A Costing Framework

for Municipalities Serving Communities in both Urban and Rural Contexts

"Making knowlege work for us"

WIN-SA
WATER INFORMATION NETWORK
- SOUTH AFRICA -

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SALGA
South African Local Government Association

ACKNOWLEDGEMENT

This project brief is compiled from a progress report on an ongoing **WRC Research Project K5/2112: Promoting and Improving Water Services Authority / Provider Performance and Identification of Good Practices through Benchmarking. The project is funded by SALGA and the WRC**

The costs calculated in this study report are all based on data that has been sourced from easily available documents. It has however been acknowledged that some important data is not freely available (e.g. info on sewer pump-stations) and this data is probably only available from officials that have intimate knowledge of their schemes and documentation at the Water Services Authorities. It should however be noted that in each instance the resources required were not omitted from the figures presented. In each case an *engineering estimate* was made of what infrastructure is likely to be in place to enable calculation of the required resources.

Reference was also be made to additional centres of excellence and best practise to verify that the metrics used to establish the *costed norms* are indeed representative. Specifically, reference will be made to the Dolphin Coast contract in iLembe DM and the Mbombela concession in Mpumalanga province.

In addition to these activities that are aimed at enhancing the veracity of the outputs, additional efforts were applied to unpack the figures and present more detail on what resources (both primary and financial) were required for the identified business processes in each of the case studies.

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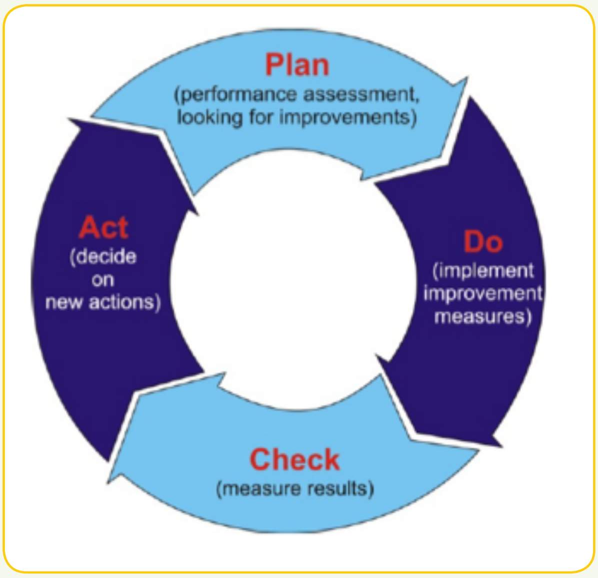
1. INTRODUCTION: THE MUNICIPAL WATER SERVICES CHALLENGE

Local Government Water Services Authorities (WSAs) in South Africa have contributed significantly towards increased access to a wide range of basic and improved water services, including substantial progress in addressing water services backlogs. Notwithstanding the progress made, this is set against the backdrop of an ongoing need to continue accelerating service delivery in order to meet *inter alia* the 2014 service delivery targets, and within an environment of growing development-driven water demand, as housing development and service upgrading accelerates. In order to seek sustainable provision of adequate, effective, efficient and safe water services, improved performance measurement and management will be crucial.

The Role of Municipal Water Services Benchmarking in Meeting the Challenge



Benchmarking's Plan-Do-Check-Act Principle of Continuous Improvement

Benchmarking is a structured, continuous process to both (i) assess and improve one's own organisational performance, and (ii) identify and adapt best practices from amongst one's peers to your own situation.

Internationally, benchmarking has been shown to lead to substantial improvements in water services performance and water services delivery efficiencies; with associated economic benefits. With thematuring of South Africa's water sectors regulatory tools it is now appropriate and possible to separate out *Promoting and Improving Water Services Authority/ Provider Performance and Identification of Good Practices through Benchmarking* regulatory performance monitoring from more introspective municipal performance benchmarking; i.e. *Benchmarking For Municipalities, By Municipalities, to the Benefit of Municipalities,* separate yet ultimately supportive of national regulatory objectives and initiatives.

1.1 The WRC/SALGA Project – Development of a Costing Framework For Water Services.

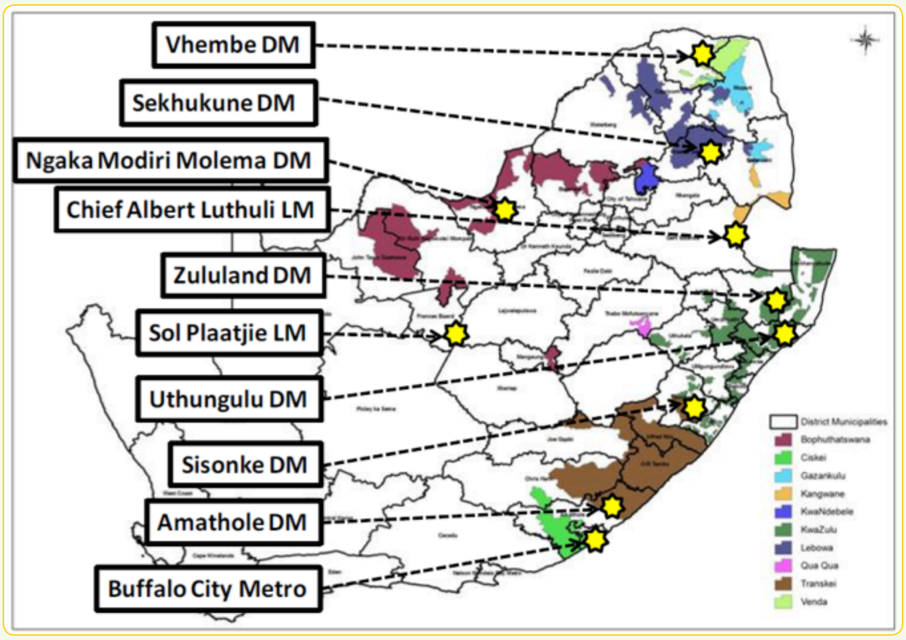
Given the municipal water services challenge highlighted above, a WRC/ SALGA project has been initiated under the Municipal Benchmarking Initiative for water services, to investigate the cost of water services for municipalities that must service both urban and rural communities.

The initiative aims to determine the cost of water service provision using a zero based budgeting approach which is being implemented within the Municipal Benchmarking Initiative.

Ten municipalities from across the country were included in the study, representing a broad spectrum of water services institutions and a comprehensive geographic spread.

The combination of the case studies ensured that consideration was given to operational circumstances that may vary according to issues such as:

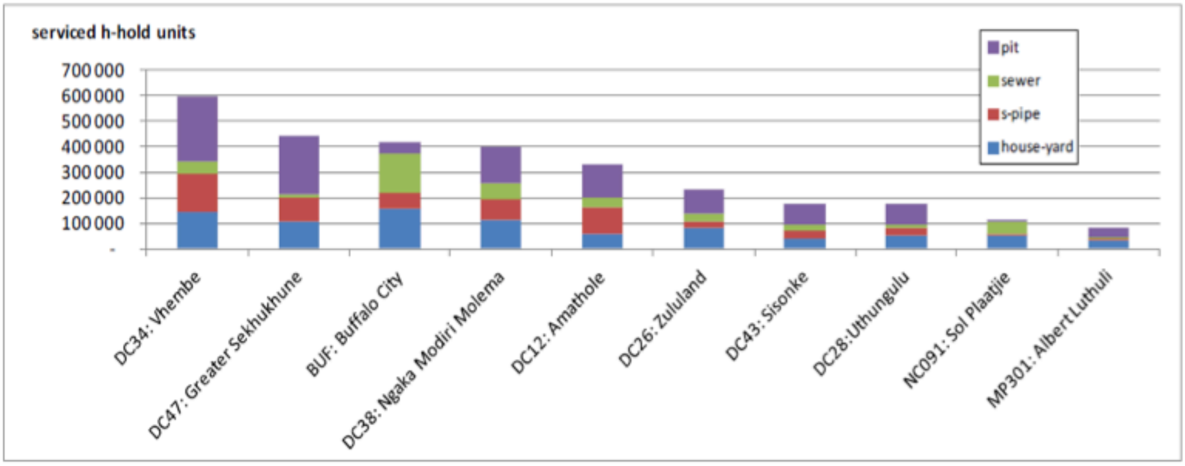
- Geographic consideration (size, topography etc)
- Availability of water resources
- Settlement patterns



Location of Cost Model Case Studies

Seven of the identified case studies are part of the group of 23 'priority district municipalities' that have been identified by government as requiring special support and intervention due to the service delivery challenges being encountered in those areas.

The municipalities that were selected for this study cover a wide range of considerations that are both quantitative *(how big is the job)* and qualitative *(how is the service being provided)*. Figure 2 below presents data extracted from the latest census that shows the range of service delivery challenge that each municipality must address. The 'challenge' is measured as the 'number of households that must be serviced in each of the service delivery categories.



The Service Delivery Challenge of the Ten Case Studies

1.1 Developing the Framework for Allocating Costs

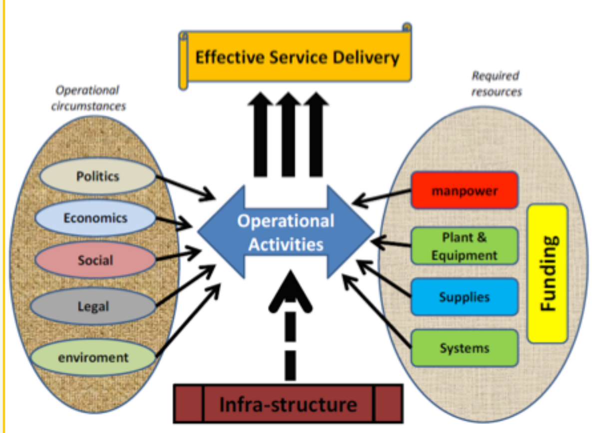
The costing framework used in this project was developed through consultation with sector specialists and municipal officials.

The basic premise of the approach is that the costs are a product of the resources required to perform the activities associated with operating the infrastructure that is used to provide the service. Naturally these factors need to be considered within an operating context, or set of circumstances.

A Framework for Planning Operation and Maintenance

The development of a costing framework necessitated the following step-wise process:

i. Identify the infrastructure being used to deliver the service.
ii. Identify the activities associated with operating the infrastructure.
iii. Group the various activities into logical functional units (business processes).
iv. Group the activities and business processes on practical geographic considerations.
v. Allocate the necessary resources to each activity.
vi. Allocate unit costs to each of the resources identified.
vii. Calculate the cost of each resource.



A Framework for Planning Operation and Maintenance

These process steps were undertaken as follows:

i. Data sources utilised.

- The *Blue Drop* report published in 2012 identifies the potable water schemes operated by each WSA. In most cases the report identifies the production capacity (Ml/d), percentage utilisation and an estimate of population served.
- The *Green Drop* Progress Report (2012) identifies each of the waste water facilities owned and operated by each WSA. The type of plant (eg. activated sludge or oxidation ponds) is noted, along with the plant capacity (Ml/d) and the degree to which the plant is utilised.
- The *2011 Census* identifies the number of households that receive different levels of water and sanitation services. From these data it was also possible to ascertain the number of household pit latrines or septic tanks that must be serviced and maintained.
- Reference was also made to the *All Towns Study* and *Reference Framework* from the Department of Water Affairs to corroborate the data extracted from the three main sources described above.

ii. Identification of business processes based on type of infrastructure.

It was necessary to identify the discrete *business processes* and the *primary operational tasks,* with due consideration of the data that was practically available from the sources described above.

In order to effectively allocate the primary resources of staff, plant and materials it was essential to identify qualitatively similar tasks that must be undertaken in operating the available infrastructure. At the same time it is important to appreciate that the *cost driver* is not necessarily consistent across all processes. In all cases the main cost driver could be any of the following, depending on local circumstances:

- The production capacity of the scheme (size)
- The technology utilised (type)
- The number of separate installations (sites)
- The geographical spread of installations (area)

The following qualitatively discrete business processes were identified:

- Potable water Operations (treatment and pipeline distribution)
- Waste water operations (sewer collection and treatment)
- Maintenance (civil, mechanical, electrical)
- Management (area based and head office) Technical support
- Technical support

iii. Allocation of basic resources.

- ***Staff***

The allocation of staff resources to each of the primary tasks was carried out on the basis of 'benchmarks' established from operations where the service provider was identified through open tender. The theory being that an open tender would have driven the contracting party to be as efficient as possible in allocating resources so that they stood a reasonable chance of winning said tenders.

- ***Plant and Equipment***

The primary 'plant' requirement is the adequate provision of vehicles, usually small light delivery vans. This was calculated in the model by linking each of the staff associated with a *primary task,* with a vehicle necessary to perform their duties. An estimate of monthly mileage was made based on the type of task to be undertaken.

In each operational area an allowance was also made for the hire of lifting equipment (TLB) on an *as and when required* basis.

- ***Energy and Chemicals***

The calculation of energy and chemical costs was performed on the following basis:

i. The volume of water supplied was determined from the sources mentioned above.

ii. It was assumed that all of water was pumped to a total head of 100m. Suitable pump and motor efficiency factors were applied (50%) to calculate the power consumed (kW). The associated cost was determined by assuming that pumps ran for 24 hours per day and utilising a cost of R1-10 (as per ESCOM tariffs).

iii. A chemical cost of R0-50 per kl of potable water produced was used (this was determined by reference to the treatment cost of Amatola Water Board and deemed to be a suitable benchmark)

- ***Materials***

The cost associated with materials is more difficult to predict, but this is typically a small proportion of the total cost. The provision has been estimated on the basis of a percentage of the current replacement cost (CRC), in this case 1%. An estimate of CRC made by multiplying the capacity of the scheme by a benchmark cost established from other sector documentation.

iv. Calculation of Costs.

Once the primary resources had been identified it was necessary to allocate costs to these. The salary structure and ranges of one of the case studies (Amathole DM) were used for each of the job categories. Vehicle cost were calculated on the basis of the 'per km rates' as published by the Department of Transport on a monthly basis.

One of the biggest challenges in carrying out a cost modelling exercise such as that being undertaken in this project is determining what method should be used to calculate the cost of overheads (rent, telephone, advertising, etc). As with all of the methodologies adopted in such exercise it is essential that a basis is adopted so that it can be debated – challenged – improved.

To this end the guideline provided by the Consulting Engineers of South Africa (CESA) has been adopted. This procedure is utilised by consulting engineers to determine the overhead factor associated with each *primary functionary* so that hourly fees can be calculated.

Description	Factor
Salaries (total cost of wmployment) of fee-earning staff, i.e professional/technical staff	1
Salries of non-fee-earning staff, i.e administrative staff salaries	0.24
Telephone and communication	0.05
Rental of premises, including elecricity, water and taxes	0.13
Transport (not covered directly from projects)	0.05
Paper, stationery consumables	0.03
Audit, bank charges, interest, insurance	0.08
Marketing	0.02
Office equipment	0.06
Training and development	0.02
Project direct expenses not recoverable	0.08
Other (i.e. Head Office expenses) - could vary widely	0.14

Notes: 1) In application of the factors shown above, item 4 (transport) was excluded since this was covered as a direct allocation for each of the business processes described above.
2) Item 2 was taken to represent staff such as office assistants, cleaners, etc.
3) Staff such as meter readers, credit controllers and receipting clerks are treated as performing primary tasks, since these activities were regarded as primary to the operations of water supply rather than a support function.

Application of these factors results in an administrative support cost equivalent to 54% of the cost of salaries of those staff performing *primary tasks.*

v. Estimation of refurbishment and rehabilitation costs.

The calculation, or estimation, of funding required for major maintenance, refurbishment and rehabilitation (capital maintenance or capmanex) is, by nature uncertain. While it is possible to schedule this work once the need manifests itself, it is not possible to accurately predict such costs far in advance.

It is also essential that annual provisions be made for such expenses as they are typically 'lumpy', with high costs in certain periods and low costs in others.

Research with insurance companies indicated that it is possible to buy cover for unforseen breakdowns of standing plant (electro-mech). Of course such insurance would be contingent on effective preventative maintenance programmes being in place. The quoted rates for such cover ranged between 3% and 5% of the new purchase price, or current replacement cost (CRC).

For civil infrastructure one can assume a useful life of 50 – 100 years and hence an annual degradation of anything from 1% - 2% per annum.

Based on these two figures and noting that the bulk of the value in water services infrastructure is held in the civil components, it was decided to use a figure of 2% of CRC as an estimation of the annual capmanex cost.

vi. Estimation of capital costs.

In South Africa, particularly in the ten case studies of this project, the creation of water service infrastructure has been funded, mainly, through grants from central government. It however must be recognised that this is a real cost and should be at least considered when calculating the cost of service, even if it is not practical to include it in tariff calculations.

This component of the cost has been estimated through a calculation of a typical annual amortization of a 30 year loan for the current replacement cost of the assets, at an interest rate of 6%.

Determination of available funding.

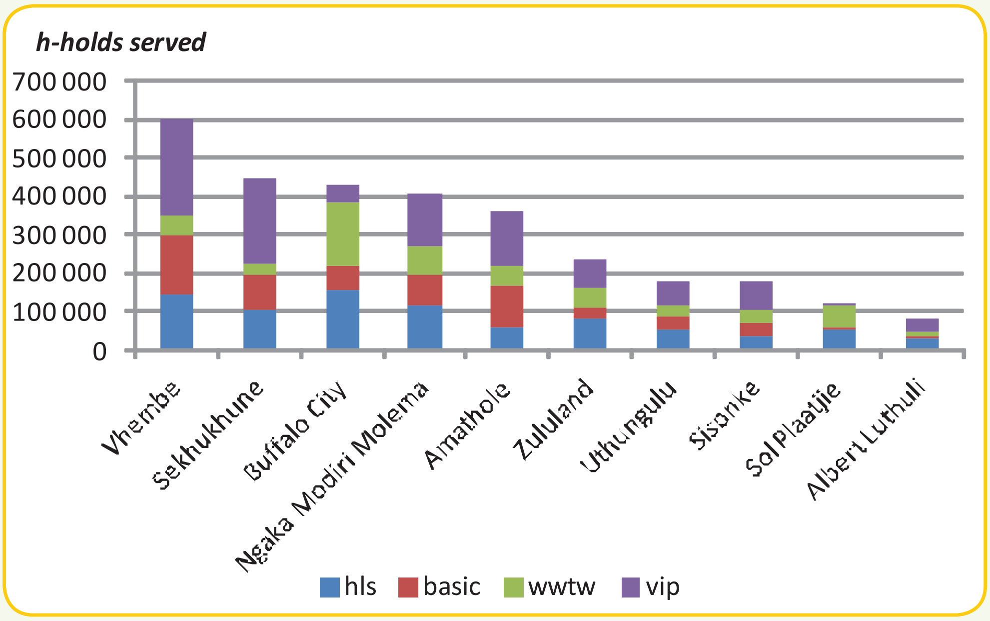
The funding available to each WSA was determined by reference to the following documentation:

- Tariff income :-Annual financial statements and budget submission to National Treasury.
- Equitable Share :-Division of Revenue Act, feb 2012, (DORA)
- RSC Levy Replacement :-As above

2. Findings From the Case Studies

2.1 Characteristics of the case studies

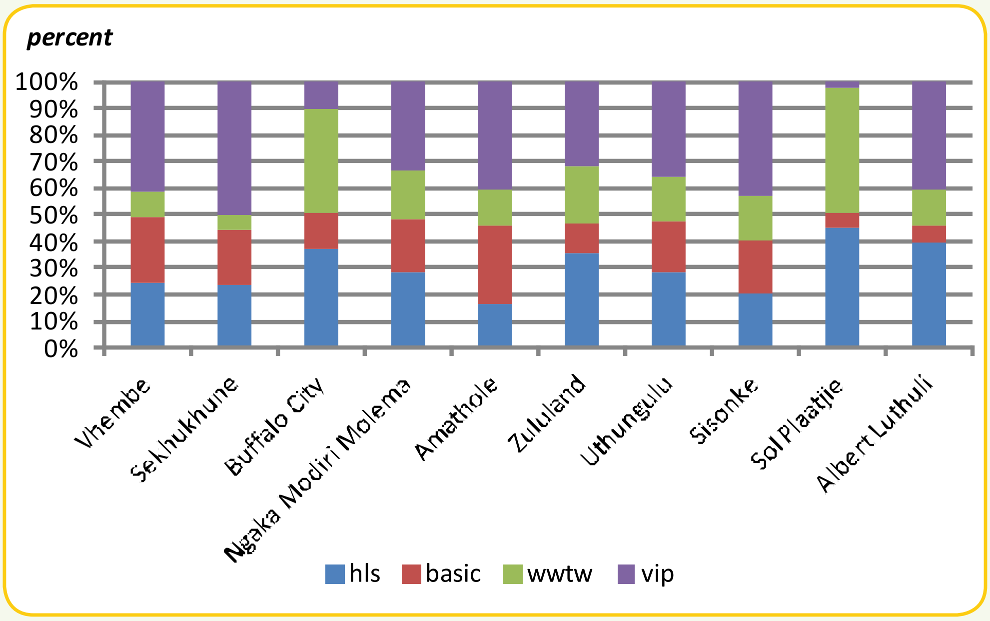
The ten case studies identified within this project range from the 7th to the 60th largest in the country[1].



hls = higher level of service (water) | *basic = standpipe supply (water)*
wwtw = sewered and septic tank (sanitation) | *vip = pit (sanitation)*

It is also notable from the figure above that the relative proportion of the type of service that each WSA must contend with varies considerably across the sample under consideration. For example, the 'service delivery challenge' of Sol Plaatje is represented by only 3% of households utilising pit latrines (BCM = 10%) whereas the other WSAs, which have large responsibilities within former homeland areas have a VIP related operational challenge ranging from 32% to 50% of their total responsibility (see figure below).

1 Determined by number of households served.



hls = higher level of service (water)
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Proportional Service Delivery Challenge

This variance in the proportion of work, as influenced by different types of infrastructure, implies that qualitatively different operational activities will have a significant influence on the nature of the operational resources required, both in nature and quantum.

Furthermore, the number of sites at which installations must be managed varies significantly between the 10 case studies.

WSA	'Sites'
Vhembe	16
Sekhukhune	18
Buffalo City	11
Ngaka Modiri Molema	18
Amathole	47
Zululand	36
Uthungulu	17
Sisonke	17
Sol Plaatjie	1
Albert Luthuli	8

Note: 1) each rural area with stand alone schemes treated as 1 'site'

Number of Operational Sites

The size of each of these schemes also varies significantly with the largest water treatment works being in Buffalo City at 186 Ml/d and the majority of the others being small works, some of which produce just 0.5 Ml/d. The significance of this being that the resource requirement may increase with the size of the operational unit, but this will not necessarily be a proportional increase.

It was notable that in the process of data gathering there was significant information available on water and waste water treatment works but almost no reliable/usable/consistent data on other infrastructural elements such as pipelines, pump-stations and reservoirs. Most importantly there was **no information at all** on sewage pump stations.

It was therefore necessary to make *engineering estimates* around the number of installations and the artisans that would be required to perform operations and maintenance.

2.2 Operational Costs and Funding Adequacy

The model company cost calculations yielded the total cost of operation, maintenance and ownership as illustrated in table b below

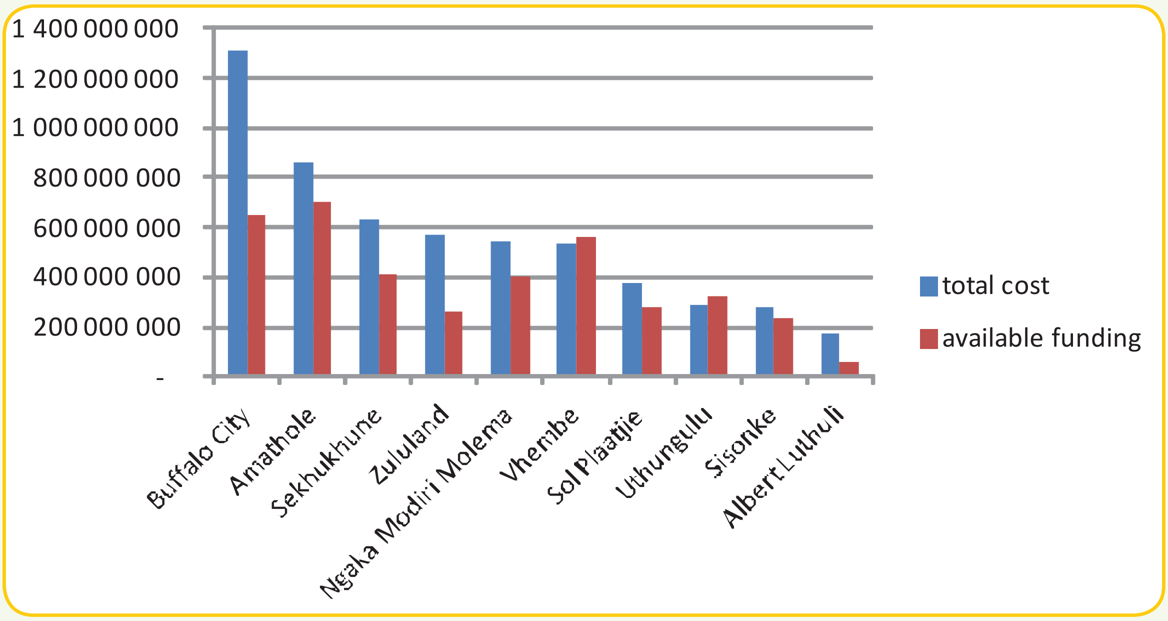
WSA	o&m	capmanex (@ 1% of CRC)	capex	total
Vhembe	740 766 020	226 540 000	339 810 000	1 307 116 020
Sekhukhune	716 588 000	56 240 000	84 360 000	857 188 000
Buffalo City	462 671 920	66 120 000	99 180 000	627 971 920
Ngaka Modiri Molema	495 086 480	29 780 000	44 670 000	569 536 480
Amathole	530 595 434	6 600 000	9 900 000	547 095 434
Zululand	425 136 297	44 180 000	66 270 000	535 586 297
Uthungulu	327 663 012	18 460 000	27 690 000	373 813 012
Sisonke	232 755 071	21 000 000	31 500 000	285 255 071
Sol Plaatjie	232 755 071	19 600 000	29 400 000	281 755 071
Albert Luthuli	137 419 970	14 500 000	21 750 000	173 669 970

Notes: capmanex = refurbishment and rehabilitation cost (calculated as a percentage of current replacement cost)

Capex = cost of capital redemption and interest (calculates as a percentage of current replacement cost)

Operational Costs

Comparison of the modelled costs with available funding reveals that most of the ten case studies do not have adequate funding to cover the full costs of service delivery in their areas of jurisdiction.



Comparison of 'Model Company' Costs and Available Funding

Importantly only 2 of the 10 WSAs have sufficient funding to cover '*normal operational costs*' (operations + maintenance + refurb), with some of the WSAs showing significant funding shortfalls. This is illustrated in table c below:

wsa	o&m	capmanex (@ 1% of CRC)	total	available funding	funding adequancy
Buffalo City	740 766 020	226 540 000	967 306 020	647 100 614	67%
Amathole	716 588 000	56 240 000	772 828 000	699 504 000	91%
Sekhukhune	462 671 920	66 120 000	528 791 920	415 619 000	79%
Zululand	495 086 480	29 780 000	524 866 480	264 203 000	50%
Ngaka Modiri Molema	530 595 434	6 600 000	537 195 434	400 326 000	75%
Vhembe	425 136 297	44 180 000	469 316 297	565 499 000	120%
Sol Plaatjie	327 663 012	18 460 000	346 123 012	275 620 109	80%
Uthungulu	232 755 071	21 000 000	253 755 071	324 027 000	128%
Sisonke	232 755 071	19 600 000	252 355 071	234 777 000	93%
Albert Luthuli	137 419 970	14 500 000	151 919 970	58 260 593	38%

Funding Adequacy (operations + maintenance + capmanex)

2.3 Unit Costs

An important feature of any calculation or measurement of costs is reducing this to a unit cost of production (or of the service). In the case of water services it is customary to utilise the following metrics:

- cost per volume of water (R/kl)
- cost per household served (R/h-hold).

Calculation of such metrics may seem to be a trivial matter when one has data on the costs and the number of households served. However, as illustrated in figure 1 above there is more than one possible combination (h-hold connection and sewered sanitation) of service delivery mechanism.

It is therefore necessary to present the unit costs of service delivery in terms of the specific level of service delivered. One difficulty that is always encountered is '*what methodology will be adopted in allocating the costs not directly associated with the operation of the plant and equipment used in providing said service*'. In conducting a high level analysis it is acceptable to look at average costs, it has also been assumed that all of the costs associated with sanitation services are billed through the volume of water provided.

The table d below illustrates the total cost of water services in the ten case study WSAs.

wsa	o&m cost	o&m + refurb cost	o&m + refurb cost
Buffalo City	740 766 020	967 306 020	1 307 116 020
Amathole	716 588 000	772 828 000	857 188 000
Sekhukhune	462 671 920	528 791 920	627 971 920
Zululand	495 086 480	524 866 480	569 536 480
Ngaka Modiri Molema	530 595 434	537 195 434	547 095 434
Vhembe	425 136 297	469 316 297	535 586 297
Sol Plaatjie	327 663 012	346 123 012	373 813 012
Uthungulu	232 755 071	253 755 071	285 255 071
Sisonke	232 755 071	252 355 071	281 755 071
Albert Luthuli	137 419 970	151 919 970	173 669 970

Total Costs of Service Delivery

The unit costs were calculated using assumed consumption levels as described in the CSIR red book:

- house and yard connections 20kl/mth/h-hold
- stand-pipe supply 3kl/mth/h-hold

The volume of water was calculated in each case by reference to the number of households that reporting various levels of service in the 2011 Census.

Table e below illustrates the unit costs of water services when it is assumed that the costs of sanitation are billed through the provision of water. The average cost of services has been used in each case:

			R/hh/annum			R/kl		
wsa	hh served	kl/yr	o&m	o&m + refurb	o&m + refurb + capex	o&m	o&m + refurb	o&m + refurb + capex
Buffalo City	217 931	40 065 480	3 399	4 439	5 998	18.49	24.14	32.62
Amathole	166 682	18 092 856	4 299	4 637	5 143	39.61	42.71	47.38
Sekhukhune	198 274	28 736 160	2 333	2 667	3 167	16.10	18.40	21.85
Zululand	109 397	21 069 804	4 526	4 798	5 206	23.50	24.91	27.03
Ngaka Modiri Molema	195 356	30 786 780	2 716	2 750	2 801	17.23	17.45	17.77
Vhembe	296 041	40 405 368	1 436	1 585	1 809	10.52	11.62	13.26
Sol Plaatjie	60 054	13 002 096	5 456	5 764	6 225	25.20	26.62	28.75
Uthungulu	86 034	13 702 776	2 705	2 949	3 316	16.99	18.52	20.82
Sisonke	73 177	10 126 884	3 181	3 449	3 850	22.98	24.92	27.82
Albert Luthuli	39 016	8 240 616	3 522	3 894	4 451	16.68	18.44	21.07

Unit Cost of Water Services

The costs indicated above are, on the whole, distressingly high. In most cases even the lowest cost associated with 'survival' activities of O&M only are far above the tariffs currently charged by most municipalities.

The outcome of this research project could have wide ranging implications in informing the calculations used in current funding mechanisms, including both tariff and grants.

3. Challenges

The development of the cost models has not been without challenges. The biggest of these being that there is no single source of data on water services infrastructure at each Water Services Authority. Some data is available at a high level, with information on such things as daily flow at water treatment and waste water treatment works being easily sourced through the Blue and Green Drop reports. This information could be corroborated through reference to the *DWA All Towns Study;* however it proved to be almost impossible to link the information on a town for town or scheme for scheme basis. This is a result of the naming system in each of reporting systems being not being uniquely referenced.

Furthermore, the information available on other important infrastructural elements such as pipelines and pump stations is extremely limited. In the case of sewer pipelines and pump stations there is very little useful information.

This has necessitated the use of a number of assumptions and engineering estimates to enable the calculation of required resources. This issue will be addressed with officials of each of the cases studies during the upcoming *field verification phase* of the project. It is envisaged that this could be achieved largely through reference to the asset register of each of the Water Services Authorities.

The WIN-SA lesson series aims to capture the innovative work of people tackling real service delivery challenges. It also aims to stimulate learning and sharing around these challenges to support creative solutions. To achieve this, the lessons series is supported by ancillary learning opportunities facilitated by WIN-SA to strengthen people-to-people learning.

To find out more about these and other WIN-SA services go to the WIN-SA portal at www.win-sa.org.za or contact the Network directly.

This document hopes to encourage ongoing discussion, debate and lesson sharing. To comment, make additions or give further input, please visit www.win-sa.org.za or send an email to info@win-sa.org.za.

Our mission is to ensure the body of knowledge in the sector is well managed, readily accessible and applied, leading to improved decision-making and performance, especially of local government.

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