INFRASTRUCTURE DELIVERY MANAGEMENT TOOLKIT FOR LOCAL GOVERNMENT

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ABSTRACT

Well managed infrastructure assists municipalities in the delivery of mandated services cost effectively, efficiently and reliably. National Treasury has embarked on a process to develop an Infrastructure Delivery Management Toolkit for Local Government. This Toolkit will be based on the 2010 Toolkit developed for Provincial Government and is hosted by the CIDB. The 2010 CIDB Toolkit is built on 3 Delivery Processes namely Portfolio Management, Project Management, Operations and Maintenance Management. National Treasury will use experiences of municipalities who have implemented infrastructure asset management or aspects of the discipline to both update and modify this 2010 Toolkit for use by Local Government. Proposed procedures, processes and methodologies will be tested for suitability and alignment with municipalities. It is expected that the Local Government Infrastructure Delivery Toolkit will assist in improving life cycle infrastructure asset management in municipalities particularly in linking levels of services to infrastructure delivery. Alignment of mandates, expectations, planning, budgeting and performance monitoring are key areas that will be addressed. Ultimately, it is expected that a clear link will be created between the services delivered and the infrastructure management actions.

INTRODUCTION

Failure of municipal infrastructure to deliver services can occur when there is inadequate asset maintenance and investment in asset capacity and strength. The development of infrastructure management systems assists in the provision of assets and the maintenance of assets.

In South Africa, the Infrastructure Delivery Management System (IDMS) was developed as a process model to facilitate the delivery of public sector infrastructure. The model identifies three distinct processes, namely (a) Portfolio Management process, (b) Project Management process and (c) Operations and Maintenance processes.

The International Infrastructure Management Manual (IIMM) documents good practice in municipal infrastructure management. The IIMM was developed in New Zealand and Australia. The World Bank's Strategic Asset Management Advisory Note (1999) recognised the management of municipal infrastructure, practiced in these countries, as being representative of world best practice. The IIMM was prepared in response to a number of global realities: (1) the vast investment made in infrastructure by municipalities; (2) the traditional focus on creation of new infrastructure rather than long term maintenance and renewal; and (4) a growing number of well-publicised infrastructure failures.

This work illustrates the mechanisms by which infrastructure delivery management toolkit for local government can easily achieved by implementing the asset management processes presented in the IIMM.

INFRASTRUCTURE DELIVERY MANAGEMENT SYSTEM

Portfolio management process

The objective of the portfolio management process is to develop, implement, monitor and control the optimal management of all the assets that make up the entire asset portfolio of the respective municipality. Portfolio management aims to achieve this objective by prioritised projects based on long term plans, available budgets and the municipality's management capacity. Optimal portfolio management is achieved by managing life cycle costs. Portfolio management aims to link municipality's strategic service delivery plan with the infrastructure required to deliver those services. The key to portfolio management activities is the development of the asset register. The asset register must reflect the condition and work history of each asset. Portfolio management aims to identify two types of infrastructure management risks (a) infrastructure planning risks and (b) programme management risks. Portfolio management also proposes that a budget is prepared for all life cycle stages including (a) acquisition, (b) rehabilitation, (c) maintenance, (d) support costs required to manage the infrastructure through all its stages and (e) disposal costs. The Medium Term Economic Funding (MTEF) cycle takes 3 years to complete with Preparation/Planning, Implementation and Close-out being the predominant phases undertaken in each year. Portfolio management proposes that an Infrastructure Delivery Cycle (IDC) be developed. Portfolio management proposes that the IDC be 4 years due to the lead time required for planning, design and project/works procurement. Portfolio management also proposes that the following outputs also be developed: (1) Asset Management Plans and (2) Construction Procurement Strategy.

Project management process

The objective of the project management process is to execute prioritised projects. IDMS has identified that public sector infrastructure projects are implemented in four phases, namely (1) planning, (2) design, (3) works and (4) close-out. Each phase consists of a number of sub-phases. The IDMS Toolkit discusses in detail the different methodologies of implementing public sector infrastructure projects.

Operation and maintenance processes

The objective of this process is to operate, maintain and dispose of assets. Operations and maintenance is the process of receiving assets into the portfolio of assets, manage and maintain it over the life cycle and eventually demobilise the asset when it is due to be terminated. The operate and maintain processes comprises of the following sub-processes (a) asset recognition, (b) mobilisation for facilities management, (c) operations of assets, (d) maintenance and (d) demobilisation of facilities management.

SYNERGY BETWEEN INFRASTRUCTURE ASSET MANAGEMENT AND IDMS

The objective of asset management is to meet a required level of service, in the most cost effective manner, through the management of assets for present and future. Evaluating the objectives of asset management and Infrastructure Delivery Management System illustrates that there are synergies between these processes. Asset management comprises of 17 quality elements as illustrated in Figure 1.

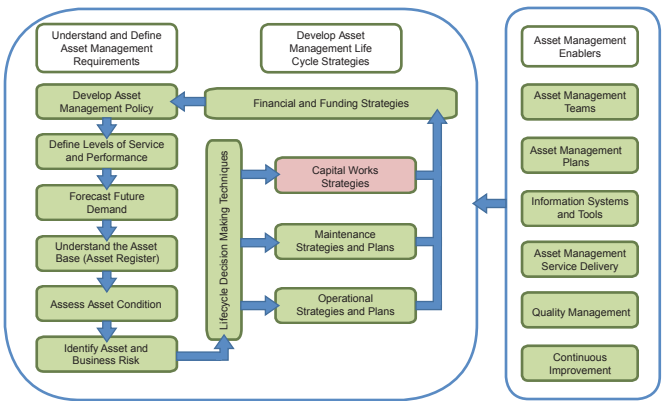

FIGURE 1 17 Quality Elements of Asset Management

Table 1 illustrates the synergies between IDMS and Asset Management Processes. Due to the synergies evident in Table 1 regarding IDMS and Asset Management processes, the remaining sections of this paper will illustrate how asset management processes can be used to implement IDMS.

ASSET MANAGEMENT PROCESSES

Asset management policy

The asset management policy provides a clear direction regarding the appropriate focus and level of asset management practice expected. The asset management level reflects the strategic business objectives as well as meeting legal requirements, community needs and available resources. Asset management policies and objectives describe to the municipality's commitment to the services it provides and its long term asset management strategies. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 2.

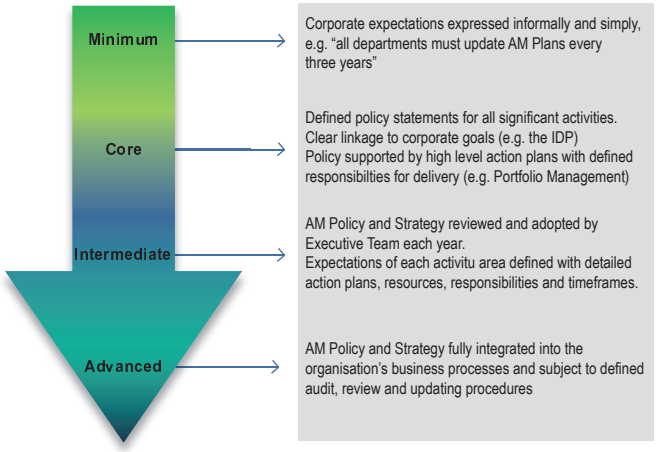

FIGURE 2 The Asset Management Policy Maturity Index

Developing and monitoring levels of service

Levels of service are a key business driver and influence all asset management decisions. Levels of service statements describe the outputs the municipality intends to deliver to customers and commonly relate to service attributes such as quality, reliability, responsiveness, sustainability, timeliness, accessibility and cost. The key objective of asset management planning is to match the levels of service the municipality delivers with the levels of service expectations of customers. Asset management planning enables the development of the cost versus level of service relationship (the price/quality relationship). Performance measurement provides an indication of an municipality's performance against its goals and levels of service. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 3.

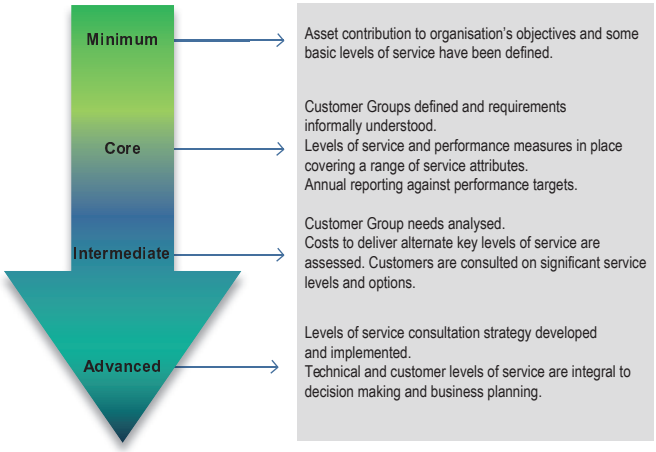

FIGURE 3 Levels of Service Maturity Index

Infrastructure Delivery Management System Processes	Asset Management Processes
1. Portfolio Management	1. Develop the asset management policy
1.1 Infrastructure Planning	2. Define levels of service and performance 3. Forecast future demand 6. Identify asset and business risks 7. Lifecycle decision making techniques
1.2 Programme Management	
1.2.1 Construction Procurement Strategy	10. Capital works Strategies
1.2.2 Programme Management Plans	11. Financial and funding strategies 13. Asset management plans
2. Project Management	
2.1 Planning	15. Asset Management Service Delivery
2.2 Design	15. Asset Management Service Delivery
2.3 Works	15. Asset Management Service Delivery
2.4 Close-out	15. Asset Management Service Delivery
3. Operations and Maintenance	
3.1 Recognise and Accept Assets	4. Understand the asset base (the asset register) 5. Assess Asset Condition
3.2 Mobilisation for Facilities Management	14. Information Systems and Tools
3.3 Operations of Assets	8. Operational strategies and plans
3.4 Maintain Assets	9. Maintenance strategies and plans
3.5 Demobilisation for Facilities Management	13. Asset management plans
3.6 Asset Management Team	12. Asset management teams
3.7 Disposal od Assets	13. Asset management plans
	16. Quality Management
	17. Continuous Improvement

TABLE 1 Synergies between IDMS and IIMM

Forecasting future demand

The ability to predict future demand for services enables asset managers to plan ahead and identify the best way of meeting that demand. Understanding the key drivers of demand is an important first step in demand forecasting. Once the factors are understood, mathematical modelling processes are often used to assess the impact of these factors on future demand. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 4.

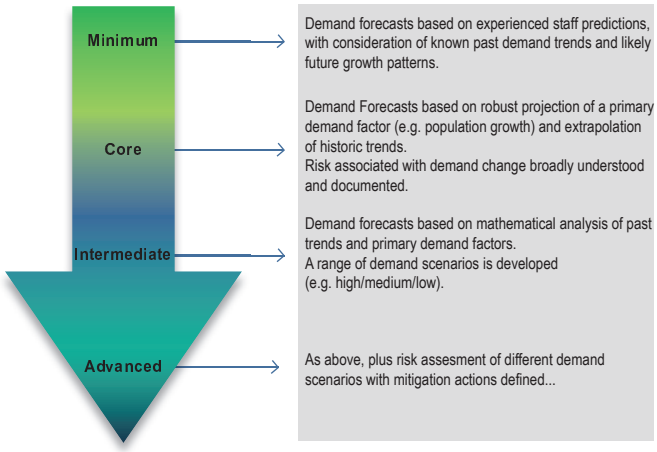

FIGURE 4 Demand Forecasting Maturity Index

Establishing base asset knowledge

Many asset management practices are initiated by understanding the assets the municipality owns, along with key supporting information such as value and age. Post identification of service requirements, asset managers need to be able to assess the asset capability to meet requirements now and in the future therefore long term information management provides the foundation for asset management planning.

A staged approach is often the most practical method of data collection. Stage 1 is initiated by identifying minimum data required for legislative compliance and reporting requirements. The highest priority is generally to be able to value the asset and identify broad replacement programmes. The second priority may be supporting maintenance management. The final phase of data collection may be to allow risk management and optimised lifecycle analysis. Similarly the level of detail to which data is captured may be progressed in a staged manner. Initial exercises may capture information at a higher asset level, later breaking down into more detailed components where the need is justified. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 5.

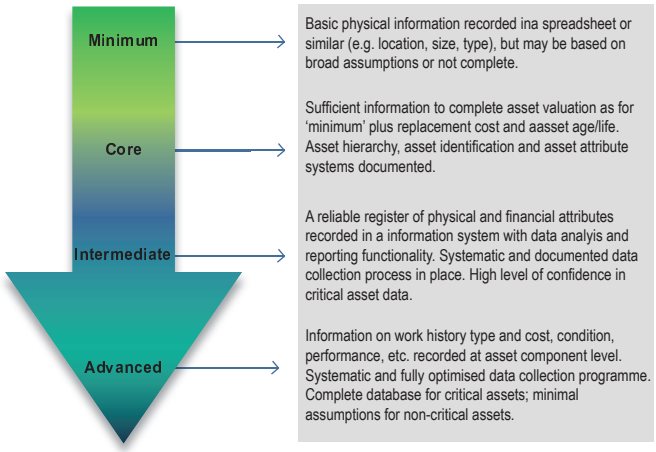

FIGURE 5 Asset Register Maturity Index

Assessing asset condition

Asset condition is a measure of the asset's physical integrity. Information on asset condition underpins effective, proactive asset management programs by enabling prediction of maintenance, rehabilitation and renewal requirements. Asset condition is also critical to the management of asset risk, because it is linked to the likelihood that that asset will physical fail. Condition assessment techniques range from simple visual inspections through to detailed mechanical, chemical or electrical testing.

The municipality will typically start with a more basic approach, focussing condition data collection on its most critical assets. 'Top-down' approaches may be used where asset age and staff knowledge is applied to assess condition and remaining life for groups of assets.

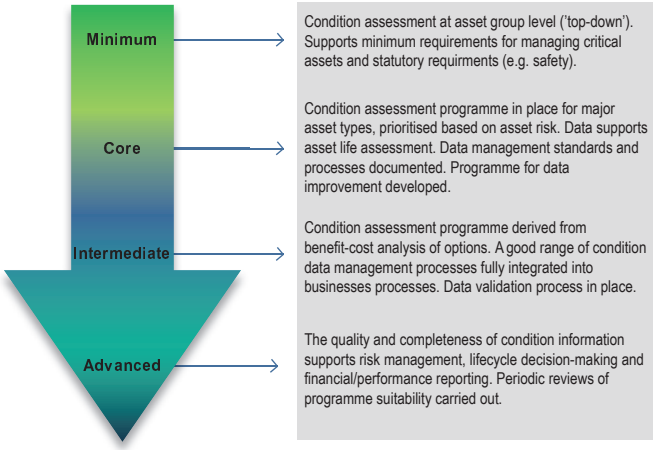

FIGURE 6 Asset Condition Maturity Index

The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 6.

Identifying critical assets and business risks

Risks are events which may compromise the delivery of the municipality's strategic objectives. The risk policy should define risk objectives, scope and strategies, including the definition of "unacceptable" risks. Risk management should be seen as a core business driver that influences all decision making, rather than an activity undertaken as an isolated process.

Therefore, a corporate risk framework should be consistently applied across the municipality. The framework should identify the criteria against which risk can be evaluated and the responsibilities for managing risk. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 7.

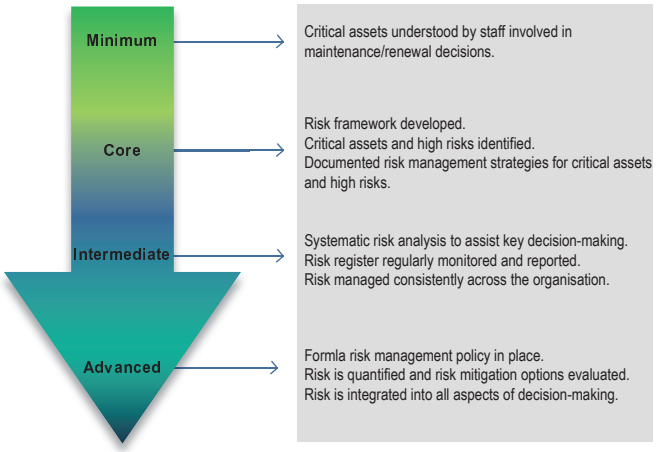

FIGURE 7 Risk Management Maturity Index

Decision making techniques

Post identification of any level of service gaps, demand requirements or risk issues, adequate operational, maintenance or capital investment strategies must be chosen. Decision techniques can be used to determine the best solution. There are many decision techniques that can be used and also many different types of decisions from deciding the best time to replace the asset to minimise overall lifecycle costs through to complex decisions involving a trade-off between social, environmental and economic impacts. Benefit-Cost Analysis (BCA) identifying the financial impacts of various options, in terms of both benefits and costs, over the duration of the analysis period. Multi-Criteria Analysis (MCA) can provide clarity to the decision making process when decisions are more complex and the benefits and costs cannot be readily quantified in financial terms. With MCA, a selection of criteria are selected to represent the benefits provided, such as criteria relating to improved water taste, better access to parks, etc. Each attribute is scored and weighted for the different options and the results can be used to identify the preferred solution(s). The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 8.

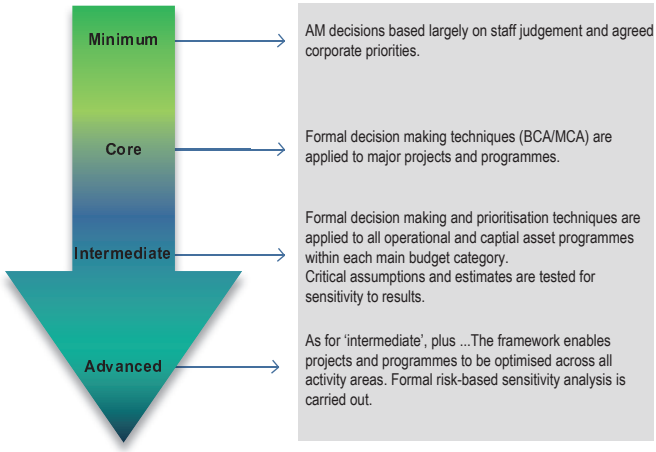

FIGURE 8 Decision Making Maturity Index

Developing operational strategies and plans

Assets should be effectively utilised to meet the needs of the community over the long-term. Good operational strategies can mitigate risk and defer the need for asset renewals or upgrade works. Strategies for ensuring that assets are well-utilised include (a) effective demand forecasting before creating new assets, to ensure asset capacity and demand requirements are matched, (b) maximising the asset utilisation by 'supply-side' demand management, for example minimising wastage through smarter property scheduling or pipe leak detection; and (c) management of customer demand, to reduce demand for over-utilised assets or vice-versa, for example through pricing, regulation, education and incentives. Sometimes there are unusual events or natural disasters that cause operational strategies to change to a different mode. These strategies aim to minimise the disruption to services from events such as key staff absences, critical asset failure or widespread disasters.

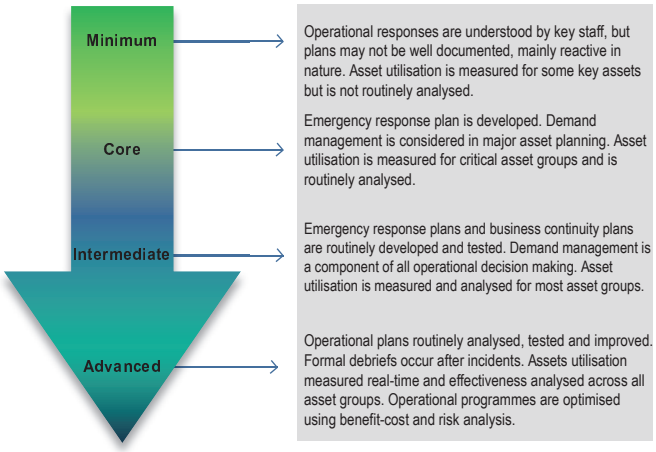

FIGURE 9 Operations Management Maturity Index

Emergency response plans clearly allocate roles, responsibilities, communication lines and response priorities as incidents evolve. Business continuity plans focus on understanding the municipality's critical functions, and how to maintain service continuity when these functions or processes fail. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 9.

Developing maintenance strategies and plans

Assets owners need to maintain their assets to deliver the required functionality and performance. Maintenance is defined as "All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal". Maintenance does not increase the service potential of the asset or keep it in its original; it slows down deterioration and delays when rehabilitation or replacement is necessary. It is mechanism to ensure that assets continue to deliver the required level of service. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 10.

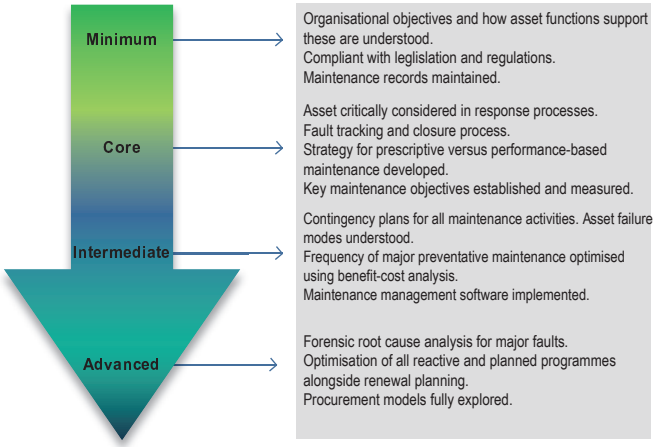

FIGURE 10 Maintenance Management Maturity Index

Developing capital investment strategies and plans

Forward looking infrastructure planning provides time to make good decisions and coordinate activities in an effective and efficient manner. Capital investments typically cover three distinct investment streams: (1) The upgrade, creation or purchase of new assets, typically to address growth in demand or changes to the required level of service; (2) the

renewal of existing assets, usually to prevent existing assets from failing service levels; and (3) investment in assets that are held as an investment in their own right, either to provide a financial return or for future opportunity value. The development of the capital investment strategy will typically evolve over time, from reviewing past investment levels, through to developing a prioritised list of "need" through to the full application of decision support tools and optimisation across the full portfolio of assets. This development of maturity is indicated in Figure 11.

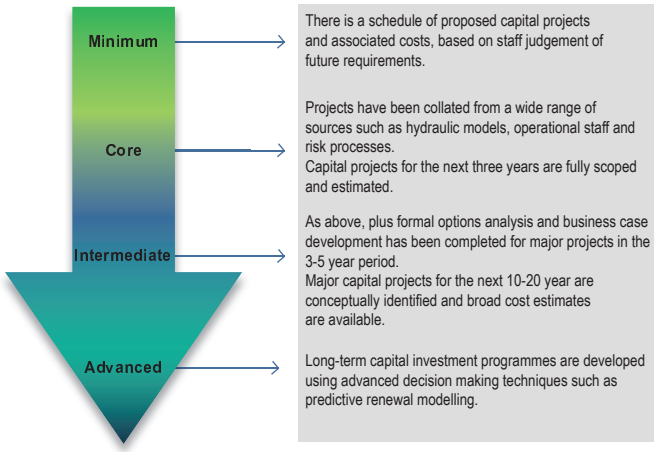

FIGURE 11 Capital Projects Maturity Index

Financial and funding strategies and plans

Financial management in municipalities is characterised by high asset values relative to the total municipality value. Financial management principles for the municipality include recognising the consumption of asset service potential, categorising expenditure appropriately, allocating costs to assets as far as practical, preparing long term forecasts, cost-effective financing and effective reporting of financial performance. A crucial output from asset and financial management is a long term assessment of financial needs and funding requirements. These forecasts should bring together all relevant data from asset management processes. The forecasts should be underpinned by clearly articulated assumptions and confidence factors for a forecast period of at least ten years. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 12.

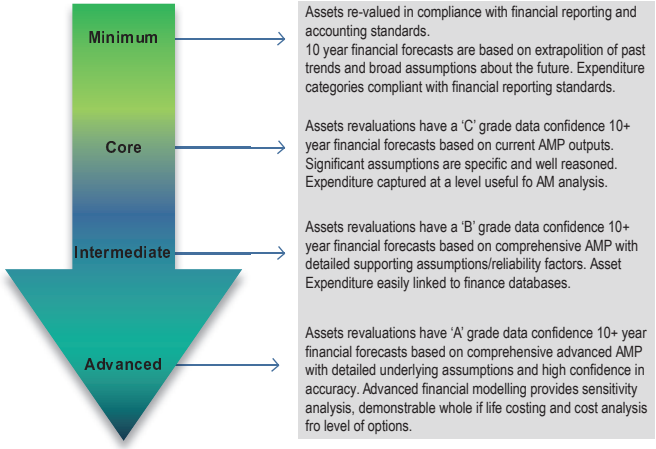

FIGURE 12 Financial Management Maturity Index

Asset management teams

Asset management roles and responsibilities need to be clearly defined and specifically allocated to people and teams to ensure that the required things are being done. There are also many different approaches to allocating roles within the structure, for example: (a) the municipality may separate the asset owner, manager, service provider/operating roles, either internally or by outsourcing some roles, (b) asset management functions may be de-centralised or centralised (i.e. an asset management team that supports all activities and asset areas); and (c) structures may be based on functions versus activities, for example, a team that delivers the operational function for all activities compared to parks, roads, commercial buildings teams that carry out all operational, planning, project functions for that activity. There are many factors to consider in making these types of structural decisions, such as the level of specialisation of the function, size of the municipality, and the likelihood and risks of silos being created. Asset management improvement programmes often require significant change to the status quo. Failure to recognise this is another common reason for lack of progress. The asset management team needs to ensure good change management practices are applied to delivering these programmes such as strong leadership, appropriate resourcing and effective communication. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 13.

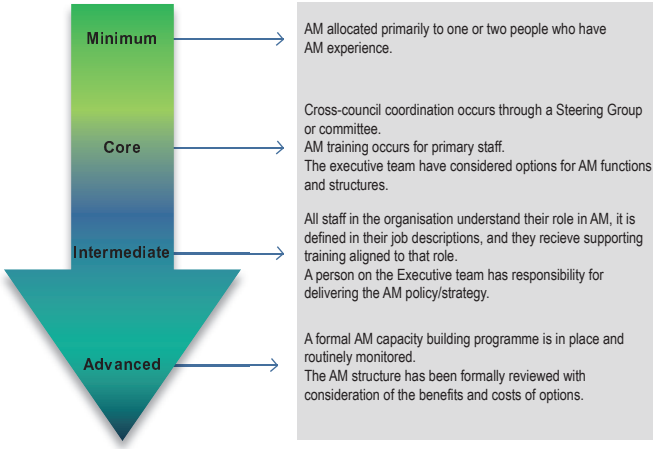

FIGURE 13 Asset Management Structures and Capabilities Maturity Index

Asset management plans

An asset management plan is a written representation of intended asset management programmes for management of infrastructure assets based on the municipality's understanding of service level requirements and the network's capability to meet those requirements. In some ways, the asset management plan can be considered as the business case for the long term financial forecasts. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 14.

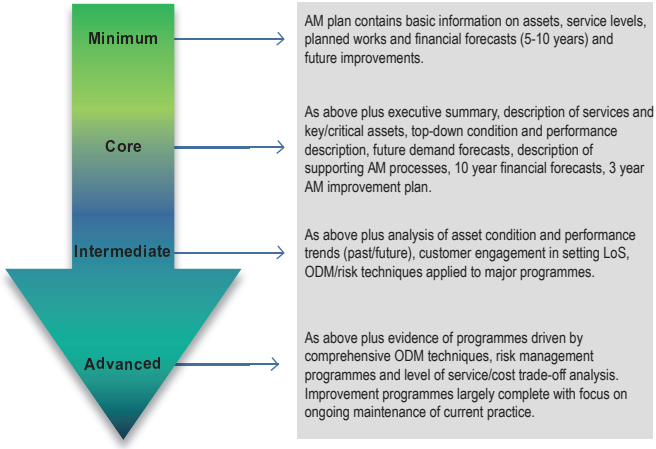

FIGURE 14 Asset Management Plan Maturity Index

Information systems and tools

An asset management information system (AMIS) is defined as "a combination of processes, data, software, and hardware applied to provide the essential outputs for effective asset management such as reduced risk and optimum infrastructure investment." AMIS development will generally pass through five stages: (1) requirements definition, (2) evaluation, (3) design, (4) implementation, and (5) ongoing management and review. The five components of AMIS, namely (a) hardware, (b) software, (c) data, (d) processes and (e) people, need to be considered at each stage.

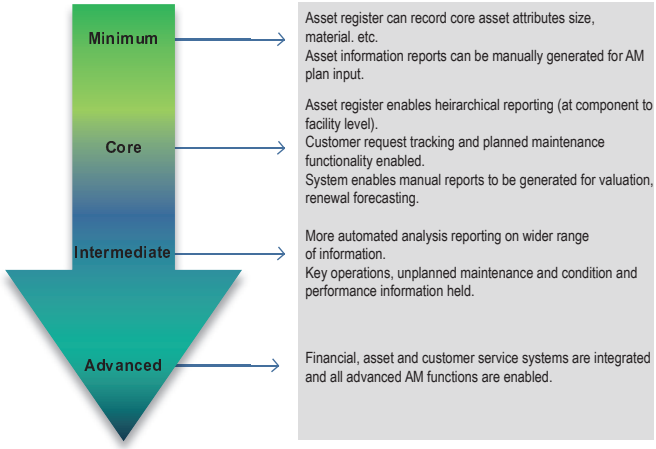

FIGURE 15 Information Systems Maturity Index

The municipality may initially focus on implementing core system functions (asset register, asset valuation, etc) and evolve to more advanced functions over time as illustrated in Figure 15.

Service delivery models

Developing and implementing strategies for service delivery involves: (1) defining core services, (2) identifying service delivery options, (3) evaluating and selecting the optimal service delivery model, and (4) procuring and implementing the service delivery model. There are many factors that influence the service delivery decision, for example legislative restrictions, availability of the contracting market and the asset owner's desire for cost certainty and risk minimisation. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 16.

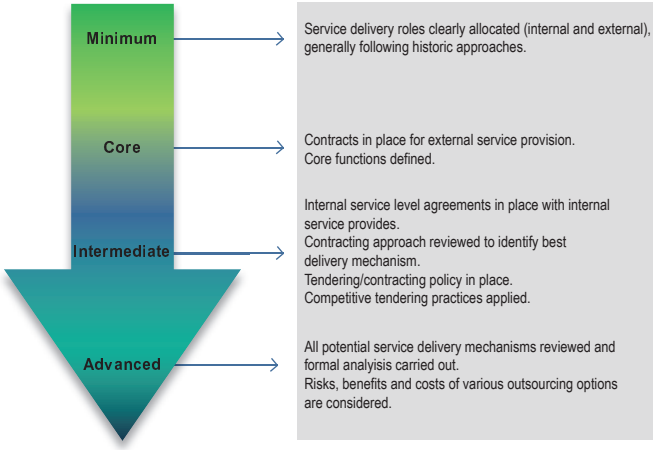

FIGURE 16 Service Delivery Maturity Index

Quality Management

A key to effective asset management is the identification, documentation and communication of the repeatable processes that facilitate the municipality function properly. A typical process document will cover: (1) objective of the process and a brief high-level description of where it fits in the overall asset management framework, (2) the inputs required, (3) the outputs expected, (4) the steps required to complete the process, and (5) related processes such as complimentary, predecessor or successor tasks. Process maps are useful for helping to understand how data is transformed and information is passed between processes ad recipients. There are a range of approaches to process maps include basic flowcharts, block diagrams, cross-functional flowcharts and data-flow diagrams. As a general principle, processes should only be documented to the extent necessary to assure effective planning, operation and control. Quality processes evolve in an iterative manner over time to an optimal level through continuous monitoring and improvement. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 17.

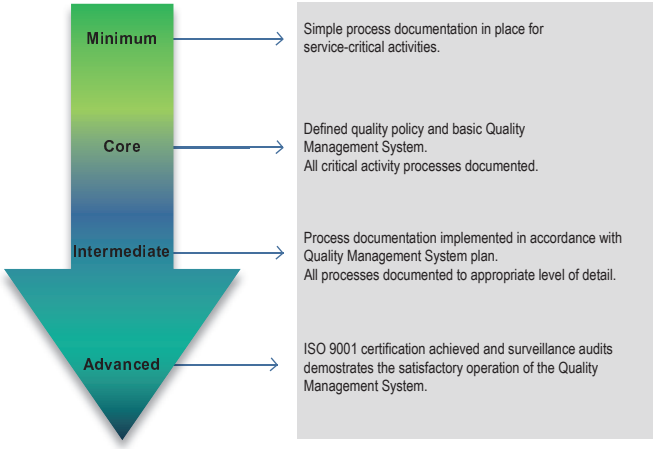

FIGURE 17 Quality Management Maturity Index

Continuous improvement

The first part of the asset management improvement plan development is to understand current and future 'appropriate' asset management practices. The understanding of the 'gap' between current and appropriate practice will help drive identification of improvement actions. The improvement plan should then be developed to focus initially on

the highest priority areas. The municipality may initially focus on implementing core system functions and evolve to more advanced functions over time as illustrated in Figure 18.

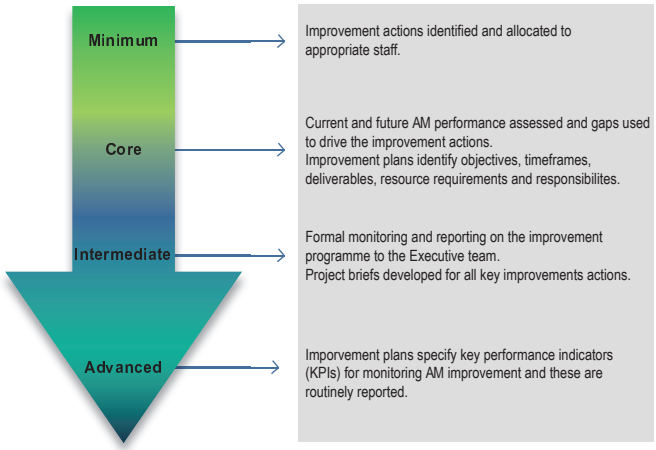

FIGURE 18 Asset Management Improvement Maturity Index

CONCLUSION

Modern asset management processes facilitate the systematic analysis required to gain reliable information about the condition and performance of infrastructure assets. Asset management processes ensure the ability to make good maintenance and renewal decisions, manage risks and predict future renewal requirements required thereby achieving the requirements of National Treasury, Provisional Treasury and Auditor General which requires the municipality to recognise and equitably recover the full costs of owning and operating infrastructure over the life of the assets. Asset management processes also assist the municipality to fully justify capital and operations expenditure and related price structures and their levels of service to the full range of stakeholders from ratepayers to Councillors and Provincial & National Government.

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