be made.

However in this report most of these problems will be by-passed by only considering the simplest definitions of marginal costs.

A.3 The Financial Criterion

A.3.1. Introduction to the Financial Criterion

A strict financial criterion requires that revenues cover all operating and capital costs, including depreciation and interest charges. Thus whereas the economic approach ignores sunk costs, the financial or accounting approach includes all such costs and is concerned with total and average costs. It means that water rates have to be based on total average costs and large discrepancies can occur between the structure of prices and costs.

During the early years of a new augmentation when demand is well below capacity financially determined rates would be higher than the prices indicated by economic considerations. Conversely when demand is approaching capacity and costly investments are required, the financial criterion may indicate a price which is lower than that which is appropriate from the economic point of view.

I.B.R.D. has been a leading voice in urging that water supplies are public utilities which should observe strict financial criteria although its attitude appears to have softened in recent years. In 1967 Ripman argued that subsidisation of water supplies in developing countries inhibits financing and is a major cause of the critical and worsening shortage. The subsidies actually provided are too small so the service inevitably deteriorates. It is certainly true that in some developing countries a lack of finance has lead to a deterioration of existing water supplies and to a curb on the development of new supplies. This has happend in Zambia with respect to the delayed development of some supplies. Furthermore finance has been a constraint on both maintenance and operation (fuel, etc.). But, more importanly it could become an even more serious factor in the future. However it is false to assume that subsidies will never make up any shortfall and that non fulfullment of strict financial criteria in the rating policy will inevitably lead to a poor service.

Although the Bank's attitude has softened one still hears statements such as pricing based on financial criteria contributes to good management by permitting improved service, efficient use of personnel and other resources. Anyone who insists, for example that communal point users must be charged, should first examine the question of why are we bothering to supply these consumers at all. Nevertheless financial viability cannot be neglected and some financial criterion must be selected, such as, revenues must cover operation and maintenance costs with Governments/donors financing all capital costs, i.e. the present policy. This is acceptable provided that the Government fully appreciates all the implications of such a policy and is prepared to finance all capital development either directly or indirectly through donors. In cases such as the NORAD financed programme currently being implemented in Western Province where foreign aid in the form of grants is already committed to certain projects, the role of financial criteria is less certain and it could be argued that the covering of operation and maintenance costs is a more appropriate criterion than the more stringent one of covering all costs. The crucial point is that whatever criterion is selected the authority must seriously attempt to adhere to it unless it is later shown that the social and economic costs of doing so make it appropriate to alter the originally selected financial criterion. It is vital that the problem of finance is tackled in the very near future. It will be necessary to make financial projections based on various sets of assumptions regarding pricing policy and to examine the financial implications. If they appear to be unacceptable the pricing policies will have to be re-examined and altered. One of the major purposes of this report is to provide a base for such financial exercises.

A.3.2. Justification for Less Stringent Financial Criteria

The weighting that will be given to the different criteria will in part depend upon how water supplies are viewed by Government. Firstly there is a strong case for regarding township water supplies primarily as a social service. If this is accepted then financial criteria are less important than if the supplies were regarded as a public utility. Secondly Government may view water supplies as a "merit want" which they elevate above the market place. For example if it is believed that significant externalities, (for example health benefits), exist, the willingness to pay for water may

underestimate the social benefits. Alternatively consumers may not realise the true value of the water supply even for themselves. Consequently they may use less than optimum amounts of water unless it is heavily subsidised or free. In these cases the role of financial criteria may again be rather limited.

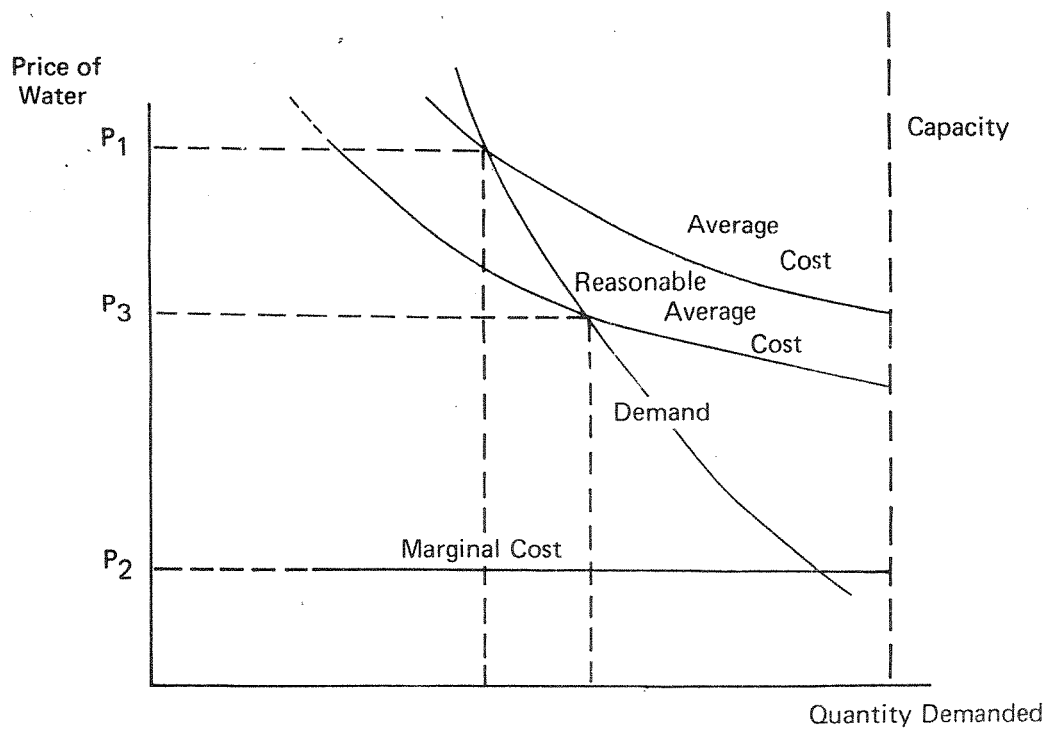
An extremely strong argument against strict financial criteria is that if the supplies must cover all their costs demand would be extremely low and it would not be justified to expand township supplies where demand already exceeds supply. Consequently the decisions which Government makes to invest in the township supplies represent an endorsement of paying limited attention to financial criteria. This attitude is often appropriate and we would argue that advocates of strict financeal criteria tend to ignore the low level of incomes of communal point consumers, the amenity value, externalities, indivisibilities and economies of scale of water supply.

The most telling argument against a strict financial criterion is that if the price of over 50n per m^3 necessary to cover all costs was charged for all water consumed, consumption would fall and a price increase would be required. If this was implemented a further fall in consumption would occur and a further price increase would be required . . . . ad infinitum. Consequently the adoption of a strict financial criterion is completely impossible.

There is often a strong case for not meeting financial criteria where the water supply organisation is not very efficient.

Figure A.1 showes the average cost curves of a water supply assuming (i) an inefficient and (ii) a reasonably efficient, organization. The short term marginal cost is assumed to be low, for example just the additional chemical and energy costs. It can be seen that if strict financial criteria were applied that price P_1 would be charged and that if economic criteria were used price P_2 would be charged. However if the water agency was more efficient a rate of P_3 would meet financial criteria. Hence, although government might say that at any rate below P_1 they are subsidising the consumers, one could also say that at any rate above P_3 the consumers are subsidising the water authority's inefficiency. Since there is no reason why

Figure A.1. The Average Cost Curves of a Water Supply Assuming an Inefficient and a Reasonably Efficient, Organization.



consumers should pay for inefficiency there is a strong case for arguing that the Government should not pass on the full cost to the consumers. Consequently P_3 should be the maximum price charged. In practice this price will be difficult, if not impossible, to determine. However, it supports the argument that rates do not always need to meet strict financial criteria.

A.3.3. Major Consumers

It is often possible to view major consumers as important contributors to the achievement of financial viability, since social criteria are less important when considering such consumers. However there is very limited scope for utilising major consumers in this way in the township supplies. They are very limited in number and, if as is recommended they are charged on a quantity used basis, their total demand accounts for under 15% of all water demanded. Furthermore a major part of this is for Government institutions such as hospitals. Industrial/commercial demand is very limited.

A.3.4. Recommended Financial Criterion

It has been suggested above that the adoption of a strict financial criterion would be (a) undesirable, and (b) impossible. Nevertheless some financial criterion must be used and enforced in order that the supplies do not become completely unviable. Intuitively the current Government objective of covering all operation and maintenance, collection and certain overhead costs seems an attractive compromise since its achievement would mean that development expenditures will not lead to a continuing increasing burden on the recurrent budget. In addition it is an objective that is easily defined, quantified and understood. Consequently it is recommended that the current financial criterion is a suitable financial target for a future pricing policy.

A.4 Subsidisation

Any consideration of subsidisation of township water supplies in Zambia must take into account that other services are heavily subsidised. This is illustrated below.

The sale of electricity to small/medium size towns in Zambia is highly subsidised. Most such towns are classified under the heading "Rural" in

ZESCO's accounts where the term "Rural" means those towns supplied with electricity which are not connected to the Copperbelt, Midland, Southern supply grid. An examination of the financial ramifications of supplying electricity to towns calssified as "Rural" demonstrates the high level of subsidisation provided by ZESCO to townships which are not dissimilar from those being considered in this water supply study.

The lates annual accounts which the consultants obtained from ZESCO were those for 1977/8. It is understood that the organisation's profits of that period have since deteriorated and ZESCO has been making losses. Nevertheless the principles concerning subsidisation of small towns is not affected. Table A.1 presents the overall financial picture of ZESCO's operations in 1976/7 and 1977/8.

Table A.1

Accounts of ZESCO's operations in 1976-8
(million K)

	1976/7	1977/8
Electricity Sales		
Rural sales	1.3	1.6
All other sales	30.4	45.2
Total sales	31.7	46.8
Other Income	1.3	1.9
Turnover		
Rural area	1.4	1.6
All other areas	31.7	47.1
Total Turnover	33.1	48.7
Operating Expenses and Finance Charges		
Rural area	4.4	5.8
All other areas	27.6	37.2
Total	32.0	43.0
Profit/Loss		
Rural area	-3.0	-4.2
All other areas	+4.1	+9.9
Total	+1.1	+5.7

An examination of Table A.1 reveals the following facts:-

(i) ZESCO heavily subsidises its sales to the smaller towns in Zambia i.e. its "rural" sales.

(ii) the "rural" losses cancelled out over 73% and 42% of ZESCO's profits from its other operations in 1976/7 and 1977/8 respectively. These figures are rather dramatic when it is realised that retail sales to the "Rural Area" account for only 4% of ZESCO's retail sales and for only about 1% of total sales, (the greater part of the electricity generated was sold in bulk to C.P.C. (mines) and exported. This provided 57% of ZESCO's revenue in 1977/8 and while it is true that the greater part of ZESCO's profits come from these bulk sales only the "Rural Area" made losses).

(iii) Those losses are due to the high cost of generation in the "Rural Areas" rather than to low consumer charges. "Rural" sales only covered just over 29% and 27% of costs in 1976/7 and 1977/8 respectively. In other words ZESCO was subsidising "rural" consumers to the extent of over 70% of the cost of the product.

Even a township as large as Mongu which received its electricity from the main Southern supply line, also benefits from subsidised electricity. The area manager reported that monthly sales average K8,000 per month, while average monthly operating expenses average K15,000. Thus even when depreciation, finance charges and the part of head office expenses attributable to Mongu are excluded, consumers are being subsidised by about 50% of costs. When those charges are included the level of subsidisation in Mongu approaches that of the towns categorised as "Rural Area".

Thus, despite the fact that the average unit price of reatil sales in the "Rural Area" was higher than that of retail sales in the main supply areas ZESCO's operations on the Copperbelt, in Lusaka and its exports heavily subsidise its sales to rural area, where rural areas means towns of the size of Mongu, Kaoma, etc.

Recent studies have also shown that there is also a considerable degree of subsidisation in public housing in Zambia. For example, the income of the many council housing accounts fail to meet their expenditures and have to be subsidised by the council's general fund.

Thus if one can justify subsidisation of water supplies on economic and social criteria in townships in Zambia, there should be no reason in principle why such supplies should not be subsidised. Any opposition based on Government financial constraints would only be valid if it could also be shown that it is more worthwhile to subsidise electricity than to subsidise water supplies.

A.5 Social and Other Criteria

The social criterion is subjective and includes objectives such as relieving poverty, meeting basic needs, redistributing income, etc. It would require that D.W.A. provides all inhabitants of the supply areas with a certain minimum quantity of water at a price they can afford to ensure satisfactory health standards, i.e. no consumers should be excluded from using the supply on the basis of price. Social criteria may often suggest that the service is worth more than the people are willing to pay. Thus a low price is indicated in order to make the supply widely available to low income groups.

In addition to considering economic, financial and social criteria the architects of a pricing policy/tariff structure must ensure that it is administratively simple and can be handled effectively by the probable calibre of staff. It must also be acceptable to consumers, local leaders and politicians.

A.6 Reconciliation of Conflicting Criteria

In both the short and medium terms the economic and social criteria will both suggest a low price for water at supply where there is considerable spare capacity. Consequently there is unlikely to be a conflict between these criteria at least during the early years of the schemes. However, even when marginal cost is low a marginal cost policy may have to be modified if that low price is still sufficiently high to exclude some poor people from using the supply or discourage them from taking the necessary minimum quantity.

Unfortunately where as in the case of Western Province during the 1980's marginal costs are low and there is considerable spare capacity, or where long run marginal cost is decreasing no tariff policy will be entirely satisfactory. The low water rate suggested by the economic and social

criteria, i.e. a rate well below average cost would lead to a large continuing financial deficit and would, therefore, conflict with the financial criterion.

Alternatively if strict financial criteria were adopted use of the scheme would be limited, the level of under-utilisation would increase, the rating system would be inequiable and some or even a majority of consumers may be excluded from the supply altogether.

There are three major alternatives available to the authority that will partially reconcile the conflicting objectives of the policy.

1. The water supply authority can act as a discriminating monopolist and practice price discrimination between different groups of consumers i.e. base charges on what the traffic will bear. There are three clearly identifiable groups in the scheme townships, communal point users, individual connection consumers and industrial/commercial/ institutional consumers. The social objective of very low prices or even free water for the poorest section of the society can be met by low, or even zero, rates for communal points. The financial criterion can be met in part by higher rates for other consumers. In particular it would involve higher prices for industrial and commercial consumers. It would partially reconcile social and financial criteria, but frequently it would be far from perfect with regard to the efficiency criterion.

2. It may be possible to reconcile the efficiency and finanacial criteria by charging consumers fixed basic fees in order to raise revenue, combined with a low cubic metre rate for additional consumption based on marginal cost, to encourage full use of the facility. However, this strategy potentially conflicts with social criteria and the fixed charge must by low enough so that it does not deter anyone from consumption altogether. Therefore, it may be necessary to have differential fixed charges so as not to penalise low use consumers. As when rates are based on flat rate charges, these differential basic fixed charges should be related to different categories of consumer, for example, low cost housing, other domestic, institutional, commercial and industrial. However all consumers may pay the same rate for usage above that covered by the fixed fee.

3. The third possible way to achieve reconciliation is to utilise a two part tariff system. This may be especially appropriate where marginal cost is high since it can lead to a high level of reconciliation between the three major criteria. Concessionary low rates would be charged for communal consumption and for minimal use from private domestic connections to provide for basic health needs, to encourage use up to the desirable minimum level and to satisfy social criteria. Above this minimum consumption level the rates can be increased to that demanded by the economic criterion, i.e. to be in line with the high marginal cost. This strategy will achieve a high level of reconciliation between economic and social criteria. Wastage will be discouraged, resources should be used efficiently and the reduced demand will enable expensive augmentations to be delayed. In addition the financial criterion will be satisfied whenever marginal cost exceeds average cost and a financial surplus may even be generated.

But if there is considerable spare capacity and low marginal costs, even a two step tariff will not be able to reconcile the financial criterion with the low price demanded by the economic and social criteria. However the social criterion can be satisfied by a low rate for a certain limited consumption. Consequently a two part tariff will enable social criteria to be fulfilled and will permit a straight trade off decision between the financial and economic criteria unimpeded by social considerations when determining the price for additional usage.

When the supplies approach capacity the situation described above will occur.

The marginal costs will increase since they will reflect the costs of further augmentations and the economic criterion will require that the price is increased to discourage demand. Thus at this point although financial and economic criteria are unlikely to suggest the same price they are unlikely to conflict seriously. Consequently at all times a two step tariff policy has considerable merit.

The consultant's policy recommendations quantified in Section 10.5 will combine these approaches to reconcile the conflicting objectives of a tariff structure.

It is recommended that, where it is considered appropriate to charge for water on a quantity used basis, rates be composed of a fixed basic charge together with unit rates for additional consumption. The effective unit rate for the first part of consumption will be lower than the rate for the additional consumption. The objective is to meet social criteria and is in effect a two part tariff. The first part is a fixed basic sum in order to simplify the billing process and to guarantee a certain minimum income from every consumer every month. It is recommended that a discriminatory pricing approach based on different categories of consumers be adopted with regard to this minimum charge.

Although the recommended tariff structure satisfies social criteria it does not fully accord with either economic or financial criteria. The recommended price for additional use may unduly restrict the use of water, where marginal cost is low, or fail to ration it effectively where there are supply constraints. Furthermore, it will only partially meet financial criteria. But, as has been discussed above it is impossible to fully satisfy all criteria and it is considered that the recommended policy represents the best compromise.

D.W.A. has, in theory, been following a similar policy for some years. Consequently the consultants endorse the present theoretical policy in principle where it is appropriate to charge for consumption on a quantity used basis. However, they question both the prices currently charged and the level of use at which the price increases.

It is considered that the quantity of water ($35m^3$) which D.W.A. allows low cost consumers at the low initial rate is too large. In some countries $6\text{-}8m^3$/household/month represents the low price cut off point. If D.W.A. was to allow the average 7 member household 700 litres/day at the low rate, consumers would be able to use the full low cost housing design figure of 100 litres/person/day before being charged higher rates. Since it is considered that this quantity is quite generous enough, it is proposed that the cut off point between the low initial rate and higher water charges should be 20 m^3/household/month.

A.7. Flat Rate Charges

The previous section explained the background to pricing policy when it is appropriate to charge for water on a quantity consumed basis. However, this is not always the case and the question of whether or not to meter to enable water to be charged for on the basis on consumption is discussed in Chapter 6. This section provides a background to charging on a flat rate basis.

Flat rate charges are administratively simple and avoid all the costs associated with metering. However, they are sometiems criticised since the same water rate for all consumers means that they are harder on the poor while the rich use more water. Metering on the other hand, is fair to low use consumers. However, even when metering is adopted it is usually necessary to have a minimum charge which can be as high as, or represent a very significant percentage of the flat rate charge. Furthermore, if it is decided that all or certain groups of consumers should be charged flat monthly water rates there are a number of alternative criteria on which the charge can be based to minimise inequity. Firstly it could depend on the ferrule of the consumers tap with additional charges for additional taps. This possibility has some merit and is easy to apply, though it could encourage tampering. Secondly it could be based on some form of property value. Although the correlation between the rates based on this criterion and the quantity of water consumed will be poor, it would be no worse than the correlation when rates are based on size of ferrule. In addition it may be a reasonably equitable method of pricing since rates may crudely be related to ability to pay.

If the Government decides that flat rate charges are appropriate for the township supplies the consultants recommend a pricing method which combines these approaches. The basis charge should be related to the housing category; (a)informal (b) low cost (c) medium cost and (d) high cost. The low basic rates for categories (a) and (b) should only allow for one tap, with additional charges for extra water.

Flat rate charges encourage consumption and also lead to increased wastage since there is no incentive for consumers to save water. Experience from

other countries suggests that low cost housing consumers who are metered may only use half the volume of water that they would have used if they were charged on a flat rate basis.

Consequently if flat rates are charged for any groups of consumers, consideration should be given to water wastage controls. This subject is examined in Chapter 7.

The importance of detering excessive consumption partly depends on the relationship between the quantity demanded by consumers and the capacity of the supply. For some time after a scheme is constructed or augmented, when there is considerable spare capacity, the encouragement of consumption accords with an economic efficiency criterion since the benefits arising from the supply would be maximised for a very limited marginal cost. These low marginal costs also mean that wastage is not an important factor. But, as the supply approaches capacity flat rate charges conflict with an economic criterion since marginal costs are increasing to reflect the cost of augmentation. Consumers are not discouraged from using as much water as they can even though they might be deriving only very minor benefits from the marginal usage. At the same time other consumers may be unable to obtain sufficient water for usage with higher benefits. When demand is close to , or has reached capacity, the cost of wastage is extremely high, ie the opportunity cost of that water is high. Consequently when a supply is close to capacity flat rate charges may become inappropriate even though they were the best policy some years earlier.

Flat rate charges may not meet the financial targets but they do not necessarily conflict with financial criteria. Since it may be possible for the authority to extract as much from consumers by means of flat rate charges as by another pricing method.

APPENDIX B

OUTLINE WATER SUPPLY SITUATION

APPENDIX B OUTLINE WATER SUPPLY SITUATION

B.1. Township Water Supply Schemes

The consultants were provided with a list of township water supplies run by (i) DWA and (ii) councils, prior to commencing the present study. The fieldwork showed that a number of errors existed and these have been corrected in the list presented below. However, it proved rather difficult to ascertain who operates certain schemes which they did not visit when conflicting answers were provided by different informants. Hence, it is possible that a few errors exist in the list given below. Nevertheless it was considered worthwhile to include such a list in this report as an Appendix since the consultants' own experience suggests that it will be useful for planning, and future studies. Furthermore its inclusion in the draft report is intended to give an opportunity to all officers receiving the report to inform the consultants of any errors, so that a completely accurate list can appear in the final report.

Table B.1

List of Township Water Supplies Operated by DWA

Central Province	- Chisamba, Mumbwa, Mkushi, Serenje
Copperbelt Province	- Masaiti
Eastern Province	- Chadiza, Chama, Chipata*, Katete, Lundazi, Nyimba, Petauke.
Luapula Province	- Kawambwa, Mbereshi, Mwense, Nchelenge, Samfya
Lusaka Province	- Luangwa
Northern Province	- Chilubi, Chinsali, Isoka, Kaputa, Luwingu, Mporokoso, Mpulungu, Nakonde
North Western Province	- Chizela, Kabompo, Kasempa, Mwinilungu, Zambesi
Southern Province	- Chirundu, Gwembe, Kalomo Boma, Namwala, Siavonga, Sinazongwe, Zimba
Western Province	- Kaoma, Kalabo, Lukulu, Limulunga, Mongu* Namushakende, Senanga, Sesheke.

*Operated by DWA on behalf of the council.

In addition to the township supplies listed above DWA runs a few small supplies. These include (i) the supplies at the border posts on the Zambia/

Zaire border at Mokambo, Sakania, Kasumbalesa and Tchinsenda, and (ii) for institutions, e.g. Kamfinsa.

Urban and township supplies operated by the councils are shown in Table B.2.

Table B.2

List of Urban and Township Water Supplies Operated by Councils

Central Province	- Kabwe, Kapiri - Mposhi, Old Mkushi
Copperbelt Province	- Chililabombwe, Chingola, Kalulushi, Kitwe, Luanshya, Mufulira, Ndola.
Eastern Province	- -
Luapula Province	- Mansa
Lusaka Province	- Chilenga, Chongwe, Kafue, Lusaka
Northern Province	- Kasama, Mbala, Mpika, Mungwi
North Western	- Solwezi, Chavuma
Southern Province	- Choma, Kalomo Livingstone, Mambova, Mazabuka, Mbalala, Monze, Pemba
Western Province	- -

B.2 Rural Water Supplies

Councils are also responsible for operating a large number of village piped supplies, a few of which might be considered as small townships. The consultants were unable to trace any lists of such supplies but based on the fieldwork in approximately 20 districts the consultants guesstimate the total to be approximately 200. However, most are in a poor operational state and a few are non-serviceable. The councils continually ask the local DWA officers in charge for assistance. Technical help is freely given, but DWA does not have the resources to provide the necessary spare parts, etc.

An attempt was made to estimate the number of rural wells and boreholes, but this proved extremely difficult since the numbers are rarely known at the district level, let alone at the provincial and national levels. However, by adding together the various data provided by water supply personnel and by using this for extrapolating the national total, the consultants have guesstimated that there are at least 8000 rural wells and 1500 boreholes.

Hence together with the minor piped supplies there are over 10,000 potential sources of potable water for the rural population. Experience suggests that the average potential number of consumers of such supplies is around 200. Thus the number of rural consumers could total 2 million, a figure which is below but reasonably consistent with the number of rural people that the National Development Plans report are served by hygenic water.

A majority, at least 80 percent, of the shallow wells are fitted with bucket and chain. The remainder depend on handpumps. Unfortuantely a large, but unknown number of the wells are no longer serviceable.

Most of the boreholes are equipped with handpumps, but it is estimated that under 40 percent are serviceable. The condition of those fitted with pump and engine is even less satisfactory because the lack of spare parts delays/ prevents repairs. Hence the number of rural persons served by potable supplies probably falls well below the figure of 2 million calculated above.

APPENDIX C

HOUSEHOLD INCOMES BASED ON UPDATING THE 1974/5 HOUSEHOLD BUDGET SURVEY

APPENDIX C HOUSEHOLD INCOMES BASED ON UPDATING THE 1974/5 HOUSEHOLD BUDGET SURVEY

C.1 Introduction

Due to the importance of accurate income data for estimating the ability to pay, the consultants wished to use all reasonable sources of income data in their attempt to build up the current picture of household incomes. Unfortunately there has not been any major relevant nationwide survey since the household budget survey was conducted by the CSO in 1974/5, (published 1980). Due to its comprehensive nature, it covered large urban, township and rural households, the consultants have attempted to utilise its results for comparison with their own surveys of late 1982 by updating the 1974/5 figures to 1982/3. During the last eight years incomes have increased significantly in cash terms, although they have lagged behind inflation. It is guesstimated that they have increased, on average, by 10 percent per annum.

The survey report presented both mean and median income figures. It proposed, and the consultants fully concur, that due to the skewness of incomes within every group, the median incomes are more meaningful than the mean figures.

C.2 Townships

Table C.1. presents income data for Mongu and Kasama, (which were grouped together in the survey), from the 1974/5 Household Budget Survey. The second column shows the same income groups as are presented in the first column for 1974/5, for 1982/3, assuming an annual 10 percent increase in incomes since 1975.

Table C.1.

Income Distribution of Households in Mongu and Kasama

Monthly income group 1974/5 (K/month)	Monthly income group 1982/3 assuming an increase of 10% p.a. (K/month)	Percentage distribution of households (%)	Cumulative percentage distribution of households (%)
0 - 20	0 - 44	9.5	9.5
20 - 40	44 - 88	17.0	26.5
40 - 60	88 - 132	17.5	44.0
60 - 80	132 - 176	16.0	60.0
80 - 100	176 - 220	6.5	66.5
100 - 120	220 - 264	8.5	75.0
120 - 140	264 - 308	9.0	84.0
140 - 160	308 - 352	3.0	87.0
160 - 180	352 - 396	1.5	88.5
180 - 200	396 - 440	1.5	90.0
200 - 250	440 - 555	4.5	94.5
250 +	550 +	5.5	100.0

Before one can use the data in Table C.1. a number of reservations must be stated. Firstly, the sample on which the survey was based was not large, 192 in Mongu and 192 in Kasama. Nevertheless samples of 6 percent in Mongu and 4 percent in Kasama are acceptable. Secondly, the assumption of an annual increase of 10 percent during 1975-80 is an informed guesstimate. Thirdly, although the figures are based on Mongu and Kasama it is believed that they are not untypical of other townships. Given these reservations, the data is useful for comparison with the consultants' estimates.

The average income in 1974/5 in the semi-urban sample areas was K 87 wages and business profit and K 5 value of own produce consumed, making K 92 in total. The median total income was about K 68 and the median cash income was K 64. On the assumption that incomes have increased by 10 percent per annum,the late 1982 median cash income would be around K 140. The corresponding mean cash income would be approximately K 190.

If one assumes that the lowest 50 percent are living in informal housing, the next 38 percent in low cost housing and the top 12 percent in high cost housing, (calculations from the consultants' 1981 study), those living in informal housing have cash incomes of K0-140, in low cost housing K140-360 and in middle/high cost housing K360 +. The corresponding median cash incomes are approximately K 80, K220 and K500. Clearly to assume that all informal housing residents are in the bottom 50 percent, and all low cost residents are in the middle 50-88 percent is incorrect. The actual figure for informal housing residents would be higher than K 80 and for low cost residents less than K 220. If the following assumptions are made; (i) 10 percent of low cost families earn less than the squatter median income and (ii) 25 percent of squatter families earn more than the low cost residents' median income, the squatter median income increases to K 94 and the low cost residents' median income decreases to K 166.

C.3 Large Urban Areas

Table C.2. presents the income distribution data for the three major household categories from the 1974/5 survey together with the same income groups for 1982/3 on the assumption of an annual 10 percent increase in incomes since 1975.

Table C.2.

Income Distribution of Urban Households

Squatters

Monthly income group 1974/5	Monthly income group late '82 assuming an increase of 10% p.a.	Percentage distribution of households
(K/mth)	(K/month)	(%)
0- 30	0- 66	9.2
30- 50	66-110	17.2
50- 70	110-154	32.1
70-100	154-220	23.4
100-130	220-286	8.5
130-170	286-374	3.7
170+	374+	5.9

Low Cost Households

Monthly income group 1974/5	Monthly income group late '82 assuming an increase of 10% p.a.	Percentage distribution of households
(K/month)	(K/month)	(%)
0- 30	0- 66	4.4
30- 50	66-110	19.2
50- 70	110-154	20.9
70-100	154-220	23.4
100-130	220-286	13.1
130-170	286-374	9.3
170+	374+	9.7

High Cost Households

Monthly income group	Monthly income group late '82 assuming an increase of 10% p.a.	Percentage distributions of households
(K/month)	(K/month)	(%)
≤150	≤330	6.0
150-200	330-440	7.1
200-300	440-660	15.6
300-400	660-880	11.6
400-500	880-1100	12.8
500-600	1100-1320	11.0
600-700	1320-1540	13.7
700-800	1540-1760	10.1
800-900	1760-1980	8.0
900 +	1980 +	4.1

The data is representative of the largest urban areas in Zambia since a total of 1313 households in Lusaka, Kitwe and Ndola were included in the sample. The breakdown of the sample was 264 squatter households, 908 low cost households and 141 high cost households. The summarised results were as follows:-

	Squatters	Low cost	High cost	All combined
Mean income (K/month)	74	96	483	123
Median income (K/month)	63	76	496	76
Interquartile range (K/month)	43-89	51-112	274-680	50-122

The updated 1982/3 figures, assuming an annual increase of 10 percent per annum are as follows:-

	Squatters	Low cost	High cost	All combined
Mean income (K/month)	163	211	1063	271
Median income (K/month)	139	167	1091	167
Interquartile range (K/month)	95-196	112-246	603-1496	110-268

These mean and median figures disguise the wide disparities that exist within every housing category that can be seen from Table C.2 and from the interquartile range figures. Within the urban squatter group the bottom 50 percent of households earned only 28 percent of the group's total income while the top 50 percent earned the other 72 percent. This result is not surprising due to the known high disparity within the squatter group, varying as it does from wealthy businessment down to very poor unemployed workers.

Similar disparities were found in the other housing groups. The corresponding splits for the low and high cost housing groups were 26.2 percent/73.8 percent and 29.1 percent/70.9 percent respectively.

These disparities will complicate the determination of a particular consumer group's ability to pay for water.

C.4 Rural

Table C.3. presents rural income data from the 1974/5 Household Budget Survey. The second column presents the income groups for 1982/3 on the assumption of an annual 10 percent increase in incomes since 1975.

Table C.3

Income Distribution* of Rural Households

Monthly income group 1974/75 (K/month)	Monthly income group 1982/83 assuming an increase of 10% p.a. (K/month)	Percentage distribution of households (%)
0- 5	0- 11	8.5
5- 10	11- 22	13.5
10- 15	22- 33	13.5
15- 20	33- 44	15.6
20- 25	44- 55	9.9
25- 30	55- 66	6.4
30- 35	66- 77	4.3
35- 40	77- 88	7.8
40- 45	88- 99	2.1
45- 50	99-110	3.5
50- 55	110-121	4.3
55- 60	121-132	1.4
60- 65	132-143	3.5
65- 70	143-154	0.7
70- 75	154-165	0.1
75-100	165-220	2.1
100-125	220-275	1.4
125 +	275 +	1.4

The survey covered approximately 100 families in two rural areas in every province, except Copperbelt. Hence it was representative of rural Zambia. Unfortunately, only overall figures are given, provincial differences are not discussed. The mean monthly rural household income, including subsistence, was K29 and the median monthly rural household income was just under K20. If it is assumed that these have increased at 10 per cent per annum the current monthly mean and median rural household incomes would be K64 and K43 respectively.

The 1974-75 survey showed that approximately half of all rural income

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* Total income including the value of subsistence which represents approximately 50 per cent of total income.

is represented by the value of own production consumed. Thus the current mean and median rural household cash incomes are estimated to be K32 and K22 respectively. The report stated that rural incomes were probably under-estimated to some degree. Consequently, it is reasonable to revise the updated 1982/83 figures to K35 and K25 respectively.

APPENDIX D

WATER SUPPLY OFFICERS' VIEWS OF CONSUMERS' ABILITY AND WILLINGNESS TO PAY

APPENDIX D WATER SUPPLY OFFICERS' VIEWS OF CONSUMERS' ABILITY AND WILLINGNESS TO PAY

During the fieldwork, 26 water supply officers in six provinces were asked for their view on;(i) how much they thought consumers would be willing to pay for water, and on (ii) how much the officers thought should be charged. They were also asked to guesstimate average incomes. The results are summarised in Table D.1. The number of responses to different questions varies because some officers felt unable to answer some of the questions.

A major feature of the analysis is that the mean and median answers to every question are similar. It can also be seen that the answers to the question of,(i) what would consumers be willing to pay, and (ii) what the officers thought should be charged are very similar. The approximate averages are as follows:

Individual connection for high cost housing residents	-	K10 per month
Individual connection for medium cost housing residents	-	K8 per month
Individual connection for low cost housing residents	-	K4.5 per month
Public standpipes for low cost housing residents	-	K2.25 per month
Public standpipes for informal housing residents	-	K1.25 per month

However, when the willingness to pay for house connections question was rephrased using the cut-off point approach (cf Section 5.6.2) in order to determine at what point consumers would prefer disconnection to paying the official rate, the willingness to pay for individual connection answers increased to approximately K30, K20 and K10 per month for high, medium and low cost residents respectively.

The results are consistent with the socio-economic surveys conducted by the consultants. They support those results and suggest that the water supply officers generally have a reasonable knowledge of the consumers.

The water supply officers' responses to current levels of income also support the survey findings. The average answers to the monthly income question were K570, K325, K161, and K94 for high cost, medium cost, low cost and informal housing residents, respectively.

Table D.1

Summary of Water Supply Officers' Views of Consumers' Ability and Willingness to Pay

	Mean (K/month)	Median (K/month)	Sample Size: Number of responses	Sample Size: Number of provinces included
Officers' view of:				
Monthly water rate that consumers would be willing to pay for their own house connections;				
High cost housing residents	11.29	11.00	24	6
Medium cost housing residents	8.10	7.00	23	6
Low cost housing residents	4.26	4.50	25	6
Monthly water rate that consumers would be willing to pay for public standpipe access;				
Low cost housing residents	2.40	2.00	21	6
Informal housing residents	1.30	1.00	20	6
The rate at which the officers personally would refuse to pay and would accept disconnection of his house	31.80	30.00	17	6
The rate at which other consumers would refuse to pay and would prefer disconnection of their house;				
High cost residents	28.90	30.00	14	5
Medium cost residents	20.50	20.00	11	5
Low cost residents	9.30	10.00	10	5
Average monthly income of households in;				
High cost housing	570	500	19	6
Medium cost housing	325	300	19	6
Low cost housing	161	150	19	6
Informal housing	94	90	16	6

Table D.1 cont'd

Summary of Water Supply Officers' Views of Consumers' Ability and Willingness to Pay

	Mean (K/month)	Median (K/month)	Sample Size: Number of responses	Sample Size: Number of provinces included
What monthly rates should be for;				
Individual connections for:				
High cost housing	10.00	10.00	14	6
Medium cost housing	7.87	8.00	15	6
Low cost housing	4.93	5.00	14	6
Public Standpipes for:				
Low cost housing	2.24	2.25	13	6
Informal housing	1.25	1.00	12	6

APPENDIX E

FAMILY SIZE

APPENDIX E FAMILY SIZE

Family size is important for a number of reasons in the present study. For example to translate the present number of individual connections into the number of persons receiving a high level of service, or to calculate the implications per household of various costs/rates per cubic metre. In their 1981 study the consultants used the census data which suggested an average family size of five persons, although this seemed intuitively to be on the low side. However, data from the socio-economic study shows this to have been too low.

The average family sizes of the Katete/Mumbwa and Northern Zambia studies conducted by the consultant produced very similar results. They are summarised in Table E.1.

Table E.1

Summary of Family Size from the Socio-Economic Surveys

Consumer Category	Katete/Mumbwa Survey		Northern Zambia Survey	
	Ave. no of persons	Percentage of children (%)	Ave. no of persons	Percentage of children (%)
High cost housing residents	8.3	53	7.8	61
Low cost housing residents	7.0	60		
Informal housing residents	10.8	50	7.0	59
Rural residents	8.6	53		

Hence the average family size of families in high and medium cost housing is 8 persons. The corresponding figure for families in low cost housing is 7 persons.

The findings were similar to those of the consultants Colquhoun. In preparing the feasibility studies of 12 towns in southern, eastern and central Zambia they estimated the overall average family size at 6.6 persons. The average of every housing category, except for the high cost group, was similar to this figure. All were in the range 6.5-6.8. The high cost housing average was 7.9 persons. Consequently, the high/medium combined figure was approximately 7 persons.

The overall average family size of the Northern Sector study was 6.5 persons. Although this is lower than the consultants' overall study figure of approximately 7.5 persons, it is again higher than that of recent government surveys. Furthermore, the surprisingly high percentages of children found in the present study are corroborated by an even higher Northern Sector figure of 64 per cent.

Taking all this data into account the consultants will assume an average household size of seven persons. This means that the consultants overall average of approximately 7.5 persons per family has been rounded downwards as a result of the evidence from other surveys. Furthermore, the same family size will be taken for all categories despite the fact that the surveys suggest a figure of approximately 8 persons for high cost housing areas. This has been done in order to simplify analysis in a situation where the surveys make no pretence at precision. The fact that the consultants' analyses will combine high and medium cost residents will reduce any inaccuracy that this may involve.

The informal family size of 10.8 persons estimated by the consultants was based on one area only, Mumbwa shanties. Hence the consultants feel that greater weight should be given to the other surveys in this instance.

Hence a family size of seven will again be assumed. The consultants would admit to a certain unease of this cavalier approach, if family size in shanty areas was important for a revenue study. However, it is not, since any revenue from such areas will be small and the important figures are the percentage of the population living in, and proportion of the water which will be supplied to, the informal areas. These are discussed in Appendix G.

APPENDIX F

CONSUMPTION CRITERIA

Appendix F CONSUMPTION CRITERIA

F.1 Summary of Different Consultants' Criteria

Consumption criteria in Zambia rely heavily on judgement. Apart from the problems of few accurately working meters and poor meter records, the fact that supplies are sometimes up against capacities and are unreliable, means that location may be as important a determinant of consumption as demand. Table F.1 summarises the main domestic criteria used by different consultants.

Table F.1

Domestic Design Criteria

	High Cost Housing	Medium Cost Housing	Low Cost Housing		Informal Housing
			Group I	Group II	
Ostlandskonsult	250	250	100	-	40
Gauff	280	150	100	-	40
Colquhoun	280	200	180	120	60
Lottie	225	225	75	-	40

It can been seen that whereas Lottie and Ostlandskonsult take the same design figure for high and medium cost housing residents, Gauff and Colquhoun take lower figures for medium cost housing. The limited evidence available in Western Province suggested that although consumption in high cost areas was higher it was not sufficiently higher to be worth differentiating, especially in view of the definitional problems relating to housing categories. In the context of the smaller township water supplies it is believed that one overall design figure is appropriate. The Western

Province Study report showed that the consultants' own investigations supported Ostlandskonsult's high/medium cost housing figure of 250 l.c.d.

A figure of 100 l.c.d. for low cost housing residents with their own connection is recommended by Ostlandskonsult and Gauff and was endorsed by the Western Province Study. Colquhoun's figures of 180 l.c.d. and 120 l.c.d. for low cost consumers having their own connections and having communal ablution blocks respectively are considered too high. The consumption figures that will be used in this study for low cost housing consumers will be 100 l.c.d. for those with their own connections and 60 l.c.d. for those using communal facilities. The latter figure contains the implicit assumption that approximately half of the low cost housing residents without their own connection will have access to ablution blocks, as well as to communal standpipes.

The socio-economic survey data, summarised below, supported the consultants' belief that 40 l.c.d. is the highest figure that should be used for communal standpipe consumers in township water supply design. Consequently, this figure will be used in this Study for informal housing residents.

F.2 Summary of the Low Service Consumption Findings of the Socio-Economic Survey

The socio-economic survey showed that average per capita use in the low cost township areas by both public standpipe and traditional source consumers was around 12-15 l.c.d. The low use of communal standpipe consumers occurred even though the average distance to the standpipes, of the sample survey consumers in the low cost housing areas, was only 55 metres with an average journey time of only 5 minutes, and an average total time spent collecting

water of 25-30 minutes per household per day. Average per capita use carried home in the rural sample area was similar (i.e. 12-15 l.c.d.), to that in the low cost housing areas in the townships. This was despite the fact that the average distance to the source was 370 metres and the average journey time was 30-40 minutes, giving an average total time spent collecting water of 150-180 minutes per household per day. Hence, not only was use by communal standpipe consumers in the townships very limited, but the hypothesis, that once consumers have to carry water any distance at all they will not increase consumption even if the standpipe is brought close to their home, received support. Furthermore, these low consumption levels were confirmed by the socio-economic report of the Northern Sector Study*. That study estimated total use, including wastage at the standpipe at 23 l.c.d. This is consistent with the consultants' socio-economic survey figure which excluded use and wastage at the communal point.

While appreciating that; (i) the Northern Sector wastage may be low during a period when consumers are aware that a supply is being studied, (this is also suggested by the fact that Lottie's water carried home figure, averaged 20 l.c.d.) and (ii) the supply constraint in Katete may restrict communal consumers' consumption, it is believed that as long as township residents continue to use public standpipes, their overall consumption may remain as low as 15 litres per capita per day, (excluding wastage at the tap). Hence, (i) designs based on a consumption criterion of more than 40 l.c.d. are inappropriate. Even a figure of 40 l.c.d., which conventional wisdom in Zambia seems to suggest is the lowest acceptable design figure for communal standpipe consumers, clearly contains a high element of wastage, (ii) individual connections, by increasing the water use of low use consumers, would significantly increase the benefits of a supply. They should therefore be encouraged wherever consumers have the ability

* Revision and Updating of Detailed Designs, Rural Township - Northern Sector. Population, Socio-Economic Aspects and Water Demand. Lottie and Associati - May 1982.

to pay for them. It is therefore proposed that bilaterial assistance to D.W.A. to increase implementation capacity for new connections at supplies where there is spare capacity, should receive donor consideration.

APPENDIX G

DIVISION OF POPULATION AND WATER CONSUMPTION

APPENDIX G DIVISION OF POPULATION AND WATER CONSUMPTION

G.1 Introduction

In a revenue study one of the most crucial assumptions relates to the proportions of total demand that will be utilised by the different consumer categories. Variations in these proportions may affect revenue in two ways. Firstly different water rates for different categories may lead to different revenues. Secondly the probable level of collection from the different categories may vary.

The main determinants of the proportion of total consumption that is taken by the different consumer categories will be the proportion of consumers living in the different housing categories, and the various consumption level/criteria.

G.2 Division of Population

Table G.1 shows the proportion of domestic consumers living in the different domestic consumer categories as used by:-

(i) the consultants in Western Province (1981)
(ii) Ostlandskonsult in Western Province (1980)
(iii) Gauff in North Western Province (1979)
(iv) Colquhuon in Southern, Eastern and Central Provinces (1978)

The consultants have confidence in the 1980 Western Province figures since they were based on Ostlandskonsult's fieldwork. But it is believed that the Ostlandskonsult figures for 1995 are over-optimistic. For example assuming a linear transfer of residents over the 15 year period 1980-95 from informal to formal housing, one would expect that by now, 1983, the percentage of residents of the Western Province townships living in informal housing would have dropped from 61 per cent to 54 per cent. This has not occurred.
In the Western Province Study report the consultants stated that:-

"It has been assumed that the proportion of the population living in informal housing, in 1995, will be the same as today. At a first glance this may

Table G.1

Summary of the Division of Population between the Different Housing Groups

	High/Medium Housing			Low Cost Housing			Informal
	All	High	Medium	All	Group I	Group II	
Western Province							
Consultants 1980	8.5	-	-	30.3	-	-	61.2
Consultants 1995	5.9	-	-	34.5	-	-	59.6
Ostlandskonsult 1980	8.4	-	-	30.3	-	-	61.3
Ostlandskonsult 1995	13.4	-	-	60.6	-	-	26.0
Eastern/Southern/ Central Provinces							
Colquhuon 1978	9.7	2.6	7.1	61.6	16.3	45.3	28.7
Colquhuon 1983	13.6	4.1	9.5	67.3	27.2	40.1	19.1
Colquhuon 1988	17.6	5.6	12.0	72.5	38.3	34.2	9.9
Colquhuon 1993	21.6	7.2	14.4	77.1	49.4	27.7	1.3
North Western Province							
Gauff throughout	27.4	4.5	22.9	26.4	-	-	46.2

seem a rather pessimistic assumption concerning the housing development in the townships of Western Province,i.e. that it represents a poor house construction performance. However, this is not true. It means that the number of formal houses will be increasing at the same rate as the projected population increase, i.e. 7 per cent per annum in most towns. It is felt that any higher rate of increase would be unrealistic. The subject was discussed with a senior official in the Town and Country Planning Department in Lusaka who endorsed the consultants' proposal. Furthermore, the same department had earlier commented that Ostlandskonsult's assumptions concerning informal housing were over-optimistic.

It is assumed that 90 per cent of the formal houses that will be constructed during 1980-1995 will be low cost, and that medium and high cost houses will only constitute 10 per cent of the newly constructed units. This is in line with the Township Development Plans prepared in the early 1970's by the Town and Country Planning Department. Their actual projections varied from town to town but the average for townships in Western Province was 8 per cent high/medium cost houses, 92 per cent low cost houses. It was stated that one reason for the relatively low percentage of high/medium cost houses is that most Government departments are now established in the townships under consideration and that most high level posts are filled so that there will be less need for an increased number of high cost housing units in the future.

Ostlandskonsult assumed that where there are people living in informal housing outside a township boundary that the population would remain unchanged over time. The argument that these communities act as a staging post for rural people moving to the townships is valid but the assumption that they will not increase is unrealistic. The consultants have assumed that these populations will double over 15 years."

It is believed that this was an accurate approach but Ostlandskonsult are not alone in forecasting the future in terms of undue optimism. Table G.1 shows that the Colquhuon figures also depend on significant increases in the proportions of the population living in better class housing. For example, Colquhuon stated that, "in future years as population increases improvements in housing standards can be expected." They went on to suggest that informal houses would be replaced by low cost houses, etc. The consultants do not believe these assumptions and feel that it would be

unrealistic to expect the proportion of the population living in better class accommodation to increase during a period of high in-migration to the townships.

The percentages of residents living in high or medium cost housing at the time of different consultants' own fieldwork were 8.5 per cent, 9.7 per cent and over 20 per cent according to Ostlandskonsult, Colquhuon and Gauff. The Gauff figure is difficult to believe. The Ostlandskonsult figure is likely to be slightly lower than the national township figure since Western Province is one of the poorer provinces. Hence an overall present day figure of 10 per cent will be assumed. This figure will be assumed to be constant throughout the study period. For sensitivity tests an optimistic figure of 15 per cent and a pessimistic figure of 6 per cent will be used.

The approximate percentages of total residents living in informal housing as estimated by the different consultants were Ostlandskonsult 60 per cent, Colquhuon 30 per cent, and Gauff 50 per cent. An overall figure of 50 per cent will be taken and it is again assumed to be constant throughout the study period. For sensitivity tests an optimistic figure of 35 per cent and a pessimistic figure of 65 per cent will be used.

These figures for high/medium cost and informal housing residents mean that it is assumed that low cost housing residents will represent 40 per cent of the population, with optimistic and pessimistic figures of 50 per cent and 29 per cent respectively. All these figures which will be used in this study are shown in Table G.2.

Table G.2

Projected Percentages of the Population Living in Different Housing Categories

	High/medium cost housing %	Total low cost housing %	Percentage of total low cost housing residents with their own individual connections %	Informal housing %
Estimated figures	10	40	33	50
Optimistic variation	15	50	50	35
Pessimistic variation	6	29	20	65

G.3 Low Cost House Connections

A further question that needs to be investigated is the proportion of low cost consumers who will have their own connection. Ostlandskonsult assumed that all would have one,although the consultants own work showed that well under 20 per cent of low cost houses in Western Province have their own connection at present. Colquhuon assumed that their 1978 field-work estimate, of approximately 26 per cent, would increase to 50 per cent by 1987 and to an eventual figure of 64 per cent.

In their Western Province study the consultants went along with the 100 per cent uptake figure although this figure was reduced to 50 per cent and 25 per cent in sensitivity tests. It is now believed that the 100 per cent uptake figure is unduly optimistic and that a figure of 33 per cent represents the best guesstimate. For sensitivity tests optimistic and pessimistic figures of 50 per cent and 20 per cent will be used.

G.4 Division of Domestic Water Consumption

Table G.3 presents the percentages of total domestic water consumption that would be used by the residents of the different housing groups when the housing group population figures of Table G.2 are combined with the proposed design criteria.

Table G.3

Division of Domestic Water Consumption
Between the Different Housing Groups

Resident Category	Consultants estimate of percentage of total domestic water used (%)	Optimistic variation (%)	Pessimistic variation (%)
High/medium cost housing	33.6	41.0	24.7
Low cost housing - individual connections	18.0	27.3	9.6
Low cost housing - communal facilities	21.5	16.4	22.9
Informal housing	26.9	15.3	42.8

G.5 Institutional/Industrial Use

The analyses in this report will be based on a figure of 10 per cent, i.e. that estimated as appropriate for Western Province in 1981. This figure is slightly lower than the figure estimated by Ostlandskonsult, mainly because the consultants decreased the schools' consumption. If large boarding schools allow pupils to use the design figure of 100 litres per pupil, the school authorities would be faced with huge monthly water bills if they paid on an amount used basis. For example, a school with 1000 pupils would be faced with a monthly term time bill of K900 if water was 30 ngwe per m^3. It is therefore probable that if institutions are metered and billed on a quantity used basis that the authorities would take measures to restrict pupils/inmates/patients consumption to well below, (i) the quantities being used/wasted today, and (ii) the design criteria most consultants are using. Of course, if schools and other institutions are not metered or continue to escape paying their water rates it is probable that the consultants will have under-estimated institutional use. The higher institutional use figures shown in Table G.6 from the Colquhuon reports are also based on higher per capita usages.

The consultants are confident that their assumptions are optimum from the point of view of this report even if the other consultants' consumption estimates, as is quite possible, turn out to be more accurate. This is because the other consultants will be correct if the rating system and/or revenue collection are inappropriate and/or unsuccessful. The assumptions in this report must be consistent with our own recommendations. If water is metered and charged for on a quanitity used basis, and rate collection from institutions is successful the Ostlandskonsult/Colquhuon institutional consumption figures may be too high. If on the other hand one of these conditions is not fulfilled, the consultants institutional use figures will be too low. However, in the subsequent revenue calculations there will be a balancing effect since the calculations of income received from institutional water sales would be too high. Hence any under-estimation of institutional use will not be carried over into the revenue calculations.

The Gauff institutional use figures are consistent with the consultants' estimates. However, the institutional/industrial total consumption is much higher from the mid 1980's due to the assumptions regarding industrial

use. While it cannot be asserted that they are unrealistic it is felt that they are rather optimistic and that more accurate water revenue figures will be obtained by assuming that industrial use will only increase in line with total use.

Hence it is argued that water revenue analyses should be based on industrial/institutional use being 10 per cent of total water production of the townships water supplies. Assuming that the problem of rate collection from institutions can be overcome, the greater the percentage of total water consumption that is used by industrial/institutional consumers the higher the revenue. This is because the problem of collecting communal standpipe rates directly from the consumers is avoided and because the cubic metre rate may be higher than the average domestic rate. Hence in the sensitivity tests a higher percentage will be used in the optimistic variation and a lower percentage in the pessimistic variation. It is proposed that figures of 20 per cent and 5 per cent respectively should be used.

G.6 Leakage

Another variable which must be estimated is the level of leakage that will be achieved. It is suggested that a total loss of 20 per cent of consumption would be realistic if the systems are properly maintained. Standpipe wastage is included in the design figures for communal consumers. For the sensitivity tests leakage figures of 15 per cent and 25 per cent respectively will be used in the optimistic and pessimistic projections.

G.7 Division of Water Consumption and Production

Tables G.4, G.5 and G.6 present the recommendations of the consultants for this study, together with the estimates of the Western Province study, Ostlandskonsult, Gauff and Colquhuon of:-

(i) the division of domestic water consumption between the different domestic consumer groups,

(ii) the summary of the division of total water consumption between all users and

(iii) the summary of the division of total water production between all users.

The recommendations for the study are based on the division of domestic use calculated in Section G.4 together with the institutional/industrial use and leakage figures proposed in Sections G.5 and G.6. The other figures have been extracted, often implicitly, from the feasibility studies by the various consultants.

Table G.6 shows that the rounded figures of the division of total water produced between the different consumer categories recommended for use in this study are as follows:-

High/medium housing residents	= 25%
Low cost housing residents	= 29%
Informal housing residents	= 20%
Institutional/industrial	= 10%
Leakage	= 16%

It can be seen from Table G.6 that the recommended figure for high/medium housing residents is somewhat higher than the figure used by the consultants in the Western Province study and slightly higher than the Ostlandskonsult figures. This is mainly due to the earlier assumption that the overall average percentage of persons living in this category is somewhat higher than in Western Province alone. The figure is lower than the corresponding Gauff figure for the same reason, i.e. Gauff have assumed a higher percentage of the population living in high/medium cost housing. The figure is lower than the corresponding Colquhuon figure partly for the same reason but also because Colquhuon took a lower design consumption figure for medium cost housing. By chance the recommended figure is close to the overall average of all the earlier report figures, i.e. 25 per cent compared to 24 per cent. This does not increase its validity but does suggest that it is a reasonable guesstimate.

The recommended figure for low cost housing consumers is similar to the Western Province figure, well above the Gauff figures and well below the Colquhuon figures. The main reason again being the different percentages of the population that the different consultants have projected as living in low cost housing. The recommended figure is slightly below the overall average of all earlier figures, i.e. 29 per cent compared to 34 per cent.

The recommended figure for the informal housing consumers is slightly lower than the Western Province study figures, but higher than the Gauff figures and far higher than the Colquhoun and Ostlandskonsult future figures. It is therefore higher than the overall average of all earlier figures, i.e. 20 per cent compared to 13 per cent. This is an important difference in a revenue study since it is most unlikely that the authority will ever be able to effectively enforce payment for more than a fraction of this water. However, the consultants are confident that their higher figure is not over-pessimistic. It is just that other consultants, notably Colquhuon have been over-optimistic in suggesting that informal housing will be phased out in the townships by 1993.

The institutional/industrial and leakage figures projected by the various consultants and recommended for this study were discussed in Sections G.5 and G.6.

Table G.4

Summary of the Division of Domestic Water Consumption between the Different Domestic Consumer Groups, (expressed as percentages)

	High/medium cost housing consumers	Low Cost housing consumers			Informal housing consumers
		All	Group I	Group II	
Western Province					
Consultants 1980	28.1	40.1	-	-	31.8
Consultants 1995	20.4	47.4	-	-	32.2
Ostlandskonsult 1980	27.9	40.2	-	-	31.9
Ostlandskonsult 1995	32.2	58.1	-	-	9.7
Eastern/Southern Central Provinces					
Colquhuoun 1982	21.8	69.5	35.0	34.5	8.7
Colquhuoun 1988	25.6	70.6	44.3	26.3	3.8
Colquhuoun 1993	28.5	71.1	51.8	19.3	0.4
North-Western Province					
Gauff 1980	51.9	28.6	-	-	19.5
Gauff 1985	50.7	28.8	-	-	20.5
Gauff 1990	50.8	29.2	-	-	20.0
Recommended for this Study	33.6	39.5	18.0	21.5	26.9
Optimistic variation	41.0	43.7	27.3	16.4	15.3
Pessimistic variation	24.7	32.5	9.6	22.9	42.8

Table G.5

Summary of the Division of Total Water Consumption between the Different Consumer Groups, (expressed as % of total consumption)

	High/ medium housing consumers	Low cost housing consumers All	Group I	Group II	Informal housing consumers	Industrial/ institutional use
Western Province						
Consultants 1980	24.8	35.5	-	-	28.2	11.5
Consultants 1995	18.2	42.3	-	-	28.7	10.8
Ostlandskonsult 1980	23.7	34.1	-	-	27.1	15.1
Ostlandskonsult 1995	27.9	50.5	-	-	8.4	13.2
Eastern/Southern/ Central Provinces						
Colquhuon 1983	16.6 (6.3/10.3)	52.9	26.6	26.3	6.6	23.9
Colquhuon 1988	20.3 (8.1/12.1)	56.1	35.2	20.9	3.0	20.6
Colquhuon 1993	23.5 (9.7/13.8)	58.7	42.7	16.0	0.4	17.4
North Western Province						
Gauff 1980	46	25	-	-	17	12
Gauff 1985	43	24	-	-	17	16
Gauff 1990	38	22	-	-	15	25
Recommended for this Study	29.8	34.9	16.0	18.9	23.8	11.5
Optimistic variation	31.6	33.7	21.0	12.7	11.7	23.0
Pessimistic variation	23.1	30.5	9.0	21.5	40.1	6.3

Table G.6

Summary of the Division of Total Water Production between Different Consumer Groups, (expressed as % of total production)

	High/ medium housing consumers	Low cost housing consumers All	Group I	Group II	Informal housing consumers	Industrial/ institutional use	Leakage
Western Province							
Consultants 1980	21.6	30.9	-	-	24.5	10.0	13.0
Consultants 1995	15.8	36.8	-	-	25.0	9.4	13.0
Ostlandskonsult 1980	20.6	29.7	-	-	23.6	13.1	13.0
Ostlandskonsult 1995	24.3	43.9	-	-	7.3	11.5	13.0
Eastern/Southern/ Central Province							
Colquhuon 1983	13.8	44.1	(22.2	21.9)	5.5	19.9	16.7
Colquhuon 1988	16.9	46.7	(29.3	17.4)	2.5	17.2	16.7
Colquhuon 1993	19.6	48.9	(35.6	13.3)	0.3	14.5	16.7
North Western Province							
Gauff 1980	40.0	22.0	-	-	15.0	10.0	13.0
Gauff 1985	37.0	21.0	-	-	15.0	14.0	13.0
Gauff 1990	33.0	19.0	-	-	13.0	22.0	13.0
Proposed for this Study	24.8	29.1	(13.3	15.8)	19.8	9.6	16.7
Optimistic variation	27.5	29.3	(18.3	11.0)	10.2	20	13.0
Pessimistic variation	18.5	24.4	(7.2	17.2)	32.1	5	20.0

APPENDIX H

THE PROPORTION OF WATER THAT WILL BE PAID FOR

APPENDIX H THE PROPORTION OF WATER THAT WILL BE PAID FOR

If the hoped for improvements are made in revenue collection, it is reasonable to assume that most of the revenue from domestic consumers with their own connections and from institutional/industrial consumers will be collected. A maximum figure of 90 per cent is proposed. However, the consultants believe that collection from consumers who use communal facilities, i.e. residents of low cost II and informal housing will always be low. It is suggested that realistic financial projections should be based on collection of 50 per cent of potential revenue from low cost II residents and of nothing from informal housing residents. Table H.1 presents the proportion of water that will be paid for under the estimated division of water consumption, and the above revenue collection assumptions.

Table H.1

Expected Quantity of Water that Will be Paid for

	High/ medium cost housing residents	Low cost housing residents Group I	Low cost housing residents Group II	Informal housing residents	Institutional /industrial consumers	Total
Percentage of total consumption (%)	29.8	16.0	18.9	23.8	11.5	100.0
Assumed level of rate collection (%)	90.0	90.0	50.0	0.0	90.0	-
Percentage of total consumption paid for (%)	26.8	14.4	9.5	0.0	10.3	61.0

Table H.1 shows that it is unlikely that more than 61 per cent of water consumed, i.e. 51 per cent of water produced, will be paid for since the revenue collection assumptions are the highest that the consultants believe could be achieved.

Table H.2 summarises the overall percentage of water consumed and water

produced that will be paid for resulting from the optimistic and pessimistic division of water consumption variations and the above revenue collection assumptions. It also shows the effect on these percentages of lowering the revenue collection assumptions.

Table H.2

Summary of the Percentage of Water that Will be Paid for Under Alternative Assumptions

Level of Revenue Collection Assumption	Percentage of Water consumed that will be paid for under:- Estimated Division of Water Consumption	Optimistic Division of Water Consumption	Pessimistic Division of Water Consumption	Percentage of Water produced that will be paid for under the:- Estimated Division of Water Consumption	Optimistic Division of Water Consumption	Pessimistic Division of Water Consumption
Individual connections 90% Low cost II consumers 50%	61.0	74.4	45.3	50.8	64.7	36.2
Individual connections 60% Low cost II consumers 25%	39.1	48.5	28.4	32.6	42.2	22.7

It can be seen that under the more optimistic revenue collection assumption the percentage of water that will be paid for under the optimistic, proposed, and pessimistic division of water assumptions will be 74%, 61% and 45% respectively. The corresponding percentages relating to water produced are 65%, 51% and 36% respectively. Under the more pessimistic revenue collection assumption all these figures are reduced by between 35% and 40%.

Under the most favourable combination of assumptions almost 75% of water consumed, i.e. 65% of water produced would be paid for. By contrast under the least favourable combination under 30% of water consumed, i.e. under 25% of water produced would be paid for. Hence there is a clear need for sensitivity tests in the revenue analyses.

APPENDIX J

EDUCATION PROGRAMME

APPENDIX J EDUCATION PROGRAMME

Whatever pricing policy/tariff structure is adopted it must be properly explained to consumers so that they fully understand it. The information provided must include a clear statement of the facts, for example, the high costs of operating and maintaining the supplies, together with the rationale behind the policy, for example, the need for revenue at least to cover the cost of operation and maintenance.

Although it is important that consumers understand these simple facts of life, it is vital that local officials do. The evidence is that today not all of them do fully understand. For example, in September 1979, the council secretary in Namushakende wrote expressing concern over the rate increase from K3 to K5 for individual connection consumers. However he totally ignored the cost side of the matter. Consequently the water authorities must ensure that local officials are educated in the need for, and rationale behind, water rates. Incidentally the above mentioned letter is also a reflection of the revenue collection performance. It was written one year after the price increase was first notified by circular and nine months after it should have been implemented.

It appears that part of the current revenue collection problem relates to a lack of education. Although the low rate of collection from communal water points is in part due to:

(a) the Government attempting to satisfy aspirations after Independence,
(b) minor politicians, even today, misleading the people about their obligations to pay for communal points,
(c) the tradition of non payment that has grown up,

the basic problem has been a lack of education and discussions about the need to pay for water. No efforts were made to discuss the matter with the people when schemes were first implemented. Later the authorities continued to ask for payment for the same service which people now regarded as free. They did not back up their efforts with any meaningful education campaigns.

If the policy of charging communal point consumers is to be successful, it is vital that a major education programme must be launched to convince the people that they must pay for communal point access. A high level of rate payment for communal points will only be achieved after a successful education campaign in which the speakers are respected by the majority of the people.

Even before an education programme aimed at the people is started the issues involved must be explained to the leaders so that they support the campaign. Without this support there would be little point in implementing a campaign aimed at the ordinary people. The support of leaders such as UNIP Chairmen and M.P.'s is essential. In the past, politicians in Zambia, for example in Lusaka, during briefings by water authority officials, have agreed to urge the people to pay for the water but have then gone and told the consumers that they do not have to pay, in order to gain popularity for themselves.

The message that should be conveyed to the leaders is that the people must understand they they have to pay for the water since the alternative is a continually increasing burden on Treasury. Since Government will not be able to fully make up the deficit it will lead to a continuing deterioration in the supplies until they break down completely.

It is important that both the support of the leaders is obtained, and the major campaign is started, prior to the opening of any augmentation and where possible prior to construction, so that a tradition of non payment is not carried forward. It may be appropriate that some or all of the meetings are organised by UNIP since party support could be pivotal. The initial meetings must be backed up by a continued effort to get the basic message across. For example, it should be stressed at any ceremonies marking the opening of any new scheme.

If the water authority is really serious and has the genuine support of local leaders it should back up its campaigns by closing water points where consumers do not pay. However this will not be possible without the support of local leaders since closures would simply lead to a situation of chaos with invective between politicians and the water authorities.

Although the tricky question of payment for communal points has been used to illustrate the need for education, the authorities may need to get other messages across to consumers. For example, rather than allow consumers to focus their discontent of a two part tariff system on the higher rate, the authorities should emphasize that they are charging a low (sub-cost) rate for low consumption for social reasons. The most suitable means of communication with consumers may depend on what the message is, and on which group of consumers is the target. Possible methods will include meetings, posters, letters to individual consumers, and use of the media.

In order to assist in this exercise the consultants have produced a number of public information sheets for use by D.W.A. and councils in their education campaigns. The topics include: Payment for Communal Water Point Access, Why Water Rates Must be Increased and The Reasons for the Disconnection Policy.

APPENDIX K

PRESENT POPULATION SERVED BY INDIVIDUAL CONNECTIONS

APPENDIX K PRESENT POPULATION SERVED BY INDIVIDUAL CONNECTIONS

Table K.1 presents the approximate number of individual connections at 25 D.W.A. supplies together with the number of people served, assuming an average of seven persons per connection. It can be seen that the overall percentage served is estimated at 24%.

It is stressed that the figures in Table K.1 may contain considerable inaccuracies since;

(i) it would have been impossible for the consultants to have counted all existing connections and,

(ii) information from PWEs, officers in charge, D.W.A. files and existing consultants' reports gave very different figures for the same town.

It was even found that counting consumers in the water register did not always give the correct answer since a considerable number of the consumers listed were no longer connected. This suggests that D.W.A. should produce an updated inventory of consumers. Their own data is out of date, and they must rely on councils for updated information.

Consequently the consultants have had to judge which of the different figures they were given was the more accurate one. Occasionally when no additional clues were available the average was taken. Nevertheless despite inaccuracies in the numbers for individual townships, it is probable that the overall figures based on the 25 township sample are reasonable order of magnitude estimates.

Where limited checks were made it was found more probable that the figures were over, rather than under, estimated. Hence, it is suggested that approximately 20% of the population of D.W.A. townships have their own individual connection.

Table K.1

Present Population Served by Individual Connections

Township	Approximate 1983 population	Number of individual connections	Number of persons served by individual connections*	Percentage of the population served by individual connections *
Chizela	664	40	280	42
Kabompo	6161	220	1540	25
Kalabo	8508	195	1365	16
Kaoma	7741	202	1414	18
Kaputa	1301	35	245	19
Kasempa	3522	170	1190	34
Katete	4987**	145	1015	20
Kawambwa	8320	317	2219	27
Lukulu	1728	104	728	42
Lundazi	4695	310	2170	46
Luwingu	4327	104	728	17
Mkushi	4720	261	1827	39
Mongu	28657	771	5397	19
Mporokoso	6909	340	2380	34
Mumbwa	8706	170	1190	14
Mwinilungu	3644	320	2240	61
Namushakende	2148	37	259	12
Nchlenge	10266	127	889	9
Nyimba	1643	84	588	36
Petauke	8661	370	2590	30
Senanga	8285	180	1260	15
Serenje	6909	285	1995	29
Sesheke	4025	230	1610	40
Siavonga	4057	230	1610	40
Zambezi	9390	260	1820	19
Total/ Overall	159974	5507	38549	24

* Based on an average of seven persons per connection

** Only two thirds of total estimated population since approximately 33% are supplied by other supplies.