ESAWAS
REGULATORS ASSOCIATION

REGIONAL BENCHMARKING OF LARGE WATER SUPPLY AND SANITATION UTILITIES 2013/2014 REPORT

October, 2015

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FOREWORD

The ESAWAS Regulators Association was established due to the need to develop effective regulation through regional regulatory cooperation.

Benchmarking analysis has become a strategic tool for water regulators to measure the performance of water utilities. All members of ESAWAS have set country-specific benchmarks against which they measure the performance of water supply and sanitation providers and the subsector as a whole. Utility performance reports are produced annually with comparative data that gauges utility performance against itself (from previous year) and against others.

However, the large utilities are often resistant to having their performance benchmarked against 'smaller' utilities as they perceive their own required effort to improve as far greater in view of the size of area being serviced. This has raised challenges for the regulator to benchmark the performance of large sized utilities with similar sized ones in its country which tend to be few or none.

This first benchmarking report presents the platform by which large utilities can be compared to similar sized utilities within the region. While the operating environment may differ, by benchmarking against similar sized utilities, lessons can be drawn on how to improve performance for both the regulator and the utility.

It is ESAWAS's intention that this benchmarking exercise be expanded to include all water supply and sanitation utilities in the region and Africa as a whole in the coming years.

ACKNOWLEDGEMENTS

The Eastern and Southern Africa Water and Sanitation (ESAWAS) Regulators Association wishes to acknowledge the various persons and institutions that supported the successful undertaking of this first regional benchmarking exercise.

Appreciation goes to GIZ-Zambia for supporting the holding of the inception meeting for the ESAWAS Technical Task Team on benchmarking held in Lusaka, Zambia in December 2014. Appreciation also goes to IBNET-World Bank for supporting the data collection exercise and the publication of the report.

Special thanks go to the Water Regulatory Council of Mozambique for initiating the regional benchmarking exercise and the development of the benchmarking tool, the Water Utility Performance Index.

ESAWAS wishes to thank all its members that dedicated staff to the Technical Task Team and further contributed to the fruition of this first regional benchmarking report.

ABBREVIATIONS/ACRONYMS

3T	Technical Task Team
AdeM	Águas da Região de Maputo
CRA	Water Regulatory Council
DAWASCO	Dar es Salaam Water and Sewerage Corporation
ESAWAS	Eastern and Southern Africa Water and Sanitation
EWURA	Energy and Water Utilities Regulatory Authority
IBNET	International Benchmarking Network
KPI	Key Performance Indicators
LWSC	Lusaka Water and Sewerage Company
LEWA	Lesotho Electricity and Water Authority
NWASCO	National Water Supply and Sanitation Council
NCW&SC	Nairobi City Water and Sewerage Company
QoSSS	Quality of Supply and Service Standards
RURA	Rwanda Utilities Regulatory Authority
WASAC	Water and Sanitation Corporation
WASCO	Water and Sewerage Company
WASREB	Water Services Regulatory Board
WSS	Water Supply and Sanitation
WUPI	Water Utility Performance Index

EXECUTIVE SUMMARY

The 8th Annual General Meeting of the ESAWAS Regulators Association held in Maputo, Mozambique in August 2014 established a Technical Task Team (3T) to develop a framework for regional benchmarking of large utilities. This was as a result of an initiative started by the Water Regulatory Council to benchmark the performance of the water utility for Maputo against similar sized utilities in the region among ESAWAS countries.

ESAWAS thus undertook to elaborate the benchmarking exercise and through the 3T, developed a regional benchmarking framework based on ten Key Performance Indicators (KPIs). This first benchmarking exercise undertaken for the period 2013/2014 has revealed some pertinent comparisons among the largest utilities in Lesotho, Rwanda, Kenya, Mozambique, Tanzania and Zambia which will form a basis for regulatory decisions.

This report is organised as follows: the first section is an introductory section; the second section describes the main aspects of water supply and sanitation regulation in the ESAWAS members' countries; in the third section the development of the regional benchmarking framework is explained. The fourth section presents the main results obtained and the final section of the report discusses the main conclusion obtained from this benchmarking exercise.

The benchmarking report presents an analysis of the performance of the largest water and sewerage utilities in each member country of ESAWAS which were: Lusaka Water and Sewerage Company (Zambia); Nairobi City Water and Sewerage Company (Kenya); Dar Es Salaam Water and Sewerage Corporation (Tanzania); Águas da Região de Maputo (Mozambique); Water and Sewerage Company (Lesotho); Water and Sanitation Corporation (Rwanda).

The main results from the benchmarking analysis highlight a performance disparity by the utilities among the components of quality of service, economic efficiency and operational sustainability. The report further shows that water and sewerage coverage, hours of water supply and non-revenue water KPIs are areas of common challenge among the utilities.

The report also introduces a performance ranking of the water and sewerage utilities using an integrated measurement of performance in the above mentioned components, called the Water Utility Performance Index. Finally based on the analysis of the main strengths and weaknesses of each utility, this report also presents suggestions for the utilities to improve their performance and increase the effectiveness of the services provided.

CHAPTER 1. INTRODUCTION

The premise of regulation is to ensure efficiency and sustainability in the provision of water supply and sanitation services. However, water supply and sanitation (WSS) regulators face increasing challenges to ensure access to efficient, affordable, reliable and quality services while balancing the commercial interest with that of social consideration through effective regulation. According to the World Bank, "*the greatest challenge lies in building competent, efficient, business-like, and service-oriented institutions. Sustainable service provision is only possible where customers themselves cover the costs of operation and maintenance; capital cost recovery is not always possible, but often requires predictable public subsidies*."

Benchmarking analysis has become a strategic tool for regulators to measure the performance of water utilities and promote competition in order to induce improvements in service delivery. Regulators have set country-specific benchmarks against which they measure the performance of WSS providers and the WSS subsector as a whole. Utility performance reports are produced annually with comparative data that gauges utility performance against itself (from previous year) and against others. However, the large utilities are often resistant to having their performance benchmarked against 'smaller' utilities as they perceive their own required effort to improve as far greater in view of the size of area serviced. This has raised challenges for the regulator to benchmark the performance of large sized utilities with similar sized ones in the country which tend to be few or none. Hence the need for regional benchmarking of large utilities.

In 2013, the Water Regulatory Council (CRA) of Mozambique initiated an exercise to benchmark the performance of the service provider for Maputo against similar sized providers for Lusaka, Zambia; Dar es Salaam, Tanzania and Nairobi, Kenya by using an in-house developed tool- the Water Utility Performance Index (WUPI). Subsequent to which, the 8th Annual General Meeting of the Eastern and Southern Africa Water and Sanitation (ESAWAS) Regulators Association held in Maputo, Mozambique in August 2014, resolved to form a Technical Task Team (3T) for benchmarking large water and sewerage utilities among member countries.

This is the first regional comparative performance report of the largest water utilities in Tanzania, Zambia, Rwanda, Mozambique, Kenya and Lesotho for the period 2013/2014. The benchmarking analysis has been done using single Key Performance Indicators (KPIs) and the WUPI. The results of this exercise are intended to serve as a support tool to:

- Create competition among large utilities;
- Generate information for decision making;
- Identify strengths and weakness within the large utilities and areas for improvements;
- Foster improvement in the WSS services; and
- Contribute to the attainment of targets with respect to country visions and Sustainable Development Goals.

CHAPTER 2. OVERVIEW OF ESAWAS REGULATORS ASSOCIATION

Ongoing water sector reforms in the Eastern and Southern African region have established autonomous regulators for WSS services provision in Lesotho, Kenya, Rwanda, Tanzania, Mozambique, Zambia and, most recently, Burundi and Zanzibar. In the other countries in the region, the mandate for regulation of WSS services generally falls under the Department of Water under the respective parent Ministry. However, countries such as Uganda, Zimbabwe, Angola and Botswana have made marked progress towards the formation of autonomous WSS regulators. As such, WSS regulation in the Eastern and Southern African region is still in growth stages with the two oldest regulators having been in operation since the year 2000.

The regulators have generally been mandated to undertake both economic and technical regulation of WSS service provision to ensure a balance between the quality of the service, the interests of consumers and the financial sustainability of the providers.

In recognising the need for the development of an effective WSS regulatory framework, six regulators from the Eastern and Southern African region came together and resolved to establish a formal cooperation on issues of mutual concern and interest in the areas of water regulation. The ESAWAS Regulators Association was thus conceived in 2007 as an informal gathering of regulators to share experiences and knowledge on WSS regulatory issues. ESAWAS was formalised in 2010 by the ratification of a Constitution among its members, and registered under the Societies Act Cap 119 of the Laws of Zambia to give it legal personality.

The objectives of the ESAWAS Regulators Association as stated in its Constitution are:

a) *Capacity Building and Information Sharing*
Facilitate information sharing and skills training at national, regional and international level to enhance the capacity of members in WSS regulation;

b) *Regional Regulatory Co-operation*
Identify and encourage the adoption of best practices to improve the effectiveness of WSS regulation in the region.

The ESAWAS Regulators Association is currently composed of six members that are: Water Services Regulatory Board (WASREB) of Kenya; the Water Regulatory Council (CRA) of Mozambique; the Rwanda Utilities Regulatory Authority (RURA) of Rwanda; the Energy and Water Utilities Regulatory Authority (EWURA) of Tanzania; the National Water Supply and Sanitation Council (NWASCO) of Zambia and Lesotho Electricity and Water Authority (LEWA) of Lesotho. The overview of the regulators is given in Table 1:

Table 1: Overview of ESAWAS Members

	Regulator	Established by	Year began operations	Number of regulated Urban WSS Utilities
1	National Water Supply and Sanitation Council (NWASCO), Zambia	Water Supply and Sanitation Act No. 28 of 1997	2000	18
2	Water Regulatory Council (CRA), Mozambique	Decree No. 74 of 1998	2000	15
3	Water Services Regulatory Board (WASREB), Kenya	Water Act of 2002	2003	103
4	Rwanda Utilities Regulatory Authority (RURA) Rwanda	Law No. 39 of 2001	2003	1
5	Energy and Water Utilities Regulatory Authority (EWURA), Tanzania	Cap 414 of 2001	2006	130
6	Lesotho Electricity and Water Authority (LEWA-Lesotho)	LEA Act of 2002, LEA Amendment Act of 2011	2013	1

For effective regulation, a number of instruments and tools have been put in place and generally include:

- Licensing: All WSS providers are required to operate under a license issued by the regulator except in Mozambique where the regulator, CRA, signs a regulatory agreement/contract with the provider that defines the regulatory framework.
- Development and Enforcement of Guidelines, Regulations, Rules and Standards: Various guidelines, regulations, rules and standards have been developed and enforced to ensure compliance to the governing water supply and sanitation legislation. Some key regulations, guidelines and standards include: Minimum Service Level, Business Planning, Corporate Governance, Reporting and Quality of Supply and Service Standards (QoSSS).
- Tariff Setting: All WSS providers are required to submit tariff applications to the regulator for review and approval.
- Performance Monitoring and Quality Control: The regulators undertake regular inspections of utility infrastructure and operations. Areas of non-compliance are addressed through written directives and orders.
- Sector Performance Reporting and Information Dissemination: The regulators have in place systems for data collection on the performance of the utilities that is used for sector reporting. All the regulators produce annual reports on the performance of the sector which is published and disseminated to the public.

CHAPTER 3. DEVELOPMENT OF REGIONAL BENCHMARKING FRAMEWORK

Each member of ESAWAS has developed a benchmarking framework suitable to the respective environment. Only LEWA, in Lesotho, had not yet began benchmarking having only recently commenced regulating WSS services in 2013. However, LEWA has Quality of Supply and Service Standards (QoSSS) in place. Nevertheless, for the purpose of regional benchmarking, it was essential to first harmonise the KPIs and benchmarks to be used.

3.1 COMPARISON OF BENCHMARKING KPIS AMONG REGULATORS

ESAWAS compared the KPIs used by each regulator for benchmarking. The respective Minimum Service Level guideline sets out the key benchmarks to be achieved by utilities for the quality of service provided. EWURA has set a Service Level Benchmark based on good practices while CRA utilises boundaries set under its indexing model. RURA, WASREB and NWASCO have defined an acceptable benchmark to be achieved.

The common KPIs among the regulators for which benchmarks have been set are:

i. Water Coverage
ii. Sewerage Coverage
iii. Water Quality
iv. Hours of Supply
v. Non-Revenue Water
vi. Operational and Maintenance (O&M) Cost Coverage
vii. Collection Efficiency
viii. Metering Ratio
ix. Staff per 1,000 Connections
x. Staff Cost as a proportion of O&M Costs

It is worth noting here that Mozambique and Rwanda have separate entities for sanitation services, hence the regulators have not yet set benchmarks for sanitation coverage.

A snapshot of KPIs, benchmarks and related weights per regulator is given in Table 2.

Table 2: Common KPIs with benchmarks set by each regulator

	WATER COVERAGE	SEWERAGE COVERAGE*	WATER QUALITY	HOURS OF SUPPLY	NRW	O&M COST COVERAGE	COLLECTION EFFICIENCY	METERING RATIO	STAFF EFFICIENCY
WASREB			Residual Chlorine, Bacteriological						Staff per 1,000 water and sewer connections
Acceptable Benchmark	**80-90%**	**80-90%**	**90-95%**	**16-20**	**20-25%**	**100-149%**	**85-95%**	**95-99%**	**5-8**
Weight	**30**	**15**	**30**	**20**	**25**	**25**	**20**	**15**	**20**
NWASCO			Residual Chlorine, Bacteriological Physio-Chemical(*Turbidity, pH,Metals, Colour)*						Staff per 1,000 water connections
Acceptable Benchmark	**80-90%**	**80-90%**	**95%**	**18-20**	**20-25%**	**100-150%**	**85-90%**	**100%**	**6-8**
Weight	**5**	**5**	**20**	**15**	**10**	**15**	**20**	**15**	**10**
EWURA			E-Coli, Turbidity						Staff per 1,000 water connections
Service Level Benchmark	**100%**	**30%**	**98%**	**24**	**20%**	**150%**	**95%**	**100%**	**5**
Weight	**5**	**40**	**15**	**5**	**15**	**10**	**15**	**15**	**10**
CRA		**N/A**	Residual Chlorine, Bacteriological, Physio-Chemical (*Turbidity, pH, Conductivity)*						Staff per 1,000 water connections
Boundaries	**40-80%**	**-**	**65-100%**	**9-24**	**25-47%**	**85%-150%**	**80-90%**	**80-90%**	**10-15**
Weight	**5.5**		**33**	**5**	**25.5**	**13**	**8**	**5**	**5**
RURA		**N/A**	Residual Chlorine, Bacteriological						Staff per 1,000 water connections
Acceptable Benchmark	**80-90%**		**90-95%**	**16-20**	**20-25%**	**#**	**85-90%**	**95-99%**	**5-8**
Weight	**25**	**-**	**25**	**20**	**25**		**20**	**20**	**20**
LEWA			Residual Chlorine, Bacteriological						
Benchmark	**Not yet defined**								

**Mozambique and Rwanda have separate entities providing sewerage services.*

#The water utility in Rwanda had until June 2014 been a single Utility providing both electricity and water. Hence, the Utility had been unable to separate O&M costs for water services only given that the costs incurred, for example at headquarters, could not be allocated either to electricity or water, thus the benchmark could not be defined.

3.2 CONSIDERATION OF BENCHMARKING TOOLS

ESAWAS considered the use of two tools for the purpose of regional benchmarking. These were the International Benchmarking Network (IBNET) tool developed by the World Bank and the Water Utility Performance Index (WUPI) developed by CRA.

- IBNET: The IBNET Toolkit provides a set of financial, technical and process indicators (mainly capturing the institutional context in which the utilities are operating) for the assessment of utility performance in the provision of water and sewerage services. This set of indicators provides the basis for cross-utility and cross-country comparisons. IBNET caters for a large number of indicators in different categories such Service Coverage, Non Revenue Water, Quality of Service, Cost and Staffing and Financial Performance among others.

- WUPI: Analysing single KPIs individually is a useful way to analyse the performance of a utility at technical level. However, by only using single KPIs in the performance analysis it is difficult to conduct an integrated evaluation of the overall performance of the utilities in closely related indicators. The WUPI is a composite indicator which allows to evaluate the performance of the utilities in an integrated way for a set of similar indicators (see Appendix 2 for a detailed description).

ESAWAS has therefore used aspects of the IBNET approach for benchmarking coupled with the WUPI as a complementary tool for analysis of performance.

3.3 HARMONISATION OF BENCHMARKS AND WEIGHTS

ESAWAS selected ten KPIs to use for regional benchmarking. Due to the differences in definition of sanitation services among the regulators, regional benchmarking will consider Sewerage Coverage by network only, as data regarding septic tanks has tended to be unreliable.

The indicators were grouped into three main components namely, (i) Quality of Service, (ii) Economic Efficiency and, (iii) Operational Sustainability. ESAWAS agreed on the broad definition and calculation for each of the indicators as shown in Table 3. The benchmarks were converted into performance boundaries by considering the minimum average performance as well as the minimum for the acceptable benchmark among the countries. The weights were arrived at by a process of normalisation of the various weights defined by the different regulators. The output of the harmonisation process is given in Table 3.

Table 3: Grouping of indicators and harmonised KPIs

	INDICATOR	DEFINITION	CALCULATION	BOUNDARIES	WEIGHT
Quality of Service					
1	**Water Coverage**	% of total population with access to improved water supply: individual household connection, kiosk, public standposts, communal/shared tap	[Total Population Served/Total Population in the Service Area]	75-90%	10
2	**Sewerage Coverage**	% of total population with access to sewerage services (no septic tanks)	[Total Population Served/Total Population in the Service Area]	40-70%	5
3	**Water Quality** • **Residual Cl (w0.4)** • **Bacteriological (w0.6)**	% of water samples undertaken meeting quality requirements	% of tests compliant in relation to applicable / national standards	90-95%	15
4	**Hours of Supply**	Aggregated average hours of supply (per town/zone/area etc) in the reporting period	Sum of weighted averages per town	16-20	10
Economic Efficiency					
5	**O&M Cost Coverage by Billing**	The level of costs covered by billed amounts	[Billed Amount/O&M Costs]	1.00-1.50	10
6	**Collection Efficiency**	The collected amounts from the billing	[Collected amount/Billed amount]x100	85-95%	15
7	**Staff Cost**	Personnel Cost as a proportion of O&M cost	[Personnel Cost/ O&M Costs]*100	30-35%	5
Operational Sustainability					
8	**Staff/1000 Connections**	Staff per 1,000 water & sewerage connections	[Total Number of Staff x 1,000]/[No. of Water + Sewerage Connections]	5-8	5
9	**NRW**	Water that does not produce revenue in a given period	[System Input Volume (imported + produced) – billed Volume]/System Input Volume	30-35%	15
10	**Metering Ratio**	The proportion of metered customers from the total	[Functional Metered Connections]/Total Connections]x100	85-95%	10

3.4 WHO TO BENCHMARK?

ESAWAS considered widening the number of utilities to be engaged in benchmarking by including all large utilities from each member country. However, it was observed that the various regulators have different ways of classifying what is a large utility as shown in Table 4.

Table 4: Classification of Large Utilities by Country

Regulator	Classification in terms of connections	Number of Utilities
WASREB, Kenya	Large > 10,000 Very Large>35,000	31 5
NWASCO, Zambia	Large > 40,000	4
EWURA, Tanzania	Large > 25,000	6 (5 Cities +Dodoma)
CRA, Mozambique	Large > 50,000	2
LEWA, Lesotho	N/A	1 national
RURA, Rwanda	N/A	1 national

Due to the observed disparity, ESAWAS agreed to benchmark only the largest or single utility in a country as the case may be.

CHAPTER 4. PERFORMANCE ANALYSIS

This section focuses on the analysis of the performance of the largest water utilities in Kenya, Tanzania, Zambia, Mozambique, Rwanda and Lesotho.

4.1 OVERVIEW OF BENCHMARKED UTILITIES

Being the first regional benchmarking exercise among ESAWAS countries, only the largest utilities in each ESAWAS member country have been selected for benchmarking. These are: Nairobi City Water and Sewerage Company (NCW&SC) of Kenya; Dar Es Salaam Water and Sewerage Corporation (DAWASCO) of Tanzania; Lusaka Water and Sewerage Company (LWSC) of Zambia; Águas da Região de Maputo (AdeM) of Mozambique; Water and Sanitation Corporation Ltd (WASAC) of Rwanda; and Water and Sewerage Company (WASCO) of Lesotho.

The general data about the Utilities is shown in Table 5 while a detailed profile of the utilities is presented in Appendix 1. All the utilities are publicly owned companies.

Table 5: Overview of Benchmarked Utilities

Utility	Areas of operation	Year Established	Population in the service area	Number of water connections	Annual Water Production (m^3/yr)
Lusaka Water and Sewerage Company (LWSC), Zambia	Lusaka city; Kafue; Chongwe; Luangwa; Chilanga	1989	2.2 Million	92,440	88,500,000
Águas da Região de Maputo (AdeM), Mozambique	Greater Maputo City	1999	2.1 Million	206,610	75,966,000
Nairobi City Water and Sewerage Company (NCW&SC), Kenya	City of Nairobi	2003	3.9 Million	284,065	201,781,886
Dar Es Salaam Water and Sewerage Corporation (DAWASCO), Tanzania	Dar Es Salaam city; Kibaha; Bagamoyo;	2005	4.6 Million	138,680	85,871,543
Water and Sewerage Company (WASCO), Lesotho	Maseru + 15 urban centres	2010	0.5 Million	78,336	17,820,117
Water and Sanitation Corporation (WASAC), Rwanda	Kigali + all urban centres in the country	2014	2.6 Million	149,332	39,969,662

4.2 REPORTING PERIOD

Due to the differences in reporting periods among the regulators, this first report has been constrained to one reporting period, 2013/2014 and contains information from:

- July 2013-June 2014 for WASREB, RURA and EWURA
- April 2013- March 2014 for LEWA
- January –December 2014 for NWASCO and CRA

4.3 PERFORMANCE BOUNDARIES

In order to obtain an integrated view of the utilities' performance, benchmarking has been done using both single KPIs and cluster indicators as defined under the WUPI. The single KPIs (using traffic light colours) and components for grouped indicators is shown in Table 6.

Table 6: Traffic light performance boundaries

Component	KPI	Good	Acceptable	Poor
Quality of Service	Water coverage	>90	90-75	< 75
	Sewerage coverage	>70	70-40	< 40
	Water Quality	>95	95-90	< 90
	Hours of Supply	>20	20-16	< 16
Economic Efficiency	O&M coverage	>1.5	1.5 – 1.00	< 1.0
	Collection efficiency	>0.95	0.95 – 0.85	< 0.85
	Staff cost	<30	30-35	>35
Operational Sustainability	Staff/1,000 Water and Sewerage Connections	<5.0	5.0 – 8.0	>8.0
	NRW	< 30	30 – 35	>35
	Metering Ratio	>95	95 – 85	< 85

4.4 PERFORMANCE ANALYSIS

The performance analysis was done according to the clusters of indicators in the components of

i. Quality of Service
ii. Economic Efficiency
iii. Operational Sustainability

Per component of indicators, the performance results by single KPIs are presented first, then the performance is analysed using the WUPI, which integrates the single KPIs.

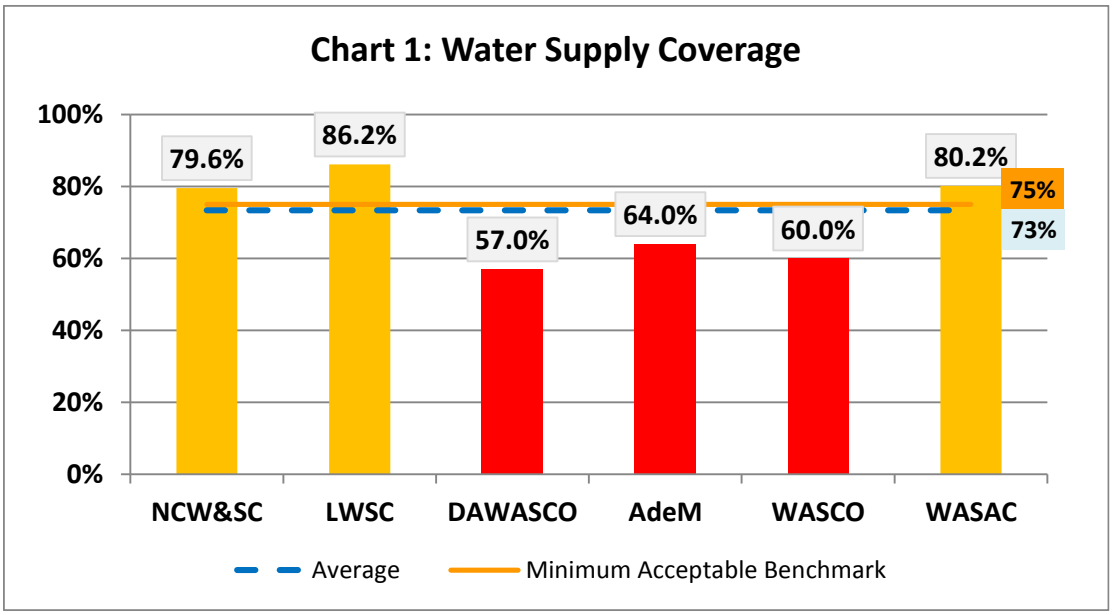
4.4.1 Quality of Service

The quality of service was measured using four KPIs, namely, water supply coverage, sewerage coverage, water quality and hours of water supply.

4.4.1.1 Water Supply Coverage

Water supply coverage considers the domestic population served through individual household connections, public stand posts and kiosks.

The water coverage on average for the six utilities was 73% (as shown in Chart 1) which was just below the minimum acceptable benchmark of 75%.Only NCW&SC, LWSC and WASAC met the acceptable performance standards. Despite having a lower number of water connections, in comparison, LWSC had the highest percentage of water coverage. This was mainly attributed to the fact that about 61.1% of the population covered are served through public stand posts and kiosks which tend to be in the densely populated areas. DAWASCO (which has the biggest population in its service area) had the lowest coverage although with about 82% of the population covered, served through individual household connections.



4.4.1.2. Sewerage Coverage

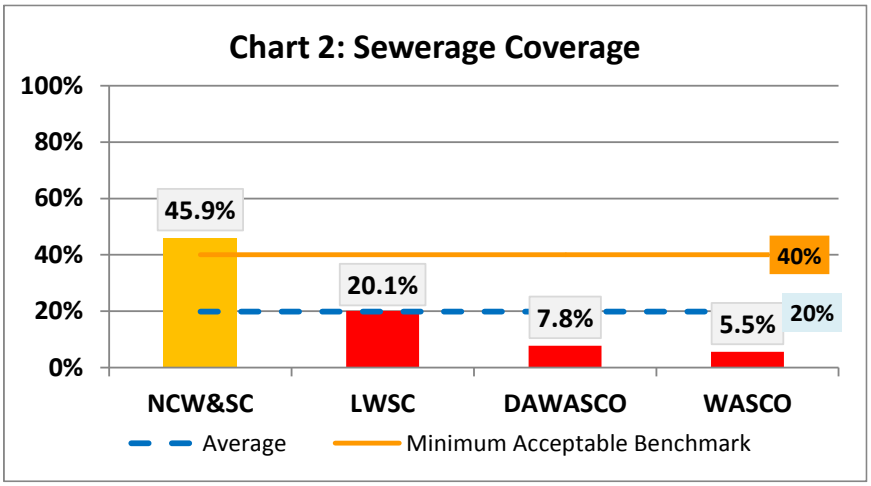
Only NCW&SC, LWSC, DAWASCO and WASCO which provide sewerage services, were analysed. Mozambique and Rwanda have separate entities for sewerage and sanitation services[1].

Due to the unreliability of data regarding septic tanks, the coverage figure in Chart 2 considers the domestic population served by the sewerage network only. The average sewerage coverage

[1] Sewage regulatory activity for Maputo city has not yet been established as negotiations with the City Council (entity responsible for the Sewage) still underway. According to the Department of Water and Sanitation of the Maputo Municipal Council, the sewerage coverage in the city is around 11%.
Kigali does not have a centralised sewer system and the private operator providing sewer services is not under regulation

was 20% which was far below the acceptable benchmark of 40%. Only NCW&SC met the minimum acceptable benchmark.

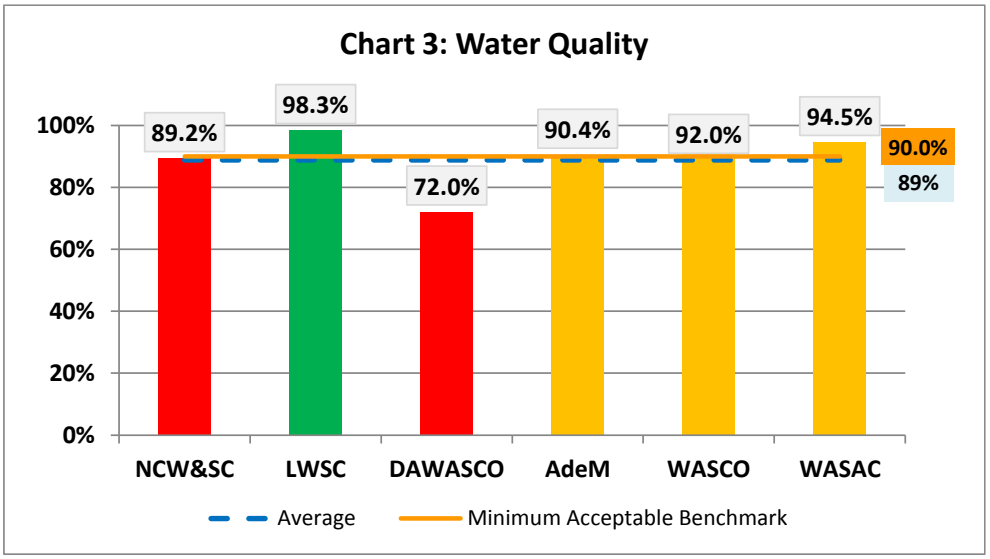
Low sewerage coverage levels in comparison to water supply coverage are majorly attributed to the high cost of investment required for sewerage infrastructure which tends to be an inhibiting factor. It is estimated that the cost of sewerage infrastructure can be more than three times the cost of water infrastructure. There is urgent need to address the investment gap in order not to reverse the gains made in water supply coverage.



4.4.1.3. Water Quality

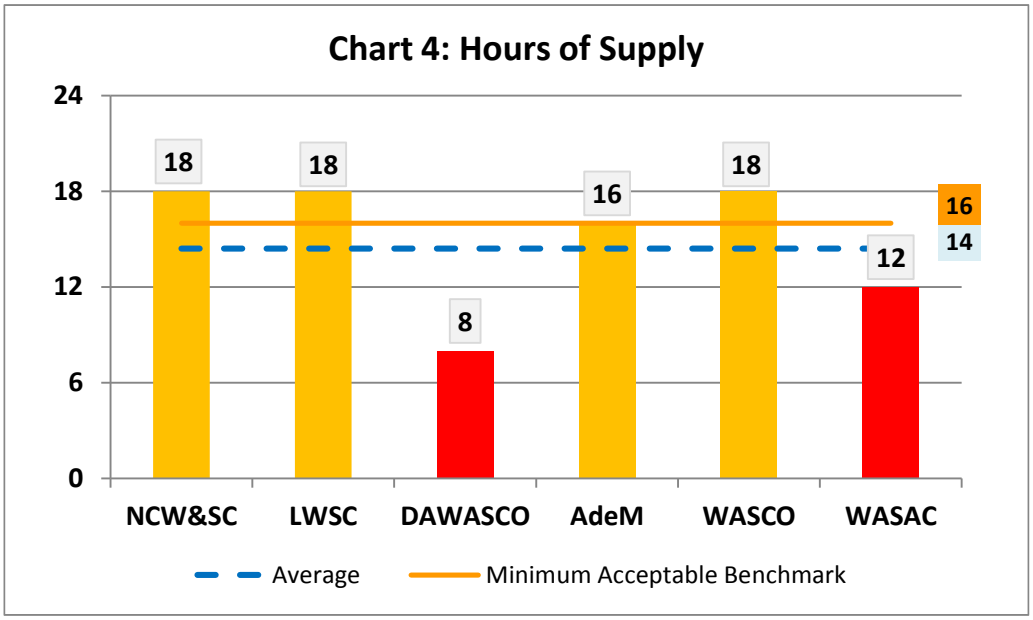
Individual countries have different standards for water quality in conformity with the national standards. Therefore, the water quality indicator in Chart 3 has only considered compliance in the parameters of Residual Chlorine and Bacteriological.

On average, the water quality compliance was 88.9% and was just below the minimum acceptable benchmark of 90%. Only LWSC attained the good water quality performance benchmark of above 95%. WASAC, WASCO and AdeM met the acceptable benchmark.



4.4.1.4. Hours of Water Supply

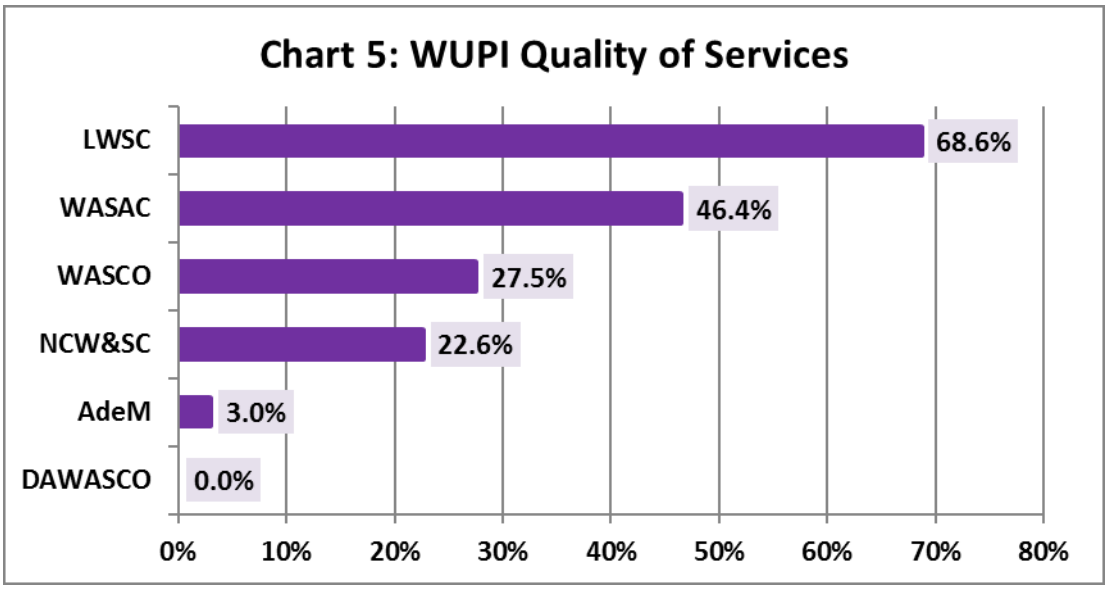
The average hours of water supply per day among the utilities was 14 hours as shown in Chart 4. This was below the minimum acceptable benchmark of 16 hours. However, it is notable that the low average performance was significantly affected by the low hours of water supply supplied by the largest utility, DAWASCO. The low hours could be attributed to the low volume of water produced by DAWASCO (85,871,543m^3) in comparison to the second biggest utility among the six, NCW&SC (201,781,886m^3). In a similar sense, WASAC also had low water production figures (39,969,662m^3) in comparison to LWSC (88,500,000m^3) which has less water connections. Nevertheless, NCW&SC, LWSC, AdeM and WASCO met the acceptable performance for the hours of water supply.



4.4.1.5. Integrated Performance - Quality of services

The integrated performance for the Quality of Services shown in Chart 5 was measured by using the WUPI-Quality of Services for water supply coverage, sewerage coverage, water quality and hours of supply indicators.

In general terms WASAC, WASCO, NCW&SC, AdeM and DAWASCO had low performance values (below 50% of the quality of services). The 0% performance by DAWASCO was due to not meeting the acceptable benchmark in all four single KPIs. On the contrary, LWSC had the best performance score on the quality of services.

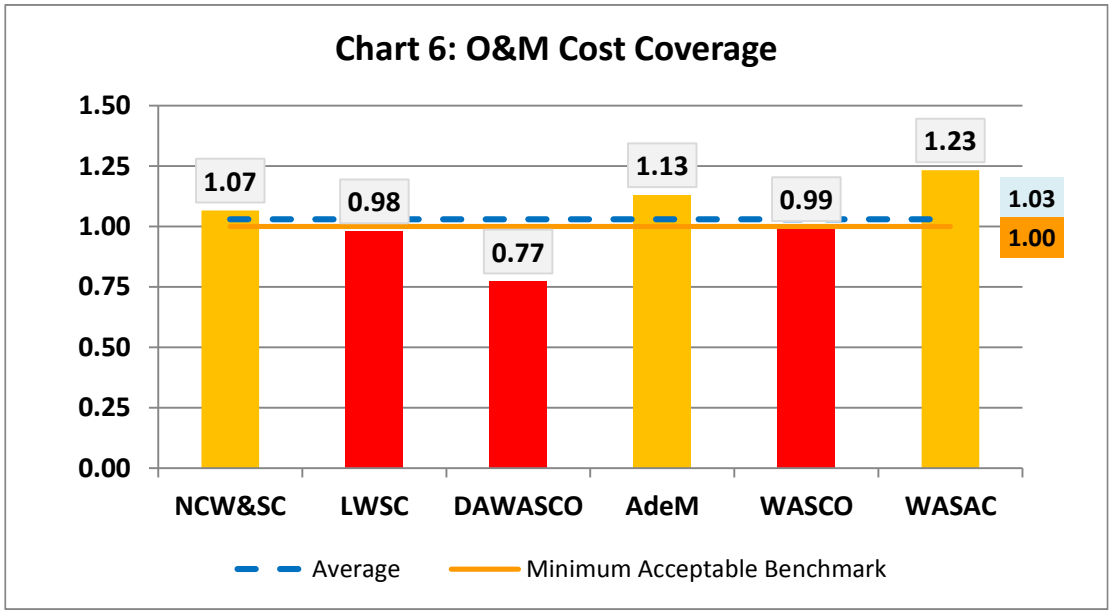


4.4.2. Economic Efficiency

The economic efficiency performance was analysed using Operation and Maintenance (O&M) Cost Coverage, Collection Efficiency ratio and Staff Cost as a proportion of O&M Costs.

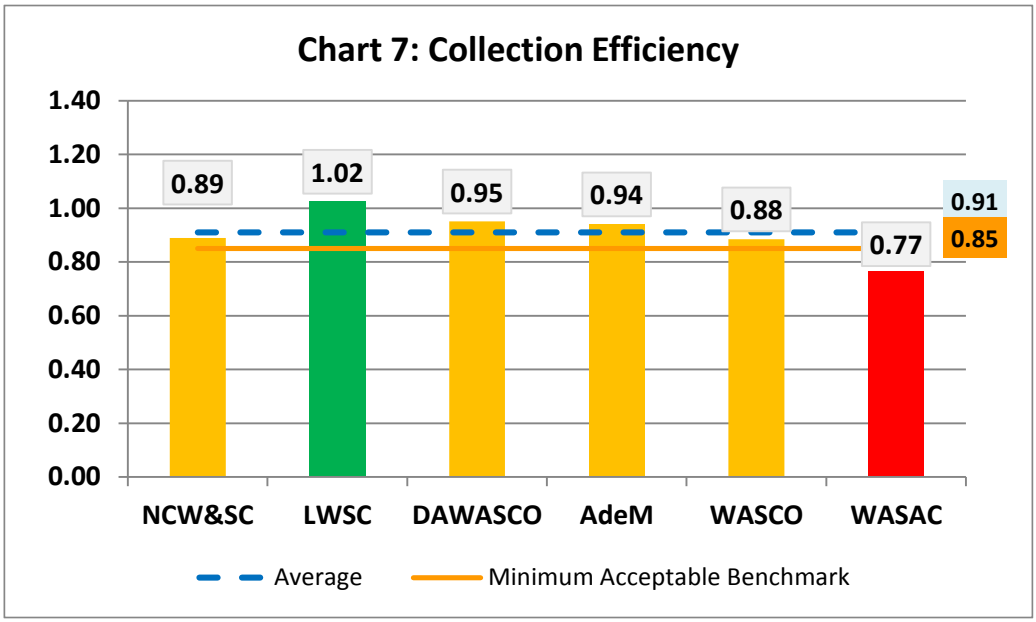
4.4.2.1. Operation and Maintenance Cost Coverage

The O&M Cost Coverage in Chart 6 is the cost covered by billed amounts (operating revenue). The average O&M Cost Coverage was 1.03 which was above the minimum acceptable benchmark of 1.00. Only WASAC, AdeM and NCW&SC met the minimum acceptable performance benchmark with WASAC posting the best performance at 1.23. This implies a constraint on the ability of the utilities to generate sufficient revenue to meet capital expenditure.



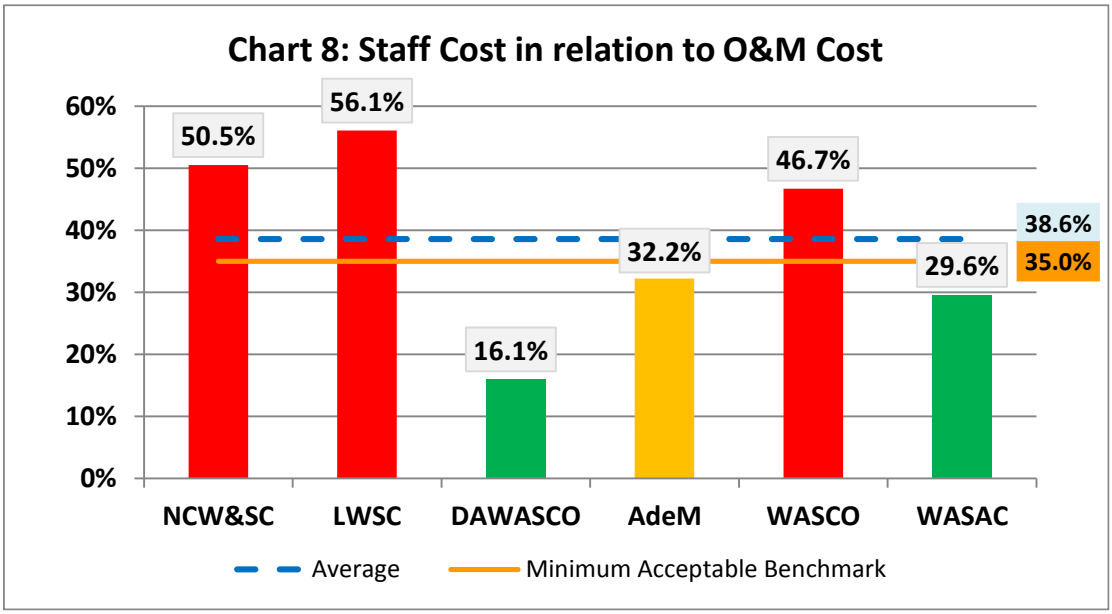
4.4.2.2. Collection Efficiency

Collection ratios above 85% are a key factor in sustaining financial performance of water and sewerage services utilities, both in the short and medium term. The Collection Efficiency in Chart 7 shows the level of cash income in the utility against the billed amount. The average collection efficiency was above the minimum acceptable benchmark of 85%. NCW&SC, DAWASCO and WASCO met the acceptable performance benchmark while only LWSC met the good benchmark of above 95%. WASAC was the only utility below the acceptable benchmark.



4.4.2.3. Staff Cost as a proportion of O&M Costs

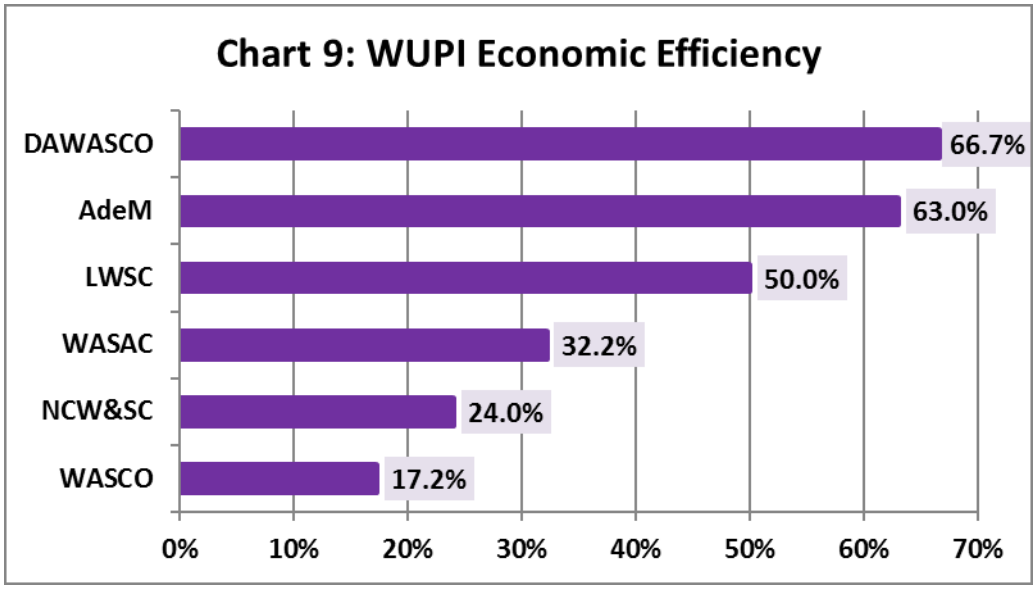
The Staff Cost is analysed against O&M costs of the utility and presented in Chart 8. The average was 38.6% against the minimum acceptable benchmark of 35%. This was poor average performance considering that the internationally accepted “bottom line” for the staff cost is 30% of the total cost. Only DAWASCO and WASAC met the good benchmark of less than 30% proportion. AdeM met the acceptable benchmark while the rest were way below acceptable with more than 40% of O&M costs attributed to staff costs.



4.4.2.4. Integrated Performance –Economic Efficiency

The WUPI-economic efficiency was used to obtain an overall view of the utilities performance in the component of economic efficiency as shown in Chart 9. DAWASCO obtained the highest performance of 66.7% while WASCO (the smallest of the six) was bottom at 17.2%

It is worth to highlight that AdeM and DAWASCO which performed best in the Economic Efficiency component, also performed the least in the Quality of Services. This presents an imbalance in performance requiring a further interrogation as to the challenges inhibiting the improvement of the quality of services. The low performance by WASAC, NCW&SC and WASCO in this component raise serious issues regarding the financial sustainability of the utilities in the medium to long term.

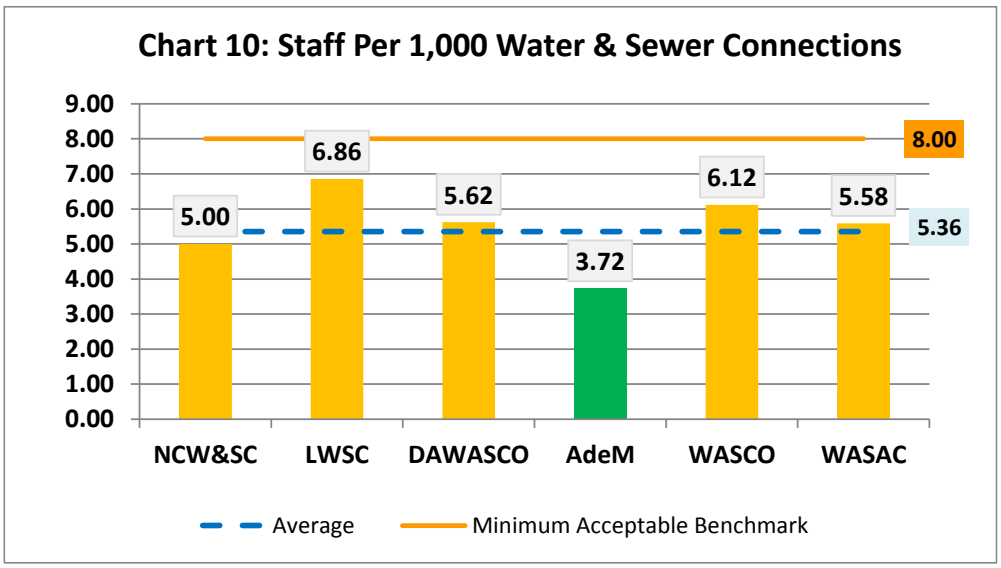


4.4.3 Operational Sustainability

The Operational Sustainability component is measured using Staff per 1,000 Water and Sewer Connections, Non-Revenue Water and Metering.

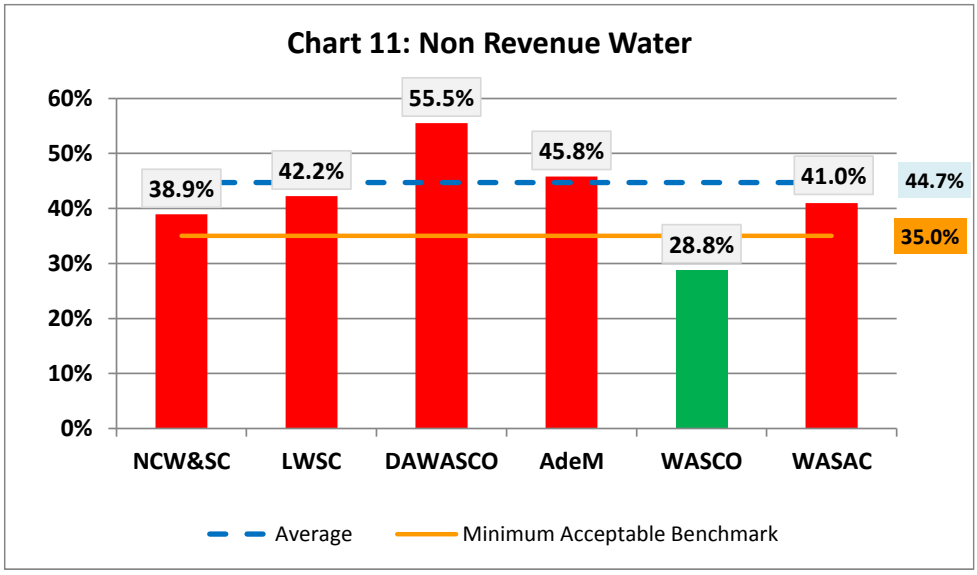
4.4.3.1. Staff per 1,000 Water and Sewer Connections

The average for Staff per 1,000 Connections was 5.36 as shown in Chart 10. This was a good performance against the minimum acceptable benchmark of 8. All the utilities met the acceptable benchmark with AdeM, which met the good benchmark of less than 5, reporting the best performance.



4.4.3.2. Non-Revenue Water (NRW)

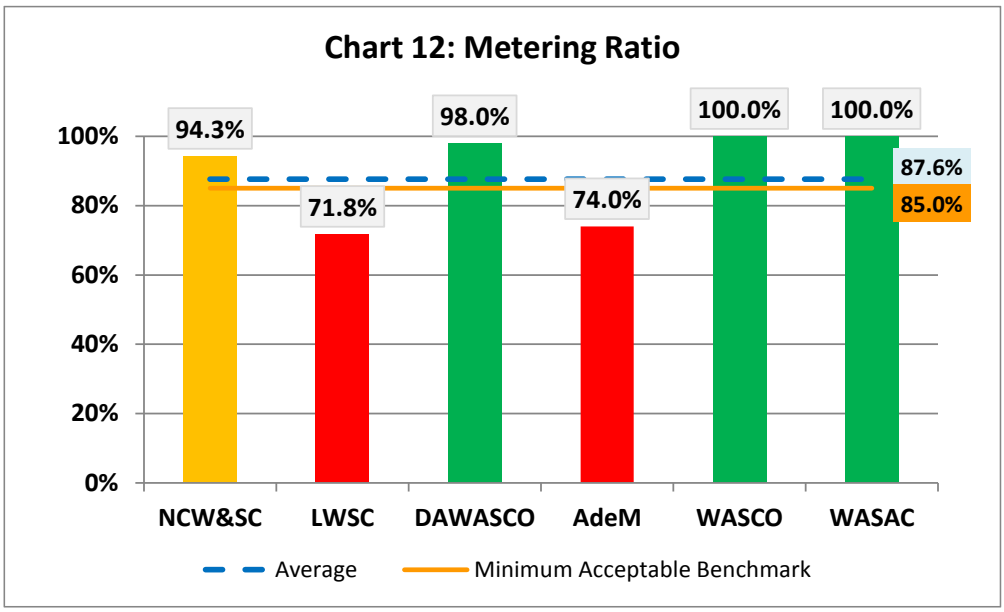
Water losses imply revenue loss and thus becomes a key area for utilities to address urgently. On average, the NRW was 44.7% which was unacceptable against the minimum benchmark of 35%. Only WASCO met the good benchmark of below 30% while the rest were all at unacceptable levels. This underscores the fact that NRW tops the agenda amongst the most common challenges faced by utilities in the region.



4.4.3.3. Metering ratio

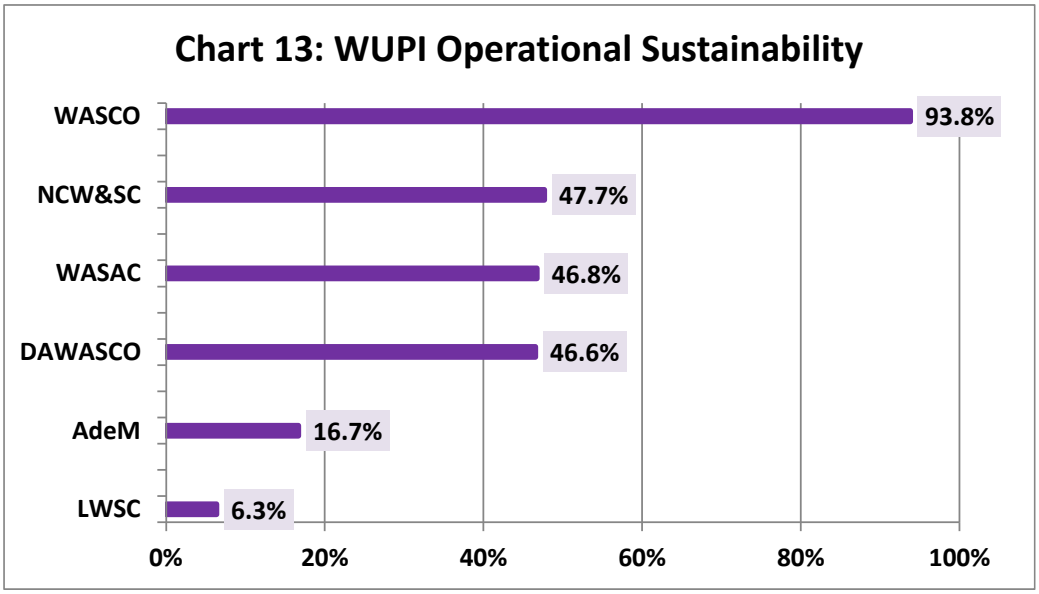
Chart 12 shows the metering ratio which is closely linked to the management of water losses.

The average metering ratio at 87.6% was just above the minimum acceptable benchmark of 85%. Interestingly, DAWASCO with the highest NRW is almost at 100% metering. WASCO and WASAC were the only utilities with 100% metering ratio. LWSC being the oldest utility among the six, seems to have lagged far behind with metering ratio of 71.8% for about 92,440 connections compared to the metering ratio of NCW&SC with over 280,000 connections.



4.4.3.4. Integrated Performance – Operational Sustainability

The WUPI Operational Sustainability as shown in Chart 13 is based on the aggregation of the three KPIs- Staff per 1,000 Water and Sewer Connections, Non-Revenue Water and Metering. WASCO obtained the highest performance (93.8%), with the rest far behind and LWSC trailing at 6.3%.



4.5 SUMMARY ANALYSIS

This section summarises the main findings of the performance analysis by using the single KPIs (Table 7) and the overall WUPI (Chart 14) which aggregates the three components (quality of services; economic efficiency; operational efficiency).

Table 7: Summary of Utility Performance

	KPI	NCWSC	LWSC	DAWASCO	AdeM	WASCO	WASAC
Quality of Services	**Water coverage**	79.6%	86.2%	57.0%	64.0%	60.0%	80.2%
	Sewerage coverage	45.9%	20.1%	7.8%	-	5.5%	-
	Water Quality	89.2%	98.3%	72.0%	90.4%	92.0%	94.5%
	Hours of Supply	18	18	8	16	18	12
Economic Efficiency	**O&M Cost Coverage**	1.07	0.98	0.77	1.13	0.99	1.23
	Collection efficiency	0.89	1.02	0.95	0.94	0.88	0.77
	Staff Cost vs O&M Costs	50.5%	56.7%	16.5%	32.2%	46.67%	29.6%
Operational Sustainability	**Staff/1,000 W&S Connections**	5.00	6.86	5.62	3.72	6.12	5.58
	NRW	38.9%	42.2%	55.5%	45.8%	28.8%	41%
	Metering Ratio	94.3%	71.8%	98.0%	74%	100%	100%

On overall, more than half the utilities met the minimum acceptable benchmark in each KPI except in Water Coverage, Sewerage Coverage, Staff Cost, O&M Cost Coverage and NRW. The worst performing KPI was NRW while the best was Staff/1000 Connections.

In general the indicators linked with the quality of services need massive investments in the water and sewerage infrastructure. Regulators have to promote investments and to ensure value for money by developing and enforcing enabling tools such as PPP tools.

Further, the picture indicates that the utilities need to strive to improve on all the economic efficiency and operational sustainability indicators with special focus on O&M Cost Coverage and NRW. In addition, regulators are obliged to ensure the economic sustainability of the utilities. Thus, transparent guidelines for progressive water tariff setting which provide returns on investments should be applied in order to allow realistic water prices. The NRW is a wide spread problem for African utilities which could be improved by applying innovative and integrated management solutions.

Finally, Chart 14 shows the ranking of the utilities by integrating the three WUPI components into an overall WUPI. The 2014 utilities ranking is: 1) LWSC and WASCO 3) WASAC 4) DAWASCO 5) NCW&SC and 6) AdeM.

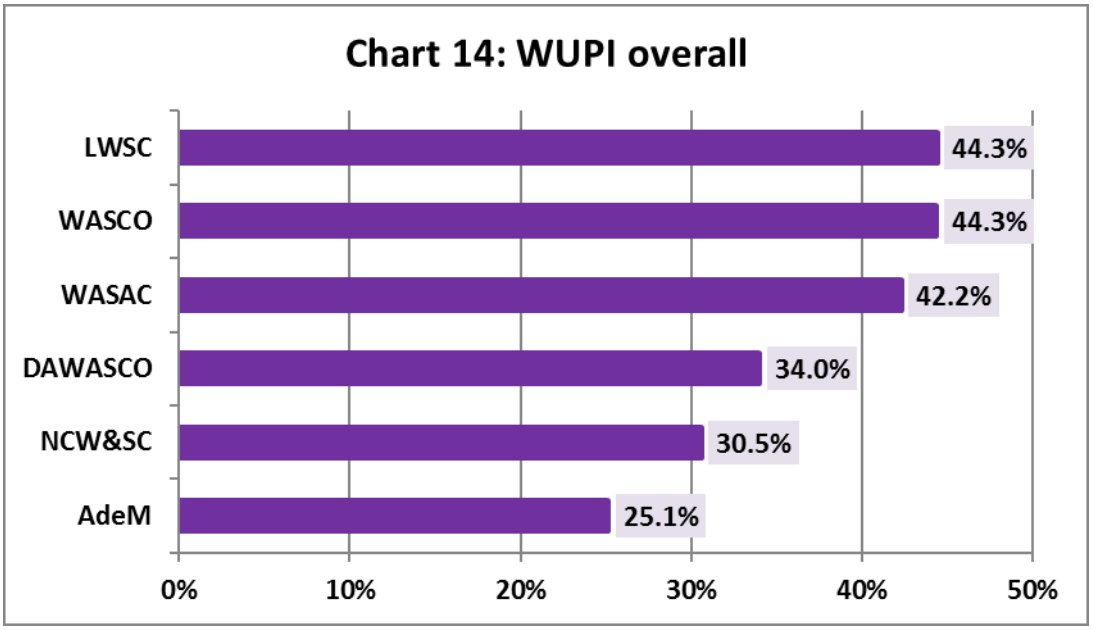


Chart 14: WUPI overall
LWSC
WASCO
WASAC
DAWASCO
NCW&SC
AdeM
44.3%
44.3%
42.2%
34.0%
30.5%
25.1%
0%
10%
20%
30%
40%
50%

CHAPTER 5: CONCLUSIONS

The production of a report on the performance of the largest utilities in countries in the Eastern and Southern African region is an opportunity for the utilities to be compared with their peers and learn from the good practices. This is the premise of this report and through which, ESAWAS has developed performance standards to compare utilities in the region.

The results obtained from this exercise reveals the heterogeneity of the utilities performance in the region. To amplify this, by comparing the performance of the utilities using the different performance components (quality of service; economic efficiency; operational efficiency) an apparent imbalance in performance presents itself. For instance, a utility scoring high in the economic efficiency components does not automatically imply a similar score in the quality of service components. In fact, in some cases, there is a converse in performance.

The approach followed in this report by using KPIs and the WUPI - which enables the evaluation of the performance of the utility from an integrated approach - allows identification of the main strength and weakness areas of the utilities. Thus, regulators, utilities and stakeholders alike have a basis for decision-making in order to craft measures to improve effectiveness of the utilities. In fact from the results obtained from the comparison of performance among the utilities, the following conclusions can be drawn:

- ***NCWSC***: the Kenyan utility presents good performance in the Operational Sustainability component but with mid to low performance in the Quality of Services and Economic Efficiency components respectively. Therefore there is a clear need to improve both the technical and financial managerial activities of the company to improve service quality. However such kind of activities would require significant investments.

- ***DAWASCO***: the Tanzanian utility reveals an imbalance in performance, with a high performance in the Economic Efficiency component and medium performance in Operational Sustainability component but with very low performance in the Quality of Services component. Thus, this utility should prioritise its technical activities in order to improve its performance.

- ***LWSC***: the Zambian utility has a good performance in the Quality of Services component and medium performance in the Economic Efficiency component but very low performance in the Operational Sustainability component. The utility needs to concert efforts to improving metering ratio and reducing NRW.

- ***AdeM***: the Mozambican utility has a relatively good performance in Economic Efficiency but second lowest performance in both the Operational Sustainability and Quality of Services components. Thus much effort is required in the technical activities in order to improve performance.

- ***WASAC***: the Rwandese utility has a good performance in the Quality of Services component but reveals low performance in the Economic Efficiency component and

medium performance in the Operational Sustainability component. The most pressing issue for this utility is the low performance on the economic efficiency. This situation could jeopardize the economic viability of the future investment in this company. Thus, further actions in this regard would be highly recommended.

- ***WASCO***: the Lesotho utility reveals medium performance values in all the three components. The weakest area of performance is the quality of service, O & M cost coverage and staff costs. In order to improve this component there is a clear need for new investments to increase the water coverage and the hours of water supply.

The harmonisation and definition of the regional standards for benchmarking has facilitated the performance comparison among the utilities. This is an innovative process and approach at the regional level which should be expanded within the region and Africa in the coming years. The KPIs boundaries established in this first ESAWAS benchmarking report are constrained to the current scenario and could be revisited in the following years if the trends shift.

Finally this report should be viewed as an ESAWAS baseline, which should allow yearly monitoring of utility performance trends in the region. This monitoring will generate additional information in order for regulators and decision makers to design intervention plans.

APPENDIX 1.DETAILED PROFILES OF UTILITIES

DAR ES SALAAM WATER AND SEWERAGE CORPORATION (DAWASCO)

Water Utility

The DAWASA Act 2001 established Dar es Salaam Water and Sewerage Authority (DAWASA) as the principle water service provider in Dar es Salaam and parts of Kibaha and Bagamoyo in Coast Region. In fulfilling its obligations, DAWASA has entered into a ten (10) years Lease contract with Dar es salaam Water and Sewerage Corporation to operate water and sewerage infrastructures. In the current arrangement DAWASA is the asset owner responsible for capital investment while DAWASCO is the operator of water and sanitation services; the Lease contract expires in June 2015.

The total population in the DAWASCO operation area is 4,592,454 people while the current served area of the utility has a population of 2,617,698. The sources of water are Ruvu river with intakes at Mlandizi and Bagamoyo, River Kizinga with intake at Mtoni and boreholes located in various areas within the service area. The utility has a sewerage system with sewer line of 265km long. The system has eight (8) waste water stabilization ponds, out of which only two (2) receive cesspits emptier. The average daily flow into the ponds is 2,000m3/day and 135m^3/day at Vingunguti and Kurasini ponds respectively.

General Data About Water Utility

Abbreviation	DAWASCO
Start of Operations	2005
Number of Towns in Operation Area	3
Total Population in Operation/Service Area	4,592,454
Total Water Connections	138,680
Total Waste Water/Sanitation Connections	23,771
Total Production/year	85,871,543m^3
Total Staff	699
Annual O&M Costs	TZS 54,652,637,470
Annual Water and Sewerage billing	TZS 42,255,967,000
Annual Water and Sewerage Collections	TZS 40,180,111,755

Tariff Structure

**Exchange Rate: TZS1,654 to 1US$ (2014)*

WATER TARIFF					
Category	**Domestic**	**Institutions**	**Commercial**	**Industrial**	**Kiosks**
TZS./m^3	1,098	1,098	1,098	1,098	20/20Litres

Note :

- No approved flat rate tariff, in case of faulty meter customers are billed according to the assessed average water consumption based on previous meter reading
- The sewerage tariff is TZS 275/m^3
- The flat for sewerage tariff is 80% of the water tariff

MAPUTO WATER SUPPLY SYSTEM, MAPUTO WATER COMPANY(ADEM)- MOZAMBIQUE

Water Utility

Maputo Water Supply System, supplies water to the metropolitan area of Maputo and is managed by the Water Society of Maputo Region (AdeM) under Lease Contract.

In 2010, after evaluation by the Government of the Delegated Management Framework implementation process, FIPAG (Water Asset Management Found) acquired the majority shareholder position of AdeM.

The area served by the system had more than two million, supplied by more than 200,000 house connections and 383 public standpipes.

General Data About Water Utility

Abbreviation	AdeM
Start of Operations	2010
Number of Towns in Operation Area	3
Total Population in Operation/Service Area	2,118,773
Total Water Connections	206,610
Total Waste Water/Sanitation Connections	N.A
Total Production/year	75,966,000m^3
Total Staff	769
Annual O&M Costs	MT 1,084,428,000
Annual Water Billing	MT 1,223,522,000
Annual Water Collections	MT 1,155,451,000

Tariff Structure

**Exchange Rate: MT31.35 to 1US$ (2014)*

Standpipe	Domestic				Municipalities	Non Domestic		
	Service availability rate (Fixed rate)	0-5m3	5m3-10m3	Above 10m3		Minimum Consumption (Commercial, Public)	Minimum Consumption (Industries)	Above the minimum consumption
						0-25m3	0-50m3	
MT/m3	Mt/month	Mt/month	Mt/m3	Mt/m3	Mt/m3	Mt/month	Mt/month	Mt/m3
10.00	60.00	73.00	19.00	29.50	14.60	781.25	1,562.50	31.25

Note :

- There is a social consumption up to 5m^{3}and all domestic inclued the fixed rate;
- In case of faulty meter customers are billed according to the average of previous three meter readings;
- Initial the sewerage tax fee will be 10% and will be applied as soon the negotiations are finalised with Municipalities Authority

RWANDA WATER AND SANITATION CORPORATION (WASAC)- RWANDA

Water Utility

WASAC was established in August 2014 with the mandate to produce and distribute Water and provide Sanitation services in all Urban areas in Rwanda. The Company was created in replacement of the Energy, Water and Sanitation Authority (EWSA), a public Utility that was providing both Water and Electricity.

WASAC is the water service provider for Kigali and all other towns in Rwanda and was created to operate on commercial basis and inherited all water infrastructures and is mandated to improve the service and coverage in all urban areas.

In the current arrangement, WASAC is also mandated to mobilize capital investment and execute major water investment works (through projects & programs) in rural areas before handling over the assets to districts (assets holders) that also delegate the management to private operators (rural).

General Data About Water Utility

Abbreviation	WASAC
Start of Operations	2014 (August)
Number of Towns in Operation Area	14
Total Population in Operation/Service Area	2,568,026
Total Water Connections	149,332
Total Waste Water/Sanitation Connections	Not known
Total Production/year	39,969,662.8
Total Staff	834 (August 2014)
Annual O&M Costs	FRW10,632,127,004
Annual Water and Sewerage billing	FRW13,091,528,005
Annual Water and Sewerage Collections	FRW10,017,237,945

Tariff Structure

**Exchange Rate: FRW681.86 to 1US$ (2014)*

	WATER TARIFF (VAT exclusive)						
Category	**Public taps & lifeline block (0-5)**	**6-20 m^3**	**20-50 m^3**	**50-100 m^3**	**Above 100m^3**	**Industries**	**Kiosks**
FRW/m^3	240	300	400	650	740	593	10Frw/ 20LJerrycan

Note :

1. The company uses increasing block tariff,
2. No approved flat rate tariff but can be used in case of faulty meter and customers are billed according to the average of previous three meter readings
3. No sewerage tariff fixed yet since no centralized sewerage system

LESOTHO WATER AND SEWERAGE COMPANY (WASCO) – 2013/14

Water Utility

The Water and Sewerage Company (PTY) Ltd came into being through a "Water and Sewerage Act No. 13 of 2010'', thereby making it fully fledged private company wholly owned by the Government of Lesotho earmarked to deliver water and sewerage services in the urban centres of the country.

WASCO operates in 16 designated URBAN centres serving 78,336 customers nation-wide, about 3,583 of whom are connected to sewer lines. There are also more than 4,200 domestic prepaid connections, and more than 3,370 communal pre-paid token holders. Industries and commercial premises, particularly in Maseru, use about 64% of the water produced, and domestic customers consume 36%.

With effect from 2012 and in order to enhance its operational efficiency and effectiveness, WASCO was placed under regulation undertaken by the Lesotho Electricity and Water Authority (LEWA), as per the LEA Act 2002 as Amended. LEA Amendment Act 2011 extended the Mandate of Lesotho Electricity Authority (LEA) to include the regulation of water and sewerage services, having regulated the electricity sub-sector only since 2004.

As indicated earlier, WASCO operates within the Water and Sanitation Sector and therefore reports functionally to the Ministry of Energy, Meteorology and Water Affairs., but is overseen strategically by a Board of Directors. WASCO is headed by a Chief Executive who is supported by a team of four (4) heads of Divisions referred to as Directors heading Operations and Maintenance Division; Engineering, Planning and Design Division; Finance Division and Strategic Services and Human Resources Division, respectively.

The business of WASCO emanated from the extraction and production of raw water from the rivers and bore holes, its distribution and ultimate supply to households and entities (industries and institutions), as well as collection and treatment of sewage by sewerage reticulation systems for safe disposal into the environment. On this basis, the functions or business WASCO being regulated are Production, Transmission and Distribution of potable water and sewerage reticulation systems. The functions of Septic Tanks emptying, undertaken by private contractors, are not regulated.

Fiscal Year: 1st April – 31st March

General Data About Water Utility

Abbreviation	WASCO
Start of Operations	2010
Number of Towns in Operation Area	10 towns plus 6 designated urban areas
Total Population in Operation/Service Area	490,000
Total Water Connections	78,336
Total Waste Water/Sanitation Connections	3,583
Total Production/year	17,820,117 m^3
Total Staff	501
Annual O&M Costs	M173,014,000
Annual Water and Sewerage billing	M171,233,000
Annual Water and Sewerage Collections	M151,452,000

Tariff Structure

**Exchange Rate: M10.85 to 1US$ (2014)*

	WATER TARIFF						
Category	0-5kl	Greater 5-10kl	Greater 10-15kl	Greater 15 kl	Industries	Standpipe	Sewerage
M./m^3	3.59	6.07	10.67	14.71	9.72	4.86 (flat rate)	Sewerage to be charged on 85% of water consumed
Standing Charge	21.93	36.68	36.68	36.68	244.23		Water closet customers to be charged on 60% of water consumed

NAIROBI CITY WATER AND SEWERAGE COMPANY (NCW&SC)

Water Utility

Background

In 2002 the Kenyan government launched an ambitious programme of reforms for the water sector through the enactment of the water act 2002. The new legislation separated policy formulation, regulation, water resources management, water services and created clear roles and responsibilities of the newly established key water institutions. This resulted in the establishment of the Water Services Regulatory Board (WASREB) in 2003 to oversee the implementation of policies and strategies relating to provision of water and sanitation services. Also established were regional Water Services Boards (WSBs), in the capacity of asset holders, and over 100 Water Service Providers (WSPs), as their appointed agents for actual service delivery.

Nairobi City Water and Sewerage Company (NCW&SC) was incorporated in December 2003 and appointed by the Athi Water Service Board (AWSB) as its agent with the mandate of providing water and sewerage services within the jurisdiction of the city of Nairobi. Further the Constitution of Kenya (CoK-2010) devolved water service provision to the 47 county governments. Therefore NCWSC is now wholly owned by the County Government of Nairobi. The Company is ISO 9001:2008 certified.

Nairobi City has an estimated population of 3.9 million and projected to grow to 4.5 million by 2019. Currently, of the 3.9 million residents of Nairobi, only 3 million (77% of the total population) have direct access to piped water. The rest obtain water from kiosks, vendors and informal water service providers. On average, the existing customers receive water 18-hour per day. Population served with sewer connections stand at 1.14 million, which is 29% of the total population.

General Data About Water Utility

Abbreviation	NCW&SC
Start of Operations	2003
Number of Towns in Operation Area	1
Total Population in Operation/Service Area	3,723,913
Total Water Connections	308,598
Total Waste Water/Sanitation Connections	213,543
Total Production/year	201,781,886m^3
Total Staff	2,612
Annual O&M Costs	KSHS 6,463,778,670
Annual Water and Sewerage billing	KSHS 6,890,071,000
Annual Water and Sewerage Collections	KSHS 6,126,314,000

Tariff Structure

**Exchange Rate: KSHS87.92 to 1US$ (2014)*

WATER TARIFF

Category	Domestic	Institutions	Commercial	Industrial	Water to Kiosks for Resale	Bulk Water to WSPs for Resale
Consumption Block	**KSHS./m^3**					
0- 10	18.71	18.71	18.71	18.71	15	26.57
11- 30	28.07	28.07	28.07	28.07		
31- 60	42.89	42.89	42.89	42.89		
> 60	53.80	53.80	53.80	53.80		

Note :

- Sewerage is charged at 75% of the water billed for all customers with a sewer connection.
- Resale by manned kiosk vendors and communal water dispensers is Kshs 2 per 20-litres.

LUSAKA WATER AND SEWERAGE COMPANY

Water Utility

Lusaka Water and Sewerage company was incorporated as a private company registered under the Companies Act. . It is fully owned by the Local Authorities in Lusaka Province namely Lusaka, Luangwa, Chongwe, Kafue, Chilanga and Chirundu.

Lusaka Water and Sewerage Company is the biggest water supply and sanitation service provider in Zambia and has been in operation since 1989.

General Data About Water Utility

Abbreviation	LWSC
Start of Operations	1989
Number of Towns in Operation Area	6
Total Population in Operation/Service Area	2,184,637
Total Water Connections	92,440
Total Waste Water/Sanitation Connections	31,210
Total Production/year	88,500,000 m^3
Total Staff	848
Annual O&M Costs	ZMW220,547,000
Annual Water and Sewerage billing	ZMW216,244,386
Annual Water and Sewerage Collections	ZMW221,550,755

Tariff Structure

**Exchange Rate: ZMW6.15 to 1US$ (2014)*

Category	Domestic	Non domestic	Kiosks
Kwacha./m^3	4.37 #	6.27#	5ngwee/20Litres

Note :

- Flat rates for non-metered customers vary per customer category (i.e High, medium and Low)
- The sewerage tariff is 30% and 45% of water for domestic and non-domestic respectively
- The sanitation surcharge is 2.5% of water bill
- The tariff for pre-paid meters is K2.5
- #Average tariff

APPENDIX 2. WUPI

The Water Utility Performance Index (WUPI) was developed following the guidelines suggested by the OECD-JRC (2008). In summary, the OECD-JRC (2008) recommends to build the composite indicators following 10 steps: 1) development of a theoretical framework; 2) selection of the basic indicators; 3) imputation of missing data; 4) multivariate analysis; 5) normalisation; 6) weighting and aggregation; 7) robustness and sensitivity; 8) back the details (indicators); 9) association with other variables; and 10) dissemination.

The Water Utility Performance Index (WUPI) is a composite indicator developed by CRA on 2012. The WUPI used at CRA has been harmonized for this regional comparison. The WUPI allows to measure the performance of the utilities in an integrated way by aggregating three main performance components: quality of service, economic efficiency and operational sustainability. 10 KPIs are used to build up the WUPI and are clustered in the three components.

The WUPI uses the max-min technique for the KPIs normalisation. The aim of the KPIs normalization is to transform the set of KPIs selected for the construction of the WUPI, which are expressed in different units of measurement, into a homogeneous set of variables, all of which are measured in the same unit. The KPIs are then measured on a scale that ranges from 0 (the worst possible performance) to 1 (the best possible performance). For ESAWAS, it was pre-established the minimum and maximum threshold values for each indicator to perform the indicator normalisation (see Annex 1).

The final step of the construction of the WUPI is the aggregation of all of the normalised indicators into the three WUPI components and the overall WUPI. The weighted sum of the indicators, which assume total compensation among the indicators is used to aggregate the indicators. This linear aggregation of the indicators is calculated using the following formulas:

$$WUPI_{quality\_service,\ i} = \frac{\sum_{k=1}^{k=4} w^*_k \cdot I_{k,\ i}}{\sum_{k=1}^{k=4} w^*_k} \qquad WUPI_{economic\_efficiency,\ i} = \frac{\sum_{k=5}^{k=7} w^*_k \cdot I_{k,\ i}}{\sum_{k=5}^{k=7} w^*_k}$$

$$WUPI_{operatinoal\_sustainability,\ i} = \frac{\sum_{k=8}^{k=10} w^*_k \cdot I_{k,\ i}}{\sum_{k=8}^{k=10} w^*_k} \qquad WUPI_{overall,\ i} = \sum_{k=1}^{k=10} w^*_k \cdot I_{k,\ i}$$

Where *i* refers to the specific water utility under analysis, w^*_k is the relative importance of the KPI*k*, and $I_{k,i}$ is the normalised value of the KPI*k* for water utility *i*.

APPENDIX 3: COMPOSITION OF ESAWAS TECHNICAL TASK TEAM (3T) FOR BENCHMARKING

Name	Position	Task
Mutaekulwa Mutegeki	Director of Water and Sanitation, Energy and Water Regulatory Authority, Tanzania	Data Collection, Analysis, Reporting
Exaud Fatael	Technical Manager Water and Sanitation Energy and Water Regulatory Authority, Tanzania	EWURA Proxy
Jacques Nzitonda	Director of Water and Sanitation Regulation, Rwanda Utilities Regulatory Authority, Rwanda	Data Collection, Analysis, Reporting
Peter Njaggah	Director-Technical Services, Water Services Regulatory Board, Kenya	Data Collection, Analysis, Reporting
Thuso Ntlama	Manager- Economic Regulation, Lesotho Electricity and Water Regulatory Authority, Lesotho	Data Collection, Analysis, Reporting
Falla Seboko	Technical Manager -Water and Sanitation Lesotho Electricity and Water Regulatory Authority, Lesotho	LEWA Proxy
Chola Mbilima	Commercial and Financial Inspector, National Water Supply and Sanitation Council, Zambia	Data Collection, Analysis, Reporting
Anselmo Munhequete	Operations Technician-Northern Region, Water Regulatory Council, Mozambique	Data Collection, Analysis, Reporting
Jordi Gallego-Ayala	Consultant, Water Regulatory Council, Mozambique	Team Coordinator-Setting-up benchmarking framework and consolidating data
Yvonne Magawa	Executive Secretary, ESAWAS Regulators Association	Team Coordinator-Logistics