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GUIDELINES FOR INFRASTRUCTURE ASSET MANAGEMENT IN LOCAL GOVERNMENT 2006 – 2009

ACKNOWLEDGEMENTS

Project Sponsor

Molatelo Montwedi – Executive Manager Municipal Infrastructure, **dplg**

Authors

Louis Boshoff – Assignment Leader (*i* @ Consulting)

Rob Childs (*i* @ Consulting)

Lisa Roberts (Maunsell)

Stakeholder inputs

The participation of a number of stakeholder groups is gratefully acknowledged. The inputs of the following parties in particular deserve notice:

* Cities Network Focus Group on Infrastructure *(Buffalo City Local Municipality, City of Cape Town Metropolitan Municipality,City of Johannesburg Metropolitan Municipality, Ekurhuleni Metropolitan Municipality, Ethekwini Metropolitan Municipality, Msunduzi Local Municipality, Nelson Mandela Metropolitan Municipality, Tshwane Metropolitan Municipality)*

* Members of the Municipal Infrastructure Technical Task Team *(MIT3)*

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* Department of Water Affairs and Forestry *(Fred van Zyl)*

Illustrations, lay-out and design

Chantel Colyn (*i* @ Consulting)

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Any inquiries regarding the publication should be directed to:

Chief Directorate: Municipal Infrastructure

Department of Provincial and Local Government

Private Bag X804

Pretoria

0001

Tel: (012) 334 4995

Fax: (012) 334 0540

FOREWORD

Municipalities are custodians of community infrastructure such as roads, waste disposal sites, water and sanitation systems, and public facilities. As Government, we are committed to extend infrastructure service delivery to all South Africans. To this end we have created the Municipal Infrastructure Grant in 2004 to assist municipalities to complement the capital budgets of municipalities for the provision of infrastructure to the poor communities.

In March 2006, Cabinet approved the National Infrastructure Maintenance Strategy and so reinforced Government's support for the protection of community assets through well considered maintenance and renewal strategies aimed at furthering the objective of sustainable infrastructure services delivery.

Infrastructure is the cornerstone of social upliftment, public health and safety. Infrastructure is essential to achieve the increased levels of economic growth through job creation and the establishment of well serviced areas conducive for economic investment.

Infrastructure assets and community facilities are complex by nature and require robust management practices. Sound knowledge of the location, characteristics, estimated lives, capacity and utilisation, cost characteristics, risk exposure and safety requirements of assets is required to best manage them and make sustainable improvements in service delivery.

We support local government in achieving programmes that promote sustainable quality of life to all citizens. As part of a broader and ongoing support framework, we have developed this guide with inputs from local government practitioners. This guide has been compiled to assist municipal immovable asset managers. In particular, its application will assist in strengthening IDP processes and outcomes, the implementation of generally accepted municipal accounting practices related to immovable assets, improve infrastructure investment planning efforts and other municipal systems related to municipal infrastructure.

The guide draws on internationally accepted best practice, but has a strong South African flavor, given our unique context. The Office of the Accountant General has also been involved in ensuring compliance with local government specific accounting standards, and that sound financial asset management practices are embodied in this Guideline. Thus international best practice is presented in a manner that meets local legislative requirements and addresses local challenges. Case studies of how South African municipalities have successfully implemented asset management practices are provided.

This guide has been prepared specifically to assist small to medium size local municipalities in addressing the infrastructure management challenges that they face. The techniques are as far as possible presented in a format that is easy to understand and apply, supplemented by practical examples. Whilst larger, more capacitated municipalities may wish to apply more advanced techniques and systems, we believe that they will also benefit from the principles, frameworks, processes and techniques described in this guide.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES:

ANNEXURES

DEFINITIONS

The following definitions are used in this document.

Accrual principle: Transactions and events that influence the financial position of an organisation must be recognised when they occur and not when the cash resulting from the transaction or event is received or paid.

Asset: A resource controlled by a municipality as a result of past events and from which future economic benefits or service potential is expected to flow to the municipality. GAMAP/GRAP requires a minimum level of detail that separates items that have a difference in Expected Useful Life and are financially material. As a general guide, the scope of asset can be determined by considering the extent that would be associated with any periodic renewal.

Asset Hierarchy: A framework for segmenting an asset base into appropriate classifications. The asset hierarchy can be based on asset function, asset type, or a combination. GAMAP prescribes certain "categories" of assets (including land, infrastructure, community assets, and other assets – which includes administration buildings and vehicles), and each of these need to be broken down into asset "classes".

Asset Management Team: A multi-disciplinary team appointed by the Municipal Manager to initiate, monitor and review the asset management practices improvement program, the development of Infrastructure Asset Management Plans and a Comprehensive Municipal Infrastructure Plan consistent with the municipality's goals and objectives.

Asset Management: The process of decision-making, planning and control over the acquisition, use, safeguarding and disposal of assets to maximize their service delivery potential and benefits, and to minimize their related risks and costs over their entire life.

Asset Management Information System: A combination of processes, data and software applied to provide outputs required for effective asset management.

Asset Performance: The performance of an asset that is measured in line with the applicable Level of Service.

Asset Register: A record of information on each asset that supports effective financial and technical management of the assets, and meets statutory requirements.

Asset Utilisation: The extent to which an asset is being productively used – typically measured as a percentage of its capacity.

Benefit-Cost Ratio: The sum of the present values of net benefits over a specified period of the asset or facility divided by the sum of the present values of investment costs.

Capital Expenditure (CAPEX): Expenditure used to create new assets or to increase the capacity of existing assets beyond their original design capacity or service potential. CAPEX increases the value of an asset.

Carrying Amount: The amount at which an asset is included in the statement of financial position after deducting any accumulated depreciation and any impairment losses thereon.

Cashflow: The stream of costs and/or benefits over time resulting from a project investment or ownership of an asset.

Community Facilities: Discrete assets that provide a service directly to the community (such as parks, sports facilities, cemeteries, landfill sites etc).

Components: Elements of an asset.

Comprehensive Municipal Infrastructure Plan: A plan that provides a holistic overview of existing service performance, a vision of future performance scenarios, the risks, priorities, funding and tariff implications, as a strategic input to the Integrated Development Planning process.

Critical Assets: Assets for which the consequences of failure are sufficiently severe to justify pro-active inspection, maintenance and renewal. ("Important" Assets also justify pro-active inspection, maintenance and renewal, but not to the same level as "Critical" Assets).

Current Replacement Cost: A measure of replacement value – the cost of replacing an existing asset with a modern asset of equivalent capacity.

Debt Service Ratio: The ratio of interest and redemption payments on long-term loans to total income for the year.

Demand Management: Active intervention to change the pattern of demand for a service e.g. to minimise or eliminate the need to upgrade assets, to address a limitation on bulk supply capacity, or minimise losses.

Depreciation: The wearing out, consumption or other loss of value of an asset whether arising from use, passing of time or obsolescence through technological and market changes. It is accounted for by the allocation of the historical cost (or re-valued amount) of the asset less its residual value over its useful life. GAMAP/GRAP: The systematic allocation of the cost of an asset less its residual volume over its useful life.

Depreciable Amount: The cost of an asset, or another amount that replaces the cost price in the financial statements, less its residual value.

Depreciated Replacement Cost: A measure of current value of an asset, based on its current replacement cost less an allowance for deterioration of condition to date (based on the fraction of Remaining Useful Life/Expected Useful Life).

Discounted Cash Flow: A method that converts cash flows over time to equivalent values at a given point in time.

Discount rate: A rate or factor that relates present and future monetary values.

Disposal: The actions required effectively dispose, decommission, or transfer assets in terms of legal or organisational requirements.

Enhancement: Renewal and/or upgrading of an asset.

Expected Useful Life: The extent of life of an asset over which it can be expected to meet the required performance given its operational environment (including parameters such as climate, soil conditions, topography, utilisation, and operations and maintenance regime), and over which it will be productively used.

Expense: Loss in economic benefits during the accounting period in the form of outflows or depletions of assets or incurrence of liabilities that result in decreases in equity, other than those relating to distributions to equity participants (for example dividends).

Infrastructure Assets: In this document, a broad interpretation of "infrastructure" is adopted – it includes all core assets which are integral to the delivery of municipal services, including water supply, sanitation, road transport and storm-water drainage, solid waste removal, electricity supply, and community facilities. In terms of GAMAP, it includes all immovable Property, Plant and Equipment (PPE), as well as specific immovable assets such as vehicles that are directly used in the delivery of the service (such as waste removal trucks). It excludes intangible assets (such as licenses, software, etc.) and current assets (ones with a life less than 12 months, such as consumables).

Infrastructure Asset Management Plan: A plan developed for the management of Infrastructure Assets with the aim of providing specified levels of service in a cost-effective manner, now and in the future. Multi-disciplinary management techniques (including technical and financial) are combined to determine the aggregated asset life-cycle needs. A significant component of the plan is a long-term cashflow.

Infrastructure Asset Management Policy: A formal statement adopted by Council that indicates the municipality's policy objective, the policy principles, and how these will be pursued (including the establishment of an IAM Team, and aligned systems and planning).

Infrastructure Asset Management Strategy: A document that defines key IAM processes and targets including: the definition of Consumer Groups and Service Catchments; Service Performance Standards and targets that accommodate the municipality's vision of future growth and demand; interaction and coordination measures; AMS functionality and data standards; risk management processes; IAM practice improvement processes; a funding and prioritisation strategy; and allocation of responsibility for implementation. Elements of the IAM Strategy may be addressed initially in the first little iteration of the IAM Plans. A separate IAM Strategy document is likely to benefit large municipalities in terms of alignment and coordination; and for any municipality with advanced AM practice, to foster continuity of approach.

Internal Rate of Return: The discount rate at which the net present value is zero.

Investment Costs: The upfront capital investment costs as well as any subsequent cost to extend the useful life of the asset improve its efficiency or increase its output.

Land: In this document, any reference to "land" is restricted to the land specifically required to accommodate Infrastructure Assets.

Level of Service: The defined parameters that characterise essential service delivery requirements for a particular service, against which performance may be measured. Criteria can relate to availability of the service, quality/condition, quantity, reliability, responsiveness, environmental acceptability and financial implications. Measures are identified for each criterion and used for performance monitoring and reporting and as a departure point for risk management.

Liability: A present obligation of the enterprise arising from past events, the settlement of which is expected to result in an outflow from the enterprise of resources embodying economic benefits or sacrifices of service potential.

Lifecycle: The cycle of activities that an asset goes through – including planning and design, initial acquisition and construction, cycles of operation and maintenance and capital renewal, and finally disposal.

Maintenance: The actions required for an asset to achieve its expected useful life. Maintenance can be planned or unplanned. Planned Maintenance includes measures to prevent known failure modes and can be time or condition-based. Repairs are a form of unplanned maintenance to restore an asset to its previous condition after failure or damage. Expenses on maintenance are considered operational expenditure.

Municipal Administration Buildings: Buildings owned and used by the municipality for general management purposes, and not directly associated with the delivery of a particular service (e.g. municipal offices and council chambers).

Net Asset: A net asset represents the difference between assets and liabilities. Net assets are the amount that is set aside in statutory funds, reserves, other reserves and accumulated surpluses and represents the wealth of the municipality.

Net Benefits: The benefits less costs for a specified period.

Net Present Value: The value of an asset to an organization expressed in current monetary terms. It is calculated as the net amount of discounted cash inflows arising from the use and subsequent disposal of the asset, less the value of discounted cash outflows.

Operating Expenditure (OPEX): Expenditure necessary to provide services such as maintaining roads, providing water and collection of waste. Examples of OPEX include staff costs, administration costs, consumables, maintenance and repairs and feasibility studies.

Operations: The use of manpower and consumables (such as energy, chemicals and materials) required for an asset to operate to the required performance.

Practices Improvement Plan - An action plan to improve the way infrastructure management is practiced in the municipality, based on an assessment of existing and target practice, and focusing on management processes, systems, data, and organisational arrangements. The initial Practices Improvement Plan may be prepared in the form of a Business Plan to be driven on a program basis.

Recoverable amount: The amount the entity expects to recover from the future use of an asset, including residual value on disposal.

Rehabilitation: Works to rebuild or replace parts of an asset to enable it to the original capacity and performance, and materially extend its useful life (which may be a full or partial extension of life – i.e. less than its original expected useful life).

Renewal: The replacement or rehabilitation of an asset. Expenses on renewal works are considered capital expenditure.

Remaining Useful Life: The time remaining until an asset ceases to provide the required standard of performance or economic usefulness.

Replacement: The complete replacement or reconstruction of an asset with one that performs to a similar standard of performance, as a result of which the asset life can be considered to have re-commenced**.**

Residual value: The net amount which the entity expects to obtain for an asset at the end of its useful life after deducting the expected costs of disposal.

Revenue: An increase in economic benefits during an accounting period through an enhancement of an asset or through a decrease in a liability.

Risk Management: The application of a formal process that identifies the exposure of a municipality to service performance risk and determines appropriate responses.

Upgrading: The augmentation or alteration of an asset that results in a material improvement to capacity or performance. Expenses on upgrading works are considered capital expenditure.

ACRONYMS

The following acronyms are used in this document:

AM	Asset Management
AMIS	Asset Management Information System
AMP	Asset Management Plan
AR	Asset Register
ASB	Accounting Standards Board
ASgiSA	Accelerated and Shared Growth Initiative - South Africa
BCR	Benefit-Cost Ratio
CAPEX	Capital Expenditure
CMIP	Comprehensive Municipal Infrastructure Plan
CRC	Current Replacement Cost
DEAT	Department of Environmental Affairs and Tourism
DCF	Discounted Cashflow Analysis
DME	Department of Minerals and Energy
DMP	Disaster Management Plan
dplg	Department of Provincial and Local Government
DOH	Department of Housing
DRC	Depreciated Replacement Cost
DSR	Department of Sports and Recreation
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EUL	Expected Useful Life
GAMAP	Generally Accepted Municipal Accounting Practice
GIAMA	Government-wide Immovable Asset Management Act
GIS	Geographical Information System
GRAP	Generally Recognised Accounting Practice
HR	Human Resources
HV	High Voltage
IAM	Infrastructure Asset Management – also referred to as Asset Management
IAMP	Infrastructure Asset Management Plan
IAMS	Infrastructure Asset Management Strategy
IDP	Integrated Development Plan
IIMM	International Infrastructure Management Manual
IMESA	Institution of Municipal Engineering of Southern Africa

IRR	Internal Rate of Return
km	kilometer
kVA	Kilo Volt-Ampere (1000 Watts)
kw	Kilowatt
MCA	Multi-Criteria Analysis
MFMA	Municipal Finance Management Act
MIG	Municipal Infrastructure Grant
m	Meter
m^3	Cubic Meter
MTEF	Medium Term Expenditure Framework
MV	Medium Voltage
NAMS	National Asset Management Steering Group (New Zealand)
NBR	National Building Regulations
NPV	Net Present Value
No.	Number
ODM	Optimised Decision Making
OHS	Occupational Health and Safety
O&M	Operations and Maintenance
pa	Per Annum / year
PV	Present Value
PMMS	Pavement Maintenance Management System
RDP	Reconstruction and Development Programme
RUL	Remaining Useful Life
SALGA	South African Local Government Association
SANS	South African National Standards
SARTSM	South African Road Traffic Signs Manual
SDBIP	Service Delivery and Budget Implementation Plan
TSM	Technical Services Manager

LIST OF SYMBOLS

&	And
c	Cents
=	Equals
÷	Divided by
>	Greater than
<	Less than
-	Minus
x	Multiplied by
/	or
%	Percentage
+	Plus
±	Plus or minus
R	Rand
^	To the power of

PREFACE

The objective of this document is to support improvement in the strategic management of municipal infrastructure assets. A framework is described that will facilitate the preparation of sector-specific Infrastructure Asset Management Plans (IAMPs) and the aggregation of these into a Comprehensive Municipal Infrastructure Management Plan (CMIP). The processes aim to improve strategic and tactical planning of infrastructure, performance management, risk management, financial management and capacity building, and are aligned with existing statutory municipal processes.

Guidelines are provided on the core principles, methodology and basic techniques that can be adopted in compiling both the IAMPs and CMIPs.

The document draws on the concepts and approach portrayed in the International Infrastructure Management Manual (IIMM). The guidelines are an interpretation of the IIMM for application in South Africa, given the specific legislative, institutional, financial and technical environment, and intend to strengthen baseline competence in the country.

Asset management requires a multidisciplinary approach, drawing on knowledge from disciplines such as the management and social sciences, engineering and accounting. This Guideline has been developed with significant inputs from the Office of the Accountant General. Municipal officials from different disciplines such as engineering, finance and integrated development planning are encouraged to join hands in solving the complex asset management challenges facing local government. The techniques described are appropriate for small local municipalities, though the principles and approach are applicable more widely.

Document Layout

1. Introduction to Infrastructure Asset Management	**Setting the scene:** What are IAMPs & CMIPS ● National challenges ● key AM concepts ● legal framework ● technical & accounting standards ● terminology
2. Strategic Framework for Infrastructure Asset Management	**The conceptual management framework and minimum compliance :** Legislative drivers ● strategic IAM framework ● IAM policy ● purpose of IAMPs & CMIPs ● minimum requirements
3. Getting Started	**How to launch a sustainable IAM programme in a municipality:** Proposed approach & framework ● enabling factors ● Typical AM team structure ● case studies ● critical success factors
4. Infrastructure Asset Management Plan	**Content of plan, how to prepare and minimum requirements:** Approach ● minimum requirements ● document format ● methodology ● selecting the appropriate level of detail
5. Comprehensive Municipal Infrastructure Plan	**Content of plan, linking to IDP process, how to prepare and minimum requirements:** Purpose ● process ● format ● minimum requirements
6. Basic Asset Management Toolkit	**Techniques for AM:** Information & data collection ● asset knowledge ● LOS ● demand risk management ● life-cycle plan ● financial plan ● AM practices improvement plan ● AM plan adoption

It is acknowledged that asset management, both locally and abroad, is an emerging science. This guideline will hence be updated periodically to incorporate practical field lessons and international developments.

The guideline considers the management of infrastructure associated with the provision of the following services:

- Water Supply;
- Sanitation;
- Roads, Street Lighting, and Storm Water Drainage;
- Solid Waste Disposal;
- Electricity Supply; and
- Community Facilities and Administration Buildings.

The guideline contemplates the infrastructure required to support a service, now and into the future - including upgrading, new construction, renewal of old infrastructure, and the operations and maintenance of current and new infrastructure.

The guide will be of interest to:

- municipal management officials in all disciplines (finance, technical, corporate planning, and performance management);
- councillors;
- national and provincial government departments that regulate, fund and capacitate municipalities in infrastructure management; and
- those engaged in capacity support initiatives in municipalities.

1. INTRODUCTION TO INFRASTRUCTURE ASSET MANAGEMEMT

This section of the guideline provides background to the topic of infrastructure asset management, citing challenges being faced by municipalities, and key concepts that need to be pursued. The Comprehensive Municipal Infrastructure Plan (CMIP) is introduced as a means of providing key inputs to the IDP process. A brief overview is given of the legal framework, and technical and accounting standards. Lastly, the readers' attention is drawn to the need to be careful of the interpretation of words when reading and applying this guideline.

1.1 Background

Effective management of municipal infrastructure is central to municipalities providing an acceptable standard of services to the community. Infrastructure impacts on the quality of our living environment and opportunities to prosper.

Not only is there a requirement to be effective, but the manner in which municipalities discharge their responsibilities as public entities is also important. Municipalities must demonstrate good governance and customer care, and the processes adopted must be efficient and sustainable. Councillors and officials are custodians on behalf of the public of infrastructure assets, the replacement value of which even in a small municipality, can amount to several hundred million Rand, and in larger ones, to several billion Rand.

In recent decades, concerns over poor service performance (often only highlighted during high profile failure of infrastructure) and unnecessary loss of asset value (arising from inadequate maintenance and capital renewal) has driven governments across the globe to demand improvements in infrastructure management practice in the public sector. Key themes of the latest generation of legislation introduced in this country relating to municipal infrastructure management include:

- long-term sustainability and risk management;
- service delivery efficiency and improvement;
- performance monitoring and accountability;
- community interaction and transparent processes;
- priority development of minimum basic services for all; and
- the provision financial support from central government in addressing the needs of the poor.

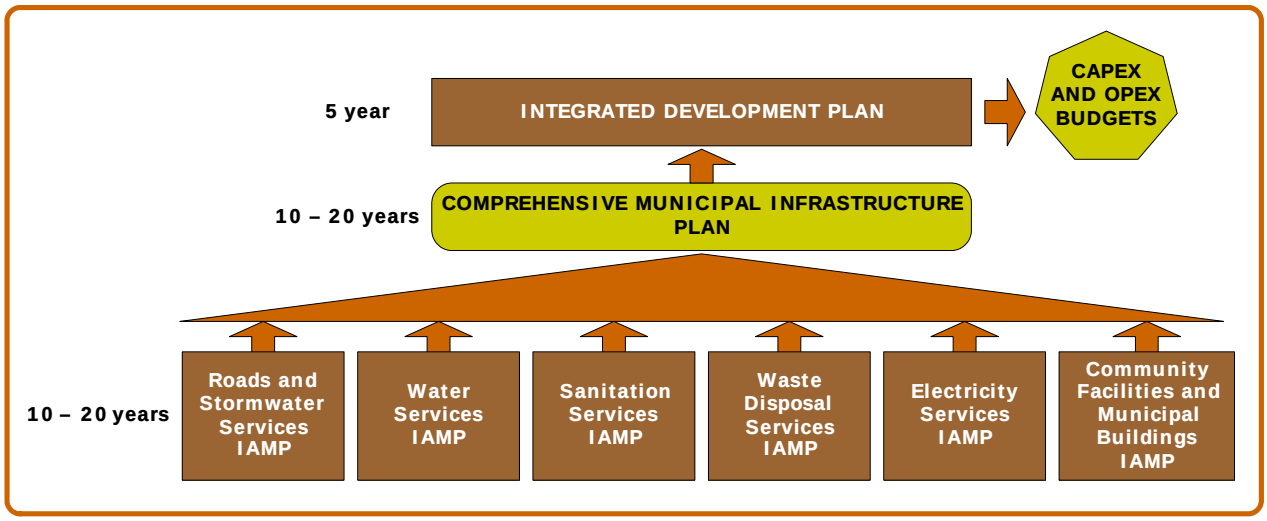
Legislation has also entrenched the Integrated Development Plan (IDP) as the principal strategic planning mechanism for municipalities. However, the IDP cannot be compiled in isolation – for the above objectives to be achieved, the IDP needs to be informed by robust, relevant and holistic information relating to the management of the municipality's infrastructure.

There is a need to direct limited resources to address the most critical needs, to achieve a balance between maintaining and renewing existing infrastructure whilst also addressing backlogs in basic services and facing ongoing changes in demand. Making effective decisions on service delivery priorities requires a team effort, with inputs provided by officials from a number of sections of the municipality, including infrastructure, community services, financial, planning, and corporate services.

In line with international practice, these guidelines propose that an Infrastructure Asset Management Plan (IAMP) is prepared for each sector (such as potable water, roads etc). These plans are used as inputs into the Comprehensive Municipal Infrastructure Plan (CMIP) that presents an integrated plan for the municipality covering all infrastructures.

The CMIP provides a capital works programme (new works, upgrading, and renewals) and operations and maintenance strategies, risks and priorities, required budgets, funding arrangements and tariff implications now and into the future, and how management practice can be improved. Figure 1-1 illustrates how the CMIP provides the infrastructure inputs for the IDP.

Figure 1-1: Comprehensive Municipal Infrastructure Plans



The preparation of these plans will enable municipalities to:

- rank projects and determine budgets based on an holistic view of local needs and priorities;
- assess optimum funding arrangements; and
- demonstrate their ability to effectively manage and maintain infrastructure investments.

Benefits of this approach are:

- better communication;
- better coordination;
- better cooperation;
- better decision-making;
- better performance management; and
- better use of public funds.

1.2 National Challenges

As municipalities pursue the eradication of backlogs in basic services, concerns are emerging over the deterioration of existing infrastructure and the sustainability of the new infrastructure being built. The problem is worst at municipalities where revenues are under pressure due to either large indigent populations, poor debt collection performance, or both.

The IDP establishes a 5 year program of projects using a process that is implementation-orientated and based on stakeholder consultation. One of the main challenges in managing infrastructure is to balance the competing demands for infrastructure construction, operations and maintenance, and renewal within each service, as well as across the various municipal services. For the IDP to be effective in addressing these issues, it needs to be informed by holistic and relevant information with a longer-term vision, say 10 to 20 years. Accordingly, strategic and tactical

planning processes in municipalities need to be strengthened, supported by staged improvements to management practices and organisational capacity that will translate to perceptible improvements to service delivery. These interventions need to be structured to take account of the financial, skills and capacity constraints that exist at many municipalities.

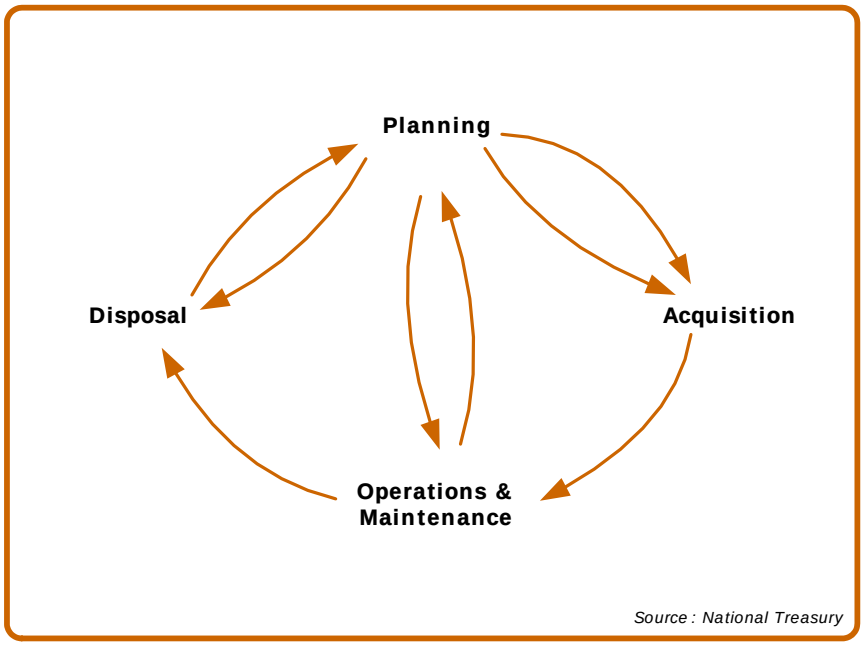
1.3 Key Asset Management Concepts

The leadership of a municipality needs to take some tough decisions on its service delivery priorities, enforcement tactics, and tolerance to risk in shaping its vision. This process will be informed by political objectives, legal compliance, and community consultation. The challenge to officials is to effectively communicate relevant and holistic information to the decision-makers to inform this process. Asset management planning provides a sound framework within which these decisions can take place.

The asset management objective is often stated as "**to provide affordable levels of service that have been agreed with customers in the most cost-effective way for present and future customers**". But what does this really mean - what is asset management? Some people understand asset management (incorrectly) as being just the maintenance of assets. Others say its 'about having strategies for managing our assets throughout their life'. Most people understand that asset management is the link between strategic and operational planning.

Figure 1-2 indicates the life-cycle of a single asset.

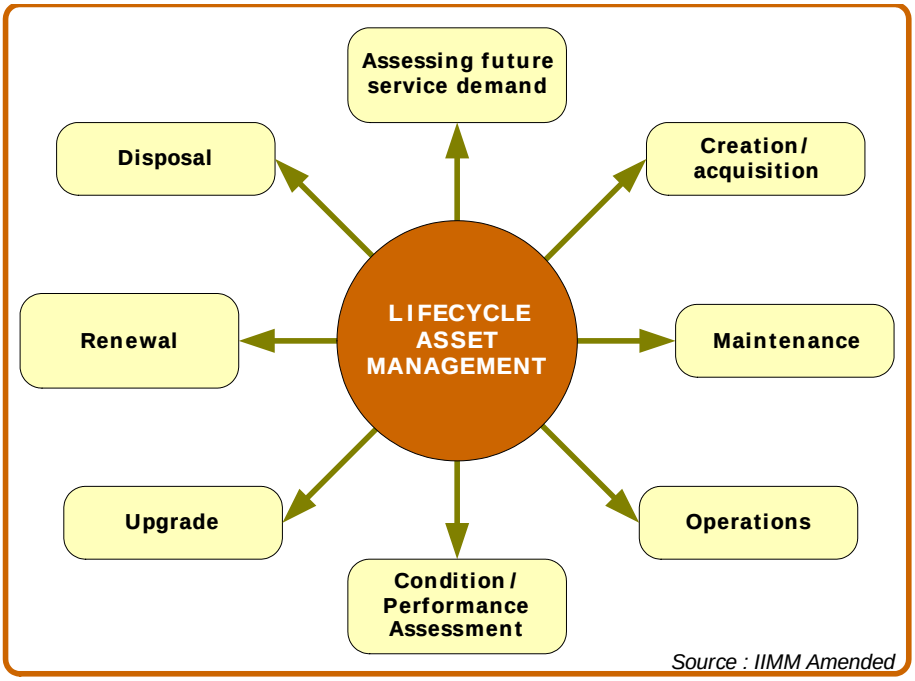
Figure 1-2: Lifecycle of an Asset



In the case of a network, there are a number of assets that are mutually inter-dependent for the provision of a service, and the lifecycle needs of all the existing assets, as well as possible future extensions or upgrades, need to be considered in an integrated fashion.

Figure 1-3 below shows the range of activities encompassed in 'lifecycle asset management'. The asset manager is concerned with planning activities around the asset lifecycle such as forecasting future level of service and demand needs, analysing the gap between current capability of the assets and that needed to meet future demands, and developing a works programme to close that gap.

Figure 1-3: Lifecycle Asset Management (Network of Infrastructure Assets)



If we explore the asset management objective statement further we can draw out some key concepts to enhance our understanding of what asset management planning involves.

"affordable levels of service agreed with customers" implies that **community involvement** in decision making is an important concept in asset management planning. Some asset management definitions replace the term 'levels of service' with 'outcomes'. This suggests that customers need to be involved not only with debating the specific service outcomes required (e.g.: water quality standard) but with the other outcomes associated with providing the service – outcomes on the environment and the broader community. The term "customers" is intended to be inclusive of the community and any stakeholders with an interest in the service.

"in the most cost-effective way" introduces two other key concepts – that of **lifecycle** decision making and **optimal** decision making. **Lifecycle** decision making means:

- That municipalities have strategies for managing assets across the lifecycle, i.e., not constructing them and then ignoring them until they catastrophically fail.
- That the lifecycle strategies take into account critical assets and **risk management**, so that risks are identified and steps are taken to manage these to minimise risk exposure over the asset lifecycle.
- That decisions are made on when to create, replace and upgrade assets considering the lowest lifecycle cost of the asset, not just the cheapest construction cost.

Optimal decision making uses techniques to make decisions about the lowest lifecycle cost solution (as described above) but also takes into account other outcomes associated with that decision – social, cultural and environmental outcomes. Sometimes the lowest lifecycle cost is not always the best – sometimes municipalities may be prepared to pay more to achieve a better environmental or social outcome. Optimal decision making isn't just applied at an asset level; the techniques are also used to **prioritise projects at a sector and cross-sector level**, to ensure the best outcomes for the community for the least expenditure.

"for present and future customers" means that assets need to be managed in a way that the burden of cost does not fall unfairly on one generation. It also means that there must be an understanding that the demand for services will

change over time and brings in the important concepts of **long-term and sustainable infrastructure development and funding.** These are complementary terms to the ones described above – good lifecycle strategies, customer involvement in affordable outcomes, and optimal decision making will ensure that the service can be sustained into the future without adverse outcomes in other areas.

1.4 International Infrastructure Management Manual

The International Infrastructure Management Manual (IIMM) documents good practice in municipal infrastructure management, developed in New Zealand and Australia. In its Strategic Asset Management Advisory Note (1999), the World Bank recognised the management of municipal infrastructure practiced in these countries to be representative of world best practice.

The challenges facing South Africa are not unique - the IIMM was prepared in response to a number of global realities: the vast investment made in infrastructure in municipalities; the traditional focus on creation of new infrastructure rather than long term maintenance and renewal; the major benefits to be gained in living standards, cost efficiency, health and safety, and sustainability by improved practice; and a growing number of well-publicised infrastructure failures.

The manual provides guidance on life-cycle planning, systems, failure mode analysis (e.g. capacity, condition, cost, and service performance), risk management, and prioritisation (amongst others). Version 3 includes inputs from across the globe and was launched in South Africa in 2006 with endorsement by **dplg**, SALGA and IMESA. These guidelines expand on the frameworks and processes in the IIMM to provide specific guidance relevant to South African municipalities.

1.5 Legislative Framework

1.5.1 Constitution

The Constitution indicates the following objectives of local government:

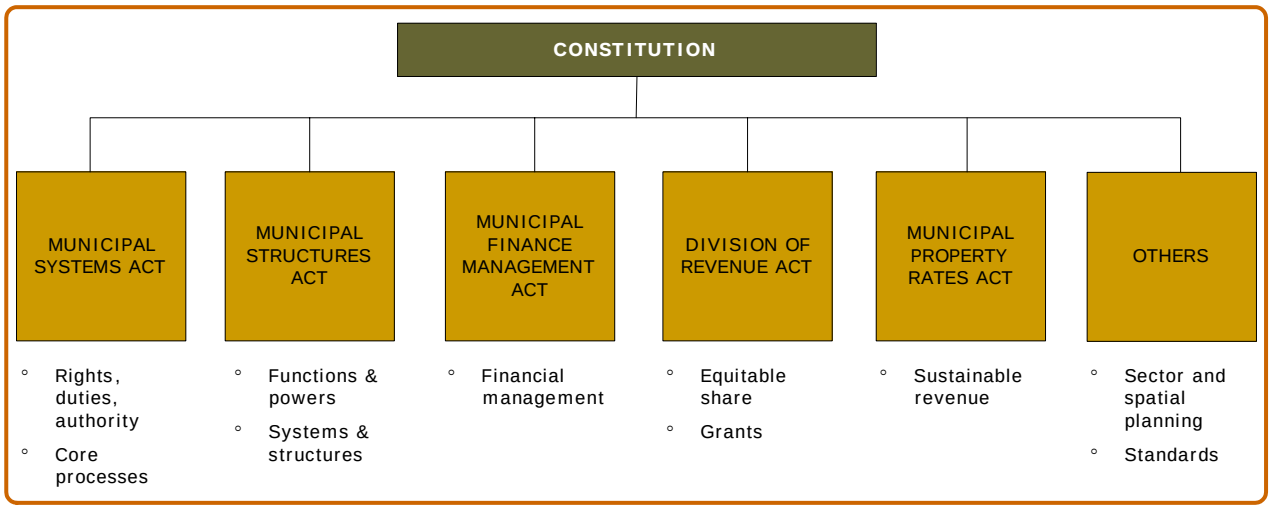
- provide democratic and accountable government for local communities;
- ensure the provision of services to the community in a sustainable manner;
- promote social and economic development;
- promote a safe and healthy environment; and
- encourage the involvement of communities and community organisations in the matters of local government.

The Constitution however cites an important caveat: municipalities should strive for the above objectives within their financial and administrative capacity. This highlights capacitating of municipalities as a fundamental and core need and places responsibility on all spheres of government to promote, monitor and support the building of such capacity.

1.5.2 Over-arching Legislation

Figure 1.4 indicates the suite of local government specific legislation. Municipalities must also comply with sector specific and cross-cutting legislation.

Figure 1-4: Local Government Specific Legislation



1.5.3 Strategic Planning

The Municipal Systems Act establishes the IDP of a municipality is the principal strategic planning instrument that guides and informs all planning and development, and all decisions with regard to the planning, management and development in the municipality. It links, integrates, and coordinates all municipal plans into a single strategic plan for the development of the municipality. It provides a basis for determining the level and extent of municipal resources and capacity required, and for formulating budgets.

Every municipal council has to approve an annual municipal budget that includes provision for capital expenditure on projects over not more than 3 years. In terms of the Municipal Systems Act, the Council must also approve a financial plan linked to an IDP that is prepared for a period of 5 years (an updated annually).

The preparation of an IDP is a legal requirement, and in terms of the Municipal Systems Act, it must include the following:

- the municipal council's long-term development vision;
- the existing level of development, identifying communities that do not have access to basic municipal services;
- the municipal council's development priorities and objectives for its elected term, including its local economic development aims and its internal transformation needs;
- the municipal council's development strategies which must be aligned with any national or provincial sectoral plans and planning requirements binding on the municipality in terms of legislation;
- a spatial development framework which includes the provision of basic guidelines for a land use management system for the municipality;
- the council's operational strategies;
- applicable disaster management plans;
- a financial plan, which must include a budget projection for at least the next three years; and
- the key performance indicators and performance targets.

The Municipal Systems Act (section 78 & 79 processes) deals with infrastructure investment planning in the sense that the cost of ownership must be known and appropriate delivery strategies identified and implemented. **dplg**, which is the custodian of this Act, views the preparation of a CMIP as a key mechanism to achieve this end.

1.5.4 Occupational Health and Safety

The Occupational Health and Safety Act (85 of 1993, Construction Regulations) requires the owner of any "structure" (including municipal infrastructure such as bridges, waterworks, reservoirs, buildings, drainage works and roads) to

maintain such structure in such a manner that "the structure remains safe for continued use and such maintenance records shall be kept and made available to an inspector upon request."

1.5.5 Sector-Specific Legislation

Municipalities must also comply with sector specific legislation, indicated in table 1-1:

Table 1-1: Sector Specific Legislation

Sector	Legislation
Water and Sanitation	Water Services Act, 1997 (Act No. 108 of 1997)
	National Water Act, 1998 (Act No. 108 of 1998)
Electricity	Electricity Act, 1987 (Act No. 41 of 1987)
	Electricity Distribution Industry Restructuring Bill, 2003
Roads and Storm- water	National Land Transport Transition Act, 2000 (Act No. 22 of 2000)
	Urban Transport Act, 1977 (Act No. 78 of 1977)
Waste Management	National Environmental Management Act, 1998 (Act No. 107 of 1998)
	Environment Conservation Act, 1989 (Act No. 73 of 1989)

1.5.6 Asset Management

In recent years, government policy has increasingly focussed on the need to balance the delivery new of infrastructure in the short term, with the need to strive for sustainability. National Treasury has prepared Asset Management Framework for national and provincial spheres of government that largely focuses on movable assets. More recently, the Department of Public Works produced the Government-wide Immovable Asset Management Act (currently a Bill – to be enacted shortly). GIAMA prescribes the need for public entities to prepare Asset Management Plans for immovable assets – though this is focussed on accommodation (building and land).

1.6 Technical Norms and Standards

National norms and standards have been regulated in terms of the Water Services Act for the provision of basic water supply and sanitation services, potable water quality, metering and flow control, and eradication of bucket toilets. DEAT and DSR are preparing norms and standards for refuse removal and sports and recreation facilities respectively. Environmental standards (in terms of the National Environmental Management Act) are being enforced by DEAT through an EIA approval process.

Construction standards and codes of practice have been published (SANS) in line with the National Building Regulations.

In recognition of the substantially different technical circumstances that can apply to planning, design and implementation of municipal infrastructure, a number of technical guidelines have been published in recent years to promote the use of "appropriate technology" that responds to local needs (such as development density, topography, climate, and ground conditions). The Guidelines for Human Settlement Planning and Design (known as the "Red Book") was compiled under the patronage of the Department of Housing as a result of collaboration of several government departments, universities, and the private sector, and is widely used.

Funding agents have adopted guidelines as a basis for the allocation of grants and subsidies (such as MIG, DOH, and DME). The MIG "Guide on Basic Levels of Service" provides broad guidance on norms for the provision of basic infrastructure, as follows:

- there is no national policy that defines the minimum level of service for residential roads, though the MIIF refers to a minimum of an "all weather access to within 500 m of the dwelling";
- streetlights should be provided at a rate of one for every four stands (or high masts for dense settlements);
- solid waste has to be removed at least once a week;
- norms are provided for the provision of community facilities such as health centres, mortuaries, community centres, parks, beaches, cemeteries, crematoriums, fencing, abattoirs, libraries, facilities for animals, street trading or market facilities, and social institutions.

DME funds the provision of electricity infrastructure for about 0.6 kVA per household.

Some municipalities have adopted their own standards, based on local needs, and in some cases consider it appropriate to use their own funds to supplement grant or subsidy allocations, to increase the level of basic service, particularly in urban areas.

1.7 Accounting Standards

There is a transition in the accounting standards that apply to municipalities. In line with international practice, the MFMA requires municipalities to comply with the Standards of Generally Recognised Accounting Practice (GRAP). The Accounting Standards Board has approved a number of Standards of Generally Accepted Municipal Accounting Practice (GAMAP) as an interim solution specifically municipalities until such time that they are replaced with a relevant GRAP standard. The standard that is applicable to Infrastructure Assets (as defined in this document) is GAMAP 17.

The changes represent a shift from an "historic cost" to an "accrual" basis of accounting. Key changes include the recognition of depreciation of assets as an expense, and grants as revenue. A Government Grants Reserve and an External Financing Fund are established as well as a Capital Replacement Reserve (for future acquisition of assets).

The deadline for municipalities to adopt the new standards ranges from the year ended June 2006 to June 2008 (depending on National Treasury's assessment of the capacity of the municipality). National Treasury encourages a pragmatic approach to the transition, but notes the need to balance this with the need to produce accurate financial statements.

Assets will need to be separately identifiable in the Immovable Asset Registers of municipalities in order to be able to depreciate them in terms of the new standards. All their assets will need to be recognised and classified into groups for disclosure in the financial statements, and their "fair value" determined (municipalities are permitted to use a "cost" basis as an interim arrangement). Most municipalities will therefore need to embark on a process to convert existing globular amounts into separate line items, and GAMAP 17 requires this to be done within 3 years of adoption of the new standard. Fair value can be based on market value where this can reasonably be established, such as for land and office buildings, but infrastructure and specialised municipal buildings will usually be assessed using a depreciated replacement cost approach (this concept is explained later in the guideline).

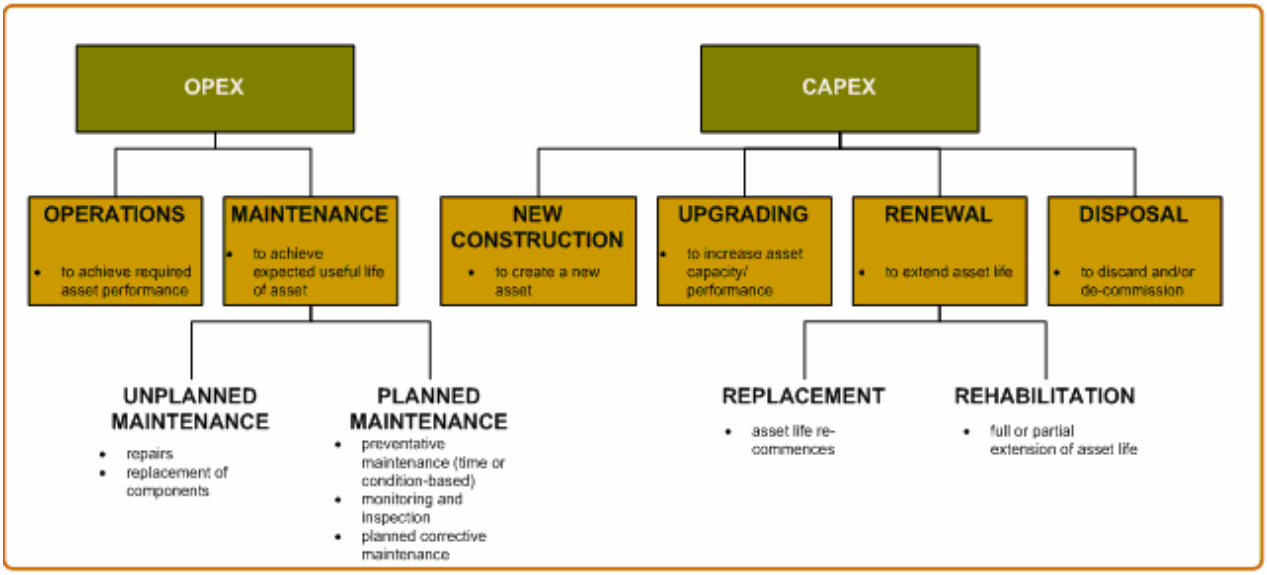
National Treasury indicates that infrastructure assets will need to be re-valued on a regular basis (the Accounting Standards Board suggests every 3 to 5 years).

1.8 Terminology

Words can be interpreted by people in many different ways, even when English is their first language. It is necessary therefore for users of the guideline to acquaint themselves with the definitions adopted for this particular document by referring to the "Definitions" section. The following summarises the intent of some of the key terms used:

Customers	The term is used in this document to refer to ALL persons involved directly or indirectly in the service – it includes the broader community, consumers and stakeholders.
Level of Service	The "level" of service is sometimes characterised by a singular measure of the availability of that service (e.g. KVA of electricity supply, gravel roads and tarred taxi routes, refuse collection frequency etc), and "standards" of service are regarded as additional qualitative measures (e.g. water quality, down time etc). Effectively, both the level and standard of service are performance criteria and should be integrated as an essential part of the municipality's performance management system. In this document, the term "Level of Service" embraces ALL the performance criteria (i.e. both "availability" and "qualitative" aspects).
Infrastructure	The term is used in this document not only to refer to civil and electrical infrastructure, but also community facilities such as sports fields, parks and cemeteries (and refuse removal vehicles – as an essential requirement for the waste disposal service).
Infrastructure Asset Management	This is a strategic planning exercise that assesses the need for the construction of new assets, and upgrading, renewals, operations and maintenance, and disposal of assets over a period of 10 to 20 years.
Renewal and Maintenance	The term "Renewal" is reserved for use only when the expected useful life of an asset is extended (and then it is also considered a capital cost. "Maintenance" is different to Renewal – it is the work that has to be done for an asset to achieve its expected useful life and is an operational expense. Figure 1-5 provides an overview of the terms.

Figure 1-5: Overview of the Definition of IAM Expenditure Categories



2. STRATEGIC FRAMEWORK FOR INFRASTRUCTURE ASSET MANAGEMENT

This section of the guideline describes the organisational framework that needs to be assembled to drive improvement in infrastructure asset management in an effective and sustainable manner.

2.1 Introduction

Section one of this guideline indicates the key benefits that can be derived from adoption of improved infrastructure asset management practice. Certainly the staged introduction of techniques that have been tried and tested internationally has the potential to add tremendous value in a range of management areas, as follows:

- Strategic Planning - by providing improved information into the IDP process on current levels of service, risks and future demand, costed strategic options with tariff implications, and coordinated programs;
- Performance Management – by determining more effective and holistic criteria and measures for service delivery, and applying these consistently to monitoring, reporting, and risk management;
- Risk Management – by introducing a focus on assessing service delivery risk at network and asset level, and identifying appropriate responses;
- Financial Management – by determining budget needs based on defined levels of service now and in the future, assessing long-term affordability to the municipality, identifying tariff implications, and establishing realistic valuation of the infrastructure assets;
- Capacity Building – by crafting prioritised interventions to steadily improve asset management practice.

The approach to implementing the improvements needs to be such that it is manageable for each municipality. The tempo and extent will be dictated by factors such as senior management buy-in, political will, the nature of existing processes, and capacity.

2.2 Legislative Drivers for the Asset Management Framework

The Municipal Systems Act (MSA) clearly indicates that municipalities must strive to ensure that municipal services are provided to local communities in a financially sustainable manner (including the maintenance, repair and replacement of physical assets) (sections 1 and 4 of the Act). This has to be achieved through prudent, economic, efficient and effective use of available resources, within each municipality's financial and administrative capacity. The Act also encourages regular review of its practice to achieve improvement in service quality (section 73 of the Act). The Integrated Development Plan (IDP) is stipulated (in section 35 of the Act) as the "principal strategic planning instrument that guides and informs all decisions with regard to the planning, management and development in the municipality" – however, as noted above, it cannot be effectively prepared in the absence of relevant and holistic information.

The Municipal Finance Management Act (MFMA) encourages sustainable and sound financial management of municipalities. It emphasises the need to allocate resources in line with strategic priorities and to link plans and budgets to achieving the long term goals of the municipality (section 21 of the Act). It highlights the need to maintain assets to the extent necessary (section 78) and to be realistic about future expenditure and revenues (section 21 of the Act). A performance management culture is promoted by advocating a continuous cycle of forecasting, implementation and review, and the introduction of an obligation to prepare and publicly report against a Service Delivery and Budget Implementation Plan (SDBIP) (section 53 of the Act).

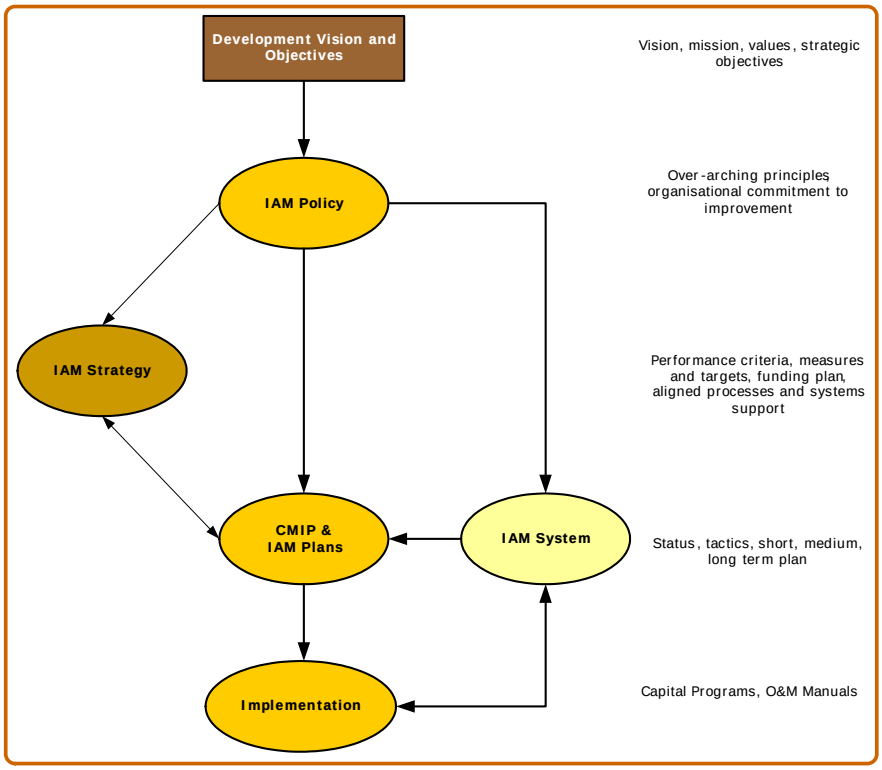
The Municipal Manager is given not only the responsibility to deliver specific outputs that must be consistent with the budget and the SDBIP, but also the authority to run the operations subject to clear statements of procedure approved by Council. This, together with the Municipal Systems Act requirement (section 11 of the Act) for municipalities to exercise their legislative or executive authority by developing and adopting policies, plans, strategies and programmes, provides a compelling argument for municipalities to establish a policy and strategy framework that addresses the financial, technical, risk, and performance management of infrastructure in a coherent fashion.

2.3 Infrastructure Asset Management Framework

These guidelines propose a framework as illustrated in figure 2-1, which includes the following key asset management documents and systems:-

- A policy statement which provides the over-arching principles and organisational objectives for managing the municipality's infrastructure to give effect to its vision.
- An asset management strategy which indicates the processes the organisation will use to put the policy into effect, providing specific criteria, measures and goals (which logically should be aligned with the performance management system of the municipality). The strategy should also indicate the approach to be taken to manage risk, and the municipality's appetite for risk (alternatively this could be addressed in a separate corporate risk management strategy). When commencing with a process of IAM, a municipality may not have sufficient information to prepare a strategy – in this case, a municipality may elect to commence with the preparation and updating of Infrastructure Asset Management Plans until sufficient information is available to prepare a strategy.
- An Infrastructure Asset Management Plan (IAMP) which sets out the sector needs and priorities, levels of service, future demand, capital works and O&M programmes and strategies, and funding plans. This plan will be updated on an annual basis.
- A Comprehensive Municipal Infrastructure Plan (CMIP) which considers cross-sector priorities and issues, and presents a holistic long term plan for the municipality's infrastructure assets. This plan will be updated on an annual basis, and will be integrated with other management strategies and plans, such as Human Resources, Information Systems and Finances.
- The IAM planning process needs to be informed by relevant information on existing infrastructure and future needs, and this will normally be provided by an IAM System. Day-to-day operations (such as the management of capital programs and O&M) would be managed in line with the policy, strategy and plan, guided by operational systems (such as maintenance works).

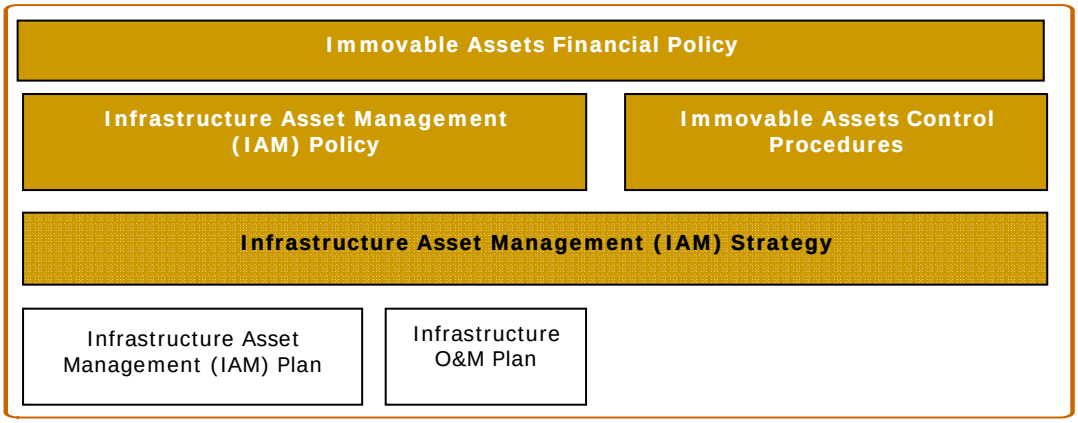
Figure 2-1: Strategic Infrastructure Asset Management Framework



2.4 Infrastructure Asset Management Policy

Most municipalities have an over-arching financial policy to deal with the financial management of both the movable and immovable assets (An Immovable Assets Financial Policy). This can be supported by an Infrastructure Asset Management (IAM) Policy which focuses specifically on the management of infrastructure assets. This focus is justified in view of the critical importance of infrastructure assets to service delivery, their substantial value, and relatively long expected lives. The IAM policies specifies will specify the municipality's policy principles (such as effective governance, sustainable service delivery, social and economic development, custodianship, cost effectiveness and efficiency, and transparency) and indicates how the municipality will give effect to these management principles through such measures as the preparation of IAM Strategies and Plans. An Immovable Asset Control Procedures document would describe the procedures to be adopted in day-to-day management of assets to exercise proper control, safe-guarding, and updating of information in the asset register. The arrangement is summarised in figure 2-2.

Figure 2-2: Policy and Strategic Framework



An example of an IAM Policy is presented below.

CASE STUDY – INFRASTRUCTURE ASSET MANAGEMENT POLICY

Policy Objective

The Municipality is committed to providing municipal services for which the Municipality is responsible, at an appropriate level, and in a transparent, accountable and sustainable manner, according to certain core principles.

Policy Principles

The following policy principles, presented in no particular order, serve as a framework for the achievement of the policy objective stated above.

Effective Governance

The Municipality strives to apply effective governance systems to provide for consistent asset management and maintenance planning in adherence to and compliance with all applicable legislation to ensure that asset management is conducted properly, and municipal services are provided as expected.

To this end, the Municipality will:

- continue to adhere to all constitutional, safety, health, systems, financial and asset-related legislation;
- regularly review and update amendments to the above legislation;
- review and update its current policies and by-laws to ensure compliance with the requirements of prevailing legislation; and
- effectively apply legislation for the benefit of the community.

Sustainable Service Delivery

The Municipality strives to provide to its customers services that are technically, environmentally and financially sustainable. To this end, the Municipality will:

- identify a suite of levels and standards of service that conform with statutory requirements and rules for their application based on long-term affordability to the Municipality;
- identify technical and functional performance criteria and measures, and establish a commensurate monitoring and evaluation system;
- identify current and future demand for services, and demand management strategies;
- set time-based targets for service delivery that reflect the need to newly construct, upgrade, renew, and dispose infrastructure assets, where applicable in line with national targets;
- apply a risk management process to identify service delivery risks at asset level and appropriate responses;
- prepare and adopt a maintenance strategy and plan to support the achievement of the required performance;
- allocate budgets based on long-term financial forecasts that take cognisance of the full life-cycle needs of existing and future infrastructure assets and the risks to achieving the adopted performance targets;
- strive for alignment of the financial statements with the actual service delivery potential of the infrastructure assets; and
- implement its tariff and credit control and debt collection policies to sustain and protect the affordability of services by the community.

Social and Economic Development

The Municipality strives to promote social and economic development in its municipal area by means of delivering municipal services in a manner that meet the needs of the various customer user-groups in the community. To this end, the Municipality will:

- regularly review its understanding of customer needs and expectations through effective consultation processes covering all service areas;
- implement changes to services in response to changing customer needs and expectations where appropriate;

- foster the appropriate use of services through the provision of clear and appropriate information;
- ensure services are managed to deliver the agreed levels and standards; and
- create job opportunities and promote skills development in support of the national EPWP.

Custodianship

The Municipality strives to be a responsible custodian and guardian of the community's assets for current and future generations.

To this end, the Municipality will:

- establish a spatial development framework in consultation with the local municipalities that takes cognisance of the affordability to the municipality of various development scenarios;
- establish appropriate development control measures in consultation with the local municipalities including community information;
- cultivate an attitude of responsible utilisation and maintenance of its assets, in partnership with the community;
- ensure that heritage resources are identified and protected; and
- a long-term view is taken into account in infrastructure asset management decisions.

Transparency

The Municipality strives to manage its infrastructure assets in a manner that is transparent to all its customers, both now and in the future. To this end, the Municipality will:

- develop and maintain a culture of regular consultation with the community with regard to its management of infrastructure in support of service delivery;
- clearly communicate its service delivery plan and actual performance through its Service Delivery and Budget Implementation Plan (SDBIP);
- avail asset management information on a ward basis; and
- continuously develop the skills of councilors and officials to effectively communicate with the community with regard to service levels and standards.

Cost-effectiveness and Efficiency

The Municipality strives to manage its infrastructure assets in an efficient and effective manner. To this end, the Municipality will:

- assess life-cycle options for proposed new infrastructure in line with the Supply Chain Management Policy;
- regularly review the actual extent, nature, utilisation, criticality, performance and condition of infrastructure assets to optimise planning and implementation works;
- assess and implement the most appropriate maintenance of infrastructure assets to achieve the required network performance standards and to achieve the expected useful life of infrastructure assets;
- continue to secure and optimally utilise governmental grants in support of the provision of free basic services;
- implement new and upgrading construction projects to maximise the utilisation of budgeted funds;
- ensure the proper utilisation and maintenance of existing assets;
- establish and implement demand management plans;
- timeously renew infrastructure assets based on capacity, performance, risk exposure, and cost;
- timeously dispose of infrastructure assets that are no longer in use;
- review management and delivery capacity, and procure external support as necessary;
- establish documented processes, systems and data to support effective life-cycle infrastructure asset management;
- strive to establish a staff contingent with the required skills and capacity, and procure external support as necessary; and
- conduct regular and independent assessments to support continuous improvement of infrastructure asset management practice.

Policy Implementation

The Municipality will develop, adopt and periodically review an Infrastructure Asset Management Strategy (IAMS) that will clearly communicate long-term infrastructure asset management performance goals, broad implementation strategies and responsibilities and will be consistent with the infrastructure asset management policy and the Municipality's vision, mission and strategic objectives. To this end, the Municipality will:

- develop and periodically update an Infrastructure Asset Management Plan (IAMP) for each service network that will portray the lifecycle plan to meet the performance goals stated in the IAMS;
- develop and maintain an Infrastructure Asset Register;
- prepare and periodically update a Maintenance Strategy and Plan;
- strive to align strategic asset management processes with the Fixed Asset Financial Policy;
- manage levels and standards of service;
- prepare network development plans;
- build capacity and motivate allocation of sufficient budgets; and
- monitor performance at network and asset level.

Courtesy of Capricorn District Municipality

2.5 Asset Management Strategy

An IAM Strategy addresses issues such as the following, as appropriate to the capacity, functions, and practice of the municipality:

- defines Customer Groups and Service Areas;
- defines criteria and measures for the levels and standards of service for each network
- records existing (baseline) levels and standards of service;
- states a policy on target levels and standards of service based on an assessment of long term affordability to the municipality;
- charts a course for the development of infrastructure in line with the entity's vision;
- defines a process where targets are set each year and reflected in the SDBIP;
- defines a funding strategy;
- defines the project prioritisation and budget allocation process;
- defines key infrastructure management processes and standardized procedures including:
  - ~ the establishment and ongoing maintenance of an Infrastructure Asset Register;
  - ~ the preparation of an IAMP for each network, and the update period; and
  - ~ the preparation of an Operations and Maintenance Plan for each network;
- requires the preparation of an comprehensive municipal infrastructure plan each year to inform the IDP;
- defines coordination measures for infrastructure planning and implementation;
- describes the functionality of a central infrastructure asset management system (AMS), and define data standards;
- indicates the principles of the accounting treatment of infrastructure assets and the linkages of the AMS to the financial system;
- defines the process to be adopted in managing physical risk of networks and the entity's risk appetite;
- commits to a process of continuous improvement of infrastructure management and planning practice and states the methodology to be used; and
- allocates responsibility for infrastructure asset management to specific individuals.

2.6 Infrastructure Asset Management Plans

An Infrastructure Asset Management Plan should:

- document the nature, extent, age, utilisation, condition, performance and value of the infrastructure network;
- identify existing and proposed levels of service to be achieved over the report period (minimum 10 years), as well as the expected changes in demand;
- outline the strategies of how the gap in the levels of service will be met through a combination of demand management (non-asset solutions) and asset lifecycle management tactics (development, renewal, operations and maintenance and any disposal) over the planning period;
- introduce a risk management process;
- assess capital and operational budget needs and funding implications; and
- assess the prevailing infrastructure asset management practice and identify improvements.

The plan should support the development vision of the municipality and facilitate prudent technical and financial decision-making. The plan will also demonstrate to funding agents and other stakeholders the municipality's ability to effectively manage its existing and proposed new infrastructure. The plan draws on available sector plans and the latest IDP, and in turn, should be used to inform updates of these documents. The IAMP should be updated, extended and improved in each subsequent version as part of the municipality's commitment to a service driven culture and the pursuit of continuous improvement.

The first IAMP(s) will typically be based on existing data and information – a main component of which should be derived from the asset register. It is important therefore that when establishing an infrastructure asset register for compliance with the MFMA, that due consideration be given to collecting data that will be required for asset management planning (as detailed in section 6.1). When preparing the first plans, the absence of detailed information must not delay the process – assumptions must be made, and duly noted in the plan. The need for improved data or information would form part of the recommendations on improvements to be made before the next iteration of the plan (and the benefits and cost of obtaining such information assessed).

Section 4 provides further information on the scope and content of an IAMP and the process for developing the plan.

2.7 Comprehensive Municipal Infrastructure Plan

In these guidelines it is proposed that municipalities draw their IAMPs together into one consolidated plan, called the Comprehensive Municipal Infrastructure Management Plan (CMIP). The CMIP will contain summarised key information from the IAMPs and will provide the core infrastructure inputs to the IDP.

There are several reasons for consolidating the IAMPs into one summarised document. Firstly the CMIP will provide a big picture view of the state of infrastructure in the municipality and the key issues and strategic options. It is difficult to make level of service and funding decisions on one sector in isolation from the others – small level of service improvements may seem affordable until they are all added together, and the need for cross subsidisation is able to be effectively considered. The CMIP also provides an opportunity to demonstrate that the municipality is considering the priorities for infrastructure development between sectors as well as within sectors for example the opportunity to review whether limited funds may be better spent upgrading water treatment plants versus building a new library.

Section 5 provides further information on the scope and content of a CMIP and the process for developing the plan.

2.8 Minimum Requirements

The minimum requirements are indicated in Table 2.1.

Table 2-1: Responsibilities of Municipalities

Element	Requirement	Tips
IAM Policy	Council to adopt within 2 years.	• Commit to an implementation approach that is in line with the capacity of the municipality
IAM Strategy	Optional as a separate document.	• Do this once the IAM practices are mature
IAMPs	IAMP for all sectors adopted by Council within 1 year (or IAMP scope covered in sector plan e.g. WSDP). Update each at least every 2 years.	• Try one IAMP first, then expand to other sectors
CMIP	First CMIP adopted by Council within 2 years. CMIPs summarise key information and strategic issues across all sectors (consistent with information indicated in the sector IAMPs). Update annually.	• All the IAMPs need to be completed first, even at a high level • CMIP needs to be brief and in a format that is understandable to non-technical people.

2.9 Summary

The adoption of an IAM policy will reflect organisational buy-in and a commitment to improve this area of the municipality's responsibilities, which is central to service delivery. Whilst it is not necessarily a pre-requisite to implementing improvements, it entrenches the good asset management as an underlying theme of wide range of management activities, and a common focus for technical, financial and planning within the municipality. The formulation of specific strategies may evolve over time as asset management practice matures, or may be useful in larger municipalities to steer a re-alignment of business practices. Guidance is provided on the content of such a policy and strategy, which can be interpreted for application at each municipality. The preparation of Infrastructure Asset Management Plans (IAMPs) for each service must be a key element of giving effect to the policy, and these need to be pulled together into a Comprehensive Municipal Infrastructure Plan (CMIP) to provide important input to the IDP process.

3. GETTING STARTED

This section of the guideline contemplates how to begin to change how infrastructure is managed in the municipality.

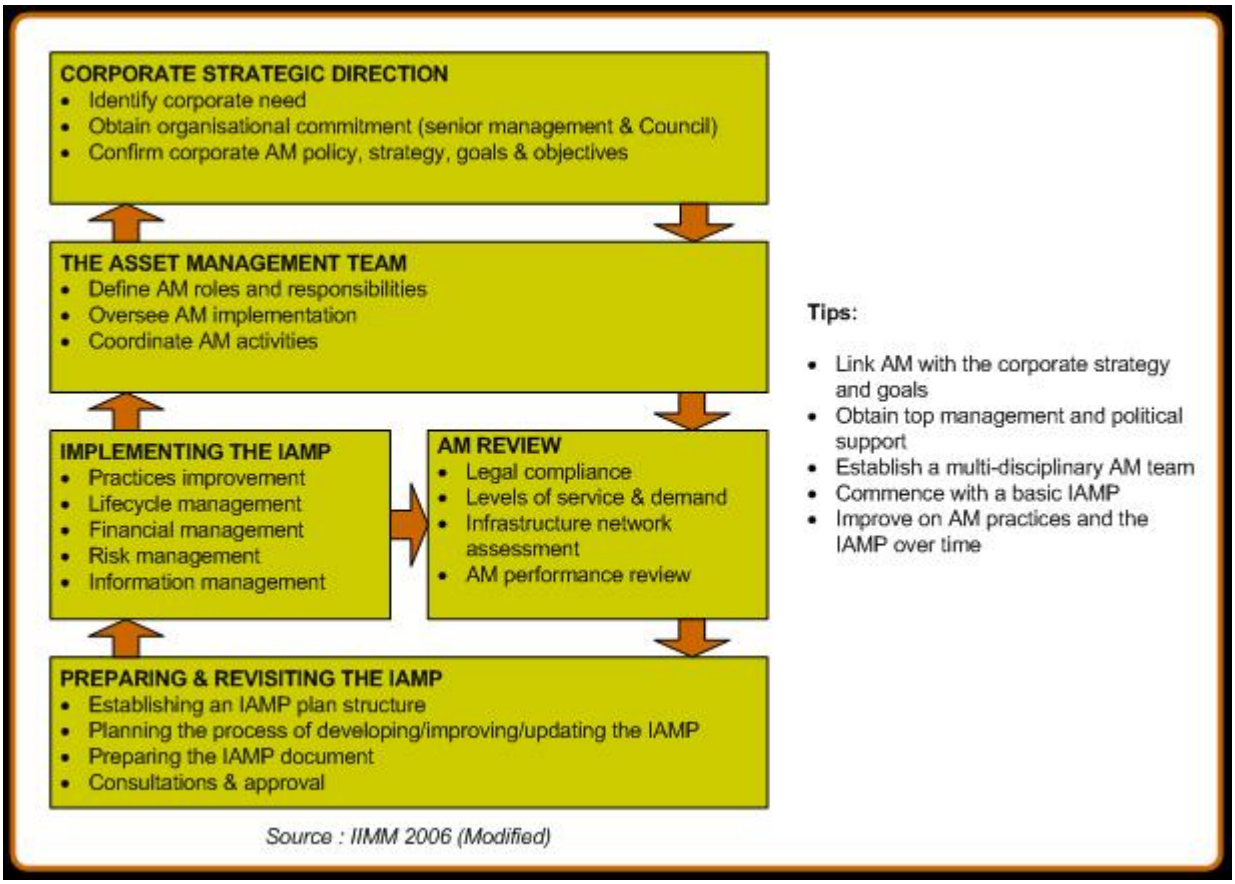
3.1 Approaches to Starting Out

To date municipalities have adopted infrastructure asset management practices for different reasons, some of which include:

- the need to comply with legislation such as the MFMA and GAMAP 17 (asset registers, asset valuation and depreciation);
- responding to qualified audited financial statements;
- reacting to a visible deterioration in the condition of infrastructure and service delivery failures;
- the need for robust planning in response to possible exponential economic growth; or
- the pursuit of excellence in infrastructure management.

Similarly, where a municipality starts with asset management depends on its existing situation and specific local needs. The following figure shows a tried-and-proven approach to a sustainable asset management programme.

Figure 3-1: Getting started with an asset management programme

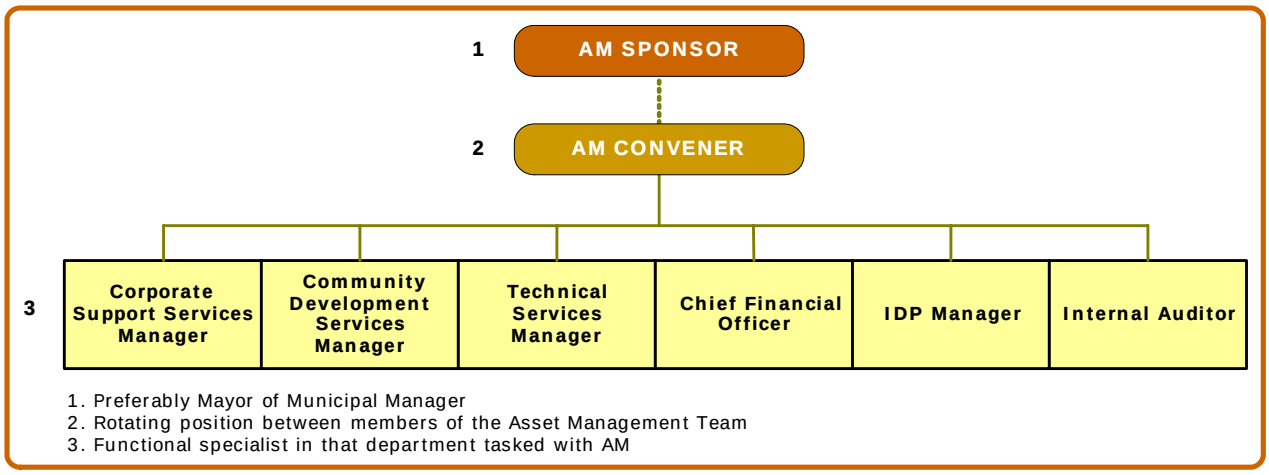


3.2 Setting up the Enablers

As discussed above, there is no one right way to start out, however there are some essential things that must be done early on in the process. The following are essential initial activities:

- securing senior management buy-in (which may require the initial preparation of a scoping document or business plan outlining what is proposed and why – section 1 of this document will provide some useful input here as to legislative drivers and benefits of AM planning);
- establishing an asset management team with representation across the municipality to steer the overall program (a typical team structure is illustrated in figure 3-2 below)
- allocating responsibility for overall coordination and supporting staff with dedicated time allocated for them to carry out this work; and
- awareness-raising and training; training particularly for staff who will be involved in undertaking AM planning and/or providing inputs to the plan.

Figure 3-2: Typical Asset Management Team Structure



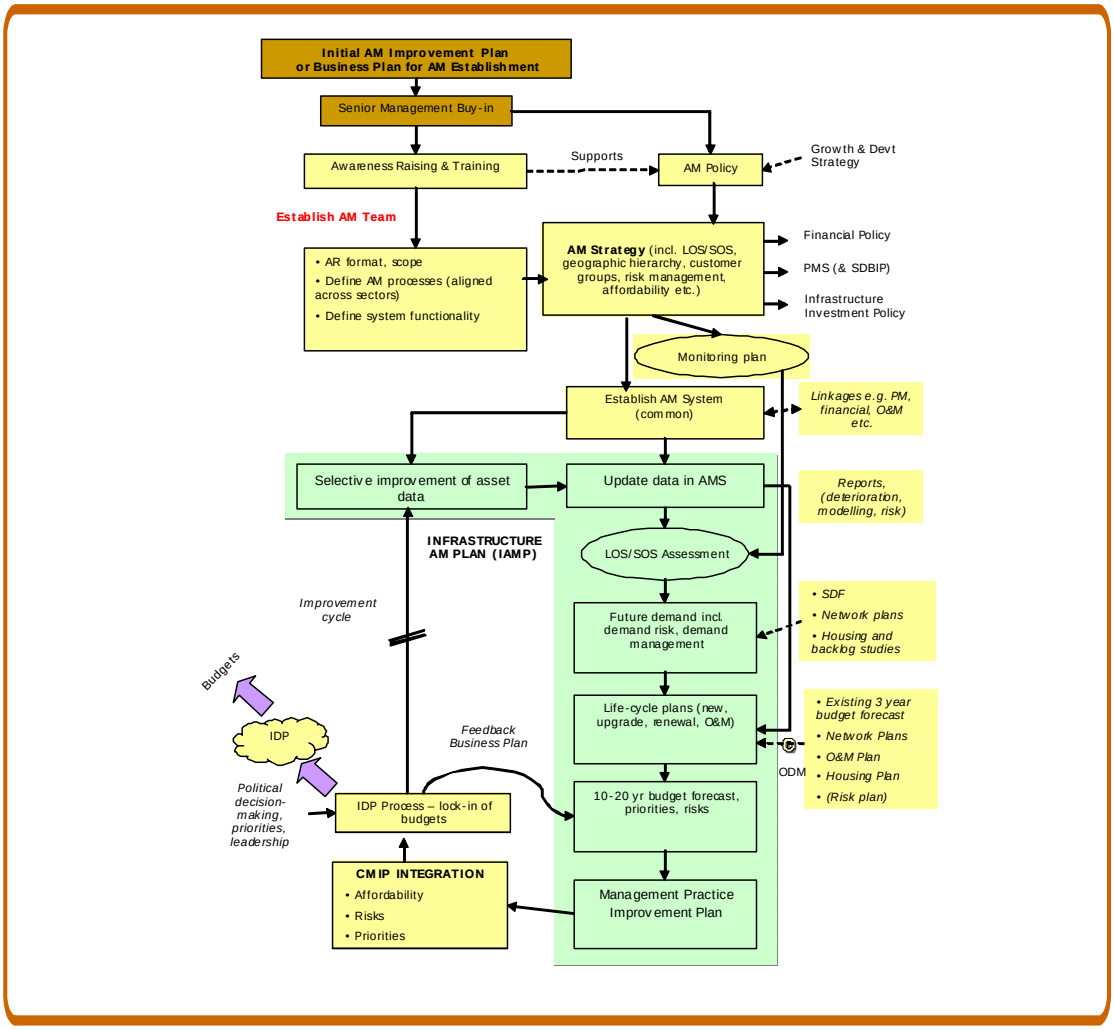
Then the focus should be on the following:

- 'taking stock' of the current situation, available information, existing processes, other planning documents, etc. Some municipalities may find that it is best to simply start with preparing an IAMP in skeleton form, populating it with existing information and known facts (sometimes just from staff) - this process in itself is useful for identifying gaps that need to be filled before a more complete IAMP can be prepared and therefore can be one input into preparing an AM strategy; and
- preparation of the IAM policy and strategy which will give staff some guidance as to the overall AM goals that the municipality wishes to achieve, and the strategy for achieving those goals (refer to section2).

And once there is a clear way forward, the municipality may then consider:

- identifying future data needs and data collection and capture into an Asset Register (being pursued by many municipalities driven by the need for MFMA compliance);
- determination of functional needs for the Asset Management System (AMS) (if this has been agreed as an initial priority) and its establishment, and preparation of a Data Management Plan.
- preparation of the first round of completed Infrastructure Asset Management Plans; and
- preparation of a Business Plan that sets out the whole process, along the lines indicated in figure 3-3, and implementation on a program basis.

Figure 3-3: Example Roadmap for Establishing a Comprehensive IAM System for a Large Municipality

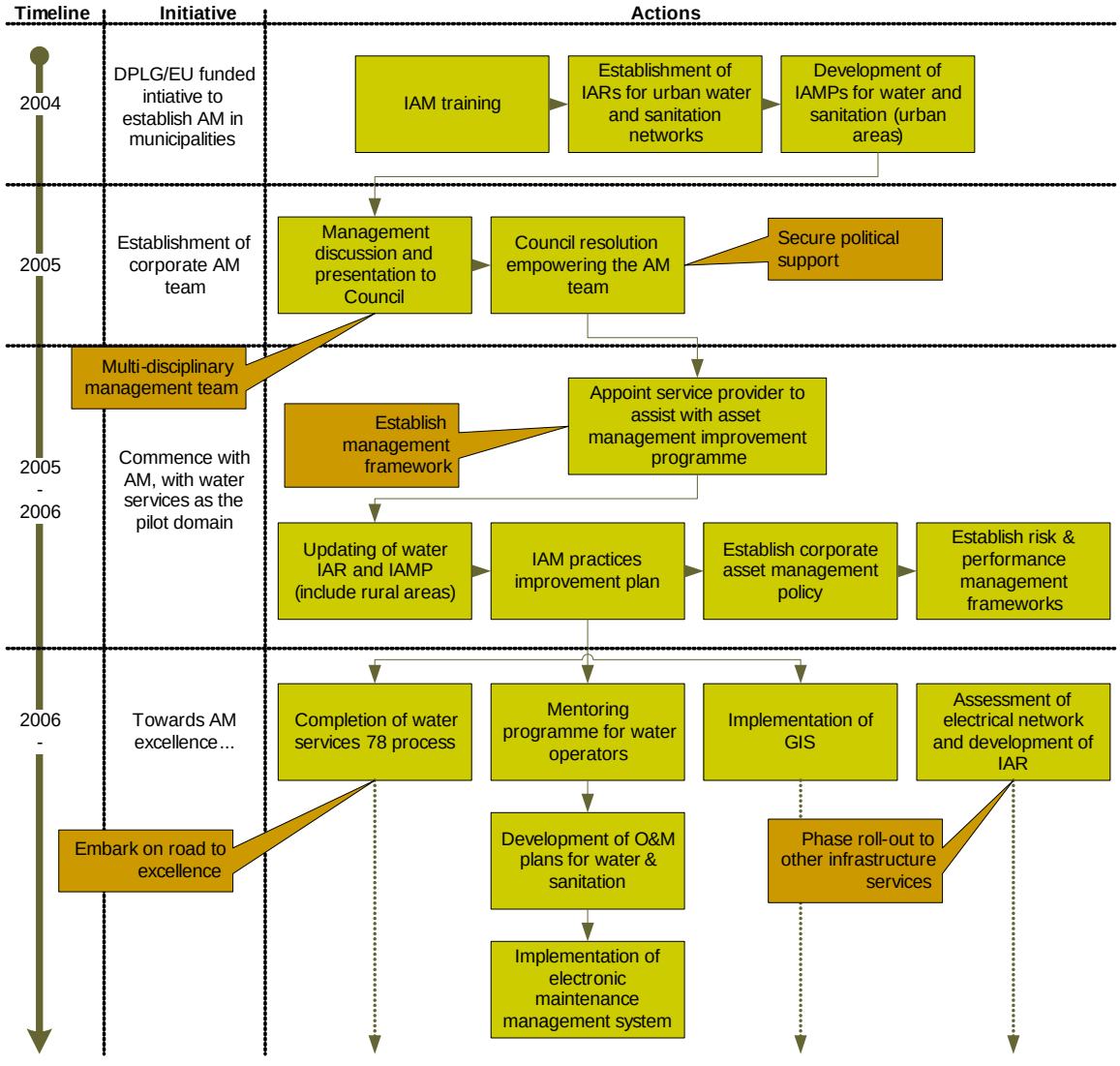


The following is a case study of how asset management has been approached in a municipality in Limpopo.

Figure 3-4: Case study: How the Lephalale Municipality Approached Asset Management

Lephalale is a B3 local municipality situated in the Limpopo Province and has a population of 107,000 people. Excluding farms, the municipality has 4,327 urban and 9,905 rural households. In 2004 the municipality participated in a DPLG/EU funded initiative to establish sound asset management practices in South Africa . The value of asset management was immediately recognized, particularly in light of massive urban expansion required to accommodate of the upgrading of the Matimaba Power Station in 2010 – 2011. The senior management team took joint responsibility for asset management and secured Council support for the establishment of a multidisciplinary asset management team.

The team decided to pilot asset management through water services, but to develop policies, management frameworks and asset registers in such a manner that it could apply to other infrastructure services . The municipality appointed a professional services provider in 2005 to update the water asset management plan and to identify improvements in business practices . In writing the plan, the team recognized the need for a management framework and developed an infrastructure management policy that was approved by Council, and risk and performance frameworks.



3.3 Critical Success Factors

National and overseas experience has shown there are a number of factors that are critical to becoming an effective asset management organisation:

"Critical to success" factors

1. An organisational champion at the highest level (the mayor, municipal manager)
2. A formally adopted IAMP which provides the basis for annual budget revisions
3. Dedicated people managing the AM planning process that do not have a role in day-to-day infrastructure operations. In a very small municipality this may be one person for the entire organisation. In a large municipality each sector may have a dedicated AM planning team next to the operations team.
4. A continuous improvement process which includes a specific improvement programme with allocated resources and timeframes, actively monitored by senior management.
5. A strong change management culture that ensures that processes and data, once developed, become embedded as 'business-as-usual' rather than a one-off compliance exercise to produce an IAMP.

But just as importantly there are some common areas that are known to hinder progress.

"Doomed-to-failure" factors

1. Setting unrealistic goals in the improvement strategy. Experience suggests that municipality need to allocate about 2 to 3 times as much resource (staff time and / or Rand) as their initial estimate of what is required to complete the task.
2. People undertaking the AM planning who do not have the right skills, have other 'jobs' to do, or do not have a strong belief in the value of the work.
3. Collecting too much data early on in the process. Until an organizations has a clear understanding of what it needs there is a risk that significant time and money is wasted capturing data that is not essential to the asset management plann9ing process (further guidance on this is provided in section 6.1).

3.4 Summary

To improve, something has to change. Ultimately, there has to be widespread buy-in and entrenchment of new management processes, some municipalities may elect to achieve this through organisation-wide adjustment of their business processes. In others it may be necessary to pursue a somewhat more organic approach, the essential ingredient being the energy of one or two champions convinced of the merits of the improvements and driving the change from within.

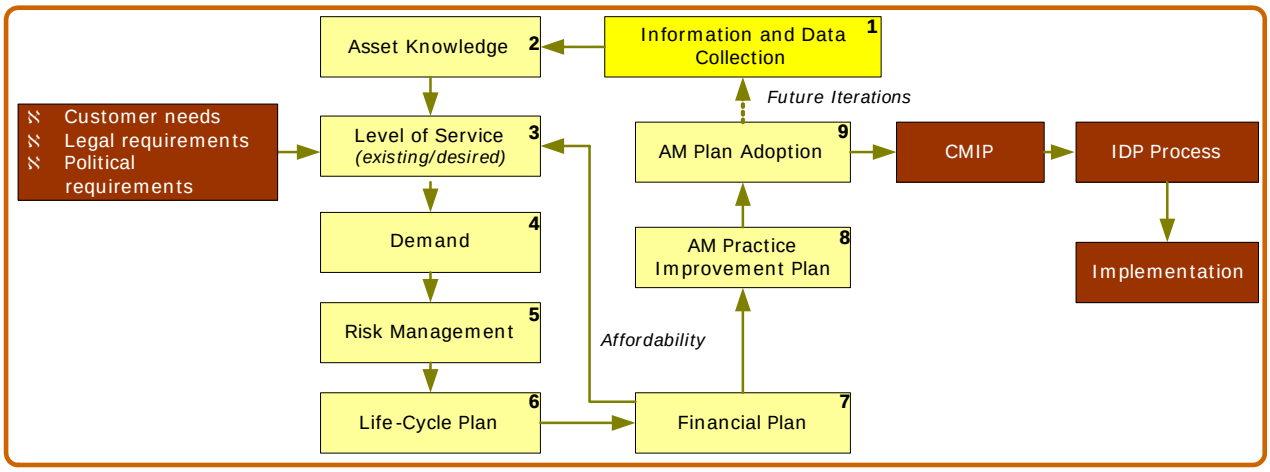
4. INFRASTRUCTURE ASSET MANAGEMENT PLAN

This section of the guideline focuses on the Infrastructure Asset Management Plan (IAMP). It provides a layout of the plan, discusses the level of detail, and sketches an approach to the preparation of the document.

4.1 Approach

Figure 4-1 provides an overview of the process of preparing an IAMP – commencing with initial data collection and using this to establish a picture of the status of the existing infrastructure (such as condition, criticality, value, extent etc), and existing levels of service. Unless the municipality has an IAM Strategy in place, it is likely that target levels of service are not well defined, and the first challenge is often to cement and document this vision (detailed performance criteria and measures can be developed in a subsequent iteration). An analysis of the gap between current and target levels of service identifies the development needs as they stand at the moment.

Figure 4-1: Process for Preparing an Asset Management Plan



The next step is to identify changes in demand for the service over the planning period (which should be a minimum of 10 years) and the impact this has on infrastructure needs - this will be influenced by the outlook of growth, and measures taken to reduce losses and control demand (if any). This followed by contemplating, in a structured way, the things that can go wrong and what can be done to avoid or reduce the risk of such events taking place.

All the preceding steps are then used to identify the gaps and issues that need to be addressed in the IAMP. This will be done through a combination of asset management strategies (new construction, upgrading, renewal, operations and maintenance, and disposal needs) and demand management over the planning period. The MTEF will provide a 3 year forecast of commitments as a starting point which can be reviewed and extended. This will need to be reviewed considering the ability of the municipality to fund the budget needs in a sustainable way and identify the tariff (or other revenue) implications.

Finally the process is wrapped up by assessing the way that infrastructure is managed at present, and determining what are the most appropriate steps to take next in improving asset management practice. Once the plan has been written, it is essential that it is submitted and approved by Council.

4.2 Minimum Requirements

The minimum requirements for IAM Plans are indicated in Table 4-1.

Table 4-1: Minimum Requirements for IAM Plans

Element	Requirement	Tips
Info and Data Collection	Within 2 years - the Asset Register must cover all infrastructure assets and provide data to support effective IAM, financial asset classes must be aligned with an asset hierarchy that is appropriate to local circumstances, and realistic Expected Useful Lives. Revaluation of all infrastructure assets within 3 years, and updated every 3 years thereafter.	• Technical and Financial management staff need to work together to adopt a simple, robust structure • Adopt processes to keep information up-to-date (e.g. add new assets, renew others) • Review systems needs across all sectors • Be sure to check that the input data is in fact reliable • Focus the detail on the more critical infrastructure
Asset Knowledge	Arrangements in place to provide IAM reporting capability within 2 years.	• Can use a simple system linked to the AR
Level of Service	Criteria and measures of levels of service (availability and performance) to be adopted by Council within 2 years, and included in SDBIP. Actual performance to be established within 3 years, and 5 and 10 year targets determined. Include this information in the IDP process.	• Explore possible measures in the first IAMP and refine/confirm in the second • Link Levels of Service to Customer Areas as appropriate • Keep the number of measures manageable • Measures must be easy to implement
Demand	In each IAMP, key drivers of demand are identified and quantified (over 10 years), noting the degree of certainty. Demand management interventions are assessed.	• Input information should be available from other sector reports (not intended to do full technical modeling) • Check the housing plans • Where input data is in conflict or missing, state the assumptions made
Risk Management	IAMPs identify critical and important assets; state the risk management process adopted, and identifies risk responses.	• If there is no corporate framework, use a rudimentary process in first IAMP, and refine. • Use a consistent process across all sectors.
Life-Cycle Plan	IAMPs identify a forecast of budget needs over 10 years of the infrastructure required to support the target Levels of Service (planning, new construction, extensions, upgrading, renewals, O&M, and disposals).	• Can use simple cost modeling • Program renewals with a smooth cash flow requirement • Determine O&M budget needs on the basis of a structured O&M Plan
Financial Plan	IAMPs document the financial status of the municipality, and determine a plan to fund sector infrastructure needs over the 10 year forecast period. State degree of confidence in the budget forecasts.	• Consider funding scenarios based on previous years' budgets, demonstrate implications
Practice Improvement Plan	Structured process adopted for the assessment of current practice and an Improvement Plan adopted in each IAMP.	• Use a process that can be repeated each year to monitor trends • Can use the World Bank hierarchy as a guideline on what to tackle first.

4.3 Document Format

A suggested format for an IAMP is shown in Figure 4-2 below, and is similar to the model proposed in the IIMM. Many variations on the format are possible, however this structure has a good flow from establishing future needs (levels of service and future demand) through to defining the strategies to meet these needs, how much this will cost and how it will be funded. Possible variations on the format could include:

- a separate asset knowledge section after the introduction (instead of being built into the lifecycle section) to help to set the scene at the beginning of the document, and better follow the process flow;
- a separate section on 'environmental management' (particularly relevant for wastewater and stormwater sectors) focusing on strategies for reducing environmental impacts of the activity; and
- building risk management strategies into each section (for example, O&M strategies focused on critical assets, capital works programme derived from the risk register) rather than as a stand-alone section.

Figure 4-2: Format of an IAM Plan

EXECUTIVE SUMMARY

- Summarises the key issues in the plan:
~ Purpose
~ Municipal context
~ Asset description
~ Levels of service
~ Growth
~ Lifecycle Management Plan
~ Financial summary
~ IAM practice

SECTION 1: INTRODUCTION

- Outlines the purpose and scope of plan, socio-economic context, legal framework and the approach adopted in preparing the plan
~ Background
~ Approach
~ Description of the network
~ Statutory framework
~ Relationship with other documents
~ Document format

SECTION 2: LEVELS OF SERVICE

- Identifies current and target level of service and performance measures
~ Targets for provision of basic services
~ Customer expectations
~ Municipality's IAM strategy
~ Current levels and standards of service
~ Gap analysis

SECTION 3: FUTURE DEMAND

- Identifies key factors influencing future demand
- Predicts future changes in demand and degree of certainty
- Considers demand management initiatives
~ Current supply and demand
~ Assessment of future demand
~ Demand management
~ Projected demand
~ Supply ceiling

SECTION 4: RISK MANAGEMENT

- Outlines risk management approach, identifies critical assets, assesses risks and identifies appropriate responses.
~ Risk Management Framework
~ Asset Criticality
~ Network risk exposure

~ Asset and network level risks
~ Risk register
~ Insurance
~ Monitoring and review

SECTION 5: LIFE-CYCLE MANAGEMENT PLAN

- Assesses long-term development, renewal and routine operations and maintenance needs

~ Replacement cost
~ Asset age and condition
~ Asset utilisation
~ Asset criticality
~ Development Plan
~ Renewal [Rehabilitation/Replacement] Plan
~ Operations and Maintenance Plan
~ Disposal plan

SECTION 6: FINANCIAL PLAN

- Identifies long-term financial forecasts and budget/funding issues and assesses risk

~ Financial performance of Municipality
~ Operating activity
~ Projected capital and operational funding requirements
~ Analysis of funding requirements
~ Funding Plan
~ Consequences of under-funding

SECTION 7: ASSET MANAGEMENT PRACTICE

- Describes current IAM practices
- Identifies proposed enhancements

~ Description of current practice
~ Gap analysis
~ Improvement Program
~ IAM Plan adoption, review and monitoring

ANNEXURES

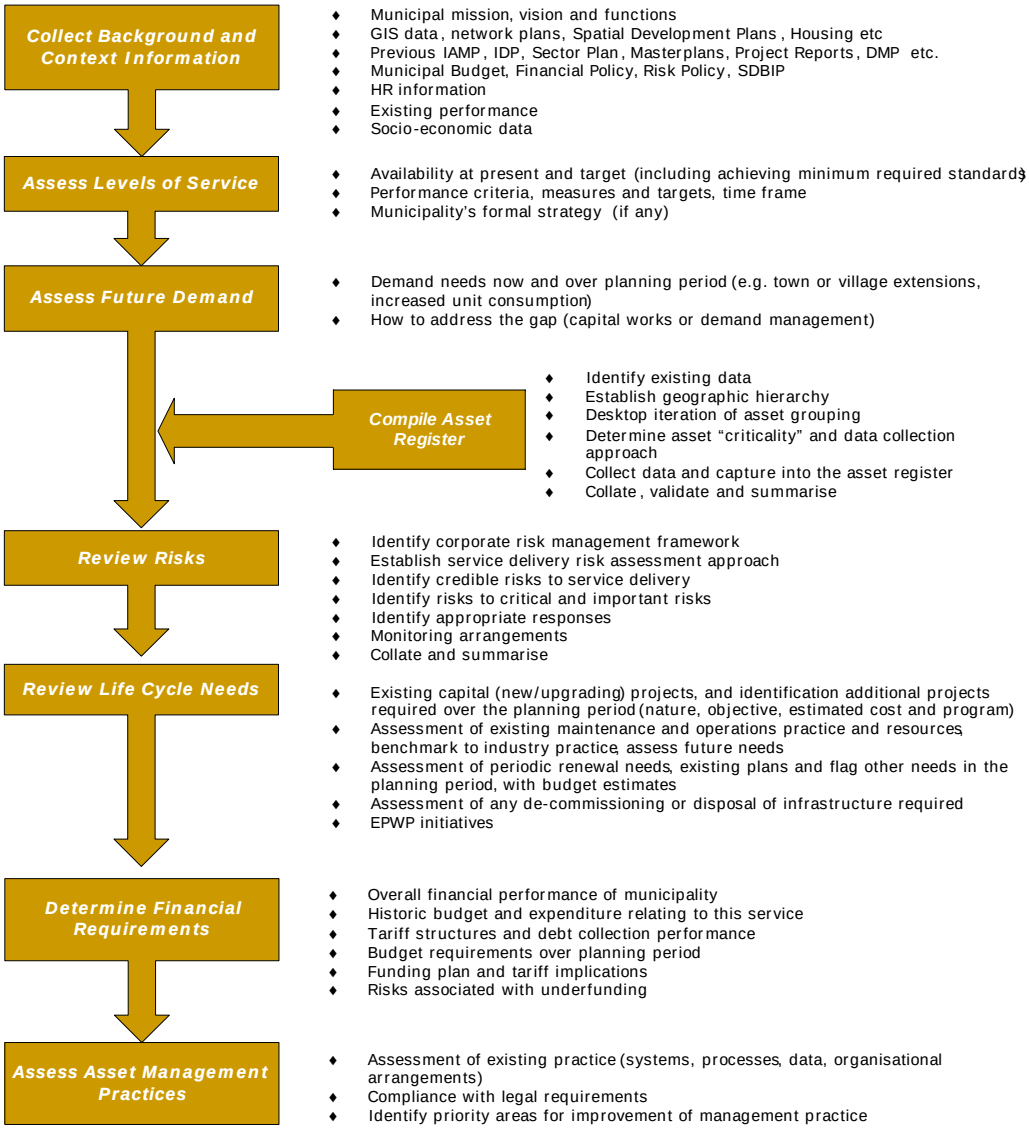
- Maps
- Summary of data
- Practice assessment
- Etc.

4.4 Methodology

The first plan prepared for a service will normally be based on existing available information (though it may logically follow the data collection exercise associated with establishing the asset register). Whilst the level of detail may be limited, the plan should cover all assets, and all the process steps (even if this is using basic techniques and the outputs are qualified with stated assumptions). In writing the first plan, it will become evident which elements of the plan need to be strengthened, and the ongoing iterative process of improvement will have commenced.

The methodology adopted will be largely dictated by the availability of reliable and complete data, information from recent technical reports, and the maturity of the asset management practice. This will influence the duration of the exercise, as will the skills and availability of the officials that undertake the exercise, but could be expected to take 4 to 6 months to complete on average.

Figure 4-3: Example Methodology for Preparation of an initial IAMP



4.5 Selecting the Appropriate Level of Detail

A theme that emerges throughout these guidelines is that asset management planning processes and IAMPs are not 'one-size-fits-all'. Some municipalities may wish to develop their IAMP to an extended level of detail, such that they almost form a procedures document for how asset management planning is undertaken in the organization. Others prefer to keep the document to a higher level and have the details in supporting documents. Either approach can work well.

In overseas countries, the trend has been for the first plans to be very long and full of theory – for two reasons, one is that there is a lack of good practice to write about so the plans talked about what should be done rather than what was being done, the second reason being that the 'audience' was relatively uneducated in asset management planning and needed to have the theoretical background. As time has gone on, IAMPs have tended to become shorter and to the point rather than longer.

Small infrastructure organizations may find the completion of an IAMP to be overwhelming and may find it useful to start with a brief document, perhaps 10 – 12 pages long, which they can then build on over time. Such a document might look like this:

- 1 page: An introduction to the municipality, key issues, strategic objectives/vision.
- 1 page: Asset knowledge – a table showing key asset statistics (e.g.: total lengths, value of each asset type) and a graph of overall network condition).
- 1 page: Levels of service – a summary of how these have been derived (customer feedback, legislative and technical minimums, IDP targets) and a discussion of the key level of service 'gaps'.
- 1 page: Tabulated levels of service – perhaps around 5 key ones showing current and future targets and, if data is available, a graph of the most important one showing how performance has trended over the last few years.
- 1 page: Future demand projections –graph showing population forecasts and demand forecasts by area with a brief overview of key demand influences (e.g.: areas of significant growth, water supply consumption changes such as increasing use of appliances, changing recreational needs).
- 1 page: Demand management strategies (e.g.: using price steps as a demand management tool, promotion of off-peak travel)
- 2 pages: Asset lifecycle strategies –
  - O&M strategies at a high level, e.g.: just a bullet point list of key activities 'we inspect our above ground assets annually', 'we monitor water quality at 10 beaches', 'we update our disaster response plan every 2 years'.
  - List of capital works over the next 10 years, linked to the level of service gaps identified, including new, upgrading works and renewal works.
- 2 pages: Financial forecasts – first page summary of assumptions and second page present summary of financial forecasts.
- 1 page: Asset Management Practice Improvement – broad priorities and programme for improvement.

4.6 Summary

Like the IDP, the preparation of the IAMP is as much about the process as it is the final product. It is important to follow the thought process from start to finish. Even if this is initially in a situation where there is poor quality information, the rigor of the process will point to the main issues and guide the main improvements required. The trick is to be honest about the quality of the input information, and contemplate the impact of that uncertainty on the outputs of the plan (which may be significant in some instances or immaterial in others). This will drive a prioritised process of improvement year-on-year, seeking only the information that is important to good decision-making.

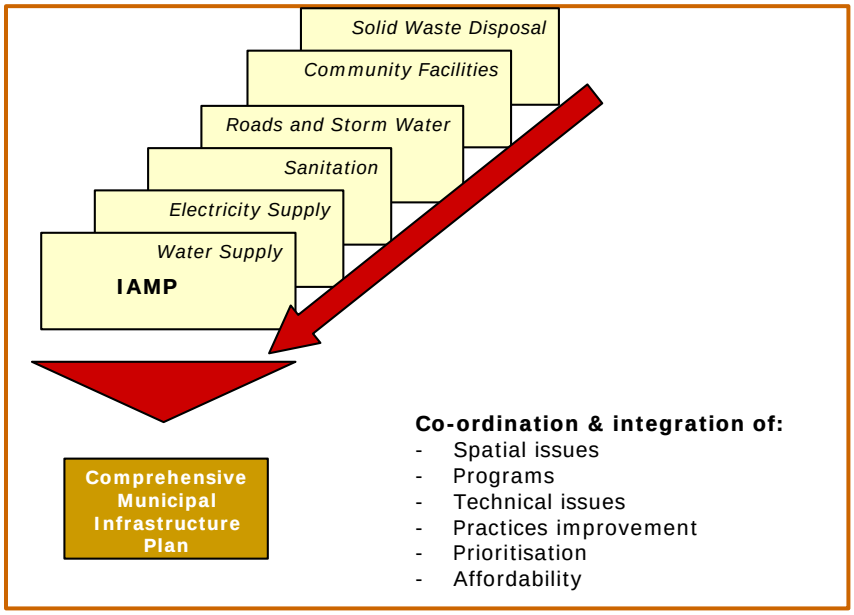
5. COMPREHENSIVE MUNICIPAL INFRASTRUCTURE PLAN (CMIP)

This section of the guideline focuses on the Comprehensive Municipal Infrastructure Plan (CMIP). It indicates how it will draw on information from the IAMPs and provide support to the IDP process. A format and process for the development of a CMIP is described, including minimum requirements.

5.1 The Purpose of CMIP

In these guidelines it is proposed that municipalities draw their IAMP's together into one consolidated plan, called the Comprehensive Municipal Infrastructure Plan (CMIP). Figure 5-1 illustrates the typical number of IAMPs that will feed into the CMIP.

Figure 5-1: Integration of Infrastructure Asset Management Plans

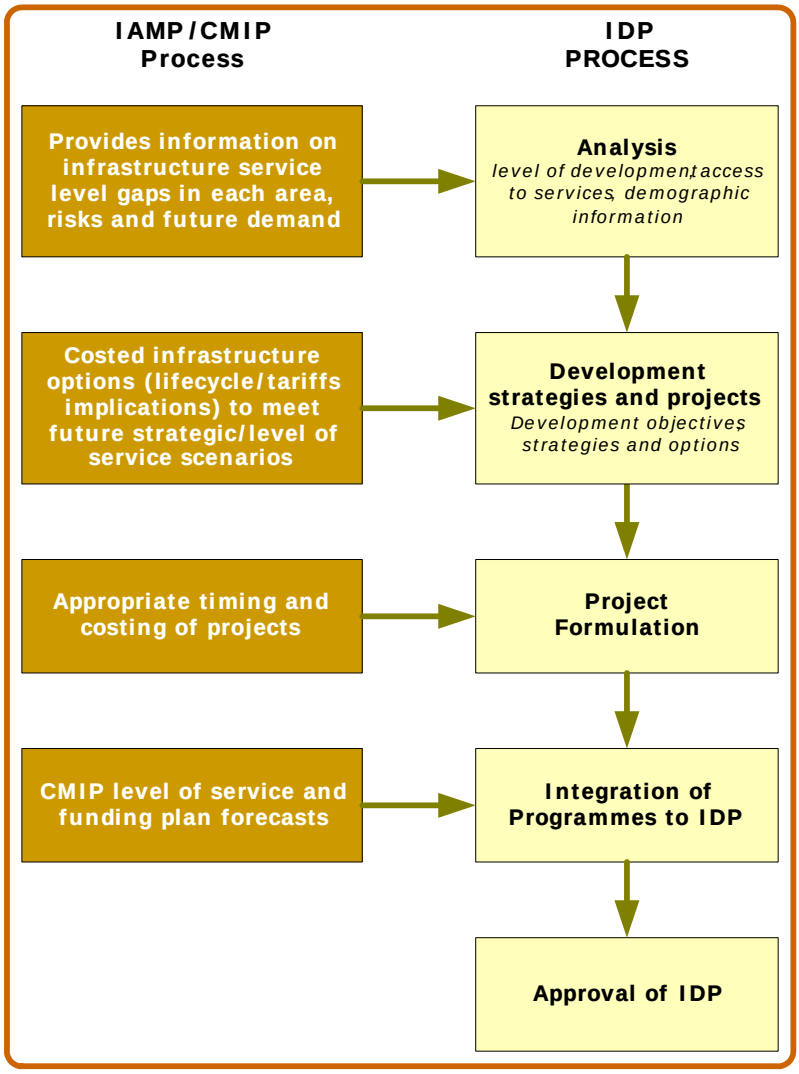


The CMIP will contribute to the municipality's infrastructure management effectiveness in a number of ways:

a. Providing robust infrastructure inputs to the IDP

Legislation has entrenched the Integrated Development Plan (IDP) as the principal strategic planning mechanism for municipalities. However the IDP needs to be informed by robust information relating to the long-term management of the municipality's infrastructure. The CMIP is the document which will provide regulators and other stakeholders with confidence in the infrastructure inputs to the IDP as illustrated in figure 5-2

Figure 5-2: Infrastructure inputs to the IDP



b. Supporting more Informed Decision Making

The CMIP is not intended to be simply a collation of the individual IAMPs into one document. The CMIP should draw out key information and strategic issues from each of the plans and present them in a way that enables decision-makers (including elected representatives and external funding organisations) to make informed decisions. The CMIP will enable these decisions to be made:

- with a clear understanding of the areas of needs and the community wants;
- with consideration of the long term view and understanding of the lifecycle cost implications of investment decisions;
- with an understanding of the level of service implications of budget cuts;
- in a holistic way across sectors, so that trade-offs can be made both within sectors and between sectors;
- transparently, so that the rationale behind decisions is understood; and
- with confidence that proposed investments are sustainable and will achieve the benefits expected.

c. Engaging the Community in Deciding Priorities

While the CMIP itself might not be a suitable document for consultation with the wider community (i.e. beyond the municipal structures such as ward committees) it should contain the information to facilitate that consultation. For example, information relating to the impact of budget cuts on strategic objectives and levels of service. The way in which the CMIP informs the municipality's consultation processes is discussed further in section 6.

d. Communication

The CMIP will have other secondary objectives beyond those described above, for example, fostering communication and understanding of other sector needs within and outside the municipality.

5.2 Process for developing the CMIP

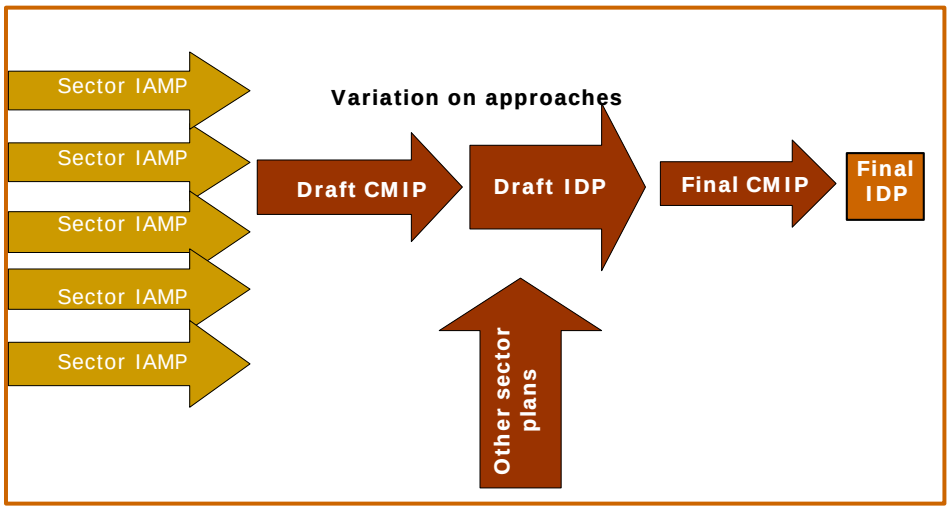
A recommended process for developing the CMIP is shown in table 5-1. The indicative timeframe shown to the left of the table represents a municipality starting from scratch, with no existing mechanisms or structures to develop an AM plan and very little base asset data. The key timelines are described below:

- By the end of year 1, management commitment and resources will be confirmed, an AM policy (and possibly strategy as discussed in section 2) will be developed and a clear project plan for closing the necessary gaps in information and processes will have been derived. A consistent structure and approach for IAMPs across the sectors will facilitate the compilation of the CMIP, and this can be done through the development of a pilot IAMP in the first year.

- By the end of year 2, asset registers will be compiled and the 6 IAMPs completed (as discussed in section 4, it may be useful to develop one first as a pilot and model for the ensuing 5 IAMPs. If so, this should be done during the first year).

- After 2 ½ years the CMIP is in draft form and ready for consultation over options and finalisation. In fact, it is likely that at this stage that the CMIP will feed into the draft IDP process for consultation. Figure 5-3 below illustrates how the CMIP might feed into the draft IDP.

Figure 5-3: CMIP feeding into draft IDP



The approach and timeframe suggested above is for municipalities that want to develop comprehensive IAMPs. However rather than waiting for information to be collected and analysed, municipalities may wish to 'jump in at the deep end' and write a first cut, simple, IAMP based on existing information, knowledge and processes, with a focus on producing lifecycle AMP forecasts and compiling an interim CMIP within 1 year.

Table 5-1: A 3-year process for developing a CMIP

	Activity	Discussion
Start	1. Management commitment to proceed	The timeline indicated here starts after management are committed and resources are assigned to the process (budgets and staff).
6 months	2. Awareness raising/training, AM policy developed and IAM Team convened	The 'Getting started' process is discussed in more detail in section 3.
12 months	3. CMIP structure and process agreed.	The CMIP team should agree a common template for the IAMP and the CMIP which has enough detail to show what information should be included and how it should be presented. For example, what prioritisation frameworks should be applied and the financial forecast templates to be used. An overall CMIP structure is suggested in section 5.3; toolkits for financial forecasts are included in section 6.7.
	4. Information and process gaps identified	As discussed in section 3, this needs to be done early in the process to ensure that budget and time is allocated for information capture and analysis. A detailed 'AM gap analysis' is sometimes used. Another approach is to have a first stab at preparing an AM Plan and identify process and data shortcomings in going through that process.
	5. Project Plan developed	The CMIP needs to be managed as a formal project with budgets, timelines and responsibilities clearly allocated. The IAM Team should get this developed and signed off by senior management.
	6. Resources confirmed	Staff time dedicated to project as outlined in project plan, service providers engaged (if required).
18 months	7. Development of 'front-end' information for CMIP.	Some information in the CMIP will be common to all sectors and is needed for the asset managers to compile IAMPs. Specifically, strategic objectives/vision, spatial development plans, population forecasts, demographic information and any other information relevant to all sectors should be developed and provided to asset managers (the IDP should provide most of this information).
	Collation of asset registers.	This process is discussed in detail in section 6.1.
2 yrs	Development of the IAMPs	This process is described in detail in section 4.
2 ½ years	IAM Team reviews all the IAMPs	A detailed review is carried out to ensure that the IAMPs contain all the information required for the CMIP development.
	IAMPs updated and finalised	To incorporate the gaps in information identified above.
	First cut CMIP collated and reviewed by IAM team.	CMIP team to review the collated results and see if the projected forecasts and strategic scenarios are plausible and fit for submission to elected representatives and the community as a draft proposal.
	Reviews and finalisation of draft CMIP.	There will be a process of grouping each sector's strategic scenario into one (e.g.: 'high development', 'medium' and 'status quo' investment levels. Projects will be ranked according to the optimized decision making approach adopted.
3 years	Community consultation	Consultation over strategic scenarios with councilors, ward committees and the broader community (described in section 6.4).
	Agree outcomes	
	Finalise CMIP	For adoption by the municipality and submission into the IDP process.

5.3 CMIP Format

A suggested format is illustrated in Figure 5-4. Note that the format proposed is for submission as a draft document for debate with councilors and the community. The format will be modified in its final form to present the adopted solutions. The debate over the level of service and budget forecasts presented in the draft CMIP may well occur simply as part of the IDP process, however there is some value in getting councilors to sign off on the CMIP (as a draft) before submitting into the IDP process.

Figure 5-4: Typical Format of CMIP

SUMMARY

- Easy to read summary of strategic issues and options and financial forecasts that can be read as a stand-alone document by a layperson.

ABOUT THE PLAN

- what it contains, how it was developed, fit with other planning documents, how you can be involved in decisions.

SECTION 1: OVERVIEW OF THE MUNICIPALITY

- Strategic vision
- AM policy
- Key statistics – to give a big picture view of the scope and type of community and infrastructure involved (e.g.: population, demographics, infrastructure value and quantity, past expenditure)

SECTION 2: STRATEGIC ISSUES, OPTIONS and PRIORITIES

- national targets for infrastructure development
- strategic issues – gap between current infrastructure development and national targets.
- strategic level of service and budget scenarios
- major proposed projects in order of priority
- (for final plan, should also include a discussion of community feedback on the options and the rationale for the adopted scenario).

SECTION 3: SECTOR SUMMARIES

- For each sector area, provide an infrastructure overview, important sector issues, level of service targets for the preferred option with 2 alternatives proposed, key risk areas and financial forecasts.
- water supply, sanitation, community facilities, solid waste, roads and stormwater, electricity

SECTION 4: CONSOLIDATED FINANCIAL FORECASTS

- cash flow projections
- tariff implications, including cross-subsidisation required
- consolidated loan schedule
- impact on debt-equity ratio

SECTION 5: CONSOLIDATED IMPROVEMENT PLAN

- improvement projects, priorities, timeframes and costs

Further guidance on developing specific sections of the plan is included in section 6.

5.4 Minimum requirements for a CMIP

The following 10 criteria are the minimum requirements for a CMIP:

Table 5-2: Criteria for minimum requirements for a CMIP

Criteria	Minimum Requirements
1. Municipality context	Information on current land use, customer types, population forecasts, spatial forecasts (at least for the first 5 years of the plan).
2. Strategic objectives	Relevant strategic level of service targets set through national or provincial standards or the municipality's strategic vision / mission statement (if the latter exists).
3. Asset Knowledge	Summarised information based on reasonable complete records on: - asset quantities - asset value (to financial standards, GAMAP) - asset age, condition and expected lives (top down assessments) The information should be able to demonstrably link to more detailed information available in IAMPs and supporting asset databases.
4. Levels of Service Targets	For each sector, one level of service supporting each core service criteria, as a minimum, for availability, quality, reliability and responsiveness. Target levels of service for years 1, 5 and 10 (option to include a 20-year target). The rationale behind the adoption of the target levels of service, including how customer input has been considered.
5. Future Demand Needs	Population and demographic forecasts for a 10 year period. Spatial development proposals for a 5 year period.
6. Risk Management	The highest criticality assets and risks and a clear action to address these.
7. Project Decision Making	The approach for prioritisation of projects within sectors and between sectors. A list of major projects for the municipality in priority order.
8. Financial Forecasts	For a minimum of 10 years, summarised for each sector but with a demonstrable link to detailed budgeting carried out for the IAMP. The financial forecasts must include funding for all works and strategies proposed in the IAMP. The underlying assumptions and the confidence in the accuracy of each key area of expenditure should be stated. Cash flow projections, tariff implications (including cross-subsidisation required) and a consolidated loan schedule must be provided, as well as an indication of the impact on debt-equity ratio.
9. AM Policies	Policy statements for each AM activity area (valuations, consultation, decision making, growth/demand management)
10.Improvement Programme	A consolidated 5-year programme of management improvement projects for all sectors with resources, timeframes and expected benefits described for each project. The financial forecasts should show where funding has been allocated for these projects.

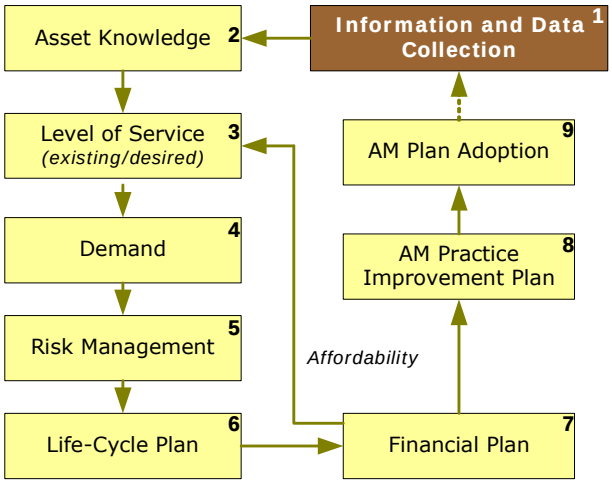
5.5 Summary

The municipality has one budget that needs to address a wide range of competing needs. The objective of the CMIP is to communicate to decision-makers all relevant information relating to infrastructure in one brief document. It is based on an aggregation of the holistic and long-term needs of each sector, as identified in the IAMPs, as well as an analysis of common themes, issues of alignment and priority.

6. BASIC ASSET MANAGEMENT TOOLKIT

This section of the guideline provides guidance on how to tackle each step in assembling an IAMP. As noted previously, the guideline is substantially focussed on guiding small municipalities to achieve a foundation of appropriate practice. Such municipalities may not initially implement all the techniques indicated in this section, but they should strive to do so within their capacity constraints, and pursue this goal in the practices improvement plan. Some municipalities may elect to pursue more advanced techniques according to their needs, and perhaps in very specific areas (such as optimised treatment of road maintenance and renewals through the use of a PMMS).

6.1 Information and Data Collection



An essential starting point for the preparation of an IAM Plan is to identify existing available information and assess its relevance, accuracy and "fit" with other information. Naturally, maximum use should be made of existing information, but there also needs to be a reality check on its validity. Any shortfall in information needs to be noted, and where necessary, reasonable assumptions made (and qualified in the IAM Plan) – it is not the intention to replicate or prepare technical reports as part of the IAM Plan preparation. Table 6-1 indicates potential sources of relevant information to contribute to the preparation of an IAM Plan.

Table 6-1: Potential source documents used in for preparing an IAM Plan

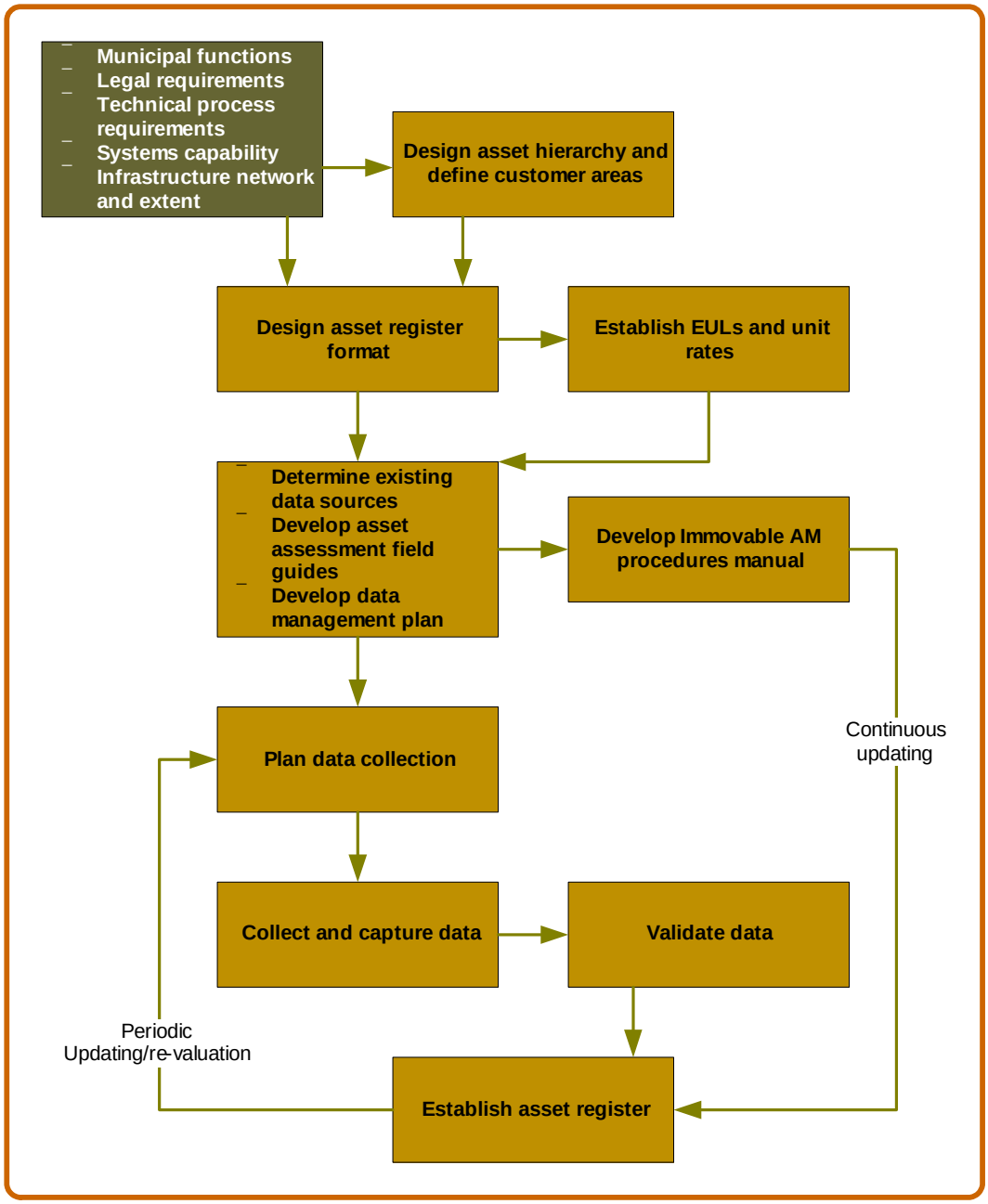
Municipality's Vision statement/ Long Term Growth and Development Strategy
Latest Integrated Development Plan (IDP)
Latest Asset Management Plan
Sector Business/Strategic Plans
Service Delivery and Budget Implementation Plan (SDBIP)
Immovable Asset Financial Policy
Maintenance Strategy
Customer Charter
Planning norms, and design and construction standards
Latest Financial Statements
Organisation Chart
Corporate Risk Policy and register
Information Management Strategy
Sector Development Plans, Masterplans, network layouts
Spatial Development Plan
Housing Plan
Demarcation Board data
Provincial Growth and Development Strategy
Contracts with bulk suppliers
Disaster Management Plan
Asset schedules or registers

An absolutely essential input is information on the nature, extent, and condition of the infrastructure, which should reside in an Asset Register.

6.1.1 Asset Register

Figure 6.1 indicates the process for establishing an asset register. As indicated earlier in this guide, municipalities are required (in terms of the MFMA) to establish an Asset Register that will enable depreciation of individual assets.

Figure 6-1: Process for Establishing an Infrastructure Asset Register



To achieve this, municipalities will need the following:

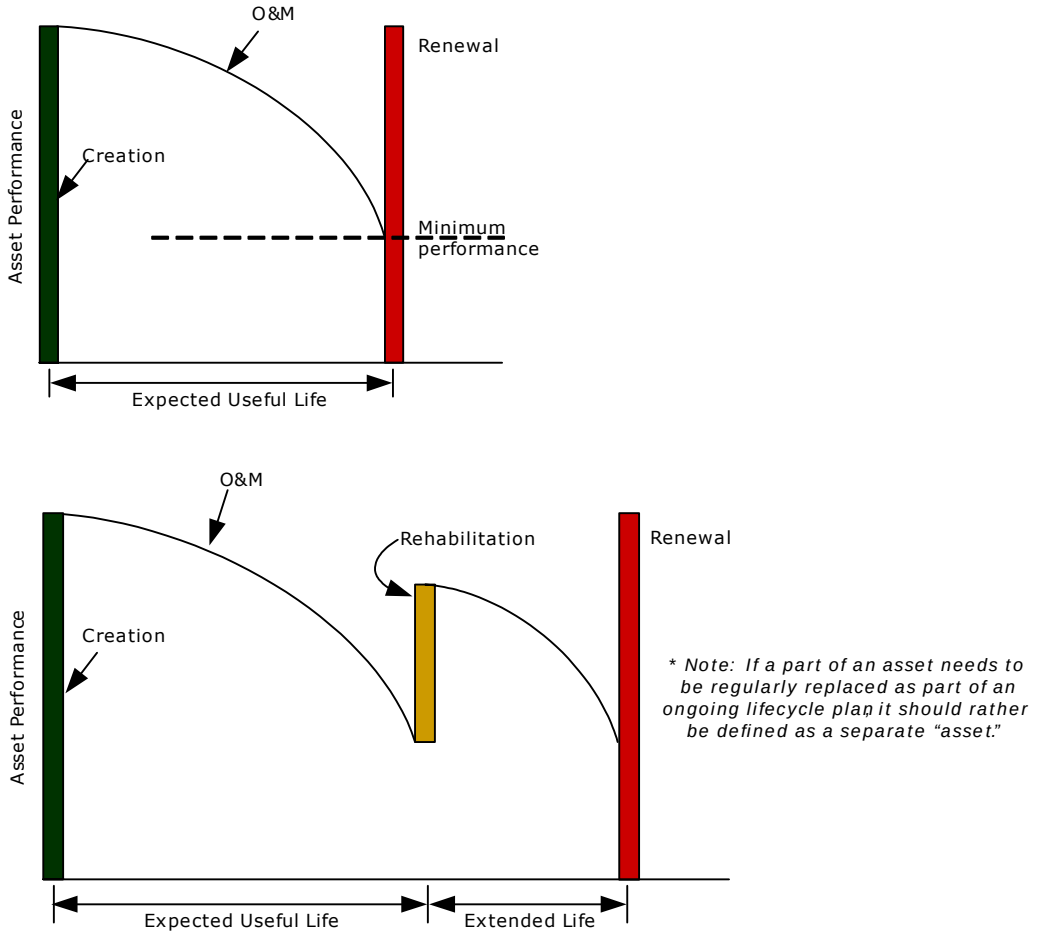
- An asset hierarchy (or "tree") that will enable information on all the municipality's infrastructure assets to be aggregated in an useful way for asset management;
- A consistent asset identification system (which enables specific assets to be readily identified); and
- Processes for the ongoing updating of information (after capturing baseline data).

When compiling an asset register for the first time, consideration needs to be given to the "design" of the asset hierarchy. It must take into account all the asset types that will be encountered in that specific municipality, and consider the most appropriate way for information to be aggregated for reporting purposes. Furthermore, the level of detail of data (e.g. at facility, asset, component, or sub-component level, and the extent of information on each element) needs to be carefully considered – data collection is expensive and time consuming. This decision should be guided by the intended use of the information.

The approach needs to accommodate the following needs:

- simple life-cycle cost modelling;
- recognition of the different risk profile of elements of the infrastructure;
- sufficient detail for the municipality to make informed strategic and tactical decisions;
- consistency with the approach used in any existing systems (such as maintenance management or GIS); and
- to cater for GAMAP requirements (i.e. the need to isolate material elements of infrastructure that have different expected useful lives – see figure 6-1):

Figure 6-2: Infrastructure Asset Lifecycle Cost Models



The level of detail should generally guided by defining assets at a level that would typically be considered practical for purposes of renewal. Some municipalities may consider it appropriate to define the hierarchy to a finer level of detail, for example to facilitate more advanced maintenance management techniques.

Apart from a hierarchy of asset types, there will be a need to define areas (e.g. wards, suburbs, villages, and catchment/depot areas), so that information can be grouped on in a consistent way and without duplication or gaps.

Ideally, the area definitions should be applied consistently across all sectors, as this will facilitate effective coordination and consolidation of needs.

In line with the recommendations included in the IIMM, data in the following categories should be captured for each asset as an initial priority:

- asset identification;
- location (this will be in a descriptive style, such as a street address, or other landmark reference, and GPS co-ordinates if available or required by the municipality);
- materials/type;
- size;
- quantity;
- year constructed;
- year last renewed;
- expected useful life

The following may initially be known only at network or asset-group level (capturing more detailed and accurate data at individual asset level may be carried out on a prioritised basis according to a structured improvement programme):

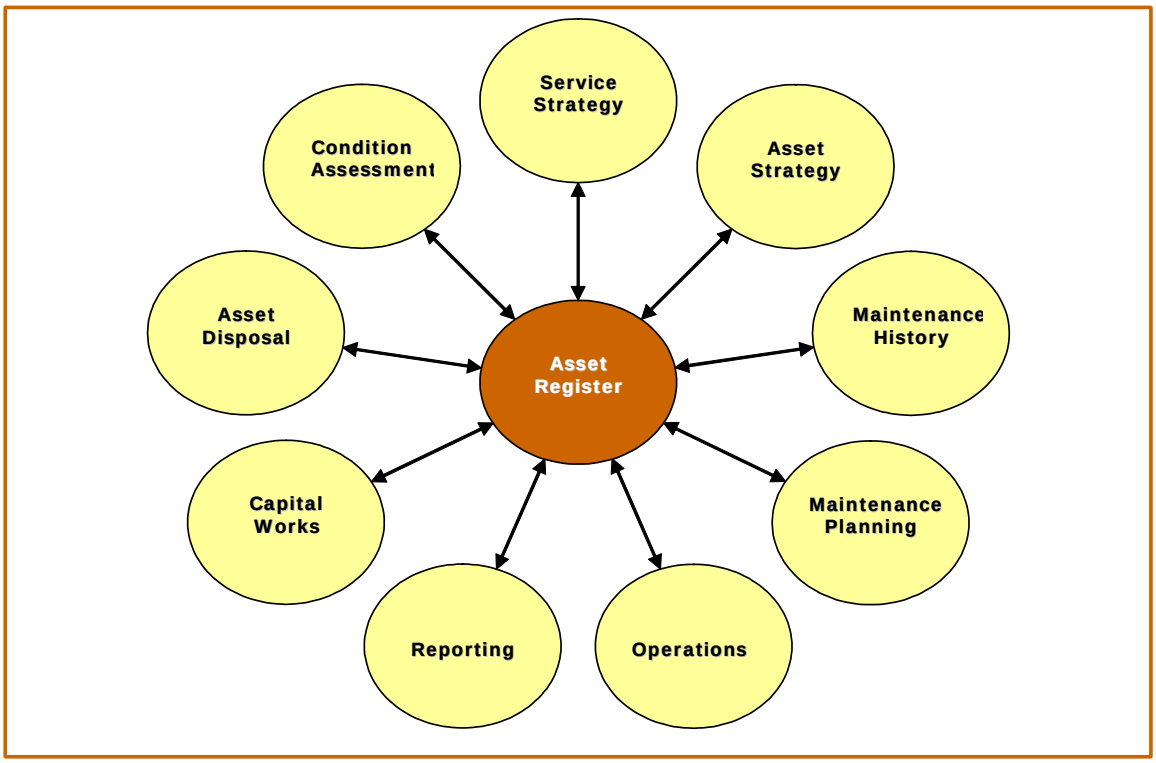
- condition grade;
- capacity;
- utilisation;
- remaining useful life;
- asset performance (measures to be in line with the network level performance measures);
- criticality grade; and
- data accuracy.

Each data category needs to be interpreted for each asset type, and applied consistently not only in the initial data collection, but also in subsequent years. Even for small asset portfolios, the preparation and documentation of a simple Data Management Plan will help in ensuring initial and continued data quality. The approach will be influenced by the method of accessing data (e.g. in the field, from GIS, from existing registers, or a combination), and the system used for capturing and reporting. An example of the content of an immovable asset register is provided in ***Annexure A***, as well as an example of valuation data.

6.1.2 Asset Management Information System (AMIS)

An AMIS will support a municipality in managing its infrastructure assets. The functionality and degree of sophistication of the system needs to be appropriate to the nature, size, and complexity of assets, and the capacity of the municipality. For small portfolios, a simple spreadsheet could be adequate, whereas sophisticated (and relatively expensive) systems are adopted by cities with extensive portfolios and the resources to manage the system.

Figure 6-3: Possible systems linkages to the Asset Register



Selective linkages may be considered appropriate, depending on the required functionality, for example:

- linking (GIS) mapping images to the physical asset register;
- down loading infrastructure data into design programs for network expansions;
- linking the asset register to a capital works system (new projects and renewals);
- a maintenance management function providing maintenance budgets and a resource planning facility, and generating work schedules based on condition data;
- a maintenance history function;
- a helpdesk facility to manage, track and record reactive maintenance;
- recording and reporting on environmental incidents;
- materials, spares and tools inventories and stocktaking functions;
- heritage asset listing;
- land register;
- energy usage;
- linking the asset register to the accounting system to update valuations, written down value and depreciation;
- linking property and water meter registers to the asset register and accounting systems; and
- linking to insurance schedules.

It is the prerogative of each municipality to consider the merits and affordability of pursuing any or all of the above linkages to support its business processes.

The following are typical modules that could be included in a basic system:

- asset register;
- maintenance management;
- contract management;
- work package management;
- stock control; and
- condition monitoring.

Advanced functions can be added to enhance long term planning and improve efficiency, such as the following:

- predictive modeling;
- detailed risk assessment;
- evaluations of asset solution options;
- optimised decision making; and
- data management.

6.1.3 Asset Identification

All infrastructure assets must have a unique identification reference number. A common approach must be used across all departments in the municipality, such as the following:

Category - Sub-category / Asset Class / Asset Descriptor - Sequential Number for the asset type.

The following are definitions of the asset categories (in accordance with GAMAP):

Property, Plant and Equipment:

- Land (not held as investment assets);
- Infrastructure Assets are ones that form part of a network of similar assets (immovable assets such as roads, water systems etc);
- Community Assets are resources that contribute to the general well-being of the community (immovable assets such as community halls, clinics, parks and outdoor sport and recreation facilities);
- Heritage Assets are culturally, environmentally, or historic significant resources (such as war memorials, historic buildings, conservation areas, archaeological sites, statues etc); and
- Other Assets are ordinary operational resources (such as the office building and stores, and movable assets such as vehicles and equipment).

Table 6-2 is an example of how the categories can be broken down into sub-categories for ease of reference and reporting:

Table 6-2: Example of PPE sub-categories

Category	ID	Sub-Category	ID
Land	LA	Sub-categories based on zoning	
Infrastructure Assets	IA	Roads Network	RDS
		Storm-water Network	STW
		Water Network	WAT
		Sanitation Network	SAN
		Solid waste disposal	SOW
		Electricity Network	ELE
Community Assets	CA	Sport & Recreation Facilities	SPR
		Community Facilities	COF
Heritage Assets	HA	Sub-categories as necessary – e.g. nature reserves, memorials, historic sites etc	
Other Assets	OA	Buildings	BUI
		Vehicles	VEH
		Operational Plant and Equipment	OPE
		Office Furniture and Equipment	OFE

Assets (both movable and immovable) are further classified according to asset class. The classifications need to be reviewed to ensure they cover all the types of assets in the municipality, and are defined in such a way that will enable effective management reporting. An asset class will often comprise a number of similar assets that can be

grouped together for ready identification using an asset descriptor. In the case of movable assets, this can be on the basis of asset type (e.g. vehicle types), and, for immovable assets, location (e.g. reticulation in Aganang, boreholes in village 6, mechanical plant at Pump Station 3).

Examples:

- IA-WAT/MEC/PS6 - 9 is the identification for: Infrastructure Assets - Water Network / Mechanical Plant / at Pump Station No6 – Asset number nine;
- CA-SPR/BG/SEL - 2 is the identification for: Community Assets – Sport & Recreation / Bowling Green / Seleka – Asset number two; and
- IA-SAN/RET/MA2 - 3 is the identification for: Infrastructure Asset – Sanitation Network / Reticulation / Marapong Extension 2 – Asset number 3.

Maintenance-significant components of the infrastructure assets (e.g. the hydrants, manholes, valves, and house connections associated with water reticulation) can be identified in a maintenance management system using an extension of the asset identification referencing system stated above.

6.1.4 Asset Hierarchy

The objective of an asset hierarchy (examples of which are provided in Table 6-3) is to portray a clear, holistic and logical breakdown of infrastructure in each of the services, using a structure that is consistent with the asset categories (discussed above) and classes (see 6.1.5) used in financial management (discussed above). Financial reporting will typically be required at the Facility/Asset Group level.

Table 6-3: Example Infrastructure Asset Hierarchy

Network	Facility or Asset Group	Asset
Roads	Paved Arterial and Distributor Roads	Formation
		Pavement structure
		Pavement surface
		Kerbs and channels
	Paved Collector and Residential Roads	Formation
		Pavement structure
		Pavement surface
		Kerbs and channels
	Gravel Roads	Formation
		Gravel surface
	Structures	Bridges
		Retaining walls
		Major culverts and subways
		Overhead gantries
	Footpaths	Hardened footpath surface
	Traffic Management	Street signs
		Traffic lights
	Street Lights	Street lights
	Street furniture	Commuter shelters
		Guard rails
	Buildings	Buildings
	Fences	Fences
Storm-water drainage	Interception and conveyance	Pipelines
		Culverts
		Open channels

Network	Facility or Asset Group	Asset
		Nodes, transitions
	Attenuation	Earth wall
		Site
		Perimeter protection
	Hydrological Monitoring Stations	Building
		Specialist Equipment
	Pump Stations	Civil works
		Building
		Electrical Plant
		Mechanical Plant
		Perimeter Protection
Water supply	Dams	Dam wall
		Site
		Perimeter Protection
	Spring protection	Pipes
		Dam wall
		Tanks
		Perimeter protection
	Boreholes	Building
		Casing
		Perimeter Protection
		Electrical plant
		Mechanical plant
		Meter
	Water treatment works (may be broken down per process element)	Civil Works
		Mechanical plant
		Electrical plant
		Buildings
		Pipes
		Meters
		Site
		Perimeter protection
	Pump station	Civil works
		Building
		Electrical Plant
		Mechanical Plant
		Telemetry
		Meter
		Site
		Perimeter Protection
	Bulk water pipelines	Pipelines
		Valves
		Meters
	Storage	Civil works - reservoirs, towers
		Tanks
		Support structure for tanks
		Mechanical plant
		Chlorinator
		Meters
		Hydrants
		Telemetry

Network	Facility or Asset Group	Asset
		Perimeter protection
		Site
	Distribution	Reticulation
		Hydrants
		Meters
		Communal standpipes
Sanitation	Collection	Sewerage reticulation
		Vehicles (e.g. Honey sucker, tractor/trailor)
	Bulk pipelines (outfall sewer)	Rising mains
		Gravity mains (outfall)
	Pump station	Civil works
		Building
		Electrical plant
		Mechanical plant
		Telemetry
		Meter
		Site
		Perimeter protection
	Wastewater Treatment Works (may be broken down per process element)	Civil Works
		Mechanical plant
		Electrical plant
		Buildings
		Meters
		Site
		Perimeter protection
Solid waste disposal	Collection	Vehicles
		Containers/bins
	Transfer stations, and processing facilities	Buildings
		Electrical plant
		Mechanical plant
		Site
		Perimeter protection
	Landfill site	Earthmoving and compaction equipment
		Landfill preparation
		Perimeter protection
		Building
		Mechanical - weighbridge
		Electrical - weighbridge
Electricity supply	HV Transmission Network (>22kV)	Overhead lines
		Underground lines
		Site
	HV Substations (>22kV)	Site
		Building
		HV outdoor equipment
		HV GIS equipment
		HV transformers
		MV indoor equipment
	MV Network (<22kV)	Site
		MV overhead
		MV underground

Network	Facility or Asset Group	Asset
	MV Substation (<22kV)	Site
		Building
		MV outdoor equipment
		MV indoor equipment
		MV transformers
	LV Network	LV underground
		LV overhead
		Consumer meters
	Network Management	Workstations
		Software
		Telemetry
		Load Control
Sports-fields, Parks and Cemeteries	Roads	Paved areas (vehicles)
		Gravel areas (vehicles)
	Hardened surface (pedestrian)	Hardened footpath surface
		Tennis/basketball court
	Buildings	Buildings
	Swimming Pool	Swimming Pool
	Storm-water	Pipes
		Culverts
		Open channels
		Nodes, transitions
		Earth retention wall
		Storm-water nodes/ transitions
	Open Space	Grass, shrubs and trees
		Park furniture
		Spectator stands
		Lighting
		Perimeter protection/fencing
Community Buildings and Administration Offices	Each Community Building Type	Site
		Structure and building fabric
		Building finishes
		Plumbing
		Electrical
		Air conditioning
		Lifts
		Fire prevention and protection
		Equipment for theatres and council chambers
		Gas installations
		Perimeter protection

6.1.5 Expected Useful Lives of Assets

The classes of assets stated in the following tables have been determined bearing in mind the need to distinguish assets that have significant financial value in relation to the sub-category, perform different functions, have different potential risk profiles, and have different Expected Useful Lives (where this makes a significant financial impact on depreciation). The tables need to be reviewed by each municipality – omitting assets not applicable and adding new ones where necessary. The Expected Useful Lives must also be checked to ensure that they are realistic in view of the standard of design and construction, the utilisation, the operating environment, the maintenance regime, legal prescriptions, and potential obsolescence.

Table 6-4: Example of Asset Classes and Expected Useful Life of Assets

Asset Class	ID	Expected Useful Life (years)
HV Transformers	HVT	50
HV Lines	HVL	50
HV Cables	HVC	50
HV Substation Equipment	HVS	50
MV Transformers (Transformers & Mini- Subs)	MVT	45
MV Cables and Lines	MVC	50
MV Substations Switch Gear	MVS	45
LV Network (overhead)	LVN	45 (see note 1)
Network Management	NM	20
Consumer Electricity Meters (credit type)	CEM	30 (see note 2)
Telemetry	TEL	20
Buildings	BUI	50
Site (access roads, parking, footpaths, lighting, landscaping, irrigation)	EF	15
Perimeter protection (Fencing, walls, gates)	PP	15
Paved arterial and distributor roads	ADR	25 (see note 3)
Paved collector and residential roads, and parking areas	CRR	50 (see note 3)
Gravel roads and parking areas	GR	25 (see note 3)
Footpaths	FP	50
Streetlights	STL	25
Road signs	RS	7
Traffic lights	TL	7
Bridges, subways and culverts	BSC	120
Guard rails and commuter shelters	GBS	15
Dams (Civil)	DAM	100
Boreholes (Civil)	BH	30
Springs (Civil)	SPR	30
Treatment Works (Civil)	TW	50
Pump Stations (Civil)	PS	50
Storage (Civil)	STO	50
Bulk Water Pipelines	BPI	120 (see note 4)
Water Reticulation	RET	120 (see note 4)
Water Meters	MET	15
Mechanical Plant	MEC	15
Electrical Plant	ELE	15
Outfall sewer	OFS	60 (see note 4)
Sewer reticulation	SEW	60 (see note 4)
Erosion protection structures	EP	15
Storm-water pipelines and lined channels	PLC	50
Unlined channels	ULC	10
Attenuation ponds	AP	25
Landfill site (civil)	LS	20 (see note 5)
Community Buildings (Abattoirs, Care Centers, Clinics, Community Centers, Disaster Management Centers etc)	CBU	50 (see note 6)
Cemeteries	CEM	50
Parks	PAR	50
Sportsfields	SPF	50
Spectator stands	STA	40
Flood lighting	FL	30
Swimming pools	SP	20
Bowling greens	BG	20

Tennis courts	TC	20
Golf Course	GC	30
Solid Waste Disposal Vehicles	SWV	10
Sludge Disposal Vehicles	SDV	15
Wheelie Bins	WB	10
Skips and Community Bins	CBI	20

Notes:

1. 60 years if underground cables.
2. 10 years if pre-paid meters.
3. Depending on the financial policy of the municipality, roads can be split into formation, pavement structure, pavement surface, and kerbs and channels, thereby reflecting the different expected useful life of each.
4. The Expected Useful Life of pipes can vary substantially based on a number of parameters, e.g. if the material is asbestos-cement, the figure could be as low as 35 years.
5. The Expected Useful Life of landfills needs to be determined on a case-to-case basis depending on available air space and fill rate.
6. The expected useful life of cemeteries needs to be based on a case-to-case basis.

6.1.6 Condition Assessment

The approach adopted for determining condition needs to:

- be standardised so that it can be consistently applied across all municipalities to enable effective benchmarking, trend monitoring, and data aggregation;
- be cost effective, repeatable and objective;
- be linked to the expected failure pattern of the specific assets (wherever practicable);
- be modeled on performance criteria rather than visual inspection of condition where such is not practicable or inappropriate (e.g. pipelines, power cabling);
- align with existing industry norms in each sector;
- support robust valuation; and
- support the modeling of renewal budget needs.

A simple generic five-point grading can be adopted, as indicated in Table 6-5.

Table 6-5: Generic Condition Grading

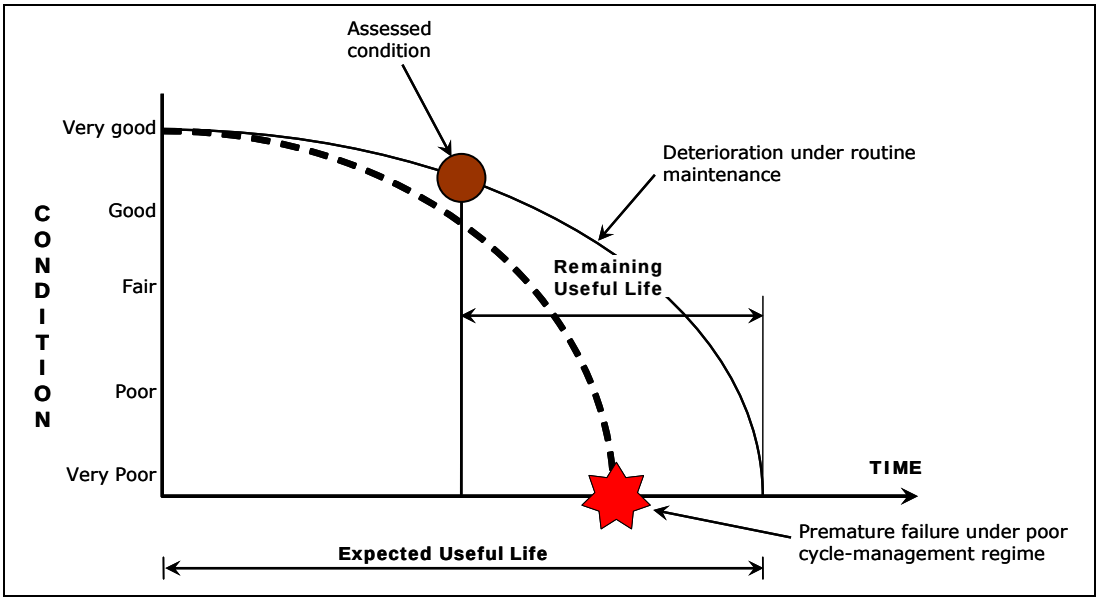
Grade	Description	Detailed description	Indicative RUL
1	Very good	Sound structure, well maintained. Only normal maintenance required.	71-100% EUL
2	Good	Serves needs but minor deterioration (< 5%). Minor maintenance required.	46-70% EUL
3	Fair	Marginal, clearly evident deterioration (10-20%). Significant maintenance required.	26-45% EUL
4	Poor	Significant deterioration of structure and/or appearance. Significant impairment of functionality (20-40%). Significant renewal/upgrade required.	11-25% EUL
5	Very poor	Unsound, failed needs reconstruction/ replacement (> 50% needs replacement)	0-10% EUL

'EUL' is Expected Useful Life

'RUL' is Remaining Useful Life

The column on "indicative" remaining useful life (RUL) is provided in Table 6-5 as a general guideline for field inspections for above-ground (visible) assets, and reflects the typical parabolic deterioration curve shown in Figure 6-4.

Figure 6-4: Typical deterioration curve



The generic condition grading should be interpreted for consistent application across each asset type. Field guides can help in ensuring consistent interpretation, using photos and descriptions of specific distresses to be noted during inspections. Table 6-6 is an example of a more specific condition grading for lined channels.

Table 6-6: Condition Grading – Lined Channels

Grade	Condition	Description
1	Very Good	Joint and lining in excellent condition. Clear of impediment. Upstream structure excellent with no unwanted vegetation.
2	Good	Joint condition slightly peeling and lining slightly blemished. Minor obstruction occur, result in minor capacity reduction. Some unwanted vegetation starts to appear. Upstream structure slightly blemished. Hairline cracks, no spalling, honeycombing of fine aggregate only. No reinforcement visible and not corrosion. No erosion or scour. No elements have collapsed.
3	Fair	Joints are cracking and lining has obvious blemishes. Some blockage and moderate capacity reduction. Less than 5% unwanted vegetation. Upstream vegetation obvious. Cracks more than 2 mm wide. Visible spalling, honeycombing of coarse aggregate. No reinforcement visible, no corrosion. Erosion and scour at edged. No collapsed elements.
4	Poor	Joint are open, but not serious condition. Major blemishes appear on lining. Blockage causing significant capacity reduction. Unwanted vegetation less than 30%. Major blemishes appear on upstream vegetation. Large cracks with displacement, visible spalling, honeycombing of coarse aggregate. Exposed reinforcement with corrosion. Significant erosion or scour. No collapsed elements, but horizontal or vertical displacement is evident.
5	Very Poor	Failed and in very poor condition.

6.1.7 Asset Valuation

It is essential that monetary value be ascribed to the infrastructure for a number of reasons. For asset managers, one of the most important reasons is to understand the cost of asset depreciation and replacement and to make sure there is sufficient funding to maintain the network in the long term.

In the past, infrastructure asset values were captured, if at all, on an historic cost basis in the financial statements. The MFMA now requires municipalities (in terms of GAMAP 17) to state the "fair value" of all infrastructure assets under their control. Actual acquisition/construction costs are initially stated, then subjected to depreciation, but there is also a requirement for periodic re-valuation.

The figures in the financial statements are more than book entries, but are a financial representation of the potential service value of the assets to the community and their consumption over time. The approach recognises that a range of factors (including the quality of maintenance) may affect the life expectancy of an asset. Consequently periodic re-assessment of actual remaining useful life is essential, particularly as the lives of infrastructure assets may span several decades. A Depreciated Replacement Cost approach to valuation of infrastructure assets is proposed (in line with the Accounting Standards Board).

Depreciated Replacement Cost (DRC)

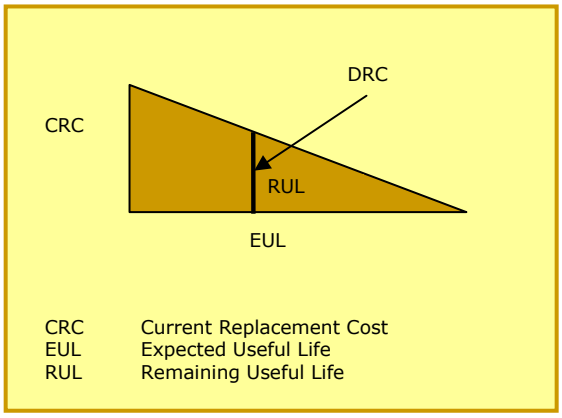
$$DRC = \frac{RUL}{EUL} \text{ x } CRC$$

Where RUL = Remaining Useful Life, established as follows:

a. Above ground assets – by visual assessment of condition and knowledge of the maintenance regime (condition grading table gives guidelines);
b. Below ground assets – Expected Useful Life minus age (since construction or last renewal); and

EUL = Expected Useful Life, which is the anticipated life of an asset from acquisition or renewal until failure taking cognisance of the operating environment and the maintenance regime.

CRC = Current Replacement Cost which is an estimate of the current cost of replacing the asset with a modern equivalent of similar capacity, based on unit rates. The unit rates should include provision for the cost of the plant, materials and labour associated with construction, as well as planning, design and supervision inputs where applicable, and VAT. The unit rate items need to be aligned with the asset hierarchy, and a unit rate is needed for each type of each asset (e.g. different materials and diameter of pipe). Provision should also be made in the rates for secondary assets (e.g. manholes, valves and consumer connections for pipelines).



Note:

The residual value of infrastructure is often taken to be zero as this represents the service potential at the end of an assets useful life, and it is simple to administer.

GAMAP presents minimum figures for Expected Useful Life for some asset types, and the National Treasury Guidelines and IIMM also recommend ranges. Based on these, and more specifically, experience of actual life achieved of such assets in South Africa, alternative figures are recommended in table 6-3. These may be adjusted and refined based on experience of the particular assets in the locality (depending for instance on local design practice, construction standards, corrosive environmental or soils conditions). Each municipality should strive to align the Expected Useful Lives adopted in their Financial Policy with actual practice.

6.1.8 Asset Criticality

Identifying critical assets is often the first step in managing asset risk. It is necessary to have some form of measurement of the consequence of failure, and therefore an indicator of the "criticality" of the assets. This will enable the following:

- focusing of the level of detail and accuracy of data collection exercise;
- crafting of focused maintenance responses;
- prioritisation of asset renewal;
- prioritisation of asset-level risk mitigation actions; and
- measurement of the overall risk exposure of each network.

A basic approach is presented in Table 6-6, where the impacts of asset failure are contemplated using a simple rating approach. The potential impacts are aggregated, resulting in the allocation of a criticality grading on a simple 3 point scale (Table 6-8). The criteria and rating attributed to each impact, and the criticality grading bands will need to be tested and adjusted over time, based on application.

The approach should typically render a small proportion of the assets in the "critical" and "important" categories (perhaps up to 5% and 15% respectively in a network with optimised risk exposure), so that they receive the special attention required. The consequence of failure of each asset will need to be carefully considered – for example, elements of a water reticulation system are likely to be non-critical (the service should be able to be restored in reasonable time), whereas a water supply pump may be critical, or not, depending on whether a standby pump is provided. Similarly an isolated reservoir could be considered important, but inter-connectivity with others could render it non-critical. The assessment of criticality is therefore a site-specific task.

Table 6-7: Consequence of Failure - generic

Area of Impact	Measure	Rating
Public and municipal employees' health and safety	Loss of life or multiple illness/injury	15
	Single illness/minor injury	5
	No effect	0
Financial losses (cost of repairs and/or loss of revenue)	More than R100,000	6
	Between R20,000 and 100,000	4
	Less than R20,000	2
Service delivery performance	Major impact	8
	Minor impact	4
	No effect	0
Environment	Major	10
	Minor	5
	No effect	0

Table 6-8: Criticality Grading

Consequence of Failure Score (sum of ratings from Table 6-7)	Description	Criticality Grading
≥15	Critical	1
11 – 14	Important	2
≤10	Non-critical	3

Municipalities may elect to conduct a more detailed risk assessment as part of their improvement in infrastructure management practice.

6.1.9 Data Accuracy

It is necessary to record and track the accuracy of the data collected on each asset as indicated in Table 6-9. The most accurate information available to a municipality should be for the most critical assets, and this should be borne in mind when planning a data collection exercise or improvement planning.

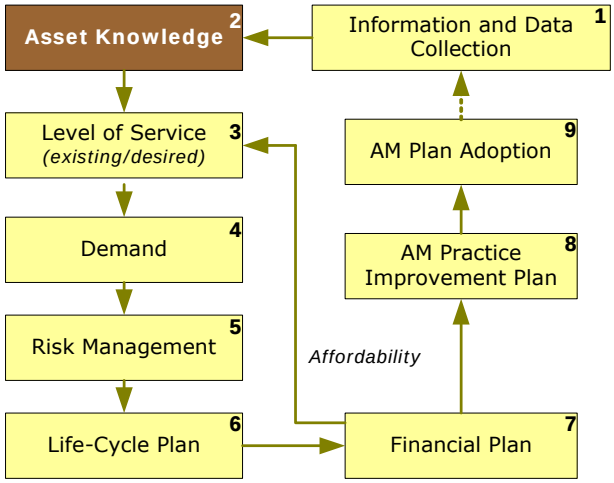
Table 6-9: Data Accuracy

Grade	Description	Accuracy
1	Accurate	± 1%
2	Minor inaccuracies	± 5%
3	50% estimated	± 20%
4	Significant data estimated	± 30%
5	All data estimated	± 40%

The use of experienced staff, a field guide and inspector training will help in obtaining consistent data. Availing the results of the previous iteration of data collection may be appropriate in some cases to foster consistency of approach (e.g. only noting changes to condition grading, utilisation etc).

Once the data has been collected and captured, it is essential that the aggregated data is reviewed by a person familiar with the assets to ensure that it is representative and consistent. The IIMM recommends an independent review of 5% of the data as a quality assurance measure.

6.2 Asset Knowledge



The information and data collected in the previous sub-section needs to be summarised in a way that will inform asset management decision making. Data will need to be reported in a way that is easily understood, with summaries for asset types, and an area basis, as well as the ability to drill down to specific assets. Figures 6-5 to 6-10 are examples of aggregated report outputs derived from the data in an Asset Register that can be used to guide and inform tactics used in the IAM Plan.

Figure 6-5: Example - Nature and Extent of Assets

77 No.	Boreholes
35 km	Bulk Water Pipelines
425 km	Reticulation
6 No.	Pump Stations
312 No.	Storage Facilities
R172 million	Replacement Value
R116 million	Current Value

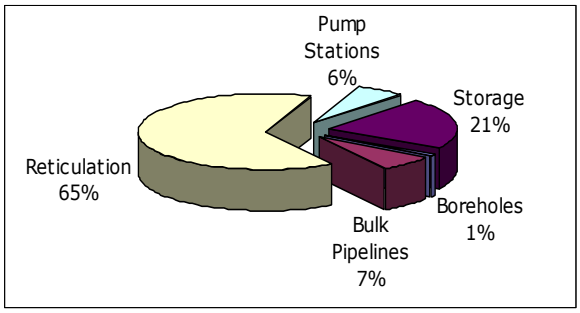


Figure 6-6: Example - Length, Age and Material – Water Reticulation

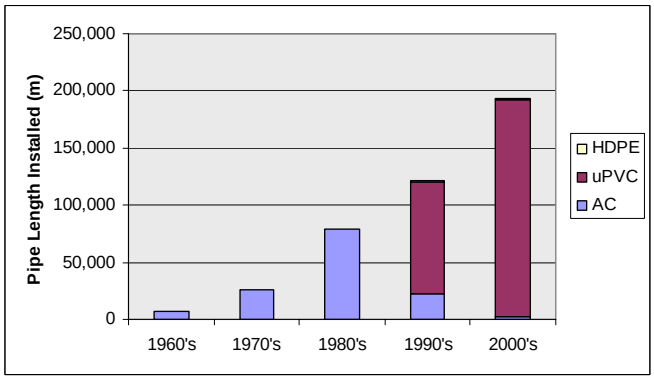


Figure 6-7: Example - Asset Age Summary

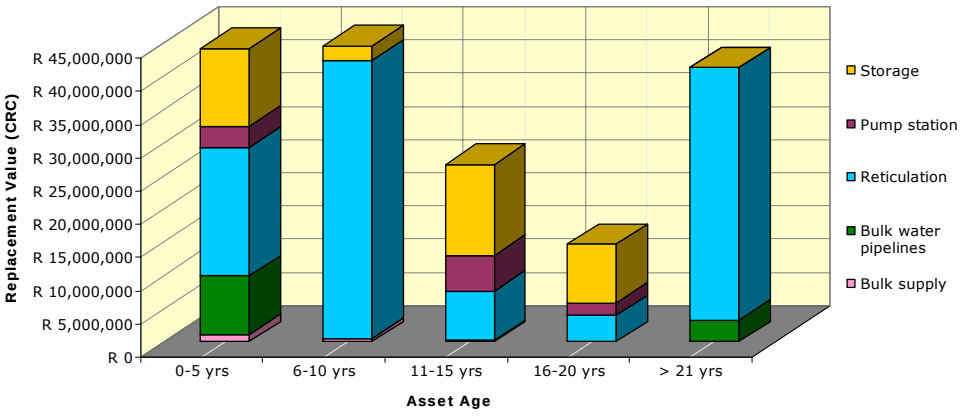


Figure 6-8: Example - Asset Condition Summary

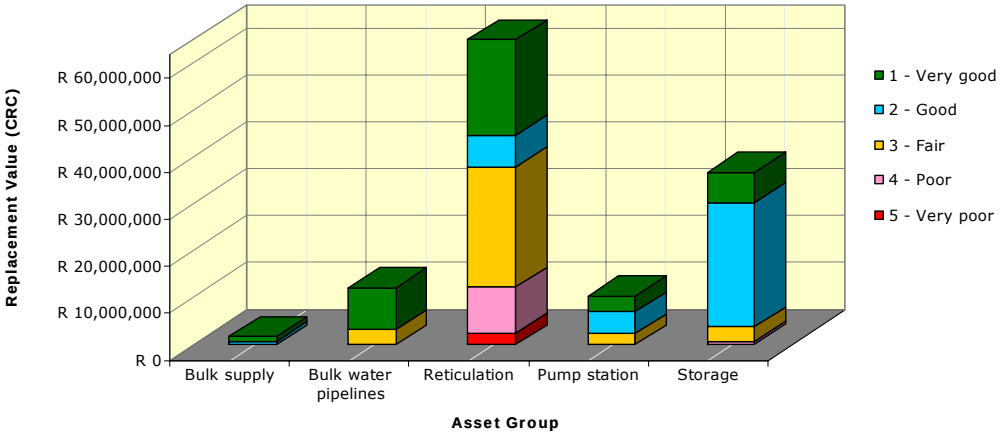


Figure 6-9: Example - Remaining Useful Life Summary

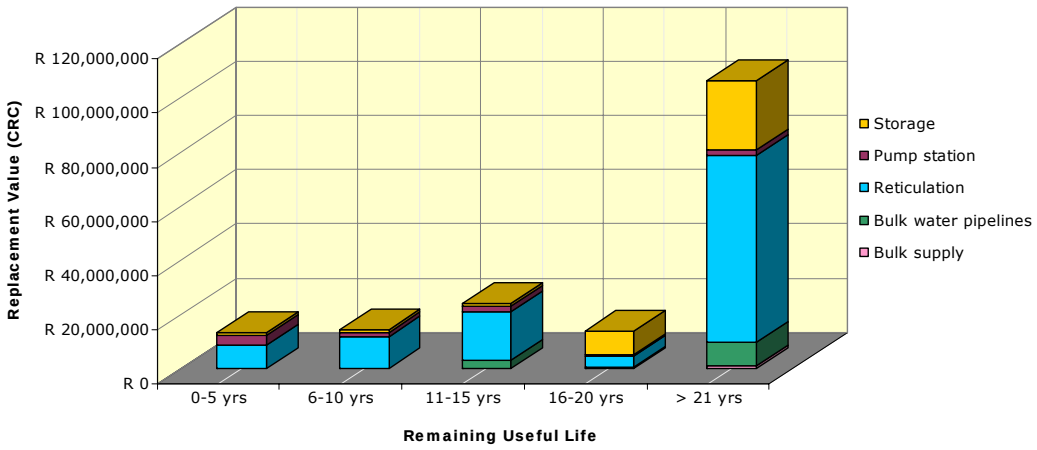
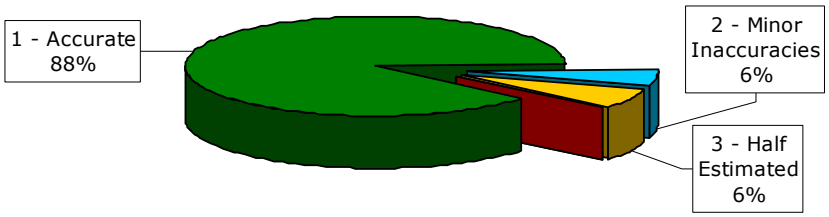
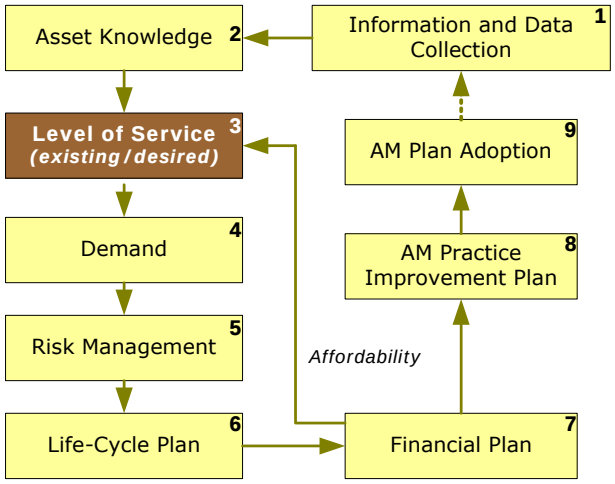


Figure 6-10: Example - Data Accuracy Summary



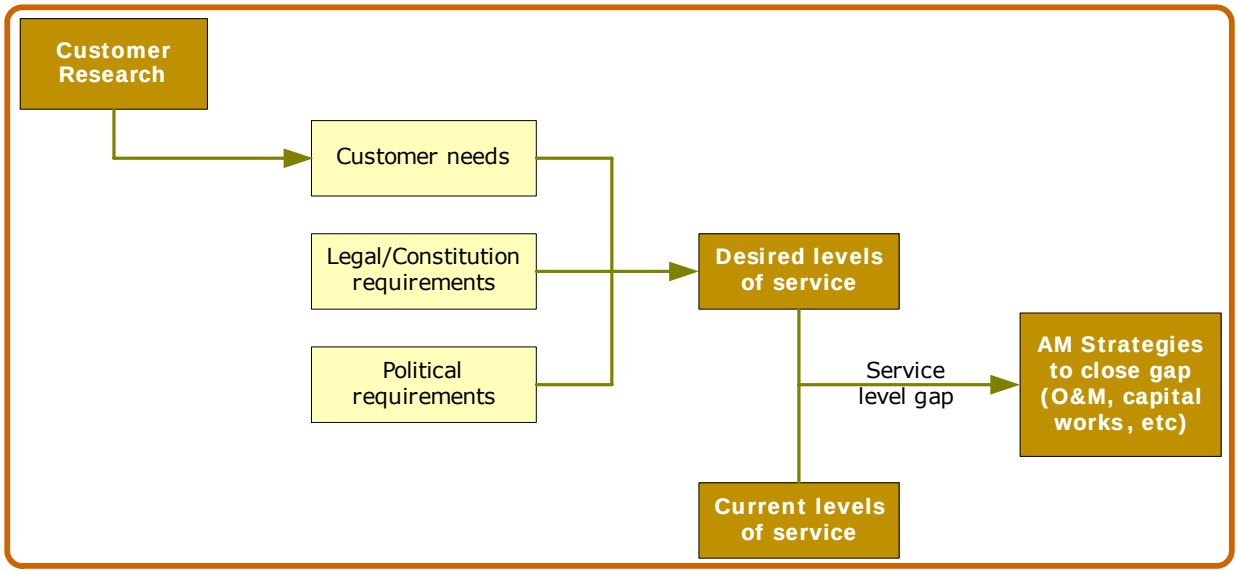
6.3 Establishing Levels of Service



One of the most important jobs of an asset manager is to understand the service level gap, that is, the gap between the service that is currently being provided by the network and the service that is desired by customers (and that they are willing to pay for).

The customer needs and wants are only one input into setting levels of service; we also need to consider minimum technical standards, legislative requirements, political requirements, as illustrated in figure 6-11.

Figure 6-11: Levels of service



This section describes the inputs to setting levels of service and provides a range of level of service examples for each asset type.

6.3.1 Customer Consultation

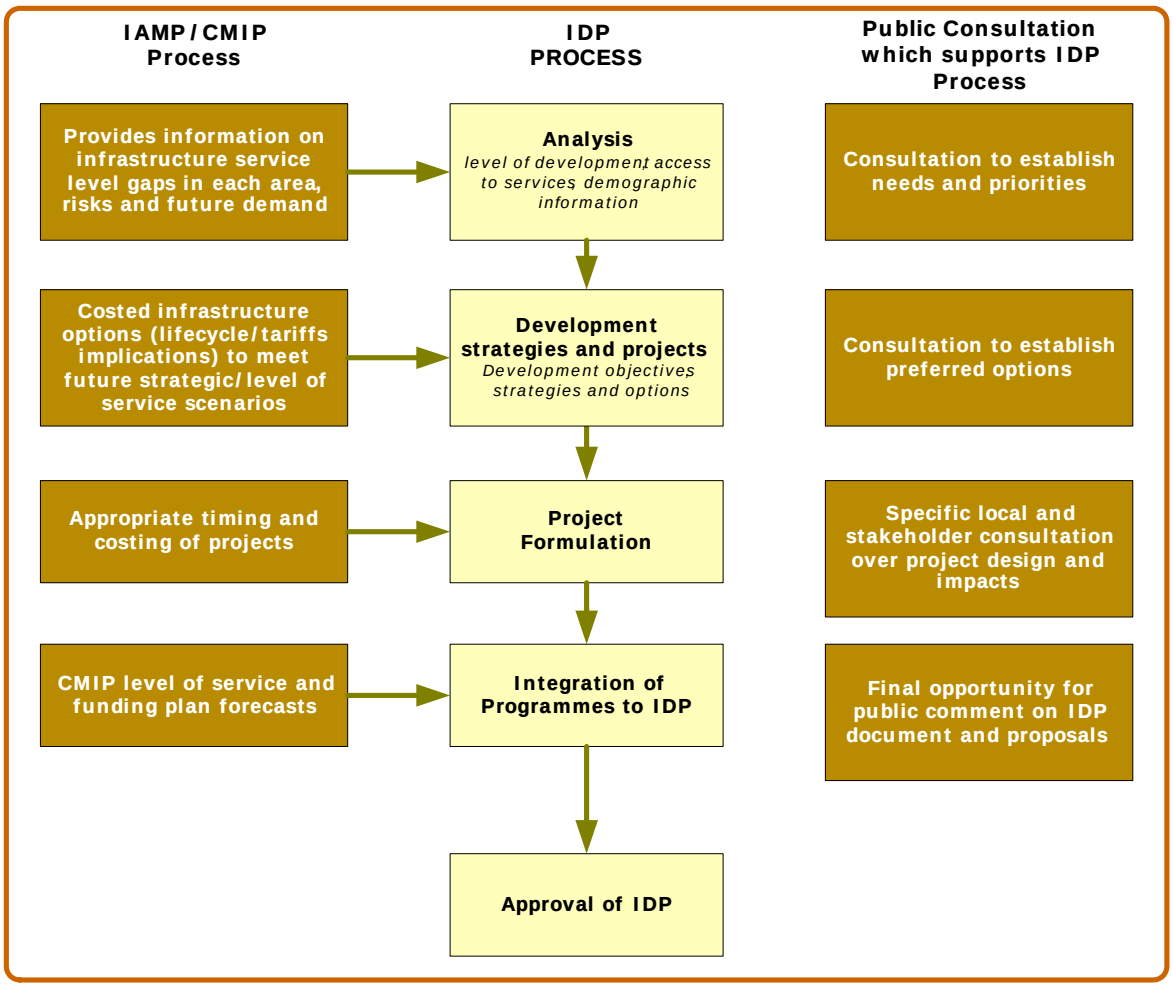
As discussed in section 2, there is an existing consultation process that surrounds the development of each municipality's IDP. It is not the intention of these guidelines to suggest that the CMIP be developed or consulted over through a separate process. Rather, this section describes:

- how the CMIP information can be used to support the IDP consultation process; and
- good practices relating to community consultation over infrastructure assets.

6.3.2 The IDP consultation process

Figure 6-12 expands on the diagram developed in section 5 to illustrate the consultation process that is required as part of the IDP process, as recommended in the IDP Guidelines. The figure illustrates that the CMIP will provide sound information on infrastructure service level options and costs to support the consultation process. In return, though not explicitly shown in this diagram, the IDP will provide information into the IAMP/CMIP process on demographic information, level of development and population forecasts which will assist the AM planning process. The IDP is also likely to be the forum for deciding the preferred strategic options which will be adopted in the final CMIP.

Figure 6-12: IDP Consultation Process



6.3.3 Selecting appropriate consultation approaches

The critical issue for anyone wishing to engage the community in decision is making the consultation process accessible to all areas of the community and all customer types.

Of course, there are existing democratic forums where elected officials and designated committees can make decisions on behalf of the community. These are valuable opportunities to engage with groups that are knowledgeable on the issues concerned and may be able to provide more detailed and informed feedback on detailed options proposed. However a truly effective consultation programme needs to reach the wider sections of the community directly, particularly those who live remotely, are illiterate and may not usually have a voice in municipal decision making.

Unfortunately too many consultation processes rely on public meetings or written submissions to planning documents, both of which can get skewed representation by people who 'can be bothered to participate', i.e., those that have special interests, and the results therefore may not reflect the values of the silent majority. On the other hand, surveys can offer a more statistically valid approach and reach a broader cross-section of the community, but the responses are more superficial and sometimes it is not easy to find out the issues (it might tell you people are dissatisfied but not always what is at the heart of that dissatisfaction.

Given the above discussion, it seems appropriate that a variety of consultation mechanisms are used, tailored to ensure access to all the customer groups identified. Below is a brief summary of the pros and cons some of the different approaches[1] – a mixture of all of these should generally be used.

Community Forums and Public Meetings

- Provide the perception that the local voice is being heard
- Opportunity to provide input in local area
- May not be a reliable way of getting feedback representative of the entire community - does the silent majority opinion differ from those who attend
- Easy to get sidetracked off the central issues (e.g.: to the problem of the footpath outside someone's house!).

Surveys

- Confidence that a wide representation of the community is being reached.
- Quantified statistical results, for example on how many people support a proposal
- some groups can still be excluded depending on the interview methodology (e.g.: those without phones)
- Surveyed persons may not have an informed understanding of the issues.
- Self completion surveys skewed to those interested enough to respond.

Meetings with Special Interest Groups

- Clear focus and understanding of issues of groups.
- Feeling of buy-in by groups.
- May be perception that special favors are being granted to specific interest groups
- Usually need strong facilitation (an external party may be useful) to ensure a balanced view is obtained from the group.

Focus Groups

- Usually a randomly selected group people of people invited to discuss issues and proposals, so no skewing of special interests.
- Opportunity to discuss issues in more depth and understand the underlying causes of dissatisfaction, needs and priorities.
- Small number of people, so no statistically valid results.

6.3.4 Selecting levels of service (performance indicators) that reflect customers key drivers

Having identified what the customer groups' value, the level of service framework should be developed to take into account key areas of concern and particularly where there are drivers for change, so that those changes can be monitored over time.

6.3.5 Informing and educating the consulted parties

There are generally three stages at which we consult with our customers over levels of service, and at each of these stages we need to consider whether the person is informed enough to provide the right input. The language used needs to be tailored to the people being consulted, without being condescending. The three stages include:

i) At the preliminary stage the consultation is usually focused on identifying the person's/community's **needs, wants and issues** relating to the service being discussed. This is often done through a mixture of community and stakeholder meetings and surveys to identify areas of concern or dissatisfaction. The information required at this stage is predominantly information on the purpose of the consultation and making sure the person understands the scope of the services under review.

ii) Having identified key issues, officials will then come up with a list of **proposals or scenarios** to address the issues. Of course, if you ask someone 'do you want this better level of service' they will always say yes. If you ask someone 'do you want a better level of service if it costs you X Rand extra per year, the answer may be somewhat different? Therefore, in obtaining feedback on specific proposals to change levels of service, people need to be informed of the benefits and negative impacts of the proposals, the impact in terms of cost both to them and to the government. This makes it harder to rely solely on survey questions, which do not

[1] Reference: Creating Customer Value from Community Assets, published by the National Asset Management Steering Group, 2002

provide a good forum for providing information to people. Focus groups and stakeholder meetings become more important inputs at this stage.

iii) Having received feedback on preferred options, officials need to consolidate these options into a **planning document** that confirms the strategic objectives, timing for projects and funding plan (in the case of the Municipalities, this is most likely to be the IDP). The plan itself provides a means of informing and educating people, and making the plan open to public submissions is one method of consultation at this final stage. However not all people have the time or ability to digest and comment on such documents.

It is here where the CMIP can add a lot of value to the IDP consultation process, by providing sound level of service and cost options.

6.3.6 Understanding the trade-offs and priorities

In section 6.7 the need to prioritise projects is identified, with the level of community support being one important factor in ranking how important that project is. There needs to be careful consideration when interpreting the results when carrying out consultation for one sector in isolation from another. For example, the municipality's facilities department could carry out a survey asking whether people are prepared to pay for a new swimming pool for an extra R 100 on their rates and get a strong Yes response. However if the same people were asked if they were prepared to pay an extra R 500 for a swimming pool, new sealed roads and a local sold waste transfer station, they might well say no.

6.3.7 Legal and regulatory requirements

National statutory requirements regarding the standards in each sector need to be observed (as noted in section 1.5 of the guide) as well as published sector guidelines and municipal standards.

6.3.8 Political Requirements

Government has in place several strategic objectives and actions plans that affect municipal infrastructure delivery and management. These include, amongst other, the eradication of backlogs and stimulation of economic growth, through the Accelerated and Shared Growth Initiative - South Africa (AsgiSA). This initiative is aimed at ensuring that poverty and unemployment is halved by 2014 (from 2004 figures).

Infrastructure investment occupies a central position with AsgiSA, in recognition of the jobs and economic opportunities that can be created through infrastructure. Cabinet also in March 2006 adopted the National Infrastructure Maintenance Strategy that strengthens AsgiSA, and highlights the need for infrastructure maintenance and renewals.

6.3.9 Levels of Service

The determination of performance criteria, measures and targets for each service is pivotal to the effective management of the service – it is a departure point for:

- financial sustainability (by linking the target standards of service with an assessment of long-term affordability to the municipality);
- effective community consultation (the standards of service different customer groups can expect to receive now and in the future);
- life-cycle planning (what new construction and upgrading of infrastructure is required and when, what outcomes are expected from the operations, maintenance, and renewals interventions);
- risk management (what can happen to prevent the performance targets being met?); and

- performance monitoring and reporting (what are the indicators that need to be monitored to report actual performance and the resources required).

Criteria considered appropriate to the performance of each service have been selected, and simple measures proposed, in the tables below. These measures can be adjusted and expanded to align with the strategic objectives of each municipality, bearing in mind that each measure implies a need to establish a commensurate monitoring system. The IIMM indicates the following range of performance categories that can be considered for different services:

- accessibility
- quality
- quantity
- availability
- reliability
- cost/affordability
- comfort
- safety
- efficiency
- sustainability
- customer service (responsiveness, customer education etc)

The performance management system of the municipality, and its annual SDBIP, should be consistent with the service criteria, measures and targets that are adopted.

Table 6-10: Example - Water Service Standards

Key service criteria		Service level characteristic	Performance measure	Target performance level
1.	Availability	Customers' access to basic potable water infrastructure	Percentage of households with availability of service of level 3 or better (defined in the table below) and system capacity exceeding 25 liters per person per day.	100%
2.	Affordability	Provision of Free Basic Water Service (25 liters per person per day) to the poor.	Percentage of indigent households paying for basic water service	Nil
3.	Quality of Service	Service Interruptions	Number of households experiencing service interruptions longer than 48 hours each year	Nil
			Number of households experiencing an aggregate of service interruptions more than 15 days per year	Nil
		Flow Rate	Number of households whose supply has inadequate flow (formal connections less than 6 kl per month, and basic supply less than 10 liters per minute).	Nil
4.	Water Quality	Water quality meets legal requirements	Percentage of tests taken in accordance with SANS 241 that meet the compliance requirements	100%
5.	Consumption Control	Metering	Percentage of formal connections that are metered	100%
6.	Utilisation	Bulk capacity	Total operational through put at Treatment Works as a percentage of total process capacity	80%
7.	Affordability	Collection efficiency	Percentage revenue collected	95%

Key service criteria		Service level characteristic	Performance measure	Target performance level
8.	Financial viability	Margin on total service	Percentage gross margin	30%
9.	Community value	Change in value of community assets	5 year rolling average increase or decrease in immovable asset value (corrected for inflation)	In accordance with development vision.

Level	Description	Level of Service
1	None	Natural resources
2	Sub Standard	Water point more than 200m walking distance
3	Basic*	Communal standpipe less than 200m walking distance
4	Intermediate	Yard connections/yard tanks
5	Full Service	House connections

** minimum requirement*

Table 6-11: Example - Road Transport Service Standards

Key service criteria		Service level characteristic	Performance measure	Target performance level
1	Availability	Vehicular access of residential and business erven to the road network	% of total with level of service of grade 3 or greater (refer grade definitions in table below).	100% have vehicular access
2	Quality	Extent of road failures and distresses	Annual review of percentage of roads in a poor (grade 4) or worse condition.	Less than 10%
3	Safety	Bridge condition	Condition grading less than "poor" (grade 4)	Nil
		Fatality rates	Number of fatalities in the municipality per year	Less than x per year
		Vehicle and pedestrian accident levels	Number of accidents reported per year	Less than y per year
4	Community value	Change in value of community assets	5 year rolling average increase or decrease in immovable asset value (corrected for inflation)	In accordance with development vision

Level	Standard	Description*		
		Pavement	Structures	Safety measures
1	None	No service provided/tracks	No service	Nil
2	Sub Standard	Earth roads	Low-level crossings	Rudimentary signage
3	Basic	Gravel roads to within 500m of dwellings	Nominal structures and culverts	SADC SARTSM compliant road signage
4	Intermediate Service	Paved roads to within 500m of dwellings and Gravel roads to each erf	Bridges over streams, and some crossing over main roads/rail	SADC SARTSM compliant road signage, some footpaths and streetlighting
5	Full Service	Paved roads to each erf	No conflict to local road users by other primary road or rail traffic	SADC SARTSM compliant and pedestrian safety measure around all highly trafficked areas and streetlighting on high trafficked roads

Table 6-12: Example - Sanitation Service Standards

Key service criteria		Service level characteristic	Performance measure	Target performance level
1.	Availability	Customers' access to basic level of sanitation service	Percentage of households with availability of service of grade 3 or better (refer table below)	100%
2.	Service Quality	Duration of service interruptions.	No of reported blockages not repaired within 24 hours	Nil
3.	Health	Effluent quality	Tests within DWAF license/permit stipulations	100%
4.	Sustainability	Untreated discharge to natural waterways	Number of overflows discharging to natural waterways per year.	Nil per year
5.	Community value	Change in value of community assets	5 year rolling average increase or decrease in immovable asset value (corrected for inflation)	In accordance with development vision
6.	Utilisation	Bulk capacity	Total throughput at Waste Water Treatment Works as a percentage of process capacity	

Level	Description	Level of Service
1	None	No formal service
2	Sub Standard	Unventilated pit latrines, buckets, or communal VIP latrines
3	Basic	On site ventilated improved pit latrine (VIP)
4	Intermediate	On site Low flush waterborne systems
5	Full Service	Full waterborne house connections

Table 6-13: Example - Stormwater Drainage Service Standards

Key service criteria		Service level characteristic	Performance measure	Target performance level
1.	Availability	Effective protection of property to prevent damage	Number of erven that are flooded, based on recorded events or complaints received	No incidences each year (excluding where rainfall exceeds 10 yearly maximum rainfall intensity).
		Provision of stormwater service	% of population with > level 3 (refer table below)	80%
2.	Health	Drainage water not to be polluted	% compliance with DWAF's E-Coli water quality guidelines	90% for vleis and coastal waters, 50% for urban rivers
3.	Safety	Effective measures to prevent loss of life or serious injury	Number of recorded incidents (drowning, injury)	No incidents each year outside the predicted annual disaster risk profile
4.	Community value	Change in value of community assets	5 year rolling average increase or decrease in immovable asset value (corrected for inflation)	In accordance with development vision

Level	Description	Level of Service
1	None	No Stormwater Provision
2	Sub Standard	Stormwater Provision in Roadway and ditches, not to a specific design standard
3	Basic	Unlined Channels to a minor system design standard of maximum 1:2 year return period
4	Intermediate Service	Lined Channels to a minor system design standard of maximum 1:2 year return period
5	Full Service	Kerbs, gutters and pipes and canal systems to a minor and major system design standard of maximum 1:20 year period

Table 6-14: Example - Solid Waste Service Standards

Key service criteria		Service level characteristic	Performance measure	Target performance level
1.	Health	Levels of dust, noise and pollution, and pests at landfill, transfer sites	Permit conditions or minimum statutory requirements for monitoring	100% compliance
2.	Reliability	Reliability of collection service	Number of "erven – incidents" of waste not collected on prescribed day each year	Less than 5% of number of erven
3.	Availability	Provision of a minimum service	Percentage of respective population with availability of service equal or greater than (refer table below): Grade 2 – Rural Areas Grade 3 – Urban Areas Reviewed annually	100% in both categories
4.	Bulk capacity	Remaining Landfill Life	Remaining licensed life (years) of landfill facilities	Minimum 5 years
5.	Utilisation	Bulk capacity	Total operational throughput at Treatment Works as a percentage of total process capacity	80%

Level of Service	Description	Container	Collection point	Frequency of collection
0	No waste is collected by a formal system	No containers supplied for waste storage	Generator disposes of waste at own discretion	Generators decide individually
1	Generators dump waste at a communal point	No containers are supplied for the dumping of waste	An open area or street corner within 200 meters of generators	Dumped waste is loaded with front loaders onto tipped trucks at more or less monthly intervals
2	Generators dump waste in mass containers at a communal site	Bulk containers (3 – 21 m^3) are provided for storage of waste	Communal site either prepared or open piece of land within walking distance (200 m)	Containers are emptied with specialized vehicles when full but not less than two weekly
3	Generators contain waste on site in their own containers and put these out for collection	Containers with lids (80 liters up to 1100 liters)	Full containers are left on the side walk or pre-selected point for collection	Specialized waste collection vehicles collect waste from containers at specified intervals varying from daily to not less than weekly
4	Generators contain waste on site in containers supplied by the municipality and put these out for collection	Containers with lids (80 liters up to 1100 liters) and bulk containers with or without lids (3 – 21 m^3)	Full containers are left on the side walk or pre-selected point for collection	Specialized waste collection vehicles collect waste from containers at specified intervals varying from daily to not less than weekly
5	Generators participate in waste minimization schemes	Separate containers with lids (80 liters up to 1100 liters) and bulk containers with or without lids (3 – 21 m^3) for waste and reclaimed material	Full containers are left on the side walk or pre-selected point for collection by either municipality or recyclers	Specialized collection vehicles collect waste and recyclable material from containers at specified intervals varying from daily to not less than weekly

Table 6-15: Example - Electricity Service Standards

Key service criteria		Service level characteristic	Performance measure	Target performance level
1.	Availability	Access of households and business erven to at least basic service	Percentage of households and business erven with availability of service of grade 3 or greater (refer table below)	100%
2.	Reliability	Duration of power outages	Monitoring of outage periods. Restoration: 30% within 1.5 hours 60% within 3.5 hours 90% within 7.5 hours 98% within 24 hours	Unscheduled: 10-12 hours/year
				Scheduled: 6 hours/year
		Frequency of outages	Frequency of outages in a given period.	Unscheduled: 4-10 per year depending on category of network
				Scheduled: 2 per year on overhead networks & 1 per year for underground network
3.	Quality	Excursions of parameters such as frequency, voltage, etc outside the statutory boundaries as set out in NRS 048 & 047	Monitoring of the parameters by recorders or electronic energy meters	Frequency: ± 5Hz Voltage: ± 10%
4.	Utilisation	Bulk capacity	Total power used as a percentage of power available	According to Asset Management Plan
5.	Utilisation	Bulk capacity	Total operational throughput at Treatment Works as a percentage of total process capacity	80%

Level	Description	Level of Service
1	None	Open fires, paraffin stoves, coal stoves & candles
2	Sub Standard	Un-metered, illegal connections, unsafe
3	Basic	Electricity connected & metered/pre-paid, single point load (e.g. "Ready board")
4	Intermediate Service	Electricity connected & metered/pre-paid, distribution board with permanent wiring
5	Full Service	Electricity connected & metered, distribution board with permanent wiring to fixed outlets

Table 6-16: Example - Parks Service Standards

Key performance indicator		Service level characteristic	How performance is measured	Target performance level
1	Availability	Provision of parks and cemetery facilities	X Ha of parks of each standard, (refer table below) e.g.: 100 ha level 1	100%
2	Safety	Prevention of injury to users of the facilities	Compliance with OHS requirements	100%
		Security to users against theft or assault	Number of users experiencing an incident of theft or assault per year	Nil
3	Quality	Condition of ablution facilities	Condition Grade	No areas less than Grade 3 (fair)
4	Community value	Change in value of community assets	5 year rolling average increase or decrease in immovable asset value	In accordance with development vision

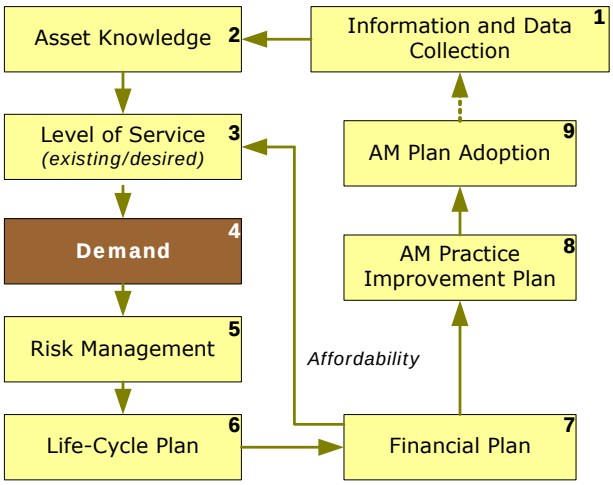
Key performance indicator		Service level characteristic	How performance is measured	Target performance level
			(corrected for inflation)	

Level	Description	Level of Service
1	None	Open field
2	Sub Standard	Open field fenced off with grass cutting – 3 monthly
3	Basic	Fenced off with defined maintained lawn area and some shrub gardens
4	Intermediate Service	Fenced off with maintained lawn areas and shrub gardens with walkways and ablution facilities with lit walkways
5	Full Service	Fenced off with maintained lawn areas and shrub gardens with automatic sprinkler systems, walkways with garden formation and play apparatus and ablution facilities and full garden lighting

Table 6-17: Example - Building Service Standards

Key performance indicator		Service level characteristic	How performance is measured	Target performance level
1	Availability	Customers (mostly internal) have adequate accommodation available for desired purpose	Customer complaints	100% of requirements are met
2	Affordability	Provide accommodation at market related prices	Annual audit of cost per m²	In line with market rates
3	Reliability	Number of unplanned maintenance actions	Number of unplanned maintenance activities required per 6000 m² floor area per month	Less than 2
		Response time for unplanned maintenance actions	Completion within 3 working days	100% compliance
4	Health and Safety	Meet legislated requirements	Comply with all OHS and SANS 0400 (NBR) requirements	100% compliance
5	Community value	Change in value of community assets	5 year rolling average increase or decrease in immovable asset value (corrected for inflation)	In accordance with development vision

6.4 Demand



6.4.1 Factors influencing demand

Demand can, and often will, change over time depending on a number of factors, as summarised in Table 6-18.

Table 6-18: Factors influencing Demand

Factor	Examples
Basic increases/decreases in demand	• Population growth/decline and dispersion • Business/economic growth and changes • Land use changes, e.g. intensification
Changes in unit demand	These relate to higher consumption of infrastructure services by individual persons, households, businesses and institutional users over time.
Changes in customer expectations	• Better safety, less delay, smoother travel • Cleaner water, higher pressure • Environmental consciousness

In order to better forecast the impact of demand factors, the following key trends need to be considered:

Economic trends

These include economic growth or decline within the area under consideration that will impact on, amongst other:

- Economic investment/disinvestment
- Expanded/contracted job opportunities
- Economic structuring, i.e. corporatisation, outsourcing and workforce mobility

Social trends

There are numerous and often complex social trends that influence future demand. Some of these include:

- Household size and population growth
- Education levels
- Increased working hours
- Lifestyle issues and preferences
- Travel and improved mobility

- Diseases, notably HIV/AIDS, the impact of which are accelerated through greater human interaction

Environmental trends

These include issues such as global warming and the depletion of scarce natural resources.

Technological trends

Advances in technology generally lead to more efficient and cost effective service delivery, as well as alternative service offerings.

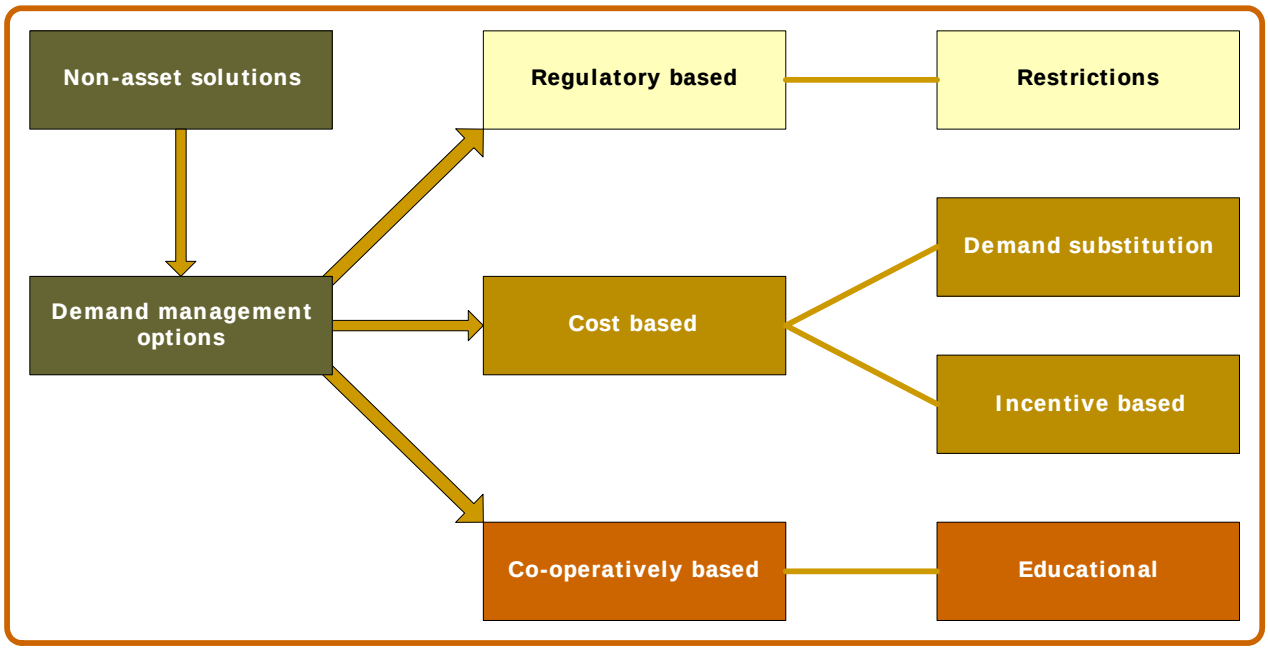
6.4.2 Demand Management

Demand management is an active intervention to curb consumption of infrastructure services in response to factors such as:

- insufficient bulk resources;
- over-utilisation of infrastructure at certain times (e.g. peak traffic or electricity consumption on winter evenings);
- funding constraints;
- theft and vandalism; and/or
- insufficient infrastructure capacity.

Non-asset solutions that can be employed to actively manage demand are outlined below in Figure 6-13:

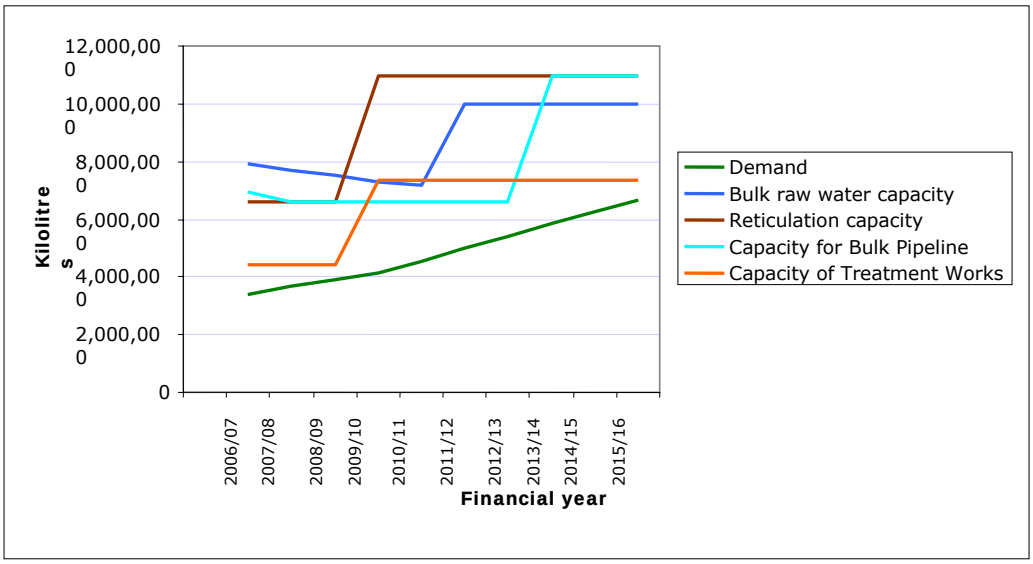
Figure 6-13: Demand management options



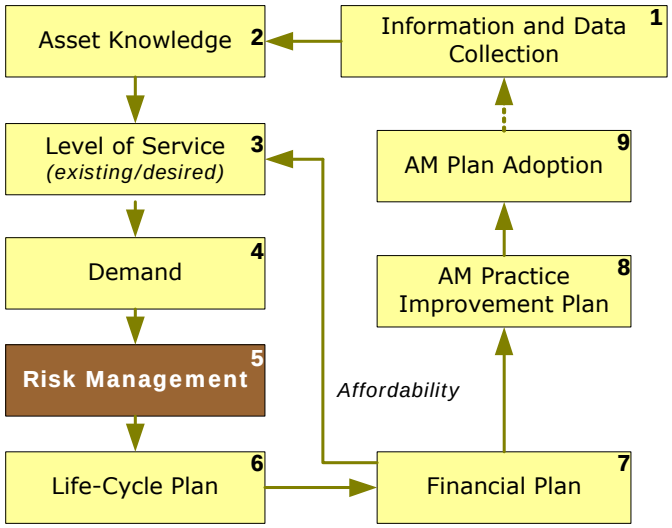
6.4.3 Demand Profile

Having identified the key demand factors, and considered the impact of demand management interventions, a profile of future service demand can be quantified. This profile will dictate the nature, location, and extent of future infrastructure needs that need to e addressed in the Life-Cycle Plan. Figure 6-14 is an example of how bulk infrastructure will need to be augmented to cater for increased water demand over a 10 year period.

Figure 6-14: Infrastructure Enhancement Needs Driven by Future Demand Profile



6.5 Risk Management



If the municipality has a formal corporate risk management policy, the prescribed processes and techniques should be adopted in the IAM Planning exercise.

All municipalities are required to prepare a Disaster Management Plan (DMP) in terms of the Disaster Management Act. Disasters are defined in the plan as events that cause death or disease, or damage to property, infrastructure or the environment, or disrupt community life, and "exceed the ability of those affected to cope with its effects using their own resources". The plan focuses on preparedness for emergency response (for example to accidents and natural disasters), and includes a mechanism to mobilize available local resources, and, where necessary, to escalate by referring incidents to a Disaster Management Centre at the District, Provincial, or National level. The DMP indicates that the risk assessment should be reviewed every year, and conducted afresh every two years. The DMP has to be included in the municipality's IDP and Council is obliged to address all identified mitigation actions. The infrastructure risks identified in the IAMP should inform the reviews of the DMP.

The risk management process needs to be tackled at two levels, as follows:-

- at network level, identify events that could impact on the performance of the service. Focus on identifying risk events that will have a major consequence (if there is no separate corporate risk plan, the exercise should include some key corporate risks); and
- at asset level, identify the most significant events that could cause critical assets to fail (or cease to function adequately).

The approach is as follows:

- identify risk events;
- determine the municipality's exposure to each risk event; and
- determine an appropriate response to each risk event.

6.5.1 Risk Identification

Risk events should be identified by officials who are familiar with the assets and their operating environment. This can be done by an individual, but there are benefits in discussing potential risk events on a collective basis. Table 6-19 is a schedule of commonly encountered risks that can be used to stimulate discussion of potential risk events.

Table 6-19: Commonly Encountered Risks

Physical	Condition-based failure
	Vandalism
	Theft/illegal connections
	System losses
Operational	Operator error
	Misuse
	Theft
	Sabotage
	Inadequate safety measures
	Insufficient skills & capacity
	Delays in contracts
	Under or over utilisation
Technical	Inadequate planning
	Inadequate data
	Inadequate systems capability
	Inadequate design
	Fitness for purpose
	Inadequate construction standards
	Insufficient infrastructure capacity
	Infrastructure obsolescence
	Inadequate maintenance
Natural/environmenta	Flood

Financial	Inadequate CAPEX budget
	Inadequate OPEX budget
	Inefficient collection
	Prohibitive O&M costs
	Unforeseen budget cuts
Institutional	Poor morale
	Inadequate or cumbersome processes
	Ineffective strategic leadership
	Unclear targets/goals
Social	Change in expectations
	Change in demand

I	Drought
	Storms
	Sinkholes
	Fire
Legal	Loss of rights/license
	Change in legislation
	Fines
External	Power cuts
	Availability of consumables (e.g. diesel, chemicals)
	Availability of parts supplies
	Reliability of bulk
	Quality of bulk
	Capacity of bulk

6.5.2 Consequences of Risk Events

A consequence rating has to be allocated to each risk event. Whilst sophisticated techniques exist that attempt to quantify these consequences, a more qualitative approach is often more practical, using a guide such as shown in table 6-20. Consequence tables are very specific to the size and type of assets, and organisational needs – thus the table should be developed with inputs from senior management of the municipality.

Table 6-20: Example Risk Consequence Rating – Network Level

Consequence Rating	Qualitative Description	Direct costs (repair, lost income, third party damage)	Service delivery performance	Effect on public health, safety and property	Environmental Damage	Municipal Image
1. Insignificant	Is readily absorbed under normal operating conditions	<R20,000	Less than 50 customers without potable water for up to 8 hrs	No health or safety impact, minor property damage	Minor transient environmental damage, visual effects only	Individual interest only, no community concern
2. Minor	Can be managed under normal operating conditions	R20,000-R100,000	Less than 50 customers without water for up to 24 hours	Minor health impact on small number of people	Minor damage to environment, longer effect	Minor community interest, minor local media report
3. Moderate	Can be managed but requires additional resources and management effort	R100,000-R500,000	Less than 50 customers without potable water for up to 48 hrs	Serious health impact on small number or minor impact on large number of people	Moderate environmental damage, local importance	Public community discussion, major local media interest

Consequence Rating	Qualitative Description	Direct costs (repair, lost income, third party damage)	Service delivery performance	Effect on public health, safety and property	Environmental Damage	Municipal Image
4. Major	Will have a prolonged impact and extensive consequences	R500,000-R5,000,000	More than 50 customers without potable water for a period of over 48 hours	Extensive injuries or significant health impacts, single fatality	Major long term environmental impact. Prosecution expected	Major loss in community confidence
5. Catastrophic	Irreversible and extensive impacts, or significantly undermining key business objectives	>R5,000,000	More than 500 customers without potable water for a period of over 48 hours	Multiple fatalities	Serious damage of national importance and irreversible impact. Prosecution expected.	National media

In asset management planning, a specific risk event that is central to decision-making is asset failure. As noted in the Asset Register section, a criticality index is determined for each asset by contemplating the consequence of failure of the asset aggregated across the following potential outcomes:

- health and safety;
- financial losses;
- service delivery performance; and
- environmental impacts.

6.5.3 Probability of Risk Events

A probability rating is allocated for each risk event. Whilst statistical probabilities may be used, municipalities may find it more practical to use subjective criteria, as indicated in Table 6-21 and 6-22.

Table 6-21: Probability Rating- Network Level

Rating	Probability	Qualitative Description
A	Rare	May occur only in exceptional circumstances
B	Unlikely	Will probably not occur
C	Moderate	Could occur at some time
D	Likely	Will probably occur
E	Almost certain	Is expected to occur

The probability of condition-based failure of assets is guided by the following:

Table 6-22: Probability Rating- Asset Level (condition-based failure)

Rating	Probability	Condition
A	Rare	Very Good
B	Unlikely	Good
C	Moderate	Fair
D	Likely	Poor
E	Almost certain	Very Poor

6.5.4 Risk Exposure

The risk exposure of a municipality to a particular event can be considered to depend 0on the consequences and the probability of that event. A matrix such as the one indicated in Table 6-23 can be used to rank events as low, moderate, significant or high risk exposure to the municipality.

Table 6-23: Risk Exposure Matrix

Probability		Consequence: 1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
	A Rare	L	L	L	M	M
	B Unlikely	L	L	M	M	S
	C Moderate	L	M	M	S	H
	D Likely	M	M	S	H	H
	E Almost certain	M	S	H	H	H

Risk Exposure	
L	LOW
M	MODERATE
S	SIGNIFICANT
H	HIGH

The risk matrix provides a means of combining asset criticality and condition data, pointing to priority interventions required for renewal of assets.

6.5.5 Risk Responses

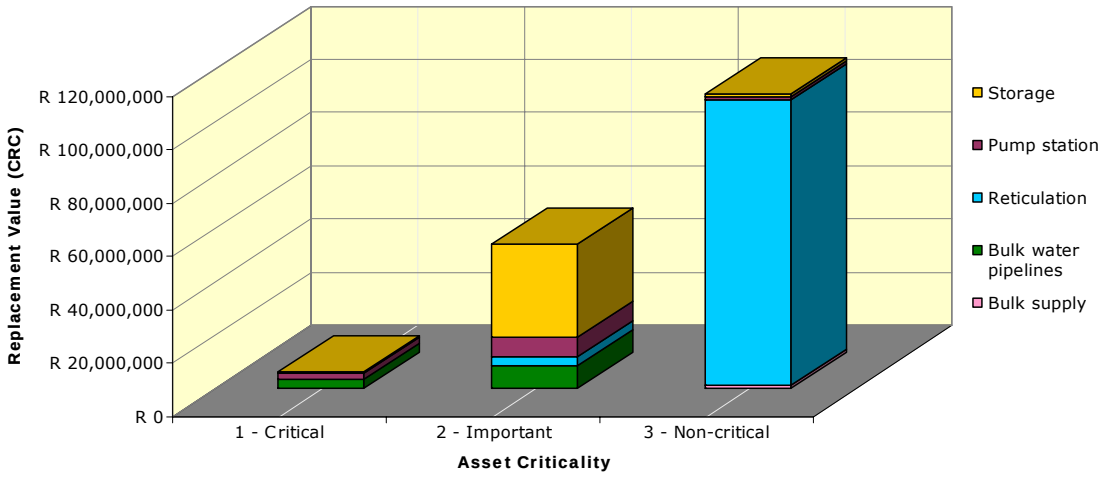
The following approach is an example of how municipalities may decide on appropriate risk responses:

L	=	Low Risk Exposure:	Manage through routine procedures.
M	=	Moderate Risk Exposure:	Mitigation action to be explored and implemented if benefit-cost is demonstrated.
S	=	Significant Risk Exposure:	Options reviewed and specific risk mitigation actions identified in the IAMP for implementation.
H	=	High Risk Exposure:	Action to reduce risk taken immediately.

6.5.6 Network-level risk exposure

Figure 6-15 indicates a distribution of a municipality's assets in each criticality grading. As a general guide, the total value of assets in the critical and important categories should not be more than around 20%. Means of reducing the risk exposure should be explored by examining the needs at asset level, focusing on mitigation actions for each critical/important asset.

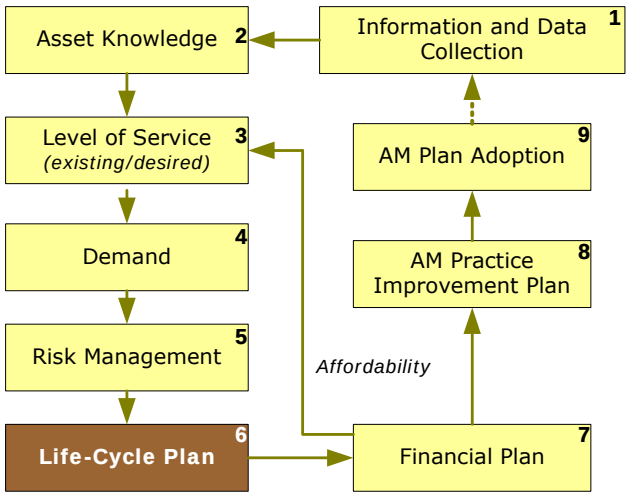
Figure 6-15: Asset Criticality Distribution



6.5.7 Risk Register

An example of a Risk Register which identifies risk events and indicates the assessment of risk exposure before and after proposed interventions is included as ***Annexure B***.

6.6 Life-cycle Plan



The life-cycle plan is a considered response to the needs identified in the preceding elements of the IAM Plan (i.e. the municipality's strategic vision, the Level of Service gaps, the pattern of future demand and demand management interventions, and service delivery risks).

The plan will indicate the approach adopted by the municipality in managing the lifecycle of each asset type (e.g. when replacement/renewal is done, how new projects are identified and prioritised, O & M practice, contracted out or in-house resources, adopted standards, whether labour intensive methods are used etc.). Initially this may mean simply documenting the way things are done at present and in later IAM plans stating formally adopted strategies. One of the key outputs from the risk assessment will be the identification of priority needs for capital renewal. The plan will indicate currently committed capital projects (from the current 3 year MTEF budget), projects identified in the current IDP, and link these to the identified needs (growth, risk mitigation, increase in level of service), making adjustments to the project scope and timing as may be necessary, and identifying the project needs over the balance of the planning period (10 to 20 years). The linkage of each project to each need will be documented in this section of the plan. The projects will include new construction, upgrading, and capital renewal.

Multi-term budget forecasts are prepared for the planning period using some form of financial modelling. Typically a unit rates approach is used, though the level of sophistication can vary depending on the accuracy required by the municipality. The unit rates need to be appropriate to the particular local environment, and take into account that renewal costs may be materially different to new construction. ***Annexure C*** provides examples of unit rates. Alternative asset solutions to addressing each need should be examined in the IAMP and the optimum solutions

reflected in the overall budgets (though, from a practical point of view, this may only be done for projects beyond a threshold value). The detailed technical response to each need will be examined in more detail at project level (i.e. as part of the project preparation phase – using life-cycle costing as a tool).

There are numerous factors that can influence the level of operations and maintenance effort (and therefore budget) required. These include locality–specific issues such as geotechnical conditions, climatic conditions, social conditions, standards of design and construction, economy-of-scale, spatial distribution etc. The budget should be informed by an O&M Plan (drawn up separately and summarised in the AM Plan) that is consistent with the performance criteria and risk assessment. Ideally it should point to the resource required to support the strategies determined for each asset type. As a minimum, it should cite any need for budget adjustment based on the assessed risk associated with current budget and O&M practices, and motivate the need for the preparation of an O&M Plan. A rational strategy would be that preventative maintenance should be exercised (at least) on critical assets and perhaps a lower level of preventative maintenance on important assets.

Annexure D provides an example schedule of annual operations and maintenance budgets that municipalities can use to estimate the future impact of new construction. As indicated above, there is wide variation of actual O&M needs (perhaps half or double the figures indicated), and so the example figures should be regarded in this context and adjusted as appropriate for the specific context of the municipality. If all municipalities measure and report maintenance in a consistent fashion, meaningful benchmarks may be able to be assembled over time. Figure 6-16 is an example of a ten year financial forecast of the life-cycle budget needs for an infrastructure network.

Example of a first basic Life-cycle Plan – Footpaths:

Asset Information

The municipality aims to provide a safe, comfortable and efficient network and facilities catering for pedestrians (including the physically disabled).

Key issues are:

- the on-going deterioration of footpath assets due to inadequate maintenance, which is diminishing the quality of service to pedestrians, resulting in safety issues in high use areas (mainly the commercial area and around schools);
- low levels of footpath maintenance and resurfacing may be increasing lifecycle costs - there is a need to define maintenance standards;
- there is a need to provide more new footpaths and disabled crossings to meet community expectations and the municipality's strategic objectives;
- footpath reinstatement following excavation by underground service authorities and damage by heavy vehicles; and
- assessment of cost effective repair techniques.

The municipality owns 46 km of footpaths, mostly of concrete construction with an estimated replacement cost of R8.3 million. Footpath information is stored on an Excel spreadsheet, with data on location, length and side of the road, but no condition information. However current overall footpath condition is considered inadequate on the basis the volume of resident complaints and observations, resulting in performance deficiencies relating to:

- ssafety - the risk of tripping due to surface irregularities (potholes, tree roots, cracks, depressions, etc.) is too high;
- appearance - generally substandard because of patching, weed growth and deterioration;
- availability - as many as 80% of residential streets do not have any footpaths, and there are insufficient cut-down crossings to allow easy passage for the disabled.

Management Strategies

The life-cycle management strategies currently used by the municipality for footpaths are summarised below.

- Routine maintenance such as crack repairs, joint/ crack leveling and growth removal are undertaken largely on a reactive basis in response to complaints. This is due to the severe constraint on funding. Improved practices will be introduced to be more proactive with condition assessment and planned repairs to improve the overall standard of service provided by footpaths. Repairs are implemented by municipal staff.
- The Supervisor is responsible for the identification of renewals, with priority based on safety issues (differential settlement/ cracks), condition and utilisation levels. A renewal being defined as the replacement of more than 10 meters of footpath.

New footpaths constructed by private developers are transferred to the ownership of the municipality when accepted as being of a satisfactory standard.

Work Programme

a) Historical Expenditure

Figures on footpath maintenance expenditure are not available. No footpath renewals have been undertaken over the past 8 years, and all resources have been applied to urgent maintenance works.

A footpath construction programme from 1994 to 1997 built 2 km of footpath per year.

b) Maintenance Forecast

Maintenance expenditure on footpaths needs to increase significantly to address a large backlog of condition related defects. Footpath maintenance expenditure is included in the financial summary assuming the current allocation for footpath is increased by an additional R100,000 pa to catch up on maintenance work.
The introduction of a job costing system will enable full footpath specific forecasts to be included in the next version of this plan.

c) Renewal Forecast

Well-maintained concrete footpaths will have a life expectancy in excess of 50 years if adequately maintained. However, about 10% of the footpaths require replacement. The forecast provides for R150,000 pa as an initial allocation, to be reviewed once a more detailed review of the needs has been done.

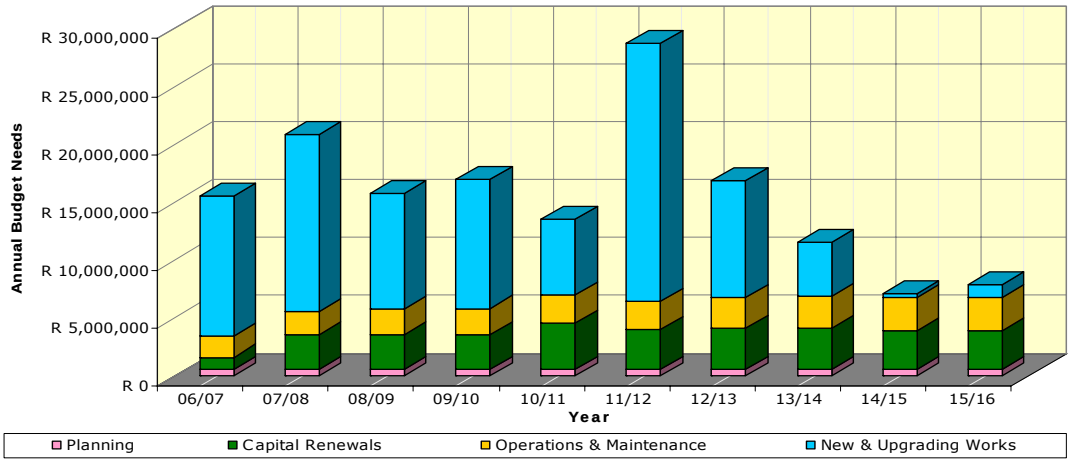
d) Development Forecast

The municipality's Strategic Objectives and the desires of the community (as expressed in the consultative process of the IDP) led to the establishment of an ongoing development programme, and the capital forecast provides for:

- new footpaths - R360,000 pa for footpath extensions;
- disabled crossings - R40,000 pa to construct 3 new crossings; and
- bus and taxi shelters - R120,000 pa to upgrade 4 new shelters.

There has been no private developer construction in the last 10 years, though new construction of some 8 kms of footpath is envisaged in the next 4 years (which will require an adjustment of the maintenance allocation).

Figure 6-16: Example of Life-cycle Budget Needs



The unit rates, O&M estimates, and Expected Useful Life figures can be used to determine the life-cycle cost of infrastructure, as indicated in the example in Table 6-24 for a new 15kW raw water pump station (excluding cost of finance):

Table 6-24: Life Cycle Cost Example (50 year period)

	Cost element	Calculation	Amount
a)	**Development**		
	Civil Works	15 x R8,251/kW (see example unit rates)	R 123,765
	Mechanical Plant	15 x R15,678/kW (see example unit rates)	R 235,170
	Electrical Plant	15 x R10,315/kW (see example unit rates)	R 154,725
	Sub-total		**R 513,660**
b)	**Annual Operations**		
	Civil Works	0.06% x R123,765 (see O&M estimation – Annexure C)	R 74
	Mechanical Plant	3% x R235,170 (see O&M estimation – Annexure C)	R 7,055
	Electrical Plant	2% x R154,725 (see O&M estimation – Annexure C)	R 3,095
	Sub-total		**R 10,224**
c)	**Annual Maintenance**		
	Civil Works	0.44% x R123,765 (see O&M estimation – Annexure C)	R 545
	Mechanical Plant	4.6% x R235,170 (see O&M estimation – Annexure C)	R 10,818
	Electrical Plant	2.3% x R154,725 (see O&M estimation - Annexure C)	R 3,559
	Sub-total		**R 14,921**
d)	**Renewal**		
	Civil Works	(renewal only after 50 years)	Nil
	Mechanical Plant	3 x R235,170 (3 renewals at years 15, 30 and 45)	R 705,510
	Electrical Plant	3 x R154,725 (3 renewals at years 15, 30 and 45)	R 464,175
	Sub-total		**R 1,169,685**
e)	**Life-Cycle Cost (over 50 years)**		
	Development	(subtotal of (a))	R 513,660
	Operations	R10,224 x 50 (subtotal of (b) over 50 years)	R 511,193
	Maintenance	R14,921 x 50 (subtotal of (c) over 50 years)	R 746,053
	Renewals	(subtotal of (d))	R 1,169,685
	Less residual value	10/15 x (R235,170 + 154,725) (10 years life of mechanical and electrical plant remaining)	-R 259,930
	TOTAL		**R 2,680,661**

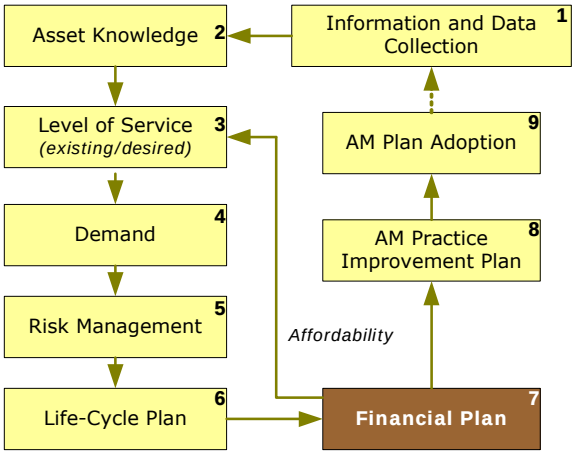
Assessment of the life-cycle costs of specific assets can be used to inform decisions between alternative solutions for new infrastructure or replacement/rehabilitation options.

6.7 Financial Planning

6.7.1 Introduction

Most municipalities will in any given financial year identify a number of capital projects. These capital projects have the purpose of enhancing the municipality's ability to provide services, or to strengthen the municipality's economic potential. This is done through the creation of new infrastructure or through infrastructure upgrades (such as the widening of a road or a process improvement in a water treatment works).

Each of these projects will typically require a capital investment (such as construction costs), after which the asset will require operational expenditure to protect the condition of the asset and to provide service benefits, as well as periodic renewals that require further capital injections. Some of these assets may provide the municipality with a constant revenue stream (typically water and electricity assets), whilst others will not (such as roads). However, the municipality needs to be sure that it can afford all the lifecycle costs that will be incurred by the asset, not just the up-front investment. For this purpose, every project proposal must be accompanied by a financial forecast to determine the financial sustainability of the asset.



A financial forecast will illustrate all the expenditure to be incurred during the asset's lifecycle, and all revenue that will realised as a result of the asset being operated. As mentioned, not all assets or infrastructure services will financially viable in their own right, meaning that there will be insufficient income generated from the use of the asset to offset the expenditure associated with that asset. By combining the income and expenditure requirements of all infrastructure assets across the major services one can determine the surplus income generated by some services, and the extent to which those surpluses can be used to subsidies expenditure in other services.

Most often the combined capital cost of identified projects in a given financial period will exceed the availability of capital with which to finance them. This means that projects must be prioritised within budget constraints. Because projects are often of a dissimilar nature, decision-makers often grapple with objectively evaluating and prioritising projects. How, for example, do you compare a roads renewal programme to the building of a community hall? Which of these projects will provide the municipality with the most benefits? At the heart of good AM planning is a sound decision making framework that makes sure existing assets and service levels are maintained – any decision to the contrary would breach the sustainability requirement. And that when investments are made in new services, the first projects are those that give most benefit for each Rand invested. The municipality must also be sure it can afford the ongoing operational cost associate with the asset,

This means that a municipality must not only consider the financial impact of the proposed solution; it must also consider broader matters such as the achievement of social objectives. For example: a project for the provision of sanitation facilities to villages largely populated by indigents may not be financially feasible in its own right, as the beneficiaries thereof may not be able to sufficiently contribute to the operating expenditure required to operate and maintain those facilities. However, Council policy (and indeed National legislation) may require that all residents enjoy a minimum standard of living that allows for basic human dignity. In such a case the project may be approved on the basis of social and legal considerations, but at a sector level (IAMP) and corporate level (CMIP) there needs to be a check to ensure that sufficient financial strength exists within the municipality to subsidies programmes and services that do not generate revenue. There needs to be a logical, transparent process for deciding on these and other priorities.

Therefore, a municipality must have in place a system of optimised decision-making, where the most appropriate solutions or projects are identified that will provide the best benefit to the community. This system consists of:

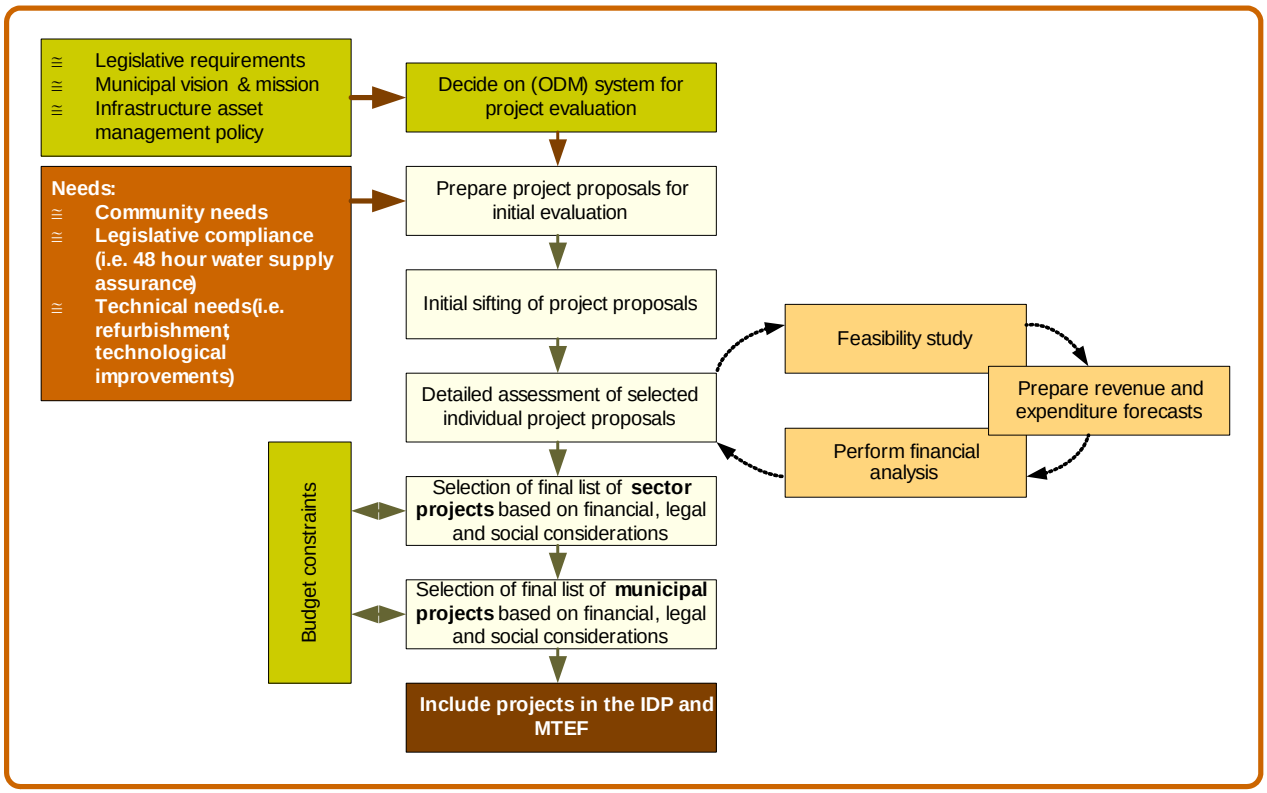
- a process and tools that define infrastructure service problems, and presents possible solutions or projects;
- a process for preparing revenue and expenditure forecasts (and, where appropriate, loan obligations) that quantifies the financial impact on the municipality and the community (usually in the form of tariff adjustments);
- a process and tools for analysing the financial merit of projects, using financial analytical indicators; and
- a framework for the evaluation of proposed solutions or projects in terms of meeting legal requirements and Council's policy objectives (i.e. financial sustainability, risk exposure, community support and legislative compliance).

This sub-section provides a framework – as illustrated in Figure 6-17 -, process and tools to assist municipalities to:

- sift through the merits of competing project proposals within a given sector;
- develop a revenue and expenditure forecast for a project proposal;
- perform financial analysis of the project; and
- assess the benefits and costs of project based on multiples criteria, including financial, legal and social considerations;

with a view to selecting those projects that will provide the most benefits to the municipality within existing budget constraints.

Figure 6-17: Investment decision process



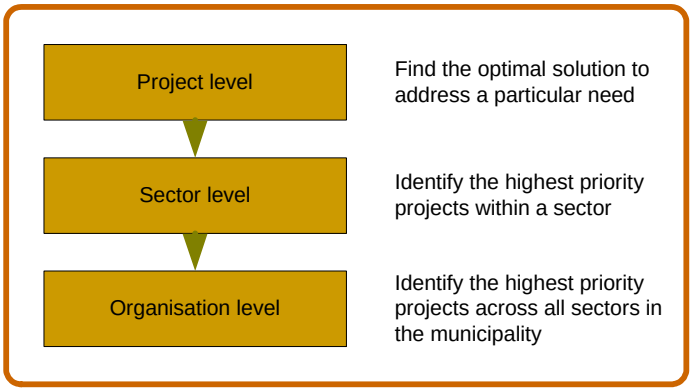
6.7.2 Decide on an ODM system for the municipality

Optimised Decision Making is defined in the NAMS guidelines[2] as "a formal process to identify and prioritise all potential solutions with consideration to financial viability, social and environmental responsibility and cultural outcomes". The NAMS ODM Guidelines propose that there are two broad methods of carrying out ODM, namely:

- a financial assessment which assesses the benefits and costs in Rand terms (described in section 6.7.3). In some cases the results of this financial assessment will be the method of prioritising projects, such as by selecting projects in order of highest Benefit-Cost Ratio (BCR).
- a multi-criteria analysis (MCA) whereby each project is scored against a number of criteria, each with different weightings, to come up with an overall ranking (examples are illustrated in sections 6.7.4 and 6.7.5). Usually the results of the financial assessment are one element in the MCA.

It should be recognised that these ODM methods can be applied at many levels, and that the focus in this section is on the sector and organisational level optimisation as illustrated in Figure 6-18.

Figure 6-18: Levels of ODM



The type of ODM method applied will obviously influence how projects are evaluated. For purposes of this Guide both methods described above are explained, though municipalities are advised to use the multi-criteria analysis for deciding on projects proposed between different sectors (the corporate level). The reason is that a municipality must not only consideration the financial outcomes of a project, but also legal, governance and social issues such as risk exposure, community wishes and other intangible matters. How to do this? The infrastructure asset management policy of the municipality will provide key policy principles (see Section 2.3) that could be used to develop criteria against which projects can be assessed. For the purpose of this Guide, a simple set of four criteria have been adopted that will be applied to illustrate how to optimise decisions between various infrastructure projects. These criteria are:

- level of support from the community (based on consultation) – the higher the level of support, the higher the score allocated;
- meeting of legislative requirements – where the project meets legislative requirements, it scores full marks in this category, and every project (such as renewals) that protects the condition of assets and therefore service sustainability, also scores full marks;
- risk exposure – the higher a project's contribution to decreasing the municipality's risk exposure, the higher the score obtained; and
- financial justification, where the higher the justification, the higher the score achieved.

The application of these criteria using both the BCR and MCA approached are discussed on the following sub-sections.

6.7.3 Needs identification

An infrastructure project aims to satisfy a particular need. Such as need may originate from:

- the community expressing a service requirement, for example that a particular road must be paved;

[2] Optimised Decision Making Guidelines, published by the New Zealand National Asset Management Steering Group, 2004.

- a technical requirement, such as the need for a process upgrade in a water treatment works that experiences high raw water turbidity; or from
- a legal requirement, such as the need to have a 48 hour water storage supply on hand.

An initial needs identification will typically not provide detailed information about the project's financial requirements, revenue potential or technical design, as an initial decision must be made whether the proposal is worthy of consideration, and whether funding should be committed towards a feasibility study and technical design. Therefore the initial proposal will typically indicate the following:

- Problem description or opportunity;
- Particulars of the proposal (i.e. location, timeframe and costs);
- Alternative solutions; and
- Perceived benefits, potential risks and other considerations – these are mostly based on engineering judgment rather than detailed research and planning;

Using the example of the requirement for a 48-hour water supply assurance, a project proposal could contain the following information:

Project proposal: Construction of a 10 Ml reservoir at Kloofnek

1. Description of problem or opportunity

The Water Services Act requires the availability of a 48 hour water supply as a buffer against supply interruptions. Phenomenal growth in urban households in the past 2 years has led to a drop in storage to the 42 hour mark. Once the housing project in the neighboring Akwanang is complete, this level will further drop to 36 hours. Given the current drought, and intermittent bulk supply issues, the municipality is particularly exposed to supply risks.

2. Possible solutions

2.1 Option 1: Construct a 10 Ml reservoir at Kloofnek

A 10 Ml reservoir could be constructed at an approximate cost of R 9 million, and commissioned within 14 months. This will increase storage capacity to 60 hours that will provide sufficient capacity until 2010.

Criteria:		Reasons:
Level of community support	☐	Not applicable – technical consideration
Legislative compliance	✓	Compliance with the Water Services Act
Risk exposure	✓	Decreased risk to water supply availability
Financial justification	☐	Not applicable

2.2 Option 2: Reduce water losses

A 10% reduction in water losses could be achieved through selective replacements in the reticulation network, at an estimated cost of R 4.5 million. This will temporarily reduce demand, thus partly correcting the storage capacity situation, and will lead to cost savings in the longer run. It will however not solve the increased demand for water, driven by new household formation.

Criteria:		Reasons:
Level of community support	☐	Not applicable – technical consideration
Legislative compliance	✓	Compliance with the Water Services Act
Risk exposure	✓	Decreased risk to water supply availability
Financial justification	☐	Not applicable

Recommendation: Proceed with Option 1 (legal compliance; appropriate response to increased demand)

6.7.4 Initial sifting of project proposals

The project proposals are sifted based on the merits and impact of the problem described and solutions offered, as well as the meeting of organisational criteria as reflected in the optimised decision making system (level of community support, legislative compliance etc.). Projects that passed this initial screening phase are deemed worthy of the time and resources required for more detailed assessment.

6.7.5 Detailed assessment of projects: preparation of financial forecasts

A financial forecast projects all revenue and expenditure associated with the project over the lifespan of the asset. The forecast will indicate whether the asset or service will realise surplus revenue or incur losses, that will indicate whether it will be financially sustainable or not. The following general guidelines apply to infrastructure projects' financial forecasting:

1. **Lifecycle costs:** Any capital investment project should show an associated operating and maintenance cost and the depreciation expense associated with the new assets.
2. **Details of sources of funding and loan obligations must be provided.** All pertinent loan details must be provided, including the principle amount, interest rate, collateral required (if any), repayment period and payment schedule. Municipalities must take care not to enter into loan agreements that exceed the lifespan of the asset, or to exceed the prescripts of National Treasury on the leveraging of balance sheets.
3. **O&M forecasts:** As well as the commissioning of new assets, O&M forecasts need to give due consideration to possible increase in maintenance as assets age, how levels of service targets will be achieved (considering the service levels gaps) and the impact of changing the service delivery strategy (contracting out). Annexure **C** provides some guidance on typical lifecycle costs associated with the different asset types.
4. **Renewal forecasts:** These can often be one of the most complicated areas to assess, particularly for underground assets where condition and remaining life is not so easily assessed. The approach is often to rely on performance issues to occur to predict exact renewal timings, and these generally only occur very late in the lifecycle. Therefore, for underground assets, renewal projects may only be able to be accurately determined in the short term. For longer term predictions, these should as a minimum be based on the assumption that assets will be replaced at the end of their expected useful life. As long as the asset register contains:
   - the replacement cost
   - the age
   - the useful life

   then the expected replacement date for each asset can be calculated and a longer renewal forecast prepared will give an indicative prediction of asset life.
5. **The impact on individual ratepayers** should always be shown.
6. **Inflation is generally excluded** from financial forecasts.
7. **All revenue relevant to the asset/service must be recorded.** It is considered prudent to present various revenue scenarios – where revenue is contingent on direct customer payments – based on varying levels of payment received.
8. **Forecasts should be compiled for a period of 20 years**, unless it is expected that the probable revenue or benefits and expenditure or costs will be for a shorter period.
9. **The level of detail** within a forecast should correspond with MFMA requirements and the information required from the CMIP. For larger organisations it would be expected that the IAMP would contain budgets to a greater level of detail and analysis, for example the IAMP should provide:
   - a breakdown of the operating costs such as reactive maintenance, pump station inspections, etc, to provide further insight on the cost drivers;
   - a list of renewals by project, at least for the first year; and

- a list of CAPEX works, at least for the first 5 years.

A key objective of asset management is the provision of levels of service that are affordable. For this purpose it is appropriate to model various levels of service scenarios into financial forecasts, to assess the financial impact thereof. The following two figures present two scenarios, as follows:

- Scenario A: Base case (expenditure required to maintain existing service levels) - this may be higher than current funding levels because of past underfunding, often because of the short-term decision making approach embedded through annual budget rounds – it is easy to make annual budget cuts and ignore the longer term implications; and
- Scenario B: Moderate level of service improvements.

The 'first cut' IAMPs will often be based around providing status quo services and existing strategies to deliver those services. The focus is often on making sure that the level of O&M and renewals is sufficient to maintain service levels (resolving under-funding is often a primary concern in the first AM Plans), and/or that the decision makers understand the service level implications of not providing sufficient funding. The continuation of status quo service levels of the 'base case', or Scenario A, can be considered as illustrated in Figure 6-19.

Figure 6-19: Scenario A: Base case to maintain existing service levels

SCENARIO A (base case)	2006	2007	2008	2025	Rank
OPERATING EXPENDITURE					
Water treatment	10,000	10,000	10,000	10,000	Essential
Reticulation	10,000	10,200	10,404	14,568	Essential
Fixed costs	10,000	10,000	10,000	10,000	Essential
Overheads	10,000	10,000	10,000	10,000	Essential
Depreciation	10,000	10,020	10,040	10,380	Essential
Interest and loan redemption	10,000	11,600	13,198	40,058	Essential
Subtotal	**60,000**	**61,820**	**63,642**	**95,006**	
Less Operating Revenue					
Tariffs	50,000	51,820	53,642	85,006	
Fixed charges	10,000	10,000	10,000	10,000	
Operating Surplus / Deficit	Nil	Nil	Nil	Nil	
CAPITAL EXPENDITURE					
Renewals	30,000	30,000	30,000	30,000	Essential
Growth related (servicing new development areas)	1,000	1,000	1,000	1,000	Essential*
Sub-total	**31,000**	**31,000**	**31,000**	**31,000**	
Plus Loan Repayments					
Total	**31,000**	**31,000**	**31,000**	**31,000**	
Funded by					
Capital Development Fund	10,000	10,020	10,040	10,380	
Borrowing	16,000	15,980	15,960	15,620	
Grant from external agency	5,000	5,000	5,000	5,000	
*Unless municipality has ability and political will to prevent the develoment					
Impact on tariffs					
	2,006	**2,007**	**2,008**	**2,025**	
Operating revenue	60,000	61,820	63,642	95,006	
Average no. of paying properties connected	50	51	52	69	
Average water tariff per property per year	***1,200***	***1,212***	***1,224***	***1,377***	

The base case financial forecast above has been presented in a very simple format. The method used was to describe expenditure by activity type, such as treatment or reticulation. Other approaches might be to group the operating expenditure by ward, instead of by asset type. If there was an equitable share allocation or a DWAF operating subsidy, these would have been included under operating revenue. Operating revenue in this case was set for a 0% surplus (neither a profit nor loss). It was determined by assuming that tariffs will equal operating expenditure less overhead costs (R 50,000 in year 1). Fixed charges have been set at an amount that will ensure cost coverage of overhead expenses (R 10,000 in year 1). To determine the annual water tariff per property, the operating revenue (tariffs plus fixed charges) is simply divided by the number of households – assuming that all households receive the same level of service and consume in equal portions.

In practice tariff setting, particularly for water, is a bit more complex. However, the emphasis here is on developing financial forecasts based on different levels of service scenarios. Tariff setting is discussed in more detail in a following section.

As AM planning gets more developed, the aim is to be able to present level of service options and the associated financial and tariff implications, so that municipalities along with the customers/community, can make informed decisions about future investment.

Figure 6-20: Scenario B: Moderate level of service improvements

SCENARIO B	2,006	2,007	2,008	2,025	Rank
OPERATING EXPENDITURE					
Base Case	60,000	61,820	63,642	95,006	
Operating costs from Scenario A investment					
O&M	20,000	20,000	20,000	20,000	Discretionay
Depreciation	10,000	20,000	20,000	20,000	Discretionay
Interest and loan redemption	50,000	51,100	52,200	105,900	Discretionay
Sub-total	**140,000**	**152,920**	**155,842**	**240,906**	
Less Operating Revenue					Discretionay
Tariffs	130,000	142,920	145,842	230,906	
Fixed charges	10,000	10,000	10,000	10,000	
Operating Surplus / Deficit	-	-	-	-	
CAPITAL EXPENDITURE					Discretionay
Base Case	31,000	31,000	31,000	31,000	
Extension of ws scheme	500,000				Discretionay
Improved water treatment					
Renewals from new works				50,000	
Sub-total	**531,000**	**31,000**	**31,000**	**81,000**	
Plus Loan Repayments					
Total	**531,000**	**31,000**	**31,000**	**81,000**	
Funded by					
Capital Development Fund	10,000	20,000	20,000	20,000	
Borrowing	21,000	11,000	11,000	61,000	
Grant from external agency	500,000				
Impact on water bill					
Average no. of properties connected	100	101	102	119	
Average water bill per property	1,400	1,514	1,528	2,024	

6.7.6 Detailed assessment of projects: financial analysis

There are many financial tools and indicators with which to assess the financial feasibility of a project. Regardless of the method employed, it is necessary to establish the costs and benefits of the project over the lifecycle of the asset. The financial forecast will provide the revenue (financial benefits) and expenditure (financial costs) associated with the project. There may however be other non-financial benefits and costs. For example, a project could yield benefits such as faster travel times through the construction of a new road, but with environmental costs, such as the disruption of an ecologically vulnerable area home to scarce species of plant and animal life.

Before undertaking financial analysis, one needs to "prepare" the cost and benefit streams over the lifecycle of the asset for equitable consideration. Therefore the first step in a financial analysis is to carry out a Discounted Cashflow Analysis (DCF) to discount future costs and benefits to Present Value (PV). Doing so allows the organisation to take into account the opportunity cost of the capital being used. The formula used to discount future cashflow is:

Figure 6-21: DCF formula

DCF formula:
Present Value (PV) = Expenditure in year n/ (1 + Discount Rate)^n

Example of the application of the DCF formula
Assume that R 10,000 will be spent in year 5, and that a discount rate of 10% will apply. The calculation is as follows:

PV = R 10,000/(1.1^5) = R 6,209

The discount rate referred to in the DCF formula is the rate or factor used to relate present and future money values. This rate should be provided by the municipality's Financial Department. Once the present values of benefits and costs are known, it is possible to assess the financial merits of the project. There are a number of financial decision indicators that one can use, though care has to be taken in choosing the one appropriate to the problem at hand, as shown in Figure 6-22.

This guide recommends that smaller local municipalities use BCR for the evaluation of all significant projects (say, greater than R100,000 capital investments). Some high value or high risk projects may require analysis using all the techniques noted in the above figure.

To perform a financial analysis, the present values of benefits and costs associated with the project over the lifecycle of the asset that is proposed must be known. However, for the purposes of financial analysis, we exclude certain cost items that would otherwise be included in a financial forecast used to determine tariffs and cash flows. The following cost items are excluded when performing a financial analysis:

- inflation;
- cost of capital, and
- depreciation.

Figure 6-22: Financial decision indicators

Decision Indicator	Formula	Application
Net Present Value (NPV)	NPV = PV of net benefits – PV of investment costs	Purpose: □ To determine the value created by an investment Avoid when: □ Comparing projects where investments costs vary significantly
Benefit-Cost Ratio (BCR)	BCR = PV of net benefits PV of investment costs	Purpose: □ Determines the benefits provided per Rand invested □ Useful for comparing projects that require different levels of investment cost
Internal Rate of Return (IRR)	Discount rate where: PV of net benefits = PV of investment costs	Purpose: □ Ranking of projects where they differ greatly in type and scale, and where insufficient capital is available Be careful of: □ Using for the ranking of projects of different timescales – IRR is prejudiced against projects with high initial costs and long term, relatively low benefits (such as a road).

Source: Adapted from NAMS Optimised Decision Making Guidelines (pg 4-5)

The Net Benefits include any financial revenue expected from the project (such as tariffs) and any O&M cost savings that may arise from the project (for example, a more efficient pump may lower O&M costs). The following figure illustrates a simple BCR calculation using DCF analysis. Using BCR, a result of > 1 indicates that the project should proceed.

Figure 6-23: BCR in action

An investment of R 500,000 is considered. The following assumptions are made:

- Annual operating costs is estimated at R 10,000
- Major maintenance is required every 5 years, at R 50,000
- Annual revenue from tariffs is estimated at R 70,000
- The discount rate is 10%

The project BCR is then calculated as follows:

	Years 5-19 are hidden for simplicity						
	YEARS						Present
	0	1	2	3	4	20	Value
Capital Investments	500,000						**500,000**
Annual Costs							
Operating Costs		10,000	10,000	10,000	10,000	10,000	85,136
Maintenance Costs		0	0	0	0	50,000	69,725
Total Annual Costs		10,000	10,000	10,000	10,000	60,000	**154,861**
Revenue							
Tariff income		70,000	70,000	70,000	70,000	70,000	**595,949**
	Net Benefit (revenue less O&M costs):						**441,089**
	BCR (Net benefit/investment cost):						**0.9**

If there had been an asset residual value, it would have been included as a benefit. With a BCR of less than 1, the project is not justified on a purely financial basis. However there may be community benefits that have not been quantified in a financial sense but which can be taken into account through prioritisation processes using multi-criteria analysis, discussed in the following section.

6.7.7 Sector level optimisation

Through the development of the IAMP, service level gaps will have been identified and will have led to a long list of projects. When we get to sector level prioritisation – e.g.: where a sector has an allocated budget for renewals, or for improving water quality across the district, and the budget is not specifically allocated to a project, then the department should have a method of prioritising projects to be undertaken within budget constraints. Below are a few examples of how a sector-level prioritisation might be applied:

Figure 6-24: Examples of sector level prioritisation

Budget allocated for extension of refuse collection service to 'area of highest need' (areas not specified in CMIP).

Approach A:
Rank projects by BCR (benefits will be calculated by the tariff that can be collected and costs are the operating costs associated with the refuse collection and disposal). Using this methodology, priority will be given to more densely populate areas (more pickups per km), those close to landfills and transfer stations and those where people can afford to pay.

Approach B:
Rank projects using a multi-criteria analysis approach where BCR is one factor, with other factors being considered such as the level of poverty in the area, any issues relating to illegal dumping effects, etc.

Budget allocated for extension of seal to roads in 'area of highest need' (areas not specified in CMIP).

Approach A
Rank projects by BCR (benefits can be calculated for faster travel times, reduced vehicle accidents, etc)

Approach B
Rank projects in order of the number of vehicles travelled on the road each day, giving priority to those with highest traffic load.

Budget allocated for water pipe renewal (areas not specified in CMIP).

Approach A
Rank projects by the number of water supply interruptions to property being caused by the pipe.

Approach B
Rank projects using an MCA approach described on the previous page with criteria including number of pipe bursts per year, type of customers connected to pipe (ie more weight given to, say, hospitals rather than residential areas), cost of replacing pipe, etc.

6.7.8 Corporate or municipal level optimisation

Eventually projects from various sectors such as roads, electricity and water will all compete for available funding. At the corporate or organisation-wide level we are required to use relatively generic criteria to prioritise between projects because of the different drivers and features that projects have in different sectors.

Some of the projects identified in the IAMP will be renewals or upgrades required to maintain the existing level of service. These are considered 'essential' funding items and do not include the renewal budget in the cross-sector prioritisation process. Notwithstanding this comment, it is good practice to have a process for prioritising renewal projects within allocated budgets.

For the remainder of the 'discretionary' (usually level of service improvement) projects, we need a robust and transparent decision making process to make sure that the projects that will provide the most value to the community are given precedence. Figure 6-25 and 6-26 illustrate a simple multi-criteria analysis approach to ranking projects. The framework will need to be developed specifically for each municipality taking into account:

- the AM policy, which will identify the municipality's corporate drivers – the criteria used to rank the projects should be in line with the AM Policy objectives;
- the financial assessment results need to be part of the decision framework – there are two ways of doing this, one is to make the BCR one of the MCA criteria (option A below), the other is to calculate a 'quasi-B/C' approach as illustrated in option B;
- the assignment of weights to each criterion should ideally be done through a customer consultation process which seeks to find out the areas of most value and need, and assigns greater weight to those criteria.

Figure 6-25: Option A: Multi-criteria Analysis

Projects being considered	Level of support from community	Legislative requirement	Risk exposure	Financial justification	Weighted Score
	Weighting				
	20	30	25	25	
Provide water supply to xy village	10	10	10	5	8.75
Extend refuse collection to xy area	5	0	5	10	4.75
Upgrade sewage treatment plant to reduce spills into river stream	5	5	5	0	3.75
New library at xy village	10	0	0	5	3.25
Reseal 50 kms of road	10	0	5	0	3.25
Scoring System	0 = No support	0 = No legislative driver	3 = moderate risk	0 = BCR < 1	
	5 = Moderate support, mainly in local area	5 = Legislative driver unlikely to be enforced	7 = significant risk	5 = BCR between 1 and 3	
	10 = Strong support across district	10 = Legislative driver likely to be enforced	10 = high risk	10 = BCR > 3	

Figure 6-26: Option B: Multi-criteria Analysis

Projects being considered	Level of support from community	Legislative requirement	Risk exposure	Weighted Benefit Score	PV costs (in R million)	Quasi Benefit-Cost
	Weighting					
	30	40	30			
Upgrade sewage treatment plant to reduce spills into river stream	5	5	5	5	2	2.50
Provide water network to xy village currently supplied by unreliable, poor quality water	10	10	10	10	5	2.00
Reseal 50 kms of road	10	0	5	4.5	3	1.50
Extend refuse collection to xy area	5	0	5	3	2	1.50
New library at xy village	10	0	0	3	5	0.60

It needs to be decided whether the analysis will consider only the municipality's cost savings (the lower maintenance costs) or also savings by the broader community (reduced injury, faster travel times).

Regardless of whether a municipality implements option A or option B, the ranking system will usually not provide an absolute ranked list that can just be slotted into the CMIP. Factors need to be considered such as whether all projects that score a 10 for legislative requirement should be moved to the top of the list regardless of scores in the other areas. Once a ranked list of projects has been developed across the organisation, it is recommended that a range of scenarios be developed that can be presented in the CMIP, for example:

- Scenario A: Base case/status quo;
- Scenario B: Moderate level of service improvement (all projects with a score > 75 are undertaken); and
- Scenario C: High level of service improvement (all projects with a score > 50 are undertaken).

6.7.9 Tariff setting

There is no uniform and consistent process followed for the setting of tariffs for municipal services in South Africa. However, most municipalities attempt to recover the costs associated with services such as water and electricity – hence the basis for tariff setting tends to be the cost associated with the service. SALGA and IMFO also recommend that municipalities apply certain principles in setting tariffs. This sub-section focuses on the requirements for tariff setting, and provides a logical process for determining tariffs. In doing so, an understanding of key accounting terms, and the treatment of costs and revenue is required.

Municipalities have powers to levy assessment rates and service charges, which include revenue from the sale of electricity and water, as well as charges for sanitation and solid waste removal. Municipalities also receive a share of nationally raised revenue referred to as the equitable share. Using this revenue, municipalities have to employ staff, purchase goods and services, maintain existing infrastructure and assets and repay lenders for amounts borrowed, including interest.

Municipalities also have to replace existing infrastructure and develop new infrastructure. These are financed from borrowings from lenders, the municipalities' own cash resources and government grants and subsidies. These new developments can also generate revenue for the municipality but will place additional expenditure demands on it. Balancing the revenue generated with the increased expenditure arising from development is the key to ongoing sustainability.

The Municipal Systems Act requires all municipalities to prepare a tariff policy that sets out the basis on how tariffs are set. This Act implies that tariffs should be based on the cost of rendering the specific service. In particular, the Act encourages municipalities to at least recover the operating and capital costs although special dispensations may be made to indigent consumers.

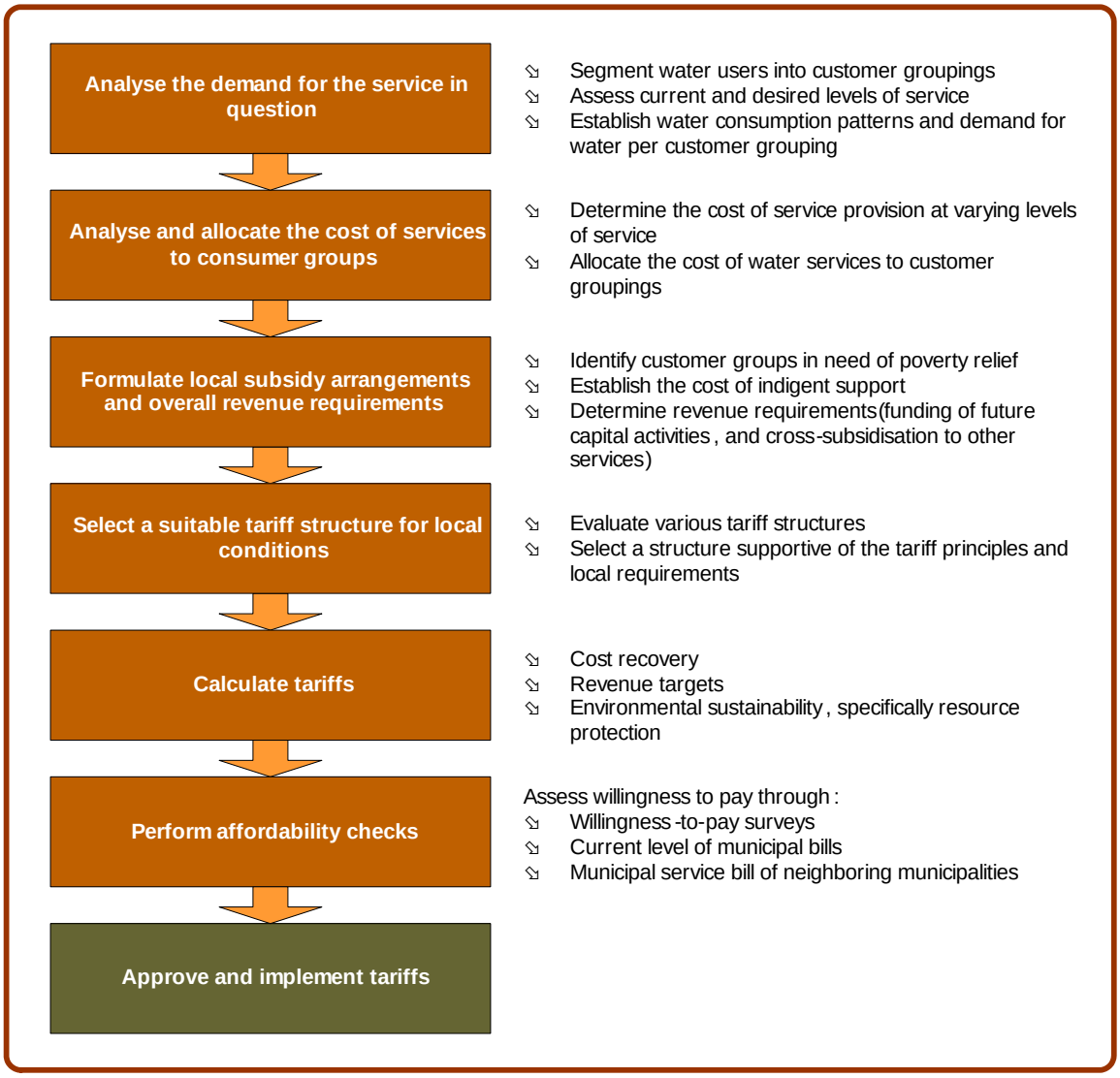
There are several principles that inform tariff determination for major municipal services[3] that includes water service provision:

- "tariffs not to be used as concealed taxes;
- ability to pay of consumer not to be used as criterion (except for indigents);
- tariffs to be uniformly and fairly applied;
- tariffs shall recover expenses associated with rendering of each service (unless policy indicates why and the extent to which such cost recovery is not feasible in the case of one or more services);
- tariffs paid by consumers or users directly related to standard of service provided and quantity of service consumed or used;
- tariffs may be determined in each annual budget to generate annual operating surplus equal to targeted percentage of operating expenses: such surpluses will be applied in relief of property rates and/or future capital expansion of service concerned (NOTE that the percentage surplus must be kept at a modest level if the tariffs are not to become concealed taxes);
- tariffs for services provided to indigents to be (annually) determined in accordance with the municipality's indigence relief programme;
- reasonable differentiation between the tariffs charged to different categories of consumers and users to be applied;
- the tariff policy to be transparently applied, and all forms of cross-subsidisation between categories of consumers and users to be fully disclosed (at least) in each annual budget;
- tariffs to be determined in a manner which makes them easy to understand by all consumers and users;
- the services to which the tariffs apply to be rendered cost-effectively;
- directly measurable service consumption to be adequately metered, and meters read monthly (if possible – if not, the policy must indicate when meters are to be read);
- charges levied to be proportionate to the measured quantity consumed;
- charges to be levied in cases of group (collective) metering of consumption;
- in addition to metered consumption, municipalities may levy an availability charge for the services concerned: the policy must indicate whether and why such a charge is to be levied, and what purpose it is meant to serve – availability charges sometimes apply to properties as yet unconnected to the system, but where connections are already available from the municipality's side;
- fixed charges may also be levied, usually for connected consumers, in order to cover the basic administrative expenses of the service (billing, meter reading, revenue collection);
- if fixed charges are levied, do they apply also to indigents; and
- tariffs for electricity, water and sewerage must cover both variable (direct) costs of service delivery, as well as the fixed costs associated with present surplus capacity"

A process for setting tariffs is indicated in Figure 6-27:

[3] IMFO. Local Government Financial Best Practice Manual. SALGA

Figure 6.27 – Process for setting tariffs



Source: Adapted from dplg (Aug 2000)

Municipalities should note the following when developing tariffs:

a. **Analysis of the demand for services** - A typical municipal area will comprise of various types of consumers with differentiated water needs and ability to pay for services rendered. This phenomenon requires that a municipality segments its consumer base to determine the demand for water, levels of service requirements, and the ability to pay for services (or the lack thereof). In most municipalities three main groupings of consumers are found:

- domestic consumers (private households) – some municipalities prefer to treat indigents as a separate grouping;
- commercial and institutional consumers (including light service user industries) - this grouping includes users such as shops, offices, hotels and public facilities such as schools, sport clubs and churches; and
- industrial consumers. This category includes industries using large volumes of a service as part of their operations.

b. **Analyse and allocate costs to consumer groups.** The following costs should be established that collectively will inform the baseline for tariff setting:

- cost of bulk purchases
- distribution costs
- distribution losses
- depreciation expenses
- finance charges
- repairs and maintenance expenses
- administration and service costs, including appropriate overheads, departmental service charges, contributions to provisions, and all other operating expenses associated with the service concerned
- targeted surplus for the financial year
- cost of indigence relief in the form of free basic water

The cost of service provision tends to differ at various levels of service (RDP standpipe, yard connections, high pressure industrial connections etc.) Care should be taken to identify the cost package per consumer unit (i.e. erven) at various levels of service.

c. **Formulate local subsidy arrangements and revenue requirements.** Most municipal areas will incorporate an indigent component that has a constitutional right of access to water. Where such a group exists, arrangements should be made to provide indigent support.

d. **Select an appropriate tariff structure.** Many types of tariff structures are found, all with distinct advantages and disadvantages. Some of these types include:

- consumption based tariffs;
- fixed charges per month or some other period;
- time of use tariffs;
- scarcity based tariffs (often a demand management measure);
- geographically varied tariffs;
- quality of service based tariffs; and
- two (or multiple) part tariffs.

These tariffs are not all equally suited to all services and conditions. A careful study, taking into consideration tariff principles, local demand and consumption patterns, and the composition of the consumer base is required in deciding upon a tariff structure.

e. Once a tariff structure has been selected, tariff can be calculated and tested for community acceptance and reasonability, and implemented.

6.8 Asset Management Practice Improvement Plan

6.8.1 Introduction

Sound management practice is required to implement a municipality's asset management policy. Indeed, without appropriate management practices there is very little hope that the
asset management policy and plans can be successfully implemented.

Infrastructure asset management practice improvement therefore considers the practice associated with the total asset management process, from the strategy to the implementation practices as portrayed in figure 6-28 (from the IIMM)

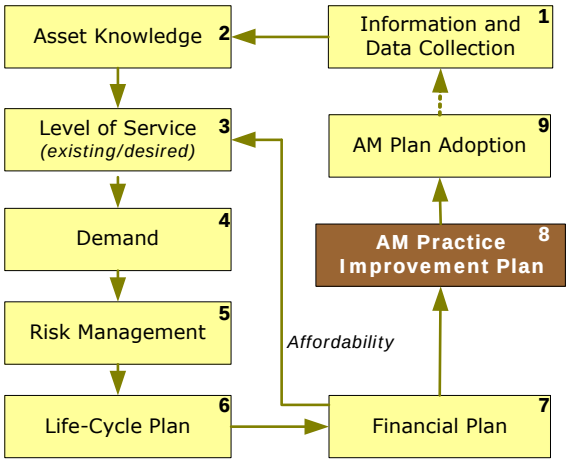
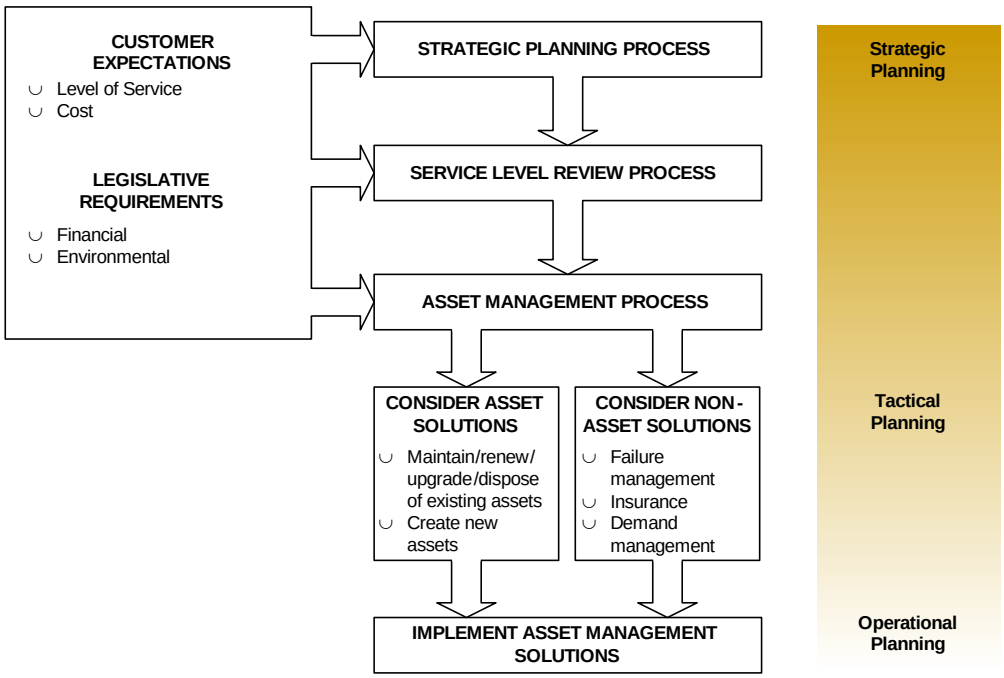


Figure 6-28: Total Asset Management Process (Source: IIMM)



Asset management practice can be considered in six broad categories, as indicated in the following figure:

Figure 6-29: Scope of infrastructure management practices

ASSET KNOWLEDGE

- Asset categorisation & hierarchy
- Location
- Physical attributes
- O&M data
- Condition data
- Performance/capacity
- Lifecycle cost data
- Asset age & lives

CURRENT ASSET MANAGEMENT PRACTICES

- Project Identification
- Contract monitoring & control
- Design/construction standards
- Asset handover
- Asset rationalisation
- Maintenance strategy
- O&M manual
- Emergency response plans

INFORMATION SYSTEMS

- Asset register
- Plans & records
- Maintenance management
- Capacity/utilisation models
- GIS
- Advanced modelling & analysis
- Project management
- Integration

STRATEGIC PLANNING PROCESSES

- Failure prediction
- Risk management
- Optimised decision making
- Service level reviews
- CAPEX evaluation long term
- Long term financial planning

AM PLAN

- Levels of service
- Demand forecasting/ management
- Asset data, description
- Lifecycle strategies
- Financial forecasts
- Practice assessment & improvement

ORGANISATIONAL TACTICS

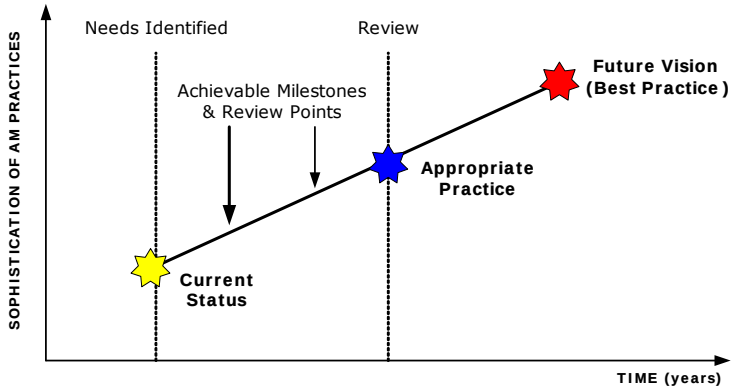
- IAM review & improvement
- Commercial tactics
- Corporate commitment
- AM roles & responsibilities
- Skills & teams
- Training

To improve upon these practices, they first need to be assessed to determine where improvement opportunities lie. Municipalities are advised to seek the services of professionals to assess infrastructure management practices, to ensure an objective outsider's view of existing practices, to identify improvement opportunities, and determine prioritised improvement tasks. However, as a starting point, an infrastructure asset management practices checklist is included in ***Annexure E*** to assist a municipality in determining whether they have the fundamentals in place.

6.8.2 Approach to improvement planning

Improving upon infrastructure management practices is not a once-off activity, but rather a continuous process that requires commitment at all levels. In planning for improvement the municipality should pursue reasonable milestones that can be achieved. This means that these milestones should be coupled to reasonable timeframes, and has sufficient budget allocation, if there is a financial implication. Care also has to be taken of the municipality's ability to absorb the impacts of changes or additional work load introduced through improvement actions. This requires consultation before implementation, timing the impacts of improvement actions, and properly communicating – and where necessary, training – to staff to raise the likelihood of successful implementation. The approach to improvement planning is shown in the following figure:

Figure 6-30: Improvement Process



1. Define the activities
2. Establish current status
3. Confirm appropriate practice
4. Identify business priorities for each activity
5. Identify tasks to close the gap
6. Set the improvement programme and assign resources andresponsibilities

6.8.3 Scoring of practices

Table 6-25 is a generic scoring approach that can be applied to all elements of infrastructure management practice. Note however, that these scores measure inputs (or enabling practices) rather than outputs such as improvements in levels of service or greater cost-effectiveness outputs are in turn measured by service level criteria (as contemplated in section 6.3 of these guidelines).

Table 6-25: Practices scoring approach

Rating	%	Description	Processes	Information Systems	Asset Knowledge (Data and Plans)
1	0	Innocence	No process exists. Never do this.	No system exists	No results seen. No confidence in information.
2	25	Awareness	Minimal documentation. Ad hoc procedures. Occasionally do this.	Manual system exists and some very basic user needs met.	Minimal results, long way to go. Very low data confidence.
3	45	Systematic Approach	Semi formal process, followed when needed for critical programs and activities.	Automated system exists. Basic user needs met.	Some results, still below expectations. Low data confidence.
4	70	Competence	Formal documented process exists, but still evolving. Process often followed.	Good system in place. Widely available. All key user needs met.	Good results, getting there. Reasonable data confidence.
5	85	Excellence	Formal documented process, well tested and followed.	Strong system in place. Nearly all user needs met.	Excellent results, still some room to improve. Good level of data confidence.
6	100	Best Possible	Strictly formal process always adhered to.	State-of-the-art system in place. All user needs met.	Unparallel results; a total success. Very high level of data confidence.

6.8.4 Improvement milestones

Table 6-26 presents typical milestones in the improvement of infrastructure asset management practice (based on a World Bank Advisory Note)

Table 6-26: Typical Milestones in Improvement of Asset Management – World Bank Advisory Note

Milestone	Requirements
Stage 1 Improvement Strategy Development	• Needs analysis / status assessment • Setting base strategy/asset management objectives • Asset data classification • Collection priorities confirmed • Asset management improvement program adopted
Stage 2 Basic Asset Register	• Set up basic asset register • Asset management information system • Identification of all assets • Basic data captured • Asset replacement cost determined • Asset replacement timetable determined • Initial asset management plans • Current levels of service identified • Basic valuations prepared
Stage 3 Basic Asset Management	• Improve attribute data • Introduce basic condition assessment • Valuation based on condition • Optimize data collection for critical assets • Maintenance history data identified • Second generation (basic) asset management plans prepared • Renewal decision-making processes documented • Determine target levels of service based on stakeholder consultation • Costs captured against assets
Stage 4 Improved Maintenance Management	• Review maintenance procedures • Apply improved procedures to assets • Schedule procedure intervals • Review maintenance plans for key assets • Begin to introduce asset criticality analysis and risk management
Stage 5 Introduce Advanced Asset Management Techniques	• Complete failure analysis on all key asset groups and critical facilities • Complete consequence of failure (risk management) analysis on all assets • Apply these findings to the life-cycle strategy and maintenance plans for assets • Valuations based on true economic lives
Stage 6 System Optimisation	• Optimized life-cycle and economic decision making used for planning levels of service, based on ongoing stakeholder consultation • All options for overcoming failures analysed • Benefits for each option quantified • Costs for each option quantified • Most appropriate strategy for each asset, facility or system identified • Advanced asset management plans developed

6.8.5 Developing project plans for improvement opportunities

Following is an example of a simple project plan for a practices improvement opportunity. Note that costs and benefits are included, to allow a BCA comparison with other proposed improvements if there is a budget constraint.

Table 6-27: Sample practices improvement project plan

Improvement Item (4)		Development of O&M strategy and plan for Water Services
Project cost		R 280,000 (VAT excl.)
Financial Year		2005/2006 – 2006/2007
Programme		Start : May 2006 - Finish : Sept 2006
Responsible	**Internal**	Manager : Technical Services, Head : Water Division, O&M staff
	External	Training providers under current DWAF funded initiative
Detail of Improvement		A comprehensive Operations and Management Plan per facility and asset type must be compiled for the **entire** municipal area, with an indication of maintenance schedules, resource requirements and allocations. Safety will also be addressed.
Benefit of Improvement		1. Improvement of existing O&M procedures 2. Improvement of the general performance of existing water infrastructure assets 3. Will increase the effective life of assets 4. Decreased interruptions and water losses 5. Improvement of service delivery

6.8.6 Evaluating practices improvement opportunities

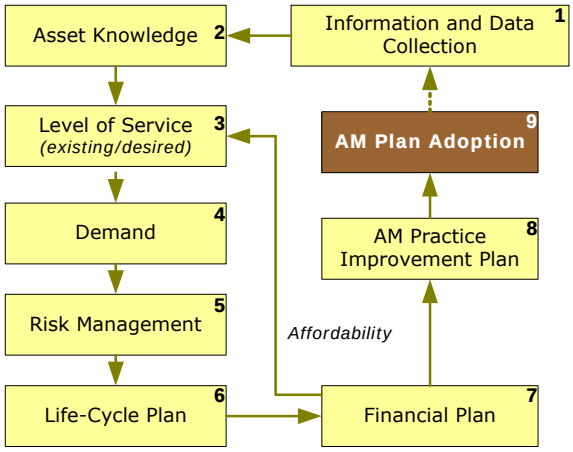
Once the costs and benefits of competing practices improvement projects are known, they can be ranked using a benefit-cost analysis as shown in the following table:

Table 6-28: Ranking of Improvement Needs

Improvement needs	Benefits					Cost (R)	Benefit-cost ratio
	Legislative compliance	Improved LOS	Cost savings	Risk mitigation	Operational efficiency		
Assessment of AM skills gap and provision of WSP for training	M			M	H	0	7.00
Development of O&M strategy and plan		L	M	L	M	0	6.00
Inclusion of policy requirement for financial analysis of high value capital projects			M	H		0	5.00
Development of risk policy, strategy and register	H		H	H	L	70,000	5.00
Development of AM policy and procedures (asset take-up, changes to asset position, depreciation etc.)	H			M	M	70,000	3.50
Development of maintenance plans for critical assets		M	L	L	H	> 200,000	2.33

6.9 IAM Plan Adoption

The IAM Plan for each sector needs to be submitted to Council for information and formal adoption.



6.10 Consolidating Asset Information and Strategies for the CMIP

Section 5 of these guidelines provides an overall process for developing a CMIP. This toolbox section provides more detailed description and examples of what is contained within the CMIP, in particular the sector summaries section.

This section of the CMIP should summarise key information from the IAMPs. A typical sector summary section would be around 4 pages:

- 1 page infrastructure overview
- 1 page key sector issues and risks
- 1 page level of service targets/scenarios
- 1 page financial forecasts.

An outline example of a sector summary is presented below.

a. Infrastructure overview

Example 1: The municipal road network has the following features:

	Land Use / customer types	Asset quantities	Value	Typical age and condition	Level of service currently provided
Ward 2	75% rural 20% residential 5% industrial/ business Pop: 20,000 16,000 indigents.	120 km of gravel roads 140 km of paved roads 30 km of tracks 8 bridges	R238 million Replacement Cost R8 million Annual Depreciation R110 million current value (DRC)	15% of paved roads in poor condition. Renewed 10 yearly. 50 % of tracks only passable with 4WD in rainy season.	10% serviced by tracks. 40% by gravel roads. 50% by paved roads.

The text description in the table could be supported by a couple of key graphs such as asset condition, or part of the table could be replaced by graphical illustration of the key statistics.

b. Key Sector Issues

Provide a high level overview of the key issues facing each sector, for example:

- Very high water usage per capita and the need for strong demand management measures
- High number of illegal connections to public network need to be managed – in some areas supply at standpipes is only available at small flow rates and for a few hours a day
- Particularly high road accident rates compared to other areas
- Problems with illegal dumping of rubbish in particular areas
- Large % of the population still on bucket system
- Outbreaks of illness in XY villages are believed to originate from the water supply

- Under-investment in basic road maintenance and resealing and caused a deterioration in asset condition over the last 10 years (could be supported by a graphic of Road Condition Index)
- Low use of community facilities and need to consider whether some should be divested
- etc

c. Key Risk Areas

This is intended to be a high level summary of the risk section in the IAMP, presenting the major risk areas and proposed management action. Describe any relationship with levels of service targets. A couple of examples are provided below. For further information on identifying risks, refer to section 6.

Public health and safety risks:

- High public health risks associated with use of pit latrines. Strategic scenario proposes to eliminate pit latrines by 2010 (scenario A) or 2016 (scenario B)
- Water supply relies on one source which is vulnerable to drought
- Old treatment processes causing fluctuating water quality
- Municipality is not carrying out its responsibilities to manage/monitor the quality of private on-site systems
- etc

d. Level of Service Targets

It is important to keep focused on just a few key outcomes when selecting levels of service (performance standards) for the CMIP. These may well be supported by more technical and detailed levels of service in the IAMP.

Future level of service targets should be presented for a range of strategic scenarios - in the following example:

- Scenario A is a 'maintain current service levels' option
- Scenario B is a 'medium service level improvement' option
- Scenario C is a 'high service level improvement' option.

In fact there may a Scenario below Scenario A that is to maintain current funding levels and allow levels of service to drop (if current funding levels are unsustainable and basic maintenance and renewals are being deferred).

The example shows a variety of sector examples but obviously each table will be focused on just one sector. Section 6.3 contains further discussion and examples in developing levels of service.

e. Financial Forecasts

Summarised expenditure and funding plans for the next 10 – 20 years should be included for each sector. The development of financial plans for both IAMPs and CMIPS are discussed in section 6.7.

6.11 Summary

The toolkit concept recognises that existing practice will vary – tools are provided that can be applied according to the specific needs and priorities of each municipality. In some cases, existing techniques will match or exceed the practice indicated in the toolkit, but in many cases municipalities will be able to identify the techniques that they need to adjust, align, completely change, or ones that need to be started from scratch.

7. REFERENCES

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ANNEXURE A

ANNEXURE A - ASSET REGISTER

Example Content of an Immovable Asset Register

1. Identification Reference (using a documented referencing convention)
2. General Ledger Code
3. Movable or Immovable Asset
4. Asset Category and Sub-category (PPE: land, infra, community, heritage, or other; investment property; or inventory property)
5. Heritage status (indicate if culturally, environmentally, or historically significant)
6. Asset Class (in accordance with a documented convention)
7. Asset Group (group of assets for reporting purposes e.g. network in a particular area, or a specific facility)
8. Description of Asset (clear description e.g. name of facility, asset type, make and model/file ref to plans)
9. Ward Number
10. Asset Location (Erf, street, room – as applicable)
11. Take-on Date (date of delivery or beneficial use)
12. Municipal ownership or lease (owner or lessee and file ref for title deed/lease/rights/restrictions details)
13. Supplier (company name, contact details)
14. Work-in-progress (capital expenses prior to beneficial use of the asset)
15. Original Cost (check treatment of VAT – e.g. invoice ref)
16. Funding Source (name and type of funding of original construction – surplus cash, loans, grants, donations, reserves)
17. Responsible Department (name of department)
18. Asset Custodian (name of person)
19. Effective Date of Custodianship (date person became custodian)
20. Basic Municipal Service (Yes or No, based on municipal policy)
21. Applicable Contracts (encumbrances, warranties, guarantees, maintenance contracts, etc)
22. Date Asset Last Renewed (full renewal - not partial)
23. Expected Useful Life (years)
24. Age (years from take-on or last renewal)
25. Remaining Useful Life (years - initially, expected useful life minus age – superceded by RUL determined on latest renewal or on re-valuation)
26. Method of depreciation (usually straight line)
27. Residual Value (usually taken as zero for infrastructure assets)
28. Capitalised Costs (expenses incurred in asset enhancement)
    - This month
    - This Financial Year
    - Since take-on/re-valuation
29. Depreciation (original cost or re-valued amount plus subsequent capitalised expenses/RUL)
    - This month
    - This Financial Year
    - Since take-on/re-valuation
30. Impairment losses (as assessed in re-valuation exercise or ad-hoc impairment event)
    - This month
    - This Financial Year
    - Since take-on/re-valuation
31. Carrying value (original cost or re-valued amount plus subsequent capitalised expenses, less subsequent depreciation and impairment)

32. Disposal method (disposed, alienated, lost, stolen, destroyed, or decommissioned)
33. Disposal expense/revenue
34. Date of write-off (date asset physically removed or decommissioned)
35. Re-valuation data (immovable assets only)
    - Latest re-valuation date
    - Next re-valuation date
    - Re-valuation method
    - PPE: DRC (or market valuation for applicable buildings)
    - Unit measure of asset extent (e.g. m; sqm, kW, Mℓ, etc)
    - Extent of asset (number)
    - Latest unit rate for replacement (Rand per unit)
    - Replacement value (current replacement cost: Unit Rate x Extent)
    - Latest re-valued amount (PPE: Replacement value x remaining useful life/expected useful life)
    - Change in value in current financial year due to re-valuation (latest re-valued amount minus carrying value on date of re-valuation)
    - Re-valuation reserve (accumulated change in value due to re-valuations)
36. Infrastructure Management Data (immovable assets only)
    - Criticality (based on documented grading convention)
    - Asset Condition (based on a documented grading convention and linked to remaining useful life)
    - Maintenance history (key information to support lifecycle decisions or link to Maintenance System)
    - Asset performance (based on a documented grading convention)
    - Asset utilisation (based on a documented grading convention)
    - Data accuracy (based on a documented grading convention)

Table A-2: Example Infrastructure Information Collected For Bulk Pipelines

ID No (IA-WAT/...)	Ward	Suburb	Location Description	Pipe Type	Ø [mm]	Length [m]	Capacity [ℓ/s]	Rate (R)	CRC (R)	DRC (R)	Year Built	RUL	EUL	Criticality	Utilisation [%]	Condition Grade	Data Conf.	Land Area [m^2]	Land Type	Land Value (CRC)	Total CRC Pipes and Land
BP-001	4	Ellisras	Bulk Pipe V3 to Ellisras	AC Class 12	300	5,920	220	551	3,261,920	1,025,175	1982	11	35	Important	90	Fair	2	5,920	Urban residential - Medium Income	355,200	3,617,120
BP-002	2	Marapong	Marapong x2	uPVC Class 12	250	243	150	551	133,893	105,999	2001	95	120	Important	60	Very good	1	243	Urban residential - Low Income	7,290	141,183
BP-003	2	Marapong	Marapong x2	AC Class 12	350	126	300	716	90,216	33,509	1984	13	35	Important	60	Poor	1	126	Urban residential - Low Income	3,780	93,996
BP-004	9	Witpoort	BH field to central Res	uPVC Class 12	160	5,617	60	385	2,162,545	1,730,036	2002	96	120	Important	50	Good	1	5,617	Rural settlement - Indigent	5,617	2,168,162
BP-005	9	Witpoort	Central Res to Hugo de Groot	uPVC Class 12	125	4,221	40	385	1,625,085	1,300,068	2002	96	120	Critical	50	Very good	1	4,221	Rural settlement - Indigent	4,221	1,629,306
BP-006	9	Witpoort	Split to Mongalo	uPVC Class 9	63	2,085	10	220	458,700	366,960	2002	96	120	Critical	50	Very good	1	2,085	Rural settlement - Indigent	2,085	460,785
BP-007	9	Witpoort	Split to Tlapaleborethe	uPVC Class 12	90	2,230	20	220	490,600	392,480	2002	96	120	Important	50	Very good	1	2,230	Rural settlement - Indigent	2,230	492,830
BP-008	11	Witpoort	Split to Kgobagodimo	uPVC Class 12	125	2,084	40	385	802,340	641,872	2002	96	120	Critical	50	Very good	1	2,084	Rural settlement - Indigent	2,084	804,424
BP-009	11	Witpoort	Split to Botsalanong	uPVC Class 9	90	5,407	20	220	1,189,540	951,632	2002	96	120	Important	50	Very good	1	5,407	Rural settlement - Indigent	5,407	1,194,947
BP-010	11	Witpoort	Botsalanong to Kopanong	uPVC Class 12	110	2,750	30	385	1,058,750	847,000	2002	96	120	Important	50	Very good	1	2,750	Rural settlement - Indigent	2,750	1,061,500
BP-011	11	Witpoort	Botsalanong to Sekgale	uPVC Class 9	75	3,956	15	220	870,320	696,256	2002	96	120	Critical	50	Very good	1	3,956	Rural settlement - Indigent	3,956	874,276

ANNEXURE B

ANNEXURE B - RISK REGISTER

Table B-1: Example - Risk Register

Risk Responsible Person	Drivers and/or Contributory Factors	Comments and/or Impact	Current Mitigation Measures			Proposed Mitigation Measures (Costs and Target Dates)		
			Consequence	Probability	Risk Exposure	Consequence	Probability	Risk Exposure
Drought - Mokolo supply affected when dam runs dry, Lephalale river dry for more than 6 months, ground water depleted. E Mothlodine Municipal Manager + Team with Mayor & Council	Lower than normal rainfall occurs frequently but those instances where 2 - 3 dry years in succession are experienced can cause serious shortages.	Insufficient water availability for human consumption and industrial use will result, conservation measures are to be used judiciously. Lephalale and Marapong affected, villages along river in RWS affected, all villages in Mokerong.	Moderate	Likely	Significant exposure	Minor	Likely	Moderate exposure
			• Water Demand Management • Additional supply sources were developed where no or little reserve supply is available.			• Operating Rules/Plan for Mokolo dam to be done. Cost: None (DWAF). • River water use to be reduced under no-flow conditions. Cost: None. • Monitoring of ground water table. • Artificial recharge of groundwater. Cost: R8m. • Target date is 31 Dec 06.		
Vandalism - Elevated Tanks, Pump stations, Valves, Equipment, Stand taps etc damaged ISD, LED, IDP officers and Community + Technical Services SFM van Wyk	Political unrest, Government failing to meet expectations, Poor service standards	Consumers, especially in rural or low cost housing areas may vent frustrations e.g. cost recovery processes or real or perceived failures in service delivery on municipal property.	Minor	Moderate	Moderate exposure	Minor	Unlikely	Low exposure
			• Eradication of backlogs and improved Levels (and standard) of Service is a priority.			• Improved performance and rate of improvement in service delivery. • Proper Institutional and Social development. • Job creation and poverty reduction is needed. • Target date is 10. Cost: To be determined.		
Water quality failure - Cholera/Typhoid infection, Water Pollution, Poor Quality Ground Water Sources. A Shiko	Poor living standards, lack of hygiene awareness, overcrowding and sub standard services	Unchlorinated municipal water or water from wells or pools can become contaminated and cause illness/death.	Major	Unlikely	Moderate exposure	Moderate	Rare	Low exposure
			• A program was begun to chlorinate all municipal water systems.			• Further training and monitoring in chlorination. Cost: R120,000. • Replacement of remaining class 3 and class 2 water supplies with acceptable quality. Cost: R8,000,000. • Target date is 30 Jun 10.		

ANNEXURE C

ANNEXURE C

EXAMPLE UNIT RATES

Municipalities should adopt unit rates that are appropriate to the types of asset actually used and local conditions. Where possible, rates should be informed by actual tender prices, and national/provincial data, and must be adjusted for inflation.

Example unit rates are indicated below, with a base date of June 2006. These are not intended to be a comprehensive listing, nor are they necessarily applicable in all situations. The rates contemplate the overall project costs, as may typically be used in pre-feasibility cost estimates. Where applicable, the rates include provision for design and supervision, provisional and general costs, project contingency, and VAT.

Table C-1: Example Unit Rates – Road Infrastructure

Asset Category	Description/type	Unit	Rate
Paved Road, Surface layer	All roads	Area (m^2)	R 55
Paved Road, Structural layer	Arterial	Area (m^2)	R 330
	Distributor	Area (m^2)	R 275
	Collector	Area (m^2)	R 220
	Residential	Area (m^2)	R 165
Unpaved Road	All roads	Area (m^2)	R 28
Structures	Bridges, vehicular	Area (m^2)	R6,000
	Bridges, pedestrian	Area (m^2)	R6,000
	Retaining Walls	Area (m^2)	R1,650

Table C-2: Example Unit Rates – Water Supply Infrastructure

Asset Category	Asset Description/type	Unit	Rate
Boreholes	0 – 40	kW	R 4,620
	40 – 85	kW	R 3,740
Water Treatment Works (Civil Structures & Pipework)	< 2	Mℓ/day	R 550,000
	2 – 10	Mℓ/day	R 1,210,000
	10 – 50	Mℓ/day	R 990,000
Water Treatment Works (Mechanical Plant)	< 2	Mℓ/day	R 330,000
	2 – 10	Mℓ/day	R 726,000
	10 – 50	Mℓ/day	R 594,000
Water Treatment Works (Electrical Plant)	< 2	Mℓ/day	R 220,000
	2 – 10	Mℓ/day	R 484,000
	10 – 50	Mℓ/day	R 396,000
Raw water pump station (Civil Works)	> 5	kW	R 32,359
	6-10	kW	R 17,393
	11-25	kW	R 8,251
	26-50	kW	R 5,178
	51-75	kW	R 4,153
	76-100	kW	R 3,640
Raw water pump station (Mechanical Works)	> 5	kW	R 61,482
	6-10	kW	R 33,047
	11-25	kW	R 15,678
	26-50	kW	R 9,837
	51-75	kW	R 7,890
	76-100	kW	R 6,917
Raw water pump station (Electrical Works)	> 5	kW	R 40,449
	6-10	kW	R 21,742

Asset Category	Asset Description / type	Unit	Rate
	11-25	kW	R 10,315
	26-50	kW	R 6,471
	51-75	kW	R 5,191
	76-100	kW	R 4,551

Table C-3: Example Unit Rates – Sanitation Infrastructure

Asset Category	Asset Description / type		Unit	Rate
Sewage Treatment Works (Civil Structures & Pipework)	<2 Mℓ		Mℓ	R 2,750,000
	2 – 10 Mℓ		Mℓ	R 2,200,000
	10 – 50 Mℓ		Mℓ	R 1,925,000
Sewage Treatment Works (Mechanical Plant)	<2 Mℓ		Mℓ	R 1,650,000
	2 – 10 Mℓ		Mℓ	R 1,320,000
	10 – 50 Mℓ		Mℓ	R 1,155,000
Sewage Treatment Works (Electrical Plant)	<2 Mℓ		Mℓ	R 1,100,000
	2 – 10 Mℓ		Mℓ	R 880,000
	10 – 50 Mℓ		Mℓ	R 770,000
Pumping Mains	Upvc (12 bar)	80mm diameter	m	R 224
		110mm diameter	m	R 308
		160mm diameter	m	R 374
		200mm diameter	m	R 578
		250mm diameter	m	R 856
	Steel (12 bar)	200mm diameter	m	R 1,034
		250mm diameter	m	R 1,351
		300mm diameter	m	R 1,619
		350mm diameter	m	R 1,759
		400mm diameter	m	R 1,943
		450mm diameter	m	R 2,085
		500mm diameter	m	R 2,197

Table C-4: Example Unit Rates –Stormwater Infrastructure

Asset Category	Asset Description / type		Unit	Rate
Attenuation Ponds	Earth embankment volume		m^3	R 165
	Outlet		No	R 550,000
	Spillway		No	R 110,000
Stormwater nodes and transitions	Catchpits		No	R 4,180
	Grid inlets		No	R 4,180
	Manholes		No	R 4,950
	Wing walls		No	R 22,000
Stormwater erosion protection	Gabions		m^3	R 605
	Rip rap		m^3	R 275
	Stone pitching		m^2	R 209
Stormwater pipes	Class 50 D	300 mm diameter	m	R 319
		375 mm diameter	m	R 429
		450 mm diameter	m	R 605
		525 mm diameter	m	R 660
	Class 75 D	300 mm diameter	m	R 319
		375 mm diameter	m	R 429
		450 mm diameter	m	R 605
		525 mm diameter	m	R 803
		900 mm diameter	m	R 2,310

Table C-5: Example Unit Rates – Solid Waste Infrastructure

Asset Category	Asset Description / type		Unit	Rate
Bins	85-litre steel, plastic or rubber		Number	R 231
	240-litre wheeled plastic bins		Number	R 358
	180 litre steel drum mounted on steel poles for street litter		Number	R 880
Bulk containers	Steel containers with closing lid: 1 cubic metres		Number	R 4,400
	Open top skip: 3 cum		Number	R 6,380
	Open top skip: 4 cum		Number	R 6,490
	Open top skip: 5 cum		Number	R 7,920
	Open top skip: 6 cum		Number	R 8,470
	Tractor with cab: four-wheel drive 61 kw		Number	R 275,000
	Tractor with cab: four-wheel drive 78 kw		Number	R 330,000
	5,000ℓ Honey Sucker		Number	R 682,000
	10,000ℓ Honey Sucker		Number	R 924,000
Compactors and plant for landfill operations	Landfill compactor		Number	R 2,420,000
	TLB (excavations and filling)		Number	R 517,000
	Bulldozer (D6)		Number	R 1,595,000
	Excavator (20 ton)		Number	R 1,072,500
	Water Tanker 10,000ℓ		Number	R 924,000
Static equipment	Balers	H10	Number	R 72,600
		H15	Number	R 83,270
		H15C	Number	R 113,300
	Tie Balers	H16	Number	R 522,500
		H26	Number	R 579,150
	Compactors	C5	Number	R 96,580
		C7	Number	R 110,550
	Chippers	2050	Number	R 107,800
		2070XL	Number	R 386,100
	12 meter steel deck 40 ton		Number	R 256,300
	12 meter steel deck 60 ton		Number	R 313,500

Table C-6: Example Unit Rates for Electricity Supply Infrastructure

Asset Category	Asset Description / type	Unit	Rate
MV Substations	200 KVA Minisubs	No	R 170,000
	315 KVA Minisubs	No	R 205,000
	500 KVA Minisubs	No	R 240,000
	100 KVA Pole-top	No	R 60,000
	200 KVA Pole-top	No	R 77,000
	400 KVA Pole-top	No	R 125,000
MV Network	33 KV overhead	Km	175,000
	11/22 KV overhead	Km	120,000
	22 KV underground	Km	2,000,000
LV Network	Open wire	Km	70,000
	Aerial Bundled Conductors (ABC)	Km	122,000
Consumer connection	Domestic (overhead)	No	R 2,500
	(underground)	No	R 4,400
	Commercial (overhead)	No	R 4,300
	(underground)	No	R 17,200
Meters	Prepayment – single phase	No	R 900
	Credit – single phase	No	R 400

Table C-7: Example Unit Rates – Parks and Cemeteries Infrastructure

Asset Category	Asset Description / type	Unit	Rate
Irrigation	Automatic sprinkler system	m²	R30
Ablution facilities	Brick with water flush systems	m²	R50
Garden furniture	Fixed seating and play apparatus	Item per park up to 5 Ha	R44,000
Perimeter security	Steel structure galvanised or painted, or brickwork	m	R550
	Electric fencing	m	R70
Landscaping	Grass, shrubs, trees	m²	R45

Table C-8: Example Unit Rates – Civic centres, Community Halls

Asset Description / type	Unit	Rate
Developed external facilities and civil works	sqm grounds	R420
Structural and building fabric	sqm building	R3,600
Building finishes	sqm building	R610
Plumbing installation	sqm ablution and kitchen facilities	R1,800
Electrical installation	sqm building	R1,400
Air conditioning installation	sqm air-conditioned area	R1,050
Lifts	lift/ landing number	R27,500
Fire equipment	sqm building	R450
Equipment for theatre and council chambers	sqm of facility	R450

Table C-9: Example Unit Rates – General Assets

Asset Category	Asset Description / type	Unit	Rate
Depots and Equipment Buildings	Brick/block walls & concrete roof slab	sqm	R5,200
	Brick/block walls & "other" roof	sqm	R4,400
	Pre-cast concrete walls & other" roof	sqm	R5,300
	Prefabricated shed	sqm	R3,750
	Traditional wattle & plants construction	sqm	R2,650
External works	Access, secure and landscaped	sqm	R45
	Access, landscaped but not secure	sqm	R25
	Access, secure but not landscaped	sqm	R25

ANNEXURE D

ANNEXURE D

EXAMPLE OF BASIS FOR ESTIMATING ANNUAL OPERATIONS AND MAINTENANCE BUDGETS

The examples presented in this annexure are estimated median costs for the operations and maintenance of assets on the assumption of an outsourced service (ie including labour, materials and consumable costs). In recognition of the fact that the level of effort required in any specific application may vary considerably, municipalities should ensure that the figures adopted are appropriate to the types of asset actually used, local conditions (social, climatic, topographic and geotechnical), and the expected standards of service. **Where possible, the figures should be derived from a detailed assessment of resources used, and may be informed by appropriate benchmark data.**

The annexure is not intended to be a comprehensive schedule covering all asset categories and types.

Table D-1: Indicative Network Annual O&M Budgets

Network	Asset		Operations (%CRC)	Maintenance (%CRC)
Roads	Pavement surface	Arterial	0	8.2
		Distributor	0	4.4
		Collector	0	1.75
		Residential	0	0.5
	Pavement structural layer	Arterial	0	1.2
		Distributor	0	1.2
		Collector	0	1.0
		Residential	0	0.1
	Gravel Road surface	Arterial	0	0.5
		Distributor	0	0.5
		Collector	0	0.5
		Residential	0	0.1
	Footpaths	Hardened surface	0	0
	Structures	Bridges, vehicular	0	1.5
		Bridges, pedestrian	0	1.4
		Culverts	0	1.1
		Retaining Walls	0	0.6
	Street Furniture	Gantries	0	0.3
		Street Signs	0	10
		Traffic Signals	0	3
		Street Lights	0	1.1
		Guard Rails	0	5.7
		Commuter Shelters	0	1.0
Water Supply	Dams		0.4	0.25
	Boreholes		1.8	5.7
	Civil Structures & Pipework (Water Treatment Works)		R120 000/ Mℓ/d	0.9
	Civil Structures & Pipework (Pumpstations)		0.1	0.5
	Civil Structures & Pipework (Reservoirs)		0.1	0.7
	Mechanical Plant		3	4.6
	Electrical Plant		2	2.3
	Bulk Water Pipelines		0.1	0.5
	Reticulation		0.1	1.5
	Treatment package plants		3	3.3
Sanitation	Civil Structures & Pipework (Sewage Treatment		R180 000/	1.4

Network	Asset	Operations (%CRC)	Maintenance (%CRC)
	Works)	Mℓ/d	
	Civil Structures & Pipework (Pumpstations)	0.1	0.5
	Mechanical Plant	3	4.6
	Electrical Plant	2	2.3
	Bulk Pipelines	0.1	0.5
	Reticulation	0.1	1.5
	Treatment package plants	3	3.3
Stormwater	Open Channels – Lined	0	1.4
	Open Channels – Unlined	0	10
	Pipes (<600mm diam.)	0	0.65
	Pipes (>600mm diam.)	0	0.35
	Nodes and transitions	0	1
	Erosion protection	0	1.25
	Hydrological monitoring and measuring equipment	0	1.5
	Ponds	0	0.35
	Pumpstation: mechanical plant	3	4.6
	Pumpstation: electrical plant	2	2.3
	Pumpstation: civil structures	0.1	0.5
Solid Waste	Vehicles	5	5
	Compactors and plant	4	5
	Static equipment	3	3
	Weighbridge	2	2
	Landfill	R 27 per ton	R 12 per ton
	Bins	20	0
	Containers	10	10
Electricity	Transformers	0.3	5.2
	Feeders	0.8	1.7
	Mini-substations	0.2	1.6
	Substation switchgear	0.3	0.5
Parks and cemeteries	Irrigation	See note	7.7
	Ablution facilities	See note	7.3
	Garden furniture	0	2.7
	Perimeter security	See note	2.3
	Landscaping	See note	7.7
Buildings	Developed external facilities and civil works	See note	5
	Structure and building fabric	0	0.55
	Building finishes	0	2
	Plumbing	0	3
	Electrical	0	3
	Air conditioning - Central plants	0	6.3
	- Small units	0	3
	Lifts	See note	13.6
	Fire	0	4.5
	Equipment for theatres and council chambers	See note	3.5
	Gas installations	See note	2.5

Note: the operations budget will depend on the level of service and usage of the facility.

ANNEXURE E

ANNEXURE E

CHECKLIST FOR CORE INFRASTRUCTURE ASSET MANAGEMENT PRACTICES

NAME OF MUNICIAPLITY: _____ **DATE:** _____

1	**Infrastructure asset knowledge**			
1.1	Do you have an asset register for infrastructure?	Yes	No	Partly
1.2	Is the asset take-on value, date, age, capacity and materials type recorded?	Yes	No	Partly
1.3	Are all infrastructure assets recorded in the asset register?	Yes	No	Partly
1.4	Can asset data be grouped to reflect asset groups, facility and network information?	Yes	No	Partly
1.5	Does the asset register contain information that allows assets to be easily located?	Yes	No	Partly
1.6	Are as-built drawings available for all assets?	Yes	No	Partly
1.7	Can you ascertain the risk exposure (criticality) for each asset from the asset register?	Yes	No	Partly
1.8	Are planned maintenance activities recorded against assets?	Yes	No	Partly
1.9	Are service failures/customer complaints/breakages recorded against assets?	Yes	No	Partly
1.10	Do you track the utilisation levels of key assets?	Yes	No	Partly
1.11	Do you regularly assess the condition of assets and record condition grades against them?	Yes	No	Partly
1.12	Do you track the costs associated with each asset (creation, O&M and refurbishment)?	Yes	No	Partly
1.13	Is a documented process in place to capture and update asset data in the asset register?	Yes	No	Partly
2	**Strategic planning**			
2.1	Do you have performance measures that address levels and standards of service?	Yes	No	Partly
2.2	Do you monitor and report on performance at network level?	Yes	No	Partly
2.3	Do you regularly assess the demand for infrastructure services (backlogs, extensions etc.)?	Yes	No	Partly
2.4	Do you regularly assess the ability of your infrastructure to meet the demand for services?	Yes	No	Partly
2.5	Do you consult with communities on issues such as service level needs and affordability issues?	Yes	No	Partly
2.6	Do you have a corporate risk policy and plan that addresses infrastructure?	Yes	No	Partly
2.7	Do you actively undertake infrastructure risk mitigation?	Yes	No	Partly
2.8	Do you prioritise projects based on funding constraints, backlogs and service risk?	Yes	No	Partly
3	**Current IM practices**			
3.1	Do you consider the full lifecycle costs of each proposed capital project?	Yes	No	Partly
3.2	Do you have a CAPEX plan that addresses backlogs, service extensions, renewals and upgrading?	Yes	No	Partly
3.3	Do you manage to spend capital according to plan?	Yes	No	Partly
3.4	Do you have processes in place to manage contractor performance?	Yes	No	Partly
3.5	Do you have a documented O&M plan?	Yes	No	Partly
3.6	Do you practice preventative maintenance for critical assets?	Yes	No	Partly
3.7	Do you have structured responses to infrastructure failures?	Yes	No	Partly
4	**Asset management plan**			
4.1	Do you prepare iAPMs?	Yes	No	Partly
4.2	Does the iAMP supports the achievement of corporate strategic goals?	Yes	No	Partly
4.3	Does it propose a lifecycle plan for the management of infrastructure?	Yes	No	Partly
4.4	Does it provide a financial plan indicating how infrastructure service objectives will be financed?	Yes	No	Partly

4.5	Does it provide an infrastructure management risk plan?	Yes	No	Partly
4.6	Does it provide an infrastructure management practices improvement plan?	Yes	No	Partly
4.7	Is the plan addressed at the needs and level of understanding of key stakeholders?	Yes	No	Partly

5 Information systems

5.1	Do you have an electronic asset register?	Yes	No	Partly
5.2	Is the system user-friendly, with easy reporting capabilities?	Yes	No	Partly
5.3	Do you have a GIS system?	Yes	No	Partly
5.4	If you have an electronic asset register, is it linked with the financial system?	Yes	No	Partly
5.5	If you have an electronic asset register and a GIS, are they linked?	Yes	No	Partly

6 Organisational and commercial tactics

6.1	Do you benchmark against other municipalities to compare the cost of service delivery?	Yes	No	Partly
6.2	Do you take steps to ensure that your tariffs are reasonable?	Yes	No	Partly
6.3	Do you have an asset management team in place?	Yes	No	Partly
6.4	Do you have top management and political support for your asset management programme?	Yes	No	Partly
6.5	Are sufficient resources made available for asset management improvements?	Yes	No	Partly
6.6	Are AM roles & responsibilities included in the PMS, and in the performance contracts of managers?	Yes	No	Partly
6.7	Do you regularly assess AM skills and capacity requirements?	Yes	No	Partly
6.8	DO you take steps to ensure that sufficient AM skills and capacity is available?	Yes	No	Partly
6.9	Do you keep track of legislative developments, and adjust your IAM framework accordingly?	Yes	No	Partly
6.10	Is the responsibility for IAM allocated to a multi-disciplinary team	Yes	No	Partly