Costs and affordability of water supply and sanitation provision in the urban areas of South Africa*

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Abstract

"Costs" and "affordability" need to be considered together with "price" and "subsidy". Underlying this is the premise that issues of developing communities cannot be addressed in isolation from developed communities, while at the same time recognising that this must take place within the limitations of the country's resources. With respect to the costs of water supply and sanitation, the cost of a high level of service (house connection and full water-borne sanitation) is approximately four times the cost of a low level of service (stand-pipe and VIP). These costs are often not fully reflected in the prices charged to domestic consumers. Considering the higher levels of service, new domestic consumers in Johannnesburg municipality are being charged only about 75% of the average current replacement cost of their services while black local authorities have been drastically undercharging for services. In Soweto consumers are charged less than 25% of the cost (for **all** services, including water supply and sanitation). With regard to affordability, some 40% of urban black multiple households are unable to pay for services at the current low tariffs. At least 55% would be unable to pay the actual costs of the services (based on figures for Soweto). Substantially fewer households appear willing to pay for these services at the current low tariffs (again based on figures for Soweto in the context of the rent boycott). The revenue that may realistically be expected to be recovered from these households in the future lies somewhere between what they are able to pay and what they are presently willing to pay. The difference between what is recovered and the actual costs will have to be made up by some form of subsidy. The size of these subsidies is substantial in comparison with the funds available to central government. In the light of this, choices with regard to services, particularly with regard to level of service, should not be considered in isolation from other competing demands for funds.

Introduction

The issue of costs and affordability in South Africa is a mixture of very simple and very complex. But whether it is simple or complex to state, it is not easy to solve. It is not in fact a new problem. What is perhaps new is the recognised ownership of the problem: Whereas in the past, apartheid policies kept black and white, poor and rich divided, there is now widespread recognition of a linkage between the two, and a determined attempt to address it. As President FW de Klerk put it on 18 March 1992 "The massive positive result sends out a powerful message to all South Africans ... that those who have the power in terms of the present, imperfect constitution really mean it when they say we want to share power. We want it to be fair and equitable" (Star, 1992a). So too, a recent editorial article of Engineering News called for the fight against poverty to be elevated to a national priority (Engineering News, 1992). A key element of such a thrust is the provision of basic services to all in the country, and in particular the provision of adequate water supply and sanitation. In order to meet this goal it is possible that there may need to be some form of cross-subsidy from rich to poor, and it is this that has made the issue of costs and affordability a contentious one.

The title of this paper, as it stands, addresses only half of the issue at stake. The other half of the issue is addressed by what could be termed the hidden aspects of the title: "price" and "subsidy". Together with "cost" and "affordability" go "price" and "subsidy". The interrelationships between these four aspects can be stated as follows:

- A very substantial proportion of the population of South Africa cannot **afford** the **cost** of basic services.
- It is accepted that the whole population should have access to adequate water supply and sanitation at a **price** that they can **afford**.
- The full cost of these services must be carried somehow. Any difference between **cost** and **price** has to be made up by some form of **subsidy**.

Irrespective of how the interrelationships are resolved, a key constraint is that the resolution must take place within the limitations of the country's resources as a whole.

In an overview of costs and affordability, this paper presents figures for cost, price, affordability and subsidy of water supply and sanitation provision in the urban areas of South Africa and proposes that a broader perspective be adopted in reconciling the competing demands for funds.

Costs of various levels of service provision

What are the costs of water supply and sanitation ? The answer depends to a significant extent on what we mean by "cost".

There are numerous different meanings. A broad definition which is common to them all is as follows: "**Cost** is a sacrifice that must be made in order to do or acquire something. The nature of the sacrifice - i.e. what is given up - may be tangible, objective or subjective, and may take one or more of many forms such as money, goods, leisure time, income, security, prestige, power, or pleasure" (Spencer, 1983). In this paper, the meaning of "cost"

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has been confined to "accounting costs" or "financial costs".

Within "financial costs" there are a number of further distinctions and definitions. The first of these is the distinction between "average" and "marginal" costs. "Average cost" is simply the total cost divided by the total number of units of output. "Marginal cost" (at any output level) is the additional cost of producing one more unit of output.

A second distinction is between "historical" costs and "current replacement" costs. Because of inflation and the long time over which the infrastructure has been developed, the two are very different.

A third distinction is between "capital" and "operating" costs. As used here, "capital cost" refers to the initial one-off cost of providing the physical water or sanitation infrastructure for a particular service. The "operating cost" refers to all routine maintenance and other costs incurred in keeping the service operational. Included in the operating cost is an allowance for office overhead, which would include certain capital items such as the cost of the head office building or the cost of a computer management system. With one exception, all financial costs are therefore included in the combination of capital and operating costs given in this paper. The exception is the cost of replacement or major rehabilitation of ageing physical infrastructure, which is not included anywhere. A portion of the annual capital budget of most utilities is spent on such work, but how to allocate these costs is not simple.

A fourth distinction is between "at capacity" costs (or costs at full utilisation) and "average current utilisation" costs. Because additions to the bulk infrastructure system are made in increments and in advance of rising projected future demand, the infrastructure is on average not fully utilised. At the very point at which the infrastructure is fully utilised, (if the demand projections are correctly made) additional capacity is provided to meet the rising demand. If the infrastructure is not fully utilised, the capital cost per unit of output is higher than if it were fully utilised.

The costs used in this paper are as follows: The capital costs of the treatment works and the internal infrastructure are marginal costs, "marginal cost" being taken as the present value of the most recent additions to the infrastructure for which costs could be obtained. The costs of the bulk reticulation (including the storage reservoirs for water supply) are average current replacement costs. All operating costs are average costs.

All of the capital costs are "at capacity" costs whereas the operating costs are "average current utilisation" costs. Because the capital costs used are "at capacity" costs and are expressed in unit terms of cost per household, the lumpiness (or capital indivisibility) of these costs has been smoothed out.

In summary therefore, the costs given in the paper are essentially average costs, calculated at current replacement value and at full utilisation.

For an expanding city, with development taking place mainly at the periphery (as has been typical of many of the urban areas of South Africa), the relative magnitude of marginal and average current replacement cost is complex. Considering the case of full water-borne sanitation, while the relative magnitude of marginal and average cost of the internal infrastructure is for all practical purposes the same, the relative magnitude of average and marginal cost of the bulk infrastructure is not. The provision of additional capacity at the periphery means providing additional sewer capacity along the whole length of the sewer pipe to the treatment works as well, making the marginal cost of the bulk reticulation more expensive than the average current replacement cost. This is generally offset to some extent by the economy of scale of the treatment works, which makes the marginal cost less expensive than the average cost. On balance it appears that the marginal cost of water-borne sanitation may well be higher than the average current replacement cost, and the same is likely to apply to a reticulated water supply system as well.

If this is so, then it means that marginal cost (as defined in this paper) would give a more realistic indication of what costs of service provision in the future are likely to be than average current replacement cost, in which case the costs presented in this paper would be lower than those that are likely to be incurred in the medium- and long-term future.

Estimates of costs of water supply and sanitation as at January 1990 were given by Van Ryneveld (1994). The capital costs were expressed as lump sum figures and the operating costs as ongoing annual or monthly figures. These estimates have been reproduced in Table 1, but have also been translated into monthly costs per site so as to enable more direct comparison between different options. These monthly costs have been calculated to increase at the rate of inflation so that they remain constant in real terms over the loan period. This is to allow a better comparison with affordability to be made over the full length of the loan period.

The monthly cost of a capital amount was calculated, based on the following assumptions:

- A loan period of 20 years
- A rate of inflation of 15%/a
- An interest rate of 20%/a (5% above the rate of inflation)
- The costs were calculated on an annual basis, with the payment being made in arrears. The monthly cost was taken as the annual cost divided by 12.
- The costs were expressed in 1990 Rands.

These costs are given for the following grouping of technical options:

Water Supply:	**Sanitation:**
Water kiosk	Bucket
Stand-pipe at 250 m	Ventilated improved pit latrine
Yard tap	Aqua-privy with soakaway
House connection	Water-borne sanitation to sewer

A number of different groupings of technical options for water supply and sanitation are recognised. One such set of groupings is that proposed by the Department of Development Aid (1988); another set is the level of service matrix compiled by the South African Housing Advisory Council in cooperation with the Division of Building Technology of the CSIR (South African Housing Advisory Council, 1988). The set of groupings used in this paper is a shortened version of the two with some modifications.

Particular points of note regarding the options are as follows:

- People generally walk between 100 and 250 m to use water kiosks; for stand-pipes, the 250 m refers to the distance that a householder would have to walk to fetch water, not to the spacing between stand-pipes.
- The ventilated improved pit (VIP) latrine is detached from the house and includes a privy and a simple seat or squat plate.
- The tank of the aqua-privy should normally be large enough for a unit supplying a family of say six to need desludging not more than every 2 to 3 years. Water usage is taken to be about 60 ℓ/site·d (a tenth of that required for full water-borne sanitation) serving a family of six. Water usage for the aqua-privy is included in the figures for the stand-pipe.

TABLE 1
COSTS OF WATER SUPPLY AND SANITATION PROVISION IN THE URBAN AREAS OF SOUTH AFRICA (1990)

Code and description		Sewage or water usage per site	Cost/site		Cost/site translated into monthly cost [d]		
			Capital cost	Operating cost	Capital cost	Operating cost	Total
		l/site·d	R/site	R/site·a	R/site·m.	R/site·m.	R/site·m.
Water supply							
WK	**Water kiosk**[a]	120	350	-	2.54	-	2.54
	Bulk services[b]		250	55	1.82	4.58	6.40
	Total		**600**	**55**	**4.36**	**4.58**	**8.94**
SP	**Stand-pipe at 250 m**[a]	200	400	-	2.91	-	2.91
	Bulk services[b]		450	95	3.27	7.92	11.19
	Total		**850**	**95**	**6.18**	**7.92**	**14.10**
YT	**Yard tap**	450	600	-	4.36	-	4.36
	Bulk services[b]		1 000	210	7.27	17.50	24.77
	Total		**1 600**	**210**	**11.63**	**17.50**	**29.13**
HC	**House connection**	900	700	-	5.09	-	5.09
	Bulk services[b]		2 000	420	14.54	35.00	49.54
	Total		**2 700**	**420**	**19.63**	**35.00**	**54.63**
Sanitation							
BU	**Bucket latrine**	-	**-**	**360**	**-**	**30**	**30**
VIP	**Ventilated improved pit**	-	**1 000**	**25**	**7.27**	**2.08**	**9.35**
AP	**Aqua-privy**	60	**1 100**	**30**	**8.00**	**2.50**	**10.50**
WB	**Water-borne sanitation**	600	2 500	-	18.18	-	18.18
	Bulk services[c]		1 800	130	13.09	10.83	23.92
	Total		**4 300**	**130**	**31.26**	**10.83**	**42.10**
Water supply and sanitation							
SP+VIP	Internal services		1 400	25	10.18	2.08	12.26
	Bulk services		450	95	3.27	7.92	11.19
	Total		**1 850**	**120**	**13.45**	**10.00**	**23.45**
YT+AP	Internal services		1 700	30	12.36	2.50	14.86
	Bulk services		1 000	210	7.27	17.50	24.77
	Total		**2 700**	**240**	**19.63**	**20.00**	**39.63**
HC+WB	Internal services		3 200	-	23.27	-	23.27
	Bulk services		3 800	550	27.63	45.83	73.46
	Total		**7 000**	**550**	**50.89**	**45.83**	**96.73**

NOTE:

a The water usage and costs given for the water kiosk (WK) and the stand-pipe (SP) were based on the assumption that water is sold at the water kiosk but is given away free at the stand-pipe. They are essentially the same level of service. Water can also be sold at a stand-pipe. The difference in water usage and cost between the two is therefore primarily a reflection of the difference between a service that is charged for and one that is not.

b Unit costs for water supply bulk services were taken to be as follows:
- Capital cost: R2 200/kℓ·d
- Operating cost: R1.30/kℓ

These figures were estimates, based on figures for Johannesburg City Council, Umgeni Water and Rand Water.

c Unit costs for water-borne sanitation bulk services were taken to be as follows:
- Capital cost: R3 000/kℓ·d
- Operating cost: 60c/kℓ

These figures were estimates, based on figures for Johannesburg City Council and East Rand Regional Services Council.

d Lump sum capital costs were converted to annual costs (not shown on the table) using the following expression:
- Annual cost = lump sum cost x 0.0872457

Annual values for both capital and operating costs were converted to monthly values by using the expression:
- Monthly cost = annual cost/12

- The water-borne sanitation to sewer system includes the toilet bowl, the shelter, simple plumbing and fixtures that would normally accompany the provision of water-borne sanitation (e.g. a washhand basin) as well as the sewer reticulation and treatment facilities required. A distinction is made between internal and bulk service provision. The local sewer network in the township is included as part of the internal services whereas the link sewers and bulk treatment works are what make up the bulk services. Sewage flow is taken to be about 600 ℓ/site·d serving a family of six. Water usage for water-borne sanitation is included in the figures for the house connection.

The figures given in Table 1 are for lower income communities, with some allowance for growth in *per capita* demand. Middle income communities would have higher demands.

The combined costs of water supply and sanitation for various levels of service are shown graphically in Fig. 1.

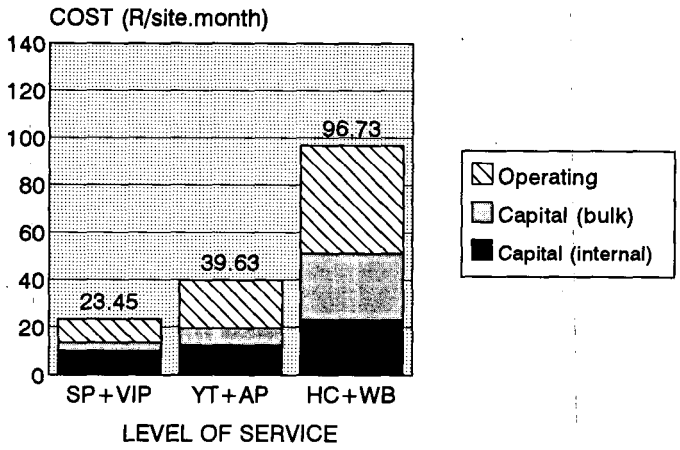

Figure 1
Combined costs of water supply and sanitation provision in the urban areas of South Africa

Actual figures for Johannesburg are given in Table 2.

In summary, the cost of a high level of service for water supply and sanitation (house connection and full water-borne sanitation) is approximately four times the cost of a low level of service (stand-pipe and VIP), the main difference being in the cost of the bulk services.

Price

Having established the costs of water supply and sanitation, the next question to ask is: What are the prices, i.e. what is charged for these services?

More attention is given here to the higher levels of service, namely full water-borne sanitation and full house connections. For illustrative purposes, figures for the Transvaal are given, and more particularly, figures for Johannesburg.

Policies for recovery of costs for bulk services have evolved over a number of years. A brief summary of this is set out in the minutes of an Ordinary Meeting of the Council of the City of Johannesburg of 27 August 1991 (Council of the City of Johannesburg, 1991).

There was no initial bulk services contribution for townships in the Transvaal established before 1975. The costs of bulk services were recovered in the service charges. In 1970 the Niemand Commission recommended that township developers contribute to the costs of the bulk services by paying an endowment of between 3% and 7% of the selling prices of the erven (Republic of South Africa, 1970). This recommendation was brought into effect during 1977, and applied retrospectively to all townships which had applied for establishment after 27 November 1974.

Under the 1977 amendment local authorities were required to motivate the amount of the endowment. This was done, certainly for Johannesburg, according to a formula which was as follows (The example of water-borne sanitation is given; water supply is similar):

$$W = \frac{K}{E} - \frac{L}{E}$$

where:

- W = Unit amount payable to Council per kℓ of sewage discharge per day (R/kℓ·d)
- K = Historical costs of the external sewerage service infrastructure plus 5 years projected expenditure for such service
- L = Council's outstanding loan debt for external sewerage services
- E = Total daily sewage discharge for the entire municipal area (kℓ/d)

Total payment by applicant to Council (R) = Total assessed sewage discharge (kℓ/d) x unit amount (R/kℓ·d).

The inhabitant of the newly established township joined existing inhabitants in contributing to the existing loan debt, and subtracted an equivalent capital amount from his own bulk services contribution so as not to pay the amount twice over. The formula was a modification of the Regulation 25A formula (or TMA formula) of the 1965 Transvaal Town-planning and Townships Provincial Ordinance (Ordinance 25 of 1965). The principle of the formula is one of "equal treatment", i.e. ensuring that the old town or city does not subsidise the new nor vice versa.

The Town-planning and Townships Ordinance 1986 (Ordinance 15 of 1986) extended the definitions under which contributions for external services were payable and made provision for the Administrator to lay down further guidelines. In the Administrator's Guidelines, it was determined that the contributions should be based on marginal costs in accordance with the recommendations of the Venter Commission. The Commission's second report gave the same definition of marginal costs as defined earlier in the paper, but took "marginal costs" to be synonymous with "average current replacement costs" and recommended essentially that these be used rather than historical costs (Republic of South Africa, 1984).

In August 1991 Johannesburg City Council amended their formula for the external services contribution to come more in line with the Administrator's Guidelines by substituting "current replacement costs plus a utilisation factor" for "historical costs plus 5 years projected expenditure" for the variable K in the above formula. The amendment was made to apply retrospectively from 1 January 1991.

Although not in force in this form in 1990, the contributions which would have been payable on this current basis to the local authority (both Central Witwatersrand RSC and Johannesburg City Council) for bulk services for 1989/90 are given in Table 3, together with figures for the ongoing tariffs.

TABLE 2
COSTS OF WATER SUPPLY AND SANITATION PROVISION FOR JOHANNESBURG (1990)

Code and description		Sewage or water usage per site	Cost/site		Cost/site translated into monthly cost[d]		
			Capital cost	Operating cost	Capital cost	Operating cost	Total
		l/site·d	R/site	R/site·a	R/site·m.	R/site·m.	R/site·m.
Water supply							
HC	**House connection**	1 200	700	-	5.09	-	5.09
	Bulk services[a]		2 400	518.40	17.45	43.20	60.65
	Total		**3 100**	**518.40**	**22.54**	**43.20**	**65.74**
Sanitation							
WB	**Water-borne sanitation**	1 000	2 500	-	18.18	-	18.18
	Bulk services[b]		2 490	162	18.10	13.50	31.60
	Total		**4 990**	**162**	**36.28**	**13.50**	**49.78**
Water supply and sanitation							
HC+WB	Internal services		3 200	-	23.27	-	23.27
	Bulk services		4 890	680.40	35.55	56.70	92.25
	Total		**8 090**	**680.40**	**58.82**	**56.70**	**115.52**

NOTE:

a Unit costs for water supply bulk services were taken to be as follows:
- Capital cost: R2 000/k*l*·d
- Operating cost: R1.20/k*l*

The figure for the capital cost was largely an estimate, based on figures which were obtained as follows:
- Treatment: R500/k*l*·d (using figures from Umgeni Water for two works which have been commissioned by them in latter years: Mill Falls, 10 M*l*/d, 1985; Wiggins, 175 M*l*/d, 1984) (Burton, 1991)
- Storage: R350/k*l*·d (an average figure based on total volume of storage in the Rand Water system, total water supplied and cost of storage per unit volume. A figure of R200 000/M*l*, obtained for the recently constructed Rand Water Board reservoir at Barnardsvlei, was used for the cost of storage per unit volume) (Rand Water, 1990; SAICE Water Division, 1990).
- Distribution: R1 200/k*l*·d (an estimate, made with reference to the figure for sewerage).The figure for the operating cost was obtained by subtracting the interest and redemption on capital from the operating cost of the City of Johannesburg (Fox, 1991).

b Unit costs for water-borne sanitation bulk services were taken to be as follows:
- Capital cost: R2 490/k*l*·d
- Operating cost: 45c/k*l*

Both the capital and the operating figures were based on figures obtained from Johannesburg City Council.
The figure for the capital cost was obtained as follows:
- Treatment: R780/k*l*·d (based on figures obtained from tenders for current work) (Scott, 1991)
- Conveyance: R1 710/k*l*·d (an average figure for Central Witwatersrand Regional Services Council (CWRSC) and Johannesburg link, main and outfall sewers) (CWRSC, 1990).

The figure for the operating cost was obtained by subtracting the interest and redemption on capital from the operating costs of the City of Johannesburg (Scott, 1991).

TABLE 3
BULK SERVICES CONTRIBUTIONS AND TARIFFS FOR WATER AND SEWERAGE IN JOHANNESBURG CITY COUNCIL (1990)[a]

Code and description		Sewage or water usage per site	Price/site		Price/site translated into monthly cost[d]		
			Capital contrib.	Ongoing tariff	Capital contrib.	Ongoing tariff	Total
		ℓ/site·d	R/site	R/site·a	R/site·m.	R/site·m.	R/site·m.
Water supply							
HC	**House connection**	1 200	700.00	-	5.09	-	5.09
	Bulk services[b]		974.40	432.00	7.08	36.00	43.08
	Total		**1 674.40**	**432.00**	**12.17**	**36.00**	**48.17**
Sanitation							
WB	**Water-borne sanitation**	1 000	2 500.00	-	18.18	-	18.18
	Bulk services[c]		985.00	145.80	7.16	12.15	19.31
	Total		**3 485.00**	**145.80**	**25.34**	**12.15**	**37.49**
Water supply and sanitation							
HC+WB	Internal services		3 200.00	-	23.27	-	23.27
	Bulk services		1 959.40	577.80	14.24	48.15	62.39
	Total		**5 159.40**	**577.80**	**37.51**	**48.15**	**85.66**

NOTE:

a All tariffs are for the 1989/90 year.

b Unit prices for water supply bulk services were taken to be as follows:
- Capital contribution: R812/kℓ·d
- Ongoing tariff: R1.00/kℓ (for comparison purposes, the industrial tariff was R1.695/kℓ)

The figure for the capital contribution was based on a figure of R934.11 (which is assumed to have been based on the 1990/91 financial year), de-escalated at 15% inflation per annum to the 1989/90 year. The figures for the ongoing tariffs were the actual tariffs (Council of the City of Johannesburg, 1991).

c Unit prices for water-borne sanitation bulk services were taken to be as follows:
- Capital contribution: R985/kℓ·d
- Ongoing tariff: R0.405/kℓ (for comparison purposes, the industrial tariff was R0.81/kℓ)

The figure for capital contribution was based on actual figures for that financial year, quoted in the minutes of the Council meeting (Council of the City of Johannesburg, 1991). The figures for the ongoing tariffs were based on the actual tariffs. There was at that stage a flat rate of R12.15/site·m. A figure of 30 kℓ/site·m. (1 kℓ/site·d) for sewerage was assumed to arrive at the tariffs. The figure for the industrial tariff was also based on the actual tariff, and it is for low volumes and low strength so that it is compatible with the domestic tariff.

A comparison of the cost and price figures for domestic water supply and sanitation provision to new consumers in Johannesburg (set out in Tables 2 and 3) is given in Fig. 2.

It is evident from this comparison that new domestic consumers in Johannesburg are not paying the full costs for their services. They are paying less than half of the bulk services cost as an initial contribution, and are then paying only 85% of the operating cost as an ongoing tariff. In total, they are paying about 75% of the cost of their services. To be paying the full costs, they should be paying the full operating cost plus the interest and redemption on the difference between their initial bulk services contribution and the actual capital cost. This would result in the ongoing tariff increasing by about 60% from R48.15/site·m. to R78.01/site·m. The total costs being incurred by the municipality (i.e. the operating costs plus the costs of servicing outstanding loans on capital expenditure) are being covered nevertheless, the shortfall being made up by an internal cross-subsidy by commercial/industrial consumers.

In Black Local Authorities the tariffs are simple, but their relationship to costs is not clear. The first aspect of this is that the service charges for water, sewerage and solid waste are lumped together with municipal property rates and charges for the house on the land, under a single charge, which has commonly been called "rent".

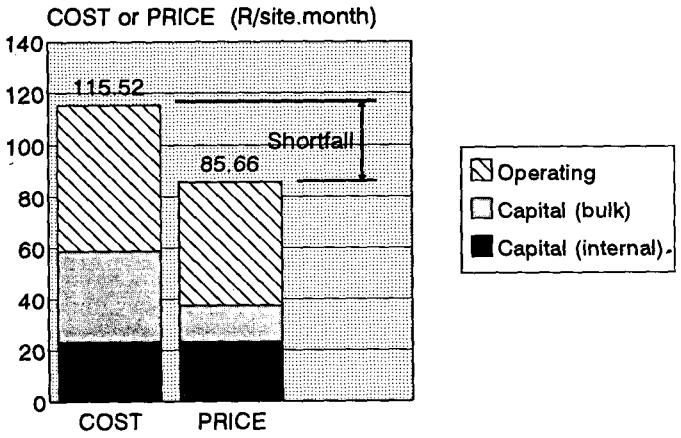

Figure 2
Comparison of cost and price of domestic water supply and sanitation provision in Johannesburg (1990)

The second aspect is that the tariffs have generally been flat rates, irrespective of consumption, so that the relationship between consumption and cost is not apparent.

The third aspect is that the charges themselves are well below actual costs. In July 1990, the maximum charge that Soweto City Council could have levied, including electricity (which was metered), was R72.50/household·m. The equivalent cost quoted was R330.47/household·m. (Mandy, 1991), more than four times the maximum price. Furthermore, this cost appears to be a historical cost, rather than an average current replacement cost, let alone a marginal cost.

Detailed breakdowns of the costs of service provision in black local authorities are not readily available. The above cost figure was the best that could be obtained. It has not been independently checked by the author. While it is possible that the figure is overstated, the indication that there is a wide disparity between cost and price is nevertheless correct.

In terms of the pact signed by the Soweto Civic Association (SCA) with the Soweto, Dobsonville and Diepmeadow councils and the TPA in 1991, residents were to have paid R55/household·m. for water, refuse removal and sewerage services from January 1992, rising to R65 in April, to R75 in July and to R85 in October. The agreement broke down in March, with residents refusing to pay the April increase (Star, 1992b).

In summary therefore:

- The actual costs of services are not fully reflected in the prices (or tariffs) charged to domestic consumers.
- Johannesburg City Council has moved away from recovering historical costs to recovering average current replacement costs from new consumers. It is recovering the total costs being incurred by it (i.e. operating costs plus the costs of servicing outstanding loans on capital expenditure). However, new domestic consumers are being charged only about 75% of the average current replacement cost of their services, the shortfall between that and the total costs actually being incurred by the municipality being made up by an internal cross-subsidy by commercial/industrial consumers.
- Black local authorities have been drastically undercharging for services. In Soweto consumers are charged less than 25% of the cost (for **all** services, including water supply and sanitation) at what appears to be only a historical cost rather than an average current replacement cost.

Affordability

In understanding affordability, it is critical to distinguish between "ability to pay" and "willingness to pay". Householders may be able to pay, but unwilling; alternatively they may be willing to pay, but unable to.

Ability to pay

Ability to pay is related to income levels in the community and the costs of other goods and services that people need to live. To get a general overview of income levels, it is useful to look at the measures and extent of poverty in the country.

There are various poverty line measures, below which a household is considered to be in what is termed "absolute poverty". The minimum living level (MLL), calculated by the Bureau of Market Research (BMR) at the University of South Africa, has been used here. It is the minimum income required for subsistence in the short term. The figure used is a weighted average for a Black household for 26 urban areas covered by the BMR. It is one of the lower figures of the various poverty lines calculated. BMR also calculates a supplemented living level (SLL), which includes slightly more for each item than the MLL as well as provision for recreation/entertainment, personal care, pension, UIF and burial contributions. It is some 30% higher than the MLL. By using the MLL as the measure of poverty, estimates of its extent are therefore conservative.

The average MLL figure for the 26 urban areas of the RSA for August 1990 for a Black family of 5 people was R624.91; for a family of 6, it was R731.48. The breakdowns of the figures are given in Table 4 (Nel and Dawson, 1990) (SLL figures are given for comparison as well).

All figures of income and living levels are at 1990 prices. The rent and service charge figures were based on actual data obtained from the local authorities.

The Urban Foundation has produced an income distribution model which gives estimates of average household incomes and their distribution, including both historical and projected figures. The figures were intended for use as input to their Housing Affordability Model, but were also recommended for use "...in analysing charges for services rendered by local authorities which households can reasonably be expected to meet" (Urban Foundation, 1991). The Income Distribution Model gives figures for the percentage of households in poverty. Figures for 1990 are given in Table 5.

In total 41.9% of SA households had formal incomes below the MLL in 1990. The average figure of MLL used in the UF study was R8503/household·a (equivalent to R709/household/m.). The actual numbers of people in poverty are given in Table 6 (Note that the average household sizes vary between the different areas and race groups).

The report pointed out that by far the majority (95% in 1990) of people in poor households were black.

The "aggregate poverty gap" is defined as the income that would have to be given to households with incomes below the MLL to bring them up to the MLL. In 1990 this was estimated to amount to R13.83 bn. or 7.91% of personal income. Total personal income was R174.9 bn.

One qualification of the income figures in the report which is pertinent to the metropolitan and urban areas is that concerning the informal sector. There are few figures available on this. Figures quoted from the Central Statistical Services (CSS) estimated unrecorded economic activities of Asians, Coloureds

TABLE 4
THE WEIGHTED AVERAGE OF THE MLLs OF 26 URBAN AREAS OF THE RSA (AUGUST 1990)

Item	No. of persons/family	
	5	6
Food	336.05	406.18
Clothing	102.28	123.10
Compulsory payments to local authority:		
(a) Rent - House)		
Site)		
(b) Miscellaneous services)	44.35	44.48
(c) Water)		
(d) Electricity)		
Fuel and light)	47.68	49.16
Washing and cleaning materials	14.77	17.94
Education	2.85	3.85
Transport (work, shopping, school)	35.55	41.57
Contributions to medical funds and medical and dental expenses, including patent medicine	20.66	22.22
Replacement of household equipment	20.72	22.98
Taxes	0.00	0.00
Minimum living level	**624.91**	**731.48**
Recreation and entertainment	31.97	38.00
Personal care	12.74	14.70
Extra washing and cleaning materials	1.14	1.34
Extra clothing	11.67	13.68
Extra transport	15.47	18.77
Extra food	88.06	126.17
Extra household equipment	2.68	2.68
Additional rent	-	-
Additional taxes	0.00	0.00
Contribution to pension, unemployment and burial funds	34.20	37.16
Supplemented living level	**822.84**	**963.98**

TABLE 5
PERCENTAGE OF HOUSEHOLDS IN SOUTH AFRICA WITH FORMAL INCOMES BELOW THE MLL (1990)

Area category	All figures in %			
	White	Coloured	Asian	Black
Metropolitan	4.1	9.9	8.5	32.1
Urban	4.7	12.5	8.1	38.7
Rural	5.1	40.1	7.5	68.4
Homeland metro				50.9
Homeland urban				63.1
Homeland rural				82.6

TABLE 6
NUMBER OF PEOPLE IN SOUTH AFRICA WITH FORMAL INCOMES BELOW THE MLL (1990)

All figures in millions

White	Coloured	Asian	Black			All
			urban	rural	total	races
0.2	0.5	0.1	5.3	11.0	16.3	17.1

TABLE 7
CENTRAL STATISTICAL SERVICE FIGURES OF THE INCOME BREAKDOWN OF AFRICANS INVOLVED IN INFORMAL SECTOR ACTIVITIES FOR THEIR OWN ACCOUNT IN THE RSA (OCTOBER 1990)

Net monthly income (R)	%
1 - 149	33
150 - 349	29
350 - 499	10
500 - 699	9
700 - 999	6
1000 - 1699	5
1700 - 2499	2
2500 +	5

and Blacks in October 1989 to be R16 bn.

In October 1990 the CSS estimated that there were 2.3 m. Africans, coloured people and Indians involved in the informal sector for their own account, while an additional 511 000 people were working for employers in the informal sector. The average monthly income of people working for employers in the informal sector in 1990 was R351 as wages and salaries. The breakdown of income of Africans working in the informal sector in the RSA for their own account is given in Table 7 (South African Institute of Race Relations, 1992):

The Urban Foundation report noted that "The informal sector probably goes much of the way to wiping out the poverty gap in metropolitan and urban areas." It pointed out, however, that "...within the metro areas [as a whole] absolute poverty would continue to exist on a significant scale and will be more pronounced on the fringes of the city - in areas presently under homeland jurisdiction".

From the above figures, it may be seen that poverty levels in the urban areas of the country, although not as bad as the rural areas, are very significant, and particularly among black people. Simply on the basis of these figures, ability to pay for services among black people is low.

In determining what a household can pay for services, two methods are generally used. The one method is based on a percentage of household income. This method is widely used, but needs to be used with caution at low income ranges. The other method is based on a typical "basket of goods and services". Items are prioritised and an amount is allocated for housing (or services), which is no specific percentage of income. The second method may be more applicable in the low income ranges.

The method adopted was to assume that at the lower end of the income distribution the maximum amount that a household would be able to pay for services was their income less any other expenses at the MLL.

If the actual cost of "rent" and services quoted in section 3 above for Soweto (R330.47) was substituted for the cost of compulsory payments to local authority plus fuel and light as set out in Table 3 above, then the percentage of black "multiple" households in the urban areas who would be unable to pay for these services would increase from the present 40% (5 m. people) to about 55% (7 m. people). In other words 40% are unable to pay for services (at the higher levels of service) priced as they are at present; 55% would be unable to pay for services if they were priced at what are probably historical costs. This is illustrated in Fig. 3, where the two MLLs are superimposed on the UF income distribution data.

If the services were priced at average current replacement costs or at marginal costs, then even fewer would be able to pay for them.

"Urban areas" as used here follows the Urban Foundation definition of metro and urban; including both RSA and homeland. Multiple households amount to some 90% of the total black urban population. The remaining 10% comprises "single" households (i.e. workers with families in the homelands).

Willingness to pay

Briscoe and De Ferranti (1988) set out a number of factors which determine consumers' willingness to pay for improved water supply, based on surveys of several projects around the world. Although intended to apply to rural water supply, they apply equally well to urban communities:

- Perceived benefits (convenience, amenity and economic benefits are important to users)
- Income (families with higher incomes are willing to pay more)
- Water charges (the higher the charge the lower the usage or consumption)
- Other prices (prices are often compared to prices of other services)
- Value of women's time (Women are generally the ones responsible for water collection and for sanitation. If their time is valued then there is a greater willingness to pay for improvements to these services)
- Level of service (users are often unwilling to pay for a low level

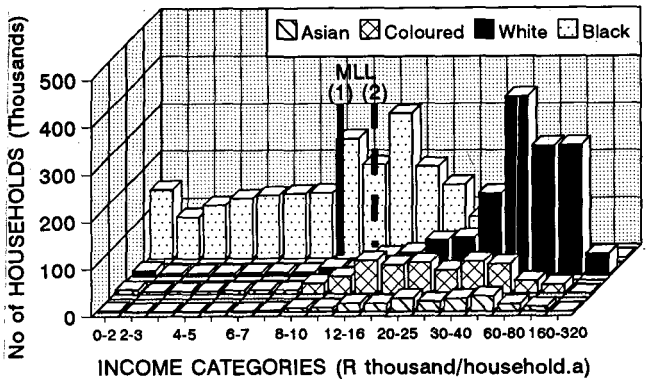

Figure 3
Minimum living levels superimposed on the UF income distribution data (1990)

Note

- *Mean number of persons per household for black "multiple" households in the urban areas of South Africa = 5.53889*
- *MLL(1) = R682.34/household·month or R8 188/household·a; it is interpolated from the BMR figures given in Table 4, which are based on the actual prices of services.*
- *MLL(2) = R919.91/household·month or R11 039/household·a; it is an "amended" MLL figure, based on the BMR figures given in Table 4, but with the services priced at their true cost.*

of service, but more willing to pay for a better service)

- Characteristics of the existing source (if existing sources are deemed acceptable then willingness to pay for improvements is low)
- Other productive activities (where water can be used to increase home production of crops and small animals, willingness to pay is likely to be higher)
- Credibility of external agency (willingness to pay is relatively high when agencies have proved that they can deliver what people want, but low where communities have had bad experiences in the past).

The "rent" boycotts in South Africa have illustrated the complex mix of factors that is at play in South Africa. An attitude survey by Frankel in 1987 found that 96% of the community supported the "rent" boycott in Soweto. Reasons given for this were as follows (Swilling, 1991):

- 51% said that it was because people think that housing and services are inadequate;
- 32% said it was because people do not have enough money;
- 11% said that it was because it was through fear of being attacked (intimidation);
- 6% said that it was in protest against the State of Emergency, and the presence of the SADF.

They are a mixture of unwillingness to pay, inability to pay and political factors. An interesting observation is that the figure of 32% of the community who indicated that they were unable to pay for their services correlates reasonably well with the figure of 40% who had formal incomes below the MLL (bearing in mind that these were formal incomes and that no specific allowance was made for informal sector incomes).

Certainly the 1970s and 1980s saw the emergence of grassroots civic organisations in black townships, with housing being a major issue around which they mobilised support in their resistance to the state's urban policies (Hendler, 1989). Seekings (1988) puts it like this: "At the root of the conflict in the PWV townships is the built environment i.e. the "physical landscape" of houses, roads and railways, factories and offices, parks and pavements, schools and sewage systems. In the townships the most important of these has been the most basic - housing - although demands for other elements in the built environment are becoming more important as residents become more assertive."

It is important therefore to recognise that the issue is not simply one of housing and services, but is also a struggle for power. The African National Congress (ANC) declared 1991 as "the year of mass action for the transfer of power to the people" (Jeffrey, 1991). This included, among others, rent and service boycotts and consumer boycotts.

In summary five comments may be made:

- Whereas for most middle and high income families (most of which are white) the price of services has never really been an issue, it definitely has been an issue for families at the bottom end of the income spectrum.
- The distinction needs to be made between "ability to pay" and "willingness to pay".
- 40% (5 m. people) of black "multiple" households in the urban areas of South Africa are unable to pay for services (at the higher levels of service) at the current low tariffs. 55% (7 m. people) would be unable to pay for services if they were priced at what are probably historical costs.
- Willingness to pay for services in black local authorities such as Soweto is even lower than ability to pay. While we have the normal conflicts and tensions over payment for services in South Africa, the issue has been distorted by lack of access to basic services which is racially biased on the one hand, and the use of rent and service charge boycotts as a political tool on the other.
- The amount of money that can realistically be expected to be recovered from consumers in the lower-income communities in the future lies somewhere between that indicated by "ability to pay" and that indicated by current "willingness to pay".

Subsidy

The area of "subsidy" is highly contentious as it is often the mechanism which has to be used to resolve the conflicts of cost, price and affordability.

The so-called "Green Book" ("Towards Guidelines for Services and Amenities for Developing Communities" (Department of Development Aid, 1988) contains a section on the philosophy of the guidelines. In it, the principle "user chooses; user pays" is recommended for the selection of levels of service for engineering services: "Authorities are reminded that it is currently government policy to promote the principle of "the user pays". This principle must be observed in the supply of urban land for developing communities, namely that in determining the appropriate standards for each developing community, authorities should bear in mind that the community will be required to bear the costs of the development".

This principle, which is one of full cost recovery for municipal services, has been seriously challenged by what has been going on in many black local authorities over the past few years. The shortfall between price and cost has been made up by various forms of subsidy. The critical question to ask is whether this kind of

TABLE 8
AGGREGATE LOCAL AUTHORITY EXPENDITURE AND INCOME DATA FOR LOCAL AUTHORITIES IN THE THREE RSC AREAS OF THE WITWATERSRAND (1990/91 BUDGETS)

Local authority	Expenditure [Rands x 10^6]	Income [Rands x 10^6]	Deficit [Rands x 10^6]	[%]
ERRSC area:				
10 white LAs:	1 316	1 315	1	0.1
10 black LAs:	348	237	111	46.8
CWRSC area:				
4 white LAs:	2 197	2 169	28	1.3
4 black LAs:	531	200	331	165.5
WRRSC area:				
5 white LAs:	289	289	0	0
7 black LAs:	57	47	10	21.3

TABLE 9
AMOUNTS OWED IN RENTS AND SERVICES CHARGED TO BLACK LOCAL AUTHORITIES IN THE FOUR PROVINCES OF SOUTH AFRICA

Province	[all figures in Rands x 10^6]			
	Mid 1986	End 1987	End 1989	End 1990
Cape Province		47	84	109.1
Natal		2.5	4	3.6
Orange Free State		17	35	68.9
Transvaal		321	641	996.6
Total	**177.6**	**387.5**	**764**	**1 178.2**

subsidy is sustainable for the country.

To get an adequate idea of this, it is not really enough simply to look at a figure per household. One needs to see what the total amount of the subsidy is for the country as a whole; and to do that, a good place to start is to see what kind of deficits the black local authorities are running up. There are two illustrations.

The first is a summary of the budgeted income and expenditure for various white and black local authorities in the three RSC areas on the Witwatersrand, which is given in Table 8 (Swilling et al., 1991).

Whereas the budgeted income and expenditure of the white local authorities are more or less balanced, they are very severely out of balance for black local authorities. Note that these figures make no explicit allowance for the "rent" boycott.

The second illustration is the deficit that has been run up by black local authorities as a consequence of the "rent" boycott. A summary of the amounts owed in rents and services to black local authorities in the four provinces of the RSA is given in Table 9 (Jeffrey, 1991).

Similar figures are quoted by Swilling: The "rent" boycott in the Transvaal started in the Vaal townships in September 1984 (rent in inverted commas because it in fact consists only partially of rent and mainly of municipal services). As at July 1990, 49 of the Transvaal's 82 townships were carrying out a "rent" boycott and the government had put in some R1.1 bn. of "bridging finance" into these townships. Of the R1.1 bn., R791 m. had been allocated to Greater Soweto. Of the R791 m., some R500 m. was as a result of the "rent" boycott itself and the remainder (R291 m.) was a budgeted deficit (from the promulgated tariffs being lower than the costs) (Swilling, 1991).

Comparing these figures with the national budget gives some idea of the magnitude: The provision for housing from the Exchequer in the 1992/93 national budget was R2 193 m. (Star, 1992c).

How does this compare with the subsidies actually needed to provide housing and services for all ? Work done for the De Loor Commission (looking at a new national housing policy) looked at the implication of subsidies. A spreadsheet model was set up which attempted to "... quantify certain fiscal and financial implications of closing the gap between demand and supply of housing in South Africa (metropolitan and other urban, 1910 boundaries), with special reference to the lower end of the income spectrum" (Development Bank of Southern Africa, 1991). The costs of the bulk infrastructure as well as provision for social infrastructure

were included in the costs of the housing. The bulk infrastructure included water, sanitation, roads, electricity, refuse disposal and telecommunications. Costs for bulk infrastructure ranged between R4 000/stand (for a low level of service) and R9 000/stand (for a high level of service). Social infrastructure made provision for facilities for education, health, law, civic functions, posts, recreation and certain other facilities. The cost of social infrastructure was calculated at R8 500/stand. Based on the assumptions made, the key finding was that to meet the effective demand by the year 2000, the annual budgetary provision for a 10-year programme from 1990 to 2000 (including service subsidies, a planned urban reception area, hostel upgrading and conversion and bulk and social infrastructure) would amount to some R3 796 m. i.e. just under R4 bn. a year for 10 years (1990 Rands). This figure includes no provision for existing commitments nor for urban renewal/ upgrading. It also provides for low levels of service on cheap land, probably near the periphery of the city, rather than densification of the inner city.

Urban transport costs were not included in the model. They are nevertheless a critical component of any housing plan. Subsidies for urban public transport commuters amounted to some R1.4 bn. for 1991 and were projected to amount to R1.9 bn. in 1992 (World Bank Urban Sector Reconnaissance Mission, 1991).

The assumptions made in the spreadsheet model were broadly in line with the final recommendations of the De Loor Commission as indicated in the press release (South African Press Association, 1992). To summarise:

- The difference between what is recovered and the actual costs will have to be made up by some form of subsidy.
- The size of these subsidies is significant in comparison with the funds available to central government. By the end of 1990 black local authorities in South Africa were owed R1.2 bn. as a consequence of the rent boycott (in addition to the budgeted deficit from the promulgated tariffs being lower than the costs). By comparison, the provision for housing from the Exchequer in the 1992/93 national budget was R2.2 bn.

Discussion

Whether or not the financial resources for these subsidies can be obtained - and on a sustainable basis - requires more detailed investigation. Nevertheless, from the figures presented above it appears that at the very least, they will be a significant drain on the country's limited resources.

There is, however, a more fundamental question that needs to be asked: If that amount of money can be raised, is it optimal use of the resource to spend it on such subsidies?

Two quotes are given to illustrate this further. The first is by Marais and the second is by Dewar.

A number of years ago Marais (1973) defined what he considered to be the basic requirements which "housing" must satisfy as:

- Access to work
- Water supply and sanitation
- Shelter.

The order of these three was not immaterial and "shelter" was consciously relegated to third position. The point that he was making was that housing and the provision of basic services need to be seen within a broader development context.

Dewar (1991) expressed an even broader view: To the question "why do people come to the cities ?", he answered as follows: "People do not come to the city to find housing. They come in order to experience the economic, social, cultural and recreational opportunities and facilities which can be generated through the physical agglomeration of large numbers of people".

He then went on to redefine "essential infrastructure", pointing out that currently almost all public investment in urban infrastructure is channelled into utility services, and "essential" social services such as schools and health facilities, and proposed a number of other priorities in gearing up South African cities to accommodate the urban poor, namely:

- Active promotion of agriculture as an urban activity
- Massive planting to yield alternative and supplementary sources of energy, building materials, recreation and to control wind
- Urban public spaces
- Public provision of economic infrastructure
- Reception centres for information, assistance, meetings etc.
- Multi-functional use of urban elements and urban spaces.

The above list focuses on the built environment. There are obviously many other needs. Not only are the costs of providing water supply and sanitation to all in South Africa very substantial, but the costs of other competing demands for funds are very substantial as well.

In South Africa, Wall (1992) has pointed out that with a significant proportion of the population unable to pay for their own basic services, coupled with historical inequalities based on race, subsidies of one form or another are playing - and will continue to play - a significant role. That may well be true. Nevertheless, there is one aspect in the provision of water supply and sanitation that demands careful consideration. That is the matter of what exactly one is trying to achieve by the provision of water supply and sanitation, and the extent to which different levels of service are able to meet these objectives.

Apart from the "basic need" aspect of the services, there are two primary reasons for the provision of water supply and sanitation:

- protection of human health
- protection of the environment.

That, however, is not generally how the average user will view the matter. With regard to sanitation, Muller (1989) has put the issue as follows: "The current received wisdom is that the objectives of sanitation centre around health. That is certainly a component. But in the minds of the user, privacy, comfort and convenience are as important. The prevention of smell and the removal of excreta from the household are probably more immediately important to the user than a nebulous improvement in health." For the user, impact on the environment (if it is not the user's immediate environment) can be an even more nebulous concept.

Users will generally aspire to high levels of service (full house connection and full water-borne sanitation), often for reasons of convenience, while the objectives of protection of health and protection of the natural environment could just as effectively be achieved by a low level of service (stand-pipe and VIP) - and at a much lower cost.

While it is widely agreed that there should be adequate access to water supply and sanitation for all, it is considered that subsidies should not be allocated to services without reference to other competing demands for funds, and certainly not to levels of service which are higher than what is adequate for health and for protection of the environment.

Conclusions

"Costs" and "affordability" need to be considered together with "price" and "subsidy". Underlying this is the premise that issues of developing communities cannot be addressed in isolation from developed communities, while at the same time recognising that this must take place within the limitations of the country's resources.

Costs of water supply and sanitation vary quite significantly between different levels of service. The cost of a high level of service for water supply and sanitation (house connection and full water-borne sanitation) is approximately four times the cost of a low level of service (stand-pipe and VIP), the main difference being in the cost (both capital and operating) of the bulk services.

These costs are often not fully reflected in the prices (or tariffs) charged to domestic consumers. Considering the higher levels of service, Johannesburg City Council has moved away from recovering historical costs to recovering average current replacement costs from new consumers. It is recovering the total costs being incurred by it (i.e. operating costs plus the costs of servicing outstanding loans on capital expenditure); however, new domestic consumers are being charged only about 75% of the average current replacement cost of their services, the shortfall between that and the total costs actually being incurred by the municipality being made up by an internal cross-subsidy by commercial/industrial consumers. Black local authorities have been drastically undercharging for services. In Soweto consumers are charged less than 25% of the cost (for **all** services, including water supply and sanitation) at what appears to be only a historical cost rather than an average current replacement cost.

With regard to affordability, the distinction needs to be made between "ability to pay" and "willingness to pay". Some 40% (5 m. people) of urban black multiple households are unable to pay for services at the current low tariffs. At least 55% (7 m. people) would be unable to pay the actual costs of the services (based on figures for Soweto), at what are probably only historical costs. Substantially fewer households appear willing to pay for these services at the current low tariffs (again based on figures for Soweto in the context of the rent boycott). The revenue that may realistically be expected to be recovered from these households in the future lies somewhere between what they are able to pay and what they are presently willing to pay.

The difference between what is recovered and the actual costs will have to be made up by some form of subsidy. The size of these subsidies is significant in comparison with the funds available to central government. By the end of 1990 black local authorities in South Africa were owed R1.2 bn. as a consequence of the rent boycott (in addition to the budgeted deficit from the promulgated tariffs being lower than the costs). By comparison, the provision for housing from the Exchequer in the 1992/93 national budget was R2.2 bn.

Users will generally aspire to high levels of service (house connection and full water-borne sanitation). In the light of the subsidies that are likely to be required to pay for these services and the country's limited resources, subsidies for services should not be considered in isolation from other competing demands for funds. More specifically, while it is widely agreed that there should be adequate access to water supply and sanitation for all, it is considered that subsidies should not be allocated to levels of service which are higher than what is adequate for health and for protection of the environment.

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