SETTING EFFECTIVE WASTEWATER CHARGES:
A Guide for Municipalities

Nuveshen Naidoo, Darian Pearce, Wean Visser, Jackie Crafford, Dineo Maila & Kyle Harris

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

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Report to the
WATER RESEARCH COMMISSION

by

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Prime Africa Consultants

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This report forms part of a series of two reports. The other report is *Implementation of effective wastewater charges by municipalities in South Africa: an investigation into the barriers and enablers* (WRC Report TT 673/16).

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FOREWORD

This study describes the barriers in implementation of effective wastewater charges in South Africa. The study provides a roadmap to the best available knowledge and solutions for addressing wastewater charge barriers. It offers the opportunity that can be used by decision makers and different personnel in the municipalities in their setting of charges for wastewater. It provides instruments to help municipalities identify needs, evaluate solution and plan, long term sustainable strategies for improved implementation of wastewater tariffs has been explored and provided for in the support.

The study reports on the levels and trends of wastewater prices in South African and outlines the way in which the prices are determined. It seeks to evaluate whether the price of water to industry is reflective of the costs incurred in the wastewater treatment processes and whether the price setting process leads to optimal or at least reasonable outcomes.

There is in-depth cost analysis and some relevant calculation on the determination of wastewater charges. This will enable municipalities to understand the relationship between the prices of services provided and the consumption of those services which are an essential component of setting charges and designing charge structures.

The publication will provide important and useful guidance for task managers within municipalities as well as among stakeholders working with the critical issue of wastewater charges. It is expected that the report will evolve over time. The report will encourage the use of standardised approaches for setting wastewater charges in municipalities.

Mr. AB Singh
DEPUTY DIRECTOR GENERAL
DATE: 28/7/16

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CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

Wastewater treatment services are one of the core business responsibilities of a municipality. Legislation in South Africa ensures the access to water services, affordably and effectively, to all consumers in an economic and sustainable manner. The approach for setting an effective wastewater treatment tariff is often challenging because it requires coordination of activities across multiple municipal departments and setting effective tariffs requires a genuine long term perspective. Fundamentally, a municipality needs to issue a tariff that covers all wastewater treatment costs and recover all these costs from the clients that it serves. This strategy and technical guideline document sets out a roadmap towards setting of accurate charges.

A rapid charge setting method, using empirical evidence from WSAs that did achieve a Green Drop score exceeding 80% in 2011 was developed. By applying the Benchmark median charge for Opex and Capex to all the WSAs in the country, the likely income required from wastewater charges to achieve a Green Drop score that exceeds 80% for all WSAs was estimated.

The resultant total income earned from this weighted average charges is R13.68 billion per year, which exceeds the current income of R9.54 billion per year reported by the FCM by 43%. This provides strong empirical evidence that the current wastewater charge structure is inadequate and under-recovers on likely actual costs. This likely explains many of the pervasive problems associated with achieving Green Drop certification. Although the addition of grants and subsidies alleviate this problem to some extent, the current charge structure is clearly not sustainable.

By applying the Benchmark median charge for Capex to all the WSAs in the country, the likely replacement value of wastewater reticulation and treatment systems for all WSAs can be estimated. At a Capex unit charge of R1.61/kl, and assuming a weighted average depreciation rate of 4.3% per year this results in an estimated replacement value of R88.99 billion, which far exceeds the estimate of R28 billion made in the 2009 Green Drop Report.

The benchmark Opex and Capex charge curves were used to assess the rapid wastewater charges for different WSAs. This analysis demonstrated typical benchmark charge estimates for metropolitan municipalities and local municipalities, separately, for different installed treatment capacities.

The analysis further demonstrated that a variety of approaches exist through which the charges can be implemented. These approaches include a volumetric charge approach, a flat fee approach, an erf-size related approach and a property value approach. Analysis and modelling of the effectiveness of these approaches have shown all of them be suited to a variety of conditions, as follows:

- The volumetric charge approach links the wastewater charge to water consumption. This method is often considered best practice, as it follows the ‘user pay principle’ and allows for progressive charges to be implemented. This approach however can fail to properly distribute the fixed costs associated with the service, but can be improved by incorporating both a fixed and volumetric charge.

- The flat fee approach is most common in relatively small communities where households are relatively homogeneous. Limited provision is made for indigent household and for households that exceed a certain size or level of potable water consumption. A number of municipalities charge a fixed annual rate to fund water treatment. Whilst these mechanisms are not particularly effective at differentiating between classes of services users, the approach is necessary in certain area due to the relatively large seasonal fluctuation of the population (i.e. holiday towns). In such a context there is a risk attached to the utilization of volume based charged structures as they might generate insufficient revenue.

- The fee related to erf size approach assigns a fee relative to the size of the property, with consideration being made for indigent households. An advantage of this method is that it is relatively easy to implement. This method has a benefit over the flat charge method, as it allows some differentiation based on socio-economics of users.

- The property value fee approach relates the wastewater charge to the rateable value of the property. The advantage of this method over the erf-size approach, is that it allows for further differentiation of charges based on consumers' ability to pay.

All analyses and findings of the study have been compiled into a strategy and training guideline for setting wastewater charges. This includes a comprehensive component, which requires multi-year strategy, as well as a rapid component, which allows WSAs to conduct a rapid assessment of benchmarked (against Green Drop compliance) charges.

1.2 PURPOSE OF THE GUIDELINE

This training guideline serves to aid municipalities in setting effective wastewater charges. It begins with a brief background on the status quo, and provides benchmark wastewater charges for a musicality to compare to. During stakeholder consultation a number of recommendations were made facilitate the development of human capacity to cope with the barriers to the implementation of effective wastewater charges by municipalities. In this guide, the key strategic thrusts are divided into intermediate goals to allow municipalities to gradually improve their cost accounting, ring-fencing, asset management, human resources and knowledge of the client base.

The focus of this guide is primarily based on due diligence, cross departmental coordination and long term planning. The interventions developed to address these barriers have been grouped into strategic thrusts with intermediate objectives that are grouped according to a specific time horizon for implementation.

2 A STRATEGY FOR SETTING EFFECTIVE WASTEWATER CHARGES

2.1 INTRODUCTION

The complexity that comes with setting wastewater charges lies in the coordination that is required across multiple departments within a given municipality, to achieve the 3 guiding principles of the Water Services Act (1997) which calls for a) social equity, b) financial sustainability and cost recovery and c) environmental sustainability. These objectives may be unpacked into a subset of pragmatic and strategic thrusts that are listed below. The thrusts listed here line up with the flow chart (Figure 1).

2.2 STRATEGIC THRUSTS

2.2.1 Social Equity

- **Understanding the customer base (*Thrust 1*):** The objective of setting a charge is to recover costs. However, a charge needs to take into account the ability of the customer base to pay for services rendered, and the degree to which that customer base will respond to changes charges over time.

- **Communicating with the customer base (*Thrust 2*):** Involving residents and communities, in addition to industry and business, is a necessary part of the stakeholder consultation process. It is also pertinent that information relating to charges, including motivations for charge increases be effectively communicated.

2.2.2 Environmental Sustainability

- **Ensuring sufficient processing capacity (*Thrust 3*):** The matter of environmental sustainability is a simple one in that plant effluent standards need to conform to the "Water Use License" stipulations. However, the difficulty in this instance is that there are no short term solutions here. Augmenting capacity and financing expansion requires due diligence and a long term perspective.

2.2.3 Financial Sustainability and Cost Recovery

- **Knowing what the expenses are (*Thrusts 4, 5 and 6*):** The concept of ring fencing applies not only to revenue streams for services rendered, but also to the costs generated to provision those services. Understanding what your cost base is, and having that fundamentally connected to the associated revenue streams is a fundamental step towards raising finance for plant refurbishment or augmentation.

- **Managing, maintaining and refurbishing assets (*Thrusts 7 and 8*):** Managing plant and reticulation capacity is a medium to long term factor. Therefore all decisions need to be made in reference to the current and future planned capacity of the wastewater service. The approach for setting an effective wastewater charge is challenging because it requires coordination of activities across multiple municipal departments and because setting an effective charge requires a genuine long term perspective. Fundamentally, a wastewater charge needs to meet two specific requirements; a) the municipality needs to issue a charge that covers all reticulation and treatment costs and b) the charges issued by the municipality need to be paid by the consumers of the wastewater services.

  Thus the principle of financial sustainability and cost recovery is in fact the primary objective of this strategy. No strategy, however good or bad in its social and environmental considerations will be sustained unless all of the necessary costs can be recovered. That being said, this strategy does not side-line the social and environmental objectives, but rather has intrinsically incorporated their consideration into the various, cross departmental objectives listed as “Intermediate Objectives” in the strategic thrusts listed in chapter 2.3. Financial sustainability is thus the foundation for the social and environmental objectives.

2.3 OBJECTIVE SETTING AND TIME FRAMES

Municipalities are hierarchical entities with planning and implementation cycles that, to a large extent, determine the amount of time required to implement an operational strategy. The intermediate objectives outlined in the strategic thrust flow are thus grouped according to the proposed length of time they would plausibly take to implement. The 3 implementation term groups have been selected to reflect the municipal planning and implementation cycles. These 3 implementation terms are outlined here:

Short Term < 12 months

Medium Term 12-36 months

- Municipalities generally plan budget allocations 3 years in advance, in order to project expenditure increases or decreases in specific operational entities. Objetives that are achievable within a 36 month time period, but which require resource alloctions to implement, are grouped into this implementation period.

Long Term 36-54 months

- Long term objectives generally are classified as those objectives which require significant resource allocations as well as lengthy periods of implementation. The length of implementation is deterined either by the significance of the the scale of a specific project (i.e. building a new wastewater treatment plant) or by the dependence on the strategic action on a number of preceding intermediate objectives.

Figure 1: StrategicThrust Flow Chart appears on centre page

STRATEGIC THRUST 1 – KNOW YOUR MARKET

Problem Statement:

Cost recovery is fundamental in ensuring municipalities can provide adequate services. To ensure that wastewater charges are adequate, fair (equitable), transparent and affordable, municipalities require an in depth knowledge of their customer base and market. Information required includes the share between industrial, commercial and residential wastewater and the quantities and quality of each waste stream. While cost recovery is essential, municipalities need to understand the financial situation of its customers to ensure that the charges are affordable. A detailed profile of the market can allow municipalities to optimize the balance between cost recovery and revenue generation considering price sensitivity can be created using progressive charge structures such as inclining block tariffs.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Build a profile of your client base:	- Build a profile of your residential and industrial client base. - Segment the residential profile according to income groups. - Segment the industrial profile according to industry class.	Short Term (< 12 months)
b) Quantify current revenue:	- Quantify the current revenue that the municipality is generating through the provision of wastewater treatment services - Disaggregate the revenue streams associated with piped waste and trucked waste.	Short Term (< 12 months)
c) Disaggregate revenue streams:	- Quantify the revenue stream associated with each segment of the residential client base. - Quantify the revenue stream associated with each segment of the industrial client base. - *Disaggregation should consider:* a. Total amount owed b. Total payments received c. Total payments outstanding	Short Term (< 12 months)
d) Ring-fence wastewater revenue:	- In the context of the water services sector ring fencing refers to instances where the revenue generated from the provision of water services is separated from other revenue streams and reallocated back to water services in order to ensure ongoing service provision. - Ring-fencing is conducted primarily for the protection of consumers of essential services such as electricity and water from financial instability in other departments of the parent entity.	Medium Term (12-36 months)
e) Assess price sensitivity:	- When a tariff change comes into effect, assess the extent to which consumption changes and the degree to which revenue streams shift. - *W.r.t consumption:* Consider the percentage increase in the water consumption charge versus the percentage change in the volume of water consumed for each segment of the residential and industrial client base. - *W.r.t. revenue streams:* Assess the percentage change in revenue generated versus the percentage change in the wastewater charge. - *Revenue assessment should consider:* a. Total amount owed b. Total payments received c. Total payments outstanding	Medium Term (12-36 months)

f) Plan future charge increases:	- Based upon the understanding of price sensitivity, plan future charge increases in relation to both price sensitivity and future revenue requirements.	Medium Term (12-36 months)
g) Implement new wastewater charges	- *See chapter 3.2.3*	Long Term (36-54 months)

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STRATEGIC THRUST FLOW CHART

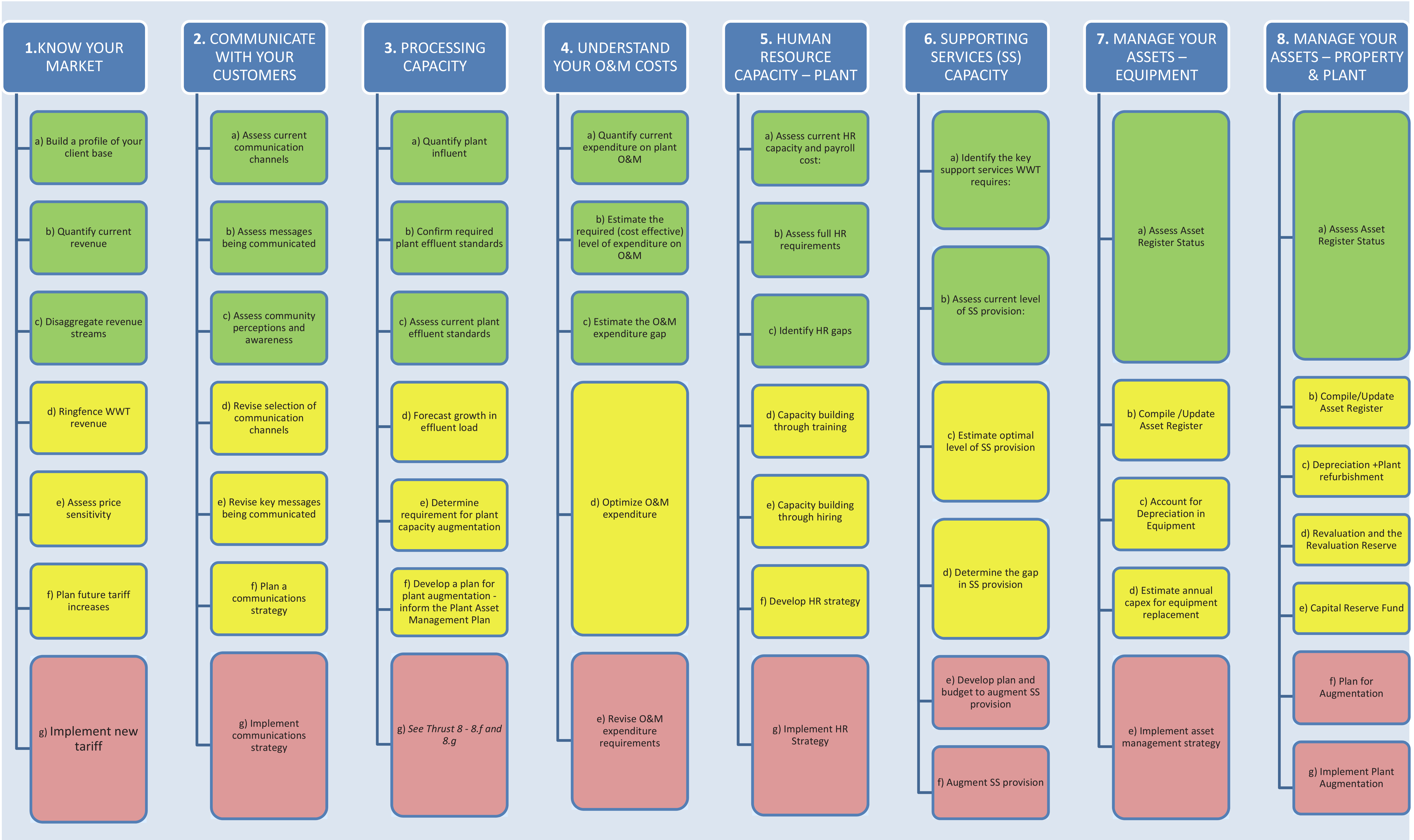

Figure 1: Strategic thrust flow chart – Wastewater Charge Strategy

STRATEGIC THRUST 2 – COMMUNICATE WITH YOUR MARKET

Problem Statement:

Another aspect to cost recovery is the willingness of the customer base to pay, of which customer service underlies. The failure of municipalities to communicate charges or the charge setting process can result in customers perceiving that a municipality is providing poor services, and reduces their willingness to pay. Customers need to be made aware of the charges for the service as well as the charge setting process, to ensure that the process is inclusive and transparent.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Assess current communication channels:	- Identify the current channels through which the municipality is communicating information to its constituency. - Conversely, communication channels might also be set up to receive information of messages from the constituency. - E.g.: Newspaper advertisements, town hall meetings, community newsletters, etc.	Short Term (< 12 months)
b) Assess messages being communicated:	- Identify what kinds of "essential information" and which "general messages" are being communicated to the constituency. - "Information" may be defined those kinds of information that the municipality is legally required to convey to its constituency. - "Key messages" may be messages that the municipality is not legally required to convey, but which may serve a purpose in being disseminated. - E.g. : "Water shortages ", "special events", etc.	Short Term (< 12 months)
c) Assess community perceptions and awareness:	- Through communications channels set up to receive information or messages from the constituency, assess what the communities perceive and are aware of with regards to wastewater services and charges.	Short Term (< 12 months)
d) Revise selection of communication channels:	- Assess the efficacy of the current channels through which the municipality is communicating information to its constituency, and through which the municipality is assessing the perception and awareness of the constituency. - Revise selection of the current channels through which the municipality is communicating information to its constituency, and through which the municipality is assessing the perception and awareness of the constituency.	Medium Term (12-36 months)
e) Revise key messages being communicated:	- Assess the efficacy of the current cluster of essential information and informative messages that are being communicated to the constituency. - Do those messages meet the strategic objectives of the municipality?	Medium Term (12-36 months)
f) Plan a communications strategy:	- Develop a communications strategy that considers: a. The communication channels utilized and their efficacy. b. The cluster of information and messages being communicated, and its relevance. c. The general perception and awareness of the constituency with regards to pertinent issues.	Medium Term (12-36 months)
g) Implement communications strategy	- Over time, the step devised in the medium term objectives need to be revised and updated.	Long Term (36-54 months)

STRATEGIC THRUST 3 – UNDERSTAND YOUR PLANT CAPACITY

Problem Statement:

Plant capacity is a major constraint affecting the costs of wastewater services as well as the ability to treat wastewater to an adequate quality for discharge. Some municipalities do not have information on plant capacities. Furthermore, poor operation and maintenance of WWTWs result in reduced effective capacities. Municipalities need to collect information on influent quantity and quality, their peak flows and seasonality. Measuring the quality of the discharge will also determine how effective a plant is at treating the volumes it processes. These indicators, together with the future demand discussed in the previous chapter, can allow municipalities to determine the required capacity and prioritize investments.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Quantify plant influent:	- Confirm composition and load of plant influent.	Short Term (< 12 months)
b) Confirm required plant effluent standards:	- Confirm the required water quality standards for the plant effluent (The Water Use License stipulates the required quality standards for effluent.)	Short Term (< 12 months)
c) Assess current plant effluent standards:	- Asses if the plant is operating within its designed capacity. - Determine the extent to which the plant is operating within or without its designed capacity.	Short Term (< 12 months)
d) Forecast growth in effluent load:	- Determine what the growth in effluent load will be over the next 5 years (short term), 10 years (medium term) and 20 years (long term)	Medium Term (12-36 months)
e) Determine requirement for plant capacity augmentation:	- Through an assessment of current plant capacity, in relation to current and forecast effluent loads, determine required plant capacity over the short, medium and long terms.	Medium Term (12-36 months)
f) Develop a plan for plant augmentation:	- Determine a set of actions for augmenting plant capacity over the short, medium and long terms. - Augmentation of plant capacity may be achieved through a set of short, medium and long term measures.	Medium Term (12-36 months)
g) Augment Plant Capacity:	- This step need to be incorporated into the asset management strategy for the WWT Plant (*See Thrust 8*)	Long Term (36-54 months)

STRATEGIC THRUST 4 – UNDERSTAND YOUR OPERATION AND MAINTENACE COSTS

Problem Statement:

Operations and maintenance costs can often be much larger than capital expenditure costs, particularly in older plants. Operations and maintenance costs include salaries for staff, administration costs, chemicals (consumables) used in the treatment of wastewater and electricity costs. Increasing electricity costs in particular are a putting severe strain on wastewater budgets. Furthermore, there are many costs associated with operations and maintenance that may not currently be apportioned correctly such as shared services. A detailed understanding of current costs is required before cost drivers of each aspect can be applied to forecast future costs and their impacts on overall wastewater costs and the charges they require.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Quantify current expenditure on plant O&M:	- Expenditure on plant operations and maintenance needs to be understood in detail.	Short Term (< 12 months)
b) Estimate the required (cost effective) level of expenditure on O&M:	- The cost effective level of expenditure refers to expenditure that is balance in the amount being spent and the results achieved for the given level of expenditure. - This estimation should take into account influent load and composition, plant capacity and design, and plant condition.	Short Term (< 12 months)
c) Estimate the O&M expenditure gap:	- Estimate the required increase in O&M expenditure required to bring the plant up to and optimal level of functionality.	Short Term (< 12 months)
d) Optimize O&M expenditure:	- Raise the level of expenditure to the optimal level. - This may be achieved through combination of budgetary reallocation and charge augmentation.	Medium Term (12-36 months)
e) Revise O&M expenditure requirements:	- O&M expenditure requirements are likely to shift over time due to: a. Changes in the prices of inputs b. Changing composition and load of influent c. Changes in plant condition - O&M requirements should be revised annually to account for these changes.	Long Term (36-54 months)

STRATEGIC THRUST 5 – DEVELOP AND IMPLEMENT A HUMAN RESOURCES STRATEGY

Problem Statement:

Human resources are the most important component of the wastewater treatment value chain, however many municipalities do not report on human resources or have human resource strategies. Rural municipalities in particular find it difficult to attract qualified staff.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Assess current HR capacity and payroll cost:	- Compile a dossier of all staff members employed in wastewater services. - Assess the qualification level of the staff members. - Consult the 'Regulations relating to compulsory national standards for process controllers and water services works'	Short Term (< 12 months)
b) Assess full HR requirements:	- Assess the plant staff requirements, paying particular attention to: a. The number staff required and specific roles that needs to be filled. b. The corresponding requirements for qualifications and experience.	Short Term (< 12 months)
c) Identify HR gaps:	- Identify gaps in the HR, paying particular attention to: a. The number staff required and specific roles that needs to be filled. b. The corresponding requirements for qualifications and experience. - Outline the long-term HR requirements for the WWT plant.	Short Term (< 12 months)
d) Capacity building through training:	- Identify opportunities to enhance human resource capacity through training of staff. - Training and development of current staff should be prioritized over hiring. - Assess the cost of training current staff.	Medium Term (12-36 months)
e) Capacity building through hiring:	- Hire additional staff, with suitable qualifications to increase HR capacity in the treatment plant. - Should only be considered if training of current staff is insufficient. - Needs to assess the cost of hiring additional staff members for the plant.	Medium Term (12-36 months)
f) Implement Long term HR strategy	- Over time issues like retention of staff, training, hiring and retrenchment all need to be considered. - The organizational response to staffing considerations needs to be captured in an HR strategy. - HR strategies need to account for local employment, long term development and retention	Long Term (36-54 months)

STRATEGIC THRUST 6 – UNDERSTANDING REQUIREMENTS FOR SUPPORT SERVICES

Problem Statement:

Wastewater services requires support of a wide range of municipal department to operate and effectively. The many supporting roles often include metering, billing, finance and management. Due to the diversity in municipal structures, each municipality needs to quantify the level of support it receives for wastewater treatment from other departments. An estimation of these costs, together with improved accounting can allow municipalities to understand the total costs of wastewater services and account for these in its charges.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Identify the key support services:	- Wastewater services requires support of a wide range of municipal department to operate and forecast effectively. - Construct a detailed register of the all the support services required by wastewater, and list the departments responsible for provisioning those services.	Short Term (< 12 months)
b) Assess current level of SS provision:	- Estimate the quantity of resources (Equipment, Office Space, Consumables, HR, etc.) devoted to providing support services to wastewater services. - Estimate the cost of providing these support services.	Short Term (< 12 months)
c) Estimate optimal level of SS provision:	- Independently assess the quantity of resources that would allow for an optimal, cost-effective level of support services to be provisioned for wastewater services.	Medium Term (12-36 months)
d) Determine the gap in SS provision:	- Estimate the increase in specific resource allocations that would be required to make up the gap between the current and optimal level of support service provision.	Medium Term (12-36 months)
e) Develop plan and budget to augment SS provision:	- Develop a phased-approach plan with corresponding budgetary requirements to augment levels of support services provision. - The time period for the phased approach should be determined by considering: a. The size of the “SS Gap”. b. The municipality’s pool available of funds.	Long Term (36-54 months)
f) Augment SS provision:	- Implement long term strategy to develop and maintain provisioning of sufficient support services to wastewater operations.	Long Term (36-54 months)

STRATEGIC THRUST 7 – DEVELOP AND IMPLEMENT AN ASSET MANAGEMENT STRATEGY

Problem Statement:

The broad definition of asset management refers to any system that monitors and maintains items of value to an entity or group. The term may apply to both tangible assets such buildings and equipment, or it may be applied to intangible concepts such as intellectual property or goodwill. It is the systematic process of deploying, operating, maintaining, upgrading and disposing of assets in a manner that fits with the profit motive of the management entity.

The term is most commonly used in the financial world to describe people and companies that manage investments on behalf of others. It is also a commonly used term in the engineering environments where asset management refers to the management of assets to achieve the greatest return on productive assets such as plants and equipment. In this context the focus shifts to the process of monitoring and maintaining facilities with the intention of providing the best possible service/performance to a given client or set of users.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Assess Asset Register Status	- Assess the current status of the wastewater equipment asset register.	Short Term (< 12 months)
b) Compile/Update Asset Register	- Update the asset register.	Medium Term (12-36 months)
c) Account for Depreciation	- Account for deprecation. - *Depreciation on equipment is an operational expense, see Thrust 3*	Medium Term (12-36 months)
d) Estimate annual capex for equipment replacement	- Determine required annual capex that will be required to offset the deterioration of equipment (i.e. to replace pumps, computers, or any other equipment that will need to be replaced in time).	Medium Term (12-36 months)
e) Implement asset management strategy	- Implement a long term strategy to manage wastewater equipment assets.	Long Term (36-54 months)

STRATEGIC THRUST 8 – DEVELOP A PLAN FOR PROPERTY AND PLANT REFURBISHMENT

Problem Statement:

The broad definition of asset management refers to any system that monitors and maintains items of value to an entity or group. The term may apply to both tangible assets such buildings and equipment, or it may be applied to intangible concepts such as intellectual property or goodwill. It is the systematic process of deploying, operating, maintaining, upgrading and disposing of assets in a manner that fits with the profit motive of the management entity.

The term is most commonly used in the financial world to describe people and companies that manage investments on behalf of others. It is also a commonly used term in the engineering environments where asset management refers to the management of assets to achieve the greatest return on productive assets such as plants and equipment. In this context the focus shifts to the process of monitoring and maintaining facilities with the intention of providing the best possible service/performance to a given client or set of users.

Intermediate Objectives:

Intermediate Objectives:	Detailed Actions:	Timeframe:
a) Assess Asset Register Status	- Assess the current status of the wastewater property and plant asset register. - A useful guide is the 'Municipal government capital asset management guideline' (National Treasury, 2008)	Short Term (< 12 months)
b) Compile and update Asset Register	- Update the asset register.	Medium Term (12-36 months)
c) Account for Depreciation	- Account for depreciation on the plant. - *Plant depreciation is an operational expense, see Thrust 3*	Medium Term (12-36 months)
d) Revalue Plant and Establish Revaluation Reserve	- A WWTW will most likely be in operation for an extended period of time, over which the replacement value of the plant will change. - In order to keep track of the changing value of the plant, which is a significant asset, regular revaluations (+/- every 5 years) need to be conducted. - The revalued value of the plant needs to be reflected in a revaluation reserve on the balance sheet.	Medium Term (12-36 months)
e) Plan for plant refurbishment, upgrades and augmentation.	- Plant refurbishment refers to maintenance that specifically increases the lifespan of the plan. - Plant refurbishment is viewed as a capex that ensures the ongoing existence of the plant in 100% operational condition.	Medium Term (12-36 months)
f) Establish Capital Reserve Fund and/or Secure Financing	- Plant upgrades are a form of capital expense that does not increase the lifespan of the plan, but they do increase the current operation capacity of the plant.	Long Term (36-54 months)
g) Implement plant refurbishment, upgrading ad/or augmentation.	- Plant refurbishments, upgrades and augmentation require funds to carry out. - The purpose of the Capital Reserve Fund is to act as a "savings" fund to allow for these activities to take place at an appointed time in the future.	Long Term (36-54 months)

3 GUIDELINES FOR SETTING WASTEWATER CHARGES

3.1 SETTING A RAPID WASTEWATER CHARGE

The cost of wastewater service provision is dependent on a range of endogenous and exogenous factors. Endogenous factors are under the direct control of the process municipality and can be managed internally. Exogenous cost factors are not under the direct control of the municipality but need to be taken into account nonetheless. Factors that would need to be considered include plant technology employed, the condition of the plant, and life expectancy of the treatment plant, volumes of influent and the required water quality standards for plant effluent. This analysis can be used to assess the appropriateness of current charges, to estimate the replacement cost of wastewater reticulation and treatment systems and its can also be used to as a rapid wastewater charge assessment tool for estimating interim charges in the absence of appropriate cost and asset replacement value data.

3.1.1 Assessing the appropriateness of current wastewater charges

By applying the Benchmark median charge for Opex and Capex (Table 1) to all the WSAs in the country, the likely income required from wastewater charges to achieve a Green Drop score that exceeds 80% for all WSAs can be estimated. The resultant total income earned from this weighted average charge is R13.68 bn per year, which exceeds the current income of R9.54 bn per year reported by the FCM by 43%. This provides strong empirical evidence that the current wastewater charge structure is inadequate and under-recovers on likely actual costs. This likely explains many of the pervasive problems associated with achieving Green Drop certification. Although the addition of grants and subsidies alleviate this problem to some extent, the current charge structure is clearly not sustainable.

3.1.2 Estimating the replacement cost of wastewater reticulation and treatment systems

By applying the Benchmark median charge for Capex to all the WSAs in the country, replacement value of wastewater reticulation and treatment systems for all WSAs can be estimated. At a Capex unit charge of R1.61/kl, and assuming a weighted average depreciation rate of 4.3% per year (as reported by the City of Cape Town's Annual Report) this results in an estimated replacement value of R88.99 billion, which far exceeds the estimate of R28 billion made in the 2009 Green Drop Report (DWS 2010).

3.1.3 Rapid wastewater charge assessment

A rapid wastewater charge assessment allows municipalities to benchmark their wastewater service charge. The results in Table 1 below demonstrates typical benchmark charge estimates for metropolitan municipalities and local municipalities, separately, for different installed treatment capacities. These results form and inform the charge setting guideline.

Table 1 Guideline rapid wastewater charge assessment (R/kl).

Total WSA Treatment Capacity (Ml/day)		5	10	25	50	100	200	500	1000
MM	**Opex**	5.28	5.06	4.78	4.56	4.34	4.12	3.84	3.62
	Opex + Capex	6.89	6.67	6.39	6.17	5.95	5.74	5.45	5.23
NM	**Opex**	5.78	5.56	5.28	5.06	4.84	4.62	4.34	4.12
	Opex + Capex	7.39	7.17	6.89	6.67	6.45	6.24	5.95	5.73

3.2 SETTING A COMPREHENSIVE WASTEWATER CHARGE

Setting a comprehensive wastewater charge proceeds through the following steps:

- Determining the total cost of wastewater services
- Designing the charge to recover costs
- Communicating the charge to the consumers
- Implementing the wastewater charge
- Revise the approach

3.2.1 Determine the Total Cost of Wastewater Services

Determining the total costs of wastewater services is captured in strategic thrust 3 through 8 (see "Strategic Thrusts" chapter 2.3) with costs being apportioned to:

- OPEX: All operational and maintenance costs (strategic thrusts 3, 5 and 6)
- CAPEX: All costs associated with refurbishing or augmenting plant, property and equipment (thrusts 7 and 8)

In other words:

TOTAL COST = CAPEX + OPEX

Where CAPEX is defined as the sum of the per annum costs of plant upgrades (that improve plant efficiency), plant refurbishment (maintenance that increases the useful life of the plant), costs incurred to augment plant capacity, capital expenditure on plant equipment and capital expenditure on equipment required to support wastewater reticulation and treatment.

And where OPEX is defined as the sum of depreciation expenses (depreciation on the reticulation systems, plant, property and equipment), salaries and wages for staff, plant expenses for operational inputs, interest charged on debt and any other operational expenses incurred in the provision of support activities (i.e. finance, communications and billing, etc.).

3.2.2 Design the Tariff to Recover Costs

Specifying a wastewater charge is captured in strategic thrust 1 (see "Strategic Thrusts" chapter 2.3) and is dependent on 1) an understanding of the different income segments of the client base served by the municipality, 2) the volume of waste generated by those income segments (usually estimated through a proxy value such as the volume of water consumed, or the number of toilets within a given residence, etc.) and 3) the price sensitivity or degree of non-payment for each of those segments.
Utilizing these 3 points of reference a charge may be designed to distribute the cost of wastewater treatment in a socially equitable manner across the client base and achieve recovery of costs. In addition, subsidies and donations, from whichever source, can be accounted for such that:

$$\textbf{TOTAL COSTS = TOTAL INCOME}$$

Where:

$$\textbf{TOTAL INCOME = REVENUE + TOTAL SUBSIDIES/DONATIONS}$$

And where REVENUE is a function of the tariff itself such that:

$$\textbf{REVENUE} = \textbf{SEGMENT}_1 * \textbf{TARIFF}_1 + \textbf{SEGMENT}_2 * \textbf{TARIFF}_2 + \ldots \textbf{SEGMENT}_N * \textbf{TARIFF}_N$$

3.2.3 Implement the charge

Implementation of the charges is captured in strategic thrusts 1 and 2 (see "Strategic Thrusts" chapter 2.3) and consists of the 1) that tariff that has been set and 2) communication of the tariff (including feedback and public comment) to the client base.

3.2.4 Revise the approach

The intermediate objectives outlined in the strategic thrusts require diligence and on-going revision. The long term objectives for each of the strategic thrusts is given in the form of a strategy, i.e. a long term commitment to undertaking the short and medium term objectives on an on-going basis. A zero-based budgeting process should be followed so that rather than simply increasing charges in line with previous budgets, the charge increases should reflect actual costs.

3.2.5 Coordinating Activities across departments

The process of coordinating municipal activities across a wide range of departments is one that requires commitment, diligence and leadership. Even with the clear guidance of a strategy, it is unlikely that all of the intermediate objectives will be met through the first round (or indeed even the second or third round) of implementation. But no result is ever perfect, and thus the emphasis of this strategy is on the principle of on-going improvement.

That being said, the short term, medium term and long term objectives of this strategy need to be implemented sequentially, across departments. The short term objectives set the foundation for the medium term objectives, which in turn set the objectives for the long term objectives. In addition, the objectives for each thrust are highly interdependent with the other thrusts. The implication here is that the short term objectives need to be completed across the board, before any of the thrusts may proceed with the medium term objectives. And this reality remains true for the transition from medium to long term objectives.

3.2.6 Technical Considerations

This is an operational strategy which focuses on the coordination of cross departmental activities and the timelines associated with those activities. However, the purpose of this strategy is not to detail the technical steps required to achieve each of the strategic objectives outlined in the strategic thrusts. Key areas of technical knowledge whether they are in chemical engineering, accounting and financing or in business administration (or in any other field) will in each step of the strategy either be 1) within the HR capacities of the given municipality or 2) will have to be externally sourced to fulfil a technical requirement. Examples of technical inputs that may be required include:

1. Costing the augmentation of a WWTW plant or pump station.
2. Designing financing mechanisms to pay for plant augmentation.
3. Determining the required maintenance schedule for a WWTW.
4. Ring fencing wastewater service operations.
5. Etcetera.

3.2.7 Formulae

Total Income	$= TI_n = ISR_n + IFP_n + GS_n + LI_n + DI_n + Surplus/Deficit_{n-1}$
Total Cost	= Capex + Opex
$Capex_n$	$= CMR_n + SU_n + PPA_n + E_n + DS_n + CR_n$
$Opex_n$	$= SW_n + OMR_n + PE_n + OE_n + R_n + WDC_n$
Where:	
TOTAL COST	
$Capex_n$	Total capital expenditure in the current period
$Opex_n$	Total operational expenditure in the current period
$CAPEX_N$	
CMR_n	Capital maintenance and refurbishment
SU_n	System Upgrade Expenses (Capital expense because improve performance/efficiency of plant)
PPA_n	Augmentation of Property or Plant
E_n	Equipment Expense (Purchase of assets that are not of direct material importance to the operation of the plant)
CR_n	Capital Reserve Allocation
$OPEX_N$	
SW_n	Salaries and Wages
OMR_n	Operational maintenance and repairs
PE_n	Plant expenses
OE_n	Other expenses
R_n	Rent
DS_n	Debt servicing (Relates to LI_n)
WDC_n	Waste Discharge Cost
DEP	Depreciation
TOTAL $INCOME_N$	
TI_n	Total Income in the current period
ISR_n	Income from Services Rendered in the current period
IFP_n	Income from Fines and Penalties in the current period
GS_n	Government Subsidies Received in the current period
LI_n	Loan Income in the current period
IIn	Interest income in the current period (Relates to CR_n)
DI_n	Donation Income in the current period
$Surplus/Deficit_{n-1}$	Budgetary surplus or deficit in the previous period

REFERENCES

Bailey, T. 2004. Waste Discharge Charge System: The Implications on Wastewater Quality Management and Monitoring. Proceedings of the 2004 Water Institute of Southern Africa (WISA) Biennial Conference 2 May 2004 ISBN: 1-920-01728-3 Cape Town, South Africa.

Boland, J. J., & Whittington, D. 2000. Increasing Block Tariffs versus Uniform Price with Rebate. Political economy of water pricing reforms, 215.

DWAF. 2005. Water and Sanitation Business: The Roles and Responsibilities of Local Government and related Institutions. The Department of Water Affairs and Forestry.

Eberhard, R. 2005. Administered Prices: Water. National Treasury.

National Treasury. 2004. Asset Management Framework.

National Treasury. 2008. Municipal Government Capital Asset Management Guideline.

National Treasury. 2013. The state of local government finances and financial management as at 30 June 2013.

National Treasury. 2014. Accounting Guideline GRAP 17: Property, Plant and Equipment
Green Drop Score Card 2012/2013. The Department of Water Affairs.

SALGA. 2011. Local Regulation Guideline: How municipalities can enhance local regulation of water services. South African Local Government Association August 2011.

Scheepers, R. and Van der Merwe-Botha, M. 2013. Energy optimization considerations for wastewater treatment plants in South Africa – A realistic perspective. ReSource 15(1):56-58.

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