WEAVING THE INTEGRATED INFRASTRUCTURE ASSET MANAGEMENT THREAD THROUGH MUNICIPAL STRATEGIC PLANNING: THE EKURHULENI EXPERIENCE, RSA

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Abstract: Much development has taken place in the practice of infrastructure asset management. But relentless population increases and urbanisation, the scourge of poverty and municipal infrastructure decay seems to demand more.

The City of Ekurhuleni, South Africa, is implementing a multi-year integrated infrastructure asset management programme. As part of this initiative, the first ever fully fledged Comprehensive Municipal Infrastructure Asset Management Plan (CMIP) in South Africa has been developed. The CMIP draws on eight sectoral asset management plans (supported by audited electronic systems) that recognises both engineered assets and land as assets, presents a robust infrastructure investment plan, tests corporate strategic objectives and planning instruments and articulates a wide range of recommendations impacting on multiple business processes and corporate plans.

The paper cautions against blindly attempting to formulate asset management responses to corporate strategy. Instead it argues the need for the positioning of integrated infrastructure asset management at the center of municipal strategy, and integration between urban planning and urban infrastructure asset management actions.

Keywords: comprehensive municipal infrastructure plan, infrastructure asset management, infrastructure asset management plan, infrastructure investment planning, infrastructure renewal.

Currency note: Monetary amounts used in this paper are in South African Rand. At the time of submission of this paper the exchange rate was 1 South African Rand = 0.144217 U.S. dollars.

INTRODUCTION

Conflicting needs and limited resources

It is commonly accepted that infrastructure asset management is concerned with the lowest cost lifecycle management given specified levels of service. This would imply balanced investment across the lifecycle with adequate provision for new infrastructure whilst protecting investments in installed infrastructure.

Fragmented reports across the globe point to a mounting infrastructure renewal backlog. For example, it was estimated that by 2007 some 79% of service life of public infrastructure in Canada was consumed and that the municipal infrastructure deficit stood at $ 123 billion[1]. The value of municipal infrastructure in South Africa was estimated at R 723 billion in 2009 (Boshoff, August 2009)[2]. Some R 336 billion of the value of the existing municipal infrastructure portfolio has been consumed (Boshoff and Childs, May 2009)[3]. The renewals backlog is in the order of R 74.4 billion, and R 19 billion per annum is necessary for ongoing asset renewal.

Some 2.5 billion people globally lack sanitation services, 1.5 billion have no access to electricity, 1 billion have no ready access to all-weather roads, and nearly 900 million use unsafe water (World Bank, 2010)[4]. Presently the global urban population stands at 3.495 billion and is expected to increase to 6.398 billion by 2050, requiring urban growth of 83%[5], the impact of which is equivalent to creating 346 cities the size of New York in the next 40 years.

This suggests strong conflict in resource allocation, given the wide public interest, differing political beliefs and the impacts on economies. These trends also place unprecedented demands on urban planning, infrastructure design and management to cope with the challenges given limited funding.

Asset management plan

There is no standard global definition governing the nature, scope and content of an asset management plan. The International Infrastructure Management Manual envisions a plan prepared for the management of one or more infrastructure assets employing multi-disciplinary skills over the lifecycle, with the aim to provide a specified level of service in the most

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1 Mirza, S. Danger Ahead: The Coming Collapse of Canada's Municipal Infrastructure. November 2007. Federation of Canadian Municipalities.

2 Boshoff, LP. Municipal Infrastructure Asset Care in South Africa: A Reality Check. Paper delivered at the Infrastructure Dialogue Series 2, hosted by the DBSA & SPAID. 14 August 2009.

3 Boshoff, LP and Childs, RB. A Basis for Estimating the Extent of Current Infrastructure Renewals Requirements in the South African Municipal Space. May 2009.

4 The World Bank Annual Report 2010. Office of the Publisher, External Affairs. ISBN: 978-0-8213-8376-6.

5 World Urbanization Prospects: The 2007 Revision Population Database. United Nations. 2008.

cost-effective manner (INGENIUM – IPWEA, 2006)[6]. PAS 55-1: 2008 defines an asset management plan as a document that articulates the activities, resources, responsibilities and timeframes for implementing the asset management strategy and delivering the asset management objectives across dominant lifecycle activities (BSI, September 2008)[7]. The Specification does not express itself on the scope of assets, but does allow for the possibility of multiple asset management plans in an asset organisation. It further requires that multiple plans covering a portfolio of asset systems or assets shall be jointly optimised and prioritised. In general, though, it appears that asset management plans everywhere are prepared for a particular asset or for a group of assets of similar functionality (such as for roads and transportation assets that may include multiple assets such as roads, footpaths, stormwater, road furniture and bridges).

Both the IIMM and PAS 55: 1 positions asset management at the tactical planning level in support of an organisation's overall strategy.

Municipal context

The Ekurhuleni Metropolitan Municipality serves 2.5 million residents, 31 989 businesses and 43 070 institutions over an area of 1 923 km^2. Its economy contributes more than 7% of South Africa's Gross Domestic Product. The municipality has an annual budget in the R 15 billion mark. Its immovable asset portfolio (excluding land) has a current replacement cost value of some R 82.5 billion. In 2005 Ekurhuleni formulated a strategic vision of the city in 2025, known as the Ekurhuleni Growth and Development Strategy 2025 (GDS 2025), to be reviewed at five-year intervals.

EKURHULENI INTEGRATED INFRASTRUCTURE ASSET MANAGEMENT PROGRAMME

Programme need and purpose

In 2009 the Municipality launched a multi-year integrated infrastructure asset management programme in support of the conversion to the accrual system of accounting, to support sustainable social and physical infrastructure planning efforts, and to inform the review of the GDS. Some of the defined key programme outputs included:

- fully componentised and revalued immovable asset registers that comply with all prevailing accounting standards;

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[6] INGENIUM – IPWEA. International Infrastructure Management Manual. Version 3.0, 2006. NAMS. New Zealand. ISBN No: 0-473-10685-X.

[7] IAM. PAS 55-1: 2008. Asset Management. Part 1: Specification for the Optimized Management of Physical Assets. September 2008. BSI. ISBN No: 978 0 580 50975 9.

- implementation of an integrated suite of electronic infrastructure asset management capabilities;
- the preparation of sector-based asset management plans and a Comprehensive Municipal Infrastructure Plan (CMIP); and
- development of an infrastructure asset management skills development plan.

Purpose and objectives of the Ekurhuleni CMIP version 1

This CMIP focuses on engineering networks, community facilities, public amenities and operational buildings, quantifies the funding needs and affordability of providing these services at desired levels and standards, and presents strategic parameters and considerations to support the formulation of political priorities that will be articulated in the next iteration of the GDS. In specific, this Plan:

- describes the extent, value, capacities and risks associated with assets supporting economic growth and social upliftment;
- reports on the state of infrastructure and social services provision and existing backlogs;
- describes standards of service and performance against these;
- assesses the state of existing infrastructure asset management practice;
- adopts a growth scenario that considers changes in the residential and non-residential sectors upto 2025, and considers the implication of such growth on the need for future infrastructure, the demand on land and the shape of the city space, asset care requirements, and improvements in infrastructure asset management practice; and
- prepares consolidated financial forecasts and considers various infrastructure investment scenarios in support of the review of the GDS.

Approach followed in Ekurhuleni

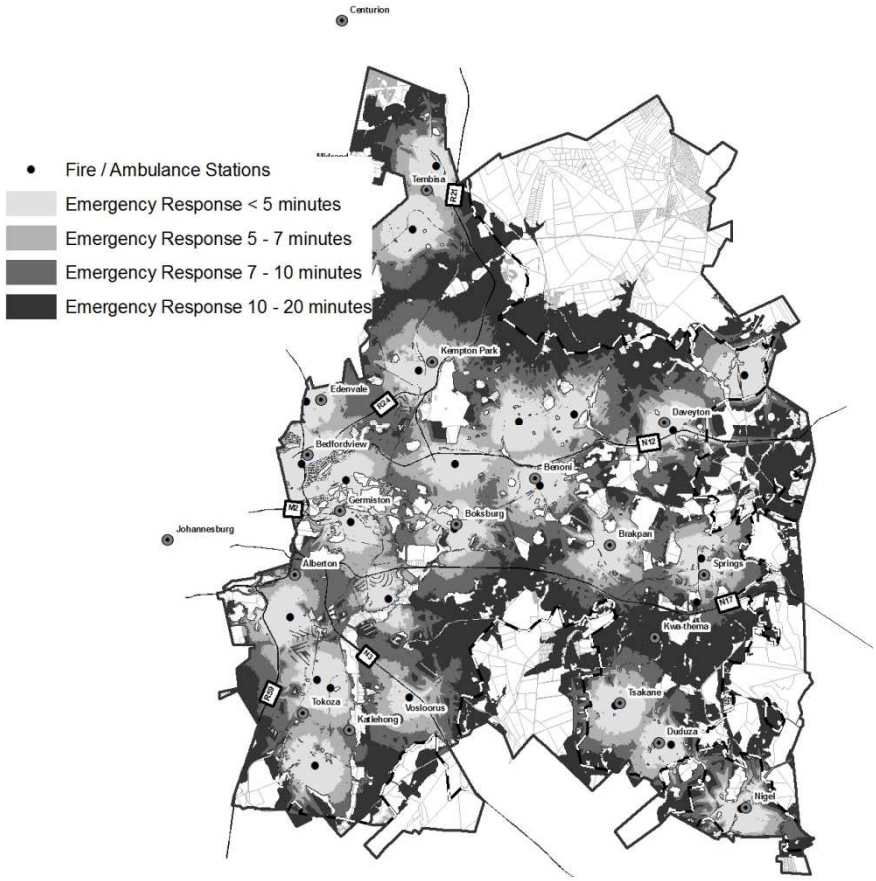
Data formats, plan templates and conventions were established at the outset for the preparation of the immovable asset register, asset management plans and the CMIP.

A customer classification system was developed to establish the existing number of customers as a precondition for determining service access, consumption and utilisation needs. Protocols were established that define qualifying criteria as customer units. Levels of Service (LOS) and Standards of Service (SOS) definitions were articulated, and clear rules documented regarding the nature of expenditure and costing associated with service packages. Customers were grouped according to a customer hierarchy that includes provision for type (e.g. business, residential and institutional), income level and density. The CitySolve system was populated with existing municipal data sets, some of which include the

billing system and the valuation roll, verified through household counts using aerial photography and CAD, and reconciled. The customer database assisted in the establishment of the customer profile that is now formally accepted within the municipality, and the CitySolve system spatially identified customers and developed spatial profiles such as customer density, household income distribution and contribution to municipal revenue. Infrastructure assets were spatially linked within the infrastructure asset register hosted on the IMQS system. An assessment was made of land in terms of extent, ownership status, land use and development constraints. A land database was established within the CitySolve system. The customer database and land database, together with economic and demographic trends, provided inputs into the formulation of a 30 year customer growth projection in the CMIP.

Armed with knowledge on the extent, type and spatial location of customers and assets, service access profiles were established through accessibility analysis as appropriate to the type of service.

Figure 1: Spatial service access profiling

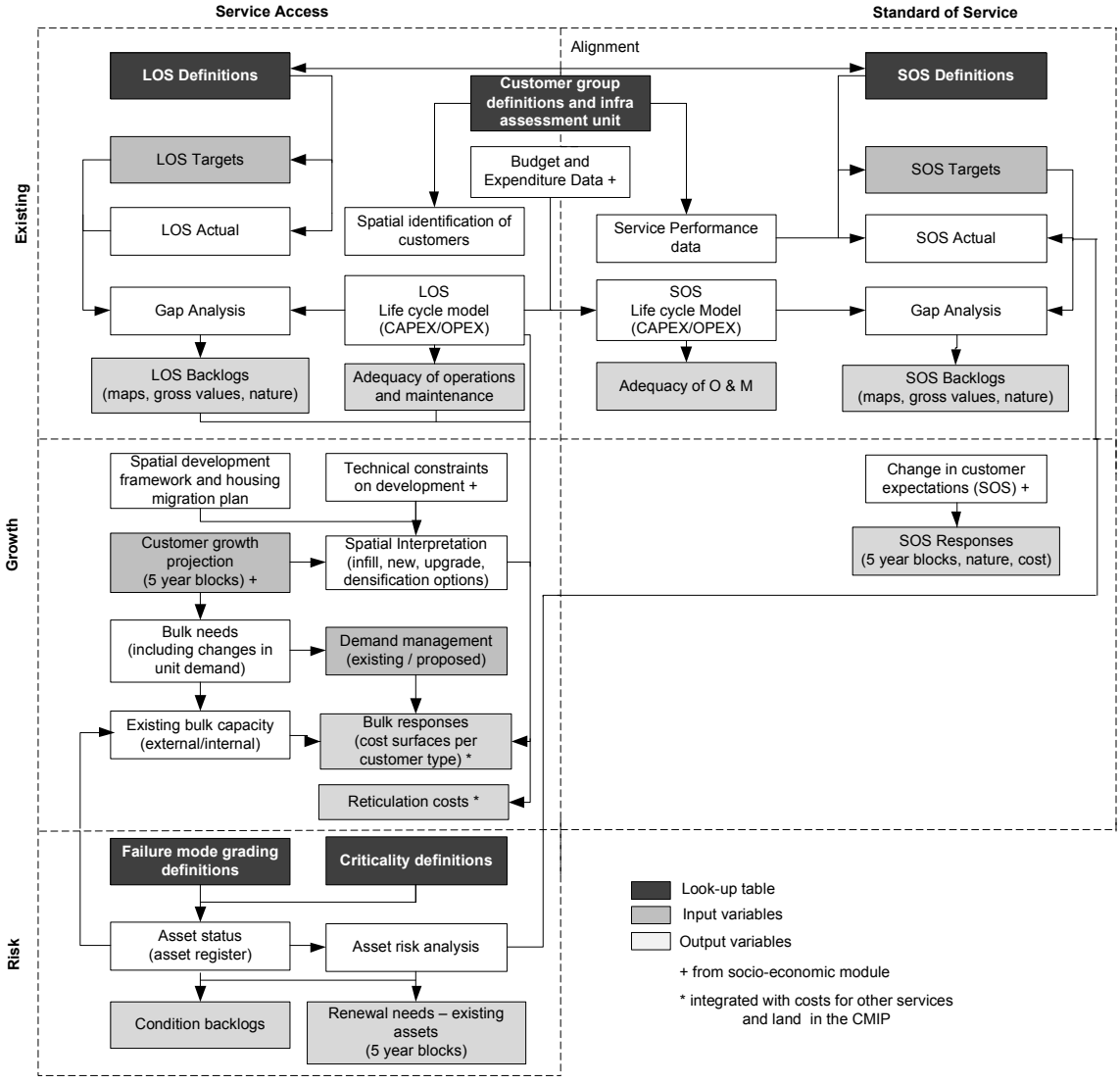


These outputs were used in the generation of service-specific asset management plans, with further processing done in the CitySolve system to model consumption and demand based on customer profiles,

improvements in levels and standards of service, lifecycle expenditure and related items. Since all data and modelling is structured, subject to documented conventions, and resides in electronic management systems, results can be easily reproduced, alternative scenarios run, and plans updated in future.

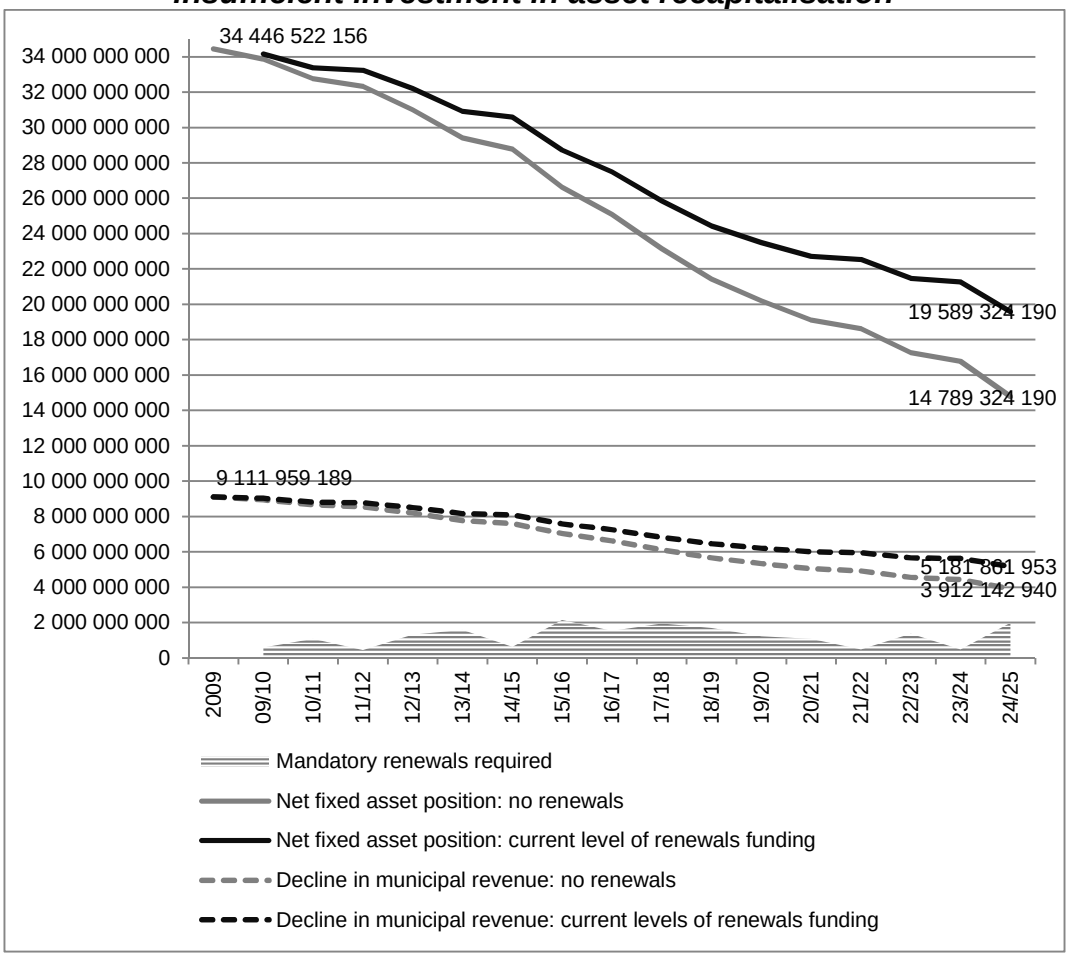
The outputs of the asset management plans were fed back into the CMIP, where a consolidated backlog assessment and risk profile was presented. Lifecycle capital needs were calculated and prioritised on the basis of risk exposure. Maintenance was calculated at component level in and expenditure presented per maintenance regime, and criticality grading, and again grouped at asset portfolio level. Operational expenditure was calculated following a zero budget-based approach taking into account committed service standards, customer consumption, future demand and other relevant factors, and then calibrated to existing expenditure profiles.

Figure 1: Asset management planning methodology using CitySolve



The CMIP also featured an infrastructure investment plan. Revenue and expenditure forecasts were prepared upto 2025, taking into account the current revenue and expenditure structures, revenue enhancement and cost reduction opportunities, customer affordability, intergovernmental transfers and external factors such as bulk supply tariff increases. The plan also assessed asset management financial performance, considered capital programme implementation capacity, and presented arguments for prioritised and balanced infrastructure investment.

Figure 3: Investment planning – modelling the adverse impacts of insufficient investment in asset recapitalisation



Key outcomes, mythbusters and paradigm-shifting realizations

- Actual infrastructure investment as per the IDP, the approved budget and the municipality's housing migration plan contradicts the GDS and the SDF. The unequal pace of service delivery in some infrastructure sectors, and inappropriate spatial provision of services, creates costly infrastructure backlogs in other sectors.
- The baseline customer profile enabled consistent estimation of service access across all infrastructure and social services. The residential

customer base increased from 436 000 to 845 664, with all of the implications in terms of the cost of services provision, revenue lost and additional subsidy implications. Untapped existing revenue potential is estimated at about R 2.7 billion per annum.

- The capital cost required to eradicate the service access backlogs (measured against Council's policy of a comprehensive suite of full levels of service) is estimated at R 14.7 billion. The current technical backlog is assessed at R 10.3 billion, and R 23.6 billion is required to service the capital demands of growth. This translates into a total period capital requirement of R 62.3 billion that equates to 76% of the value of the current immovable production asset portfolio. As a result the average annual capital requirement upto 2025 is in the order of R 4.2 billion, double the size of the current capital budget.
- The municipality's financial woes can be ascribed to under-recovery in some key services, external supply cost risk, and the size of the welfare package of R 2.2 billion per annum, previously estimated at around R 430 million per annum.
- The preparation of an infrastructure investment map, based on the value of installed infrastructure as reflected in the audited infrastructure asset register, dispelled the myth that poor people generally have poor access to municipal services. In several instances the level of installed infrastructure investment is higher in poor communities than in wealthy areas, though little cost recovery takes place in those poorer areas.
- Long term financial sustainability is threatened by overinvestment in non-performing capital assets and long term revenue potential is depleting due to infrastructure decay and underfunded recapitalisation.

MATTERS OF STRATEGY AND POSITIONING OF INFRASTRUCTURE ASSET MANAGEMENT IN LOCAL GOVERNMENT

Local governments generally exist to conduct land use planning or urban planning, to provide infrastructure and related services, and to regulate local affairs. Fowler (November 2010) notes that the Canadian Institute of Planners acknowledges the importance of infrastructure and asset management in land use planning[8].

Bertaud (April 2002) argues that the configuration of urban infrastructure networks are strongly influenced by spatial networks, and whilst an engineer can optimise the design of a particular network, the optimisation of all urban infrastructure requires proper definition of urban land use[9]. Fowler confirms this opinion, stating that land use planning is the key determinant for infrastructure demand and servicing. Bertaud further argues that urban spatial structures are highly resilient, evolve slowly, and

[8] Fowler, K. Local Government Land Use and Asset Management Planning in BC: Proposed Sustainable Service Improvements. November 2010.

[9] Bertaud, A. Note on Transportation and Urban Spatial Design. April 2002.

are shaped by market forces interacting with regulations, primary infrastructure investment and taxes (Bertaud, *ND*)[10].

Modern approaches call for the integration of urban planning and management efforts, aptly articulated by Clarke (1989: 9): "The management of urban development to meet city level and national objectives of economic growth and improved equity requires an integrated process of planning, investment (public and private), construction, operation, maintenance and rehabilitation"[11]. One could therefore reasonably question the appropriateness of practicing asset management, urban planning and infrastructure investment planning in isolation. And if this is indeed the case, then is asset management really an integrated set of practices?

A further reason for elevating asset management to the strategic level is found in its impact on overall financial sustainability. Municipalities across the globe often receive some share of the National Fiscus, but are expected to be financial self-sustainable. Infrastructure assets comprise the lion's share of a municipality's balance sheet strength and contribute the bulk of municipal income, either through service charges or through investment that increase land values and therefore property tax income. Infrastructure investment decisions can make or break a municipality and is an invaluable tool for influencing a city shape that in turn affects infrastructure design and lifecycle cost.

Yet, whilst existing asset management guidelines and practice notes recognise the need for financial sustainability, they offer little guidance to the practice of infrastructure investment planning at the corporate level. What requirements and guidance exist emphasize the need for lifecycle costing, the preparation of budgets, and estimating the impact on customer tariffs. The Optimised Decision Making Guidelines issued by NAMS, for example, provides excellent guidance in project-level assessment[12]. At corporate level, it offers guidance on multi-criteria analysis, still with the aim of assessing individual projects. But the challenges posed by rapid global urban growth, continued growth of cities, mounting infrastructure renewals backlogs, and the problem of urban poverty, suggest that urban infrastructure investment planning at the project level dabbles with micro-management and misses the big picture.

Though financial planning at the service level is fairly straightforward, the same can not be said of investment planning at the organisational level. Shortcomings to existing guides include an assessment of overall long

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10 Bertaud, A. The Spatial Organisation of Cities: Deliberate Outcome or Unforeseen Consequences? Working Paper 2004-01. Institute of Urban and Regional Development. University of California.

11 Clarke, G. New Approaches to Urban Planning and Management in the 1990s: the Role of UNCHS. Paper presented to the Workshop on Planning and Management of Urban Development in the 1990s. Birmingham, September 1989.

12 Maunsell Limited and Opus International Consultants Limited. Optimised Decision Making Guidelines. A Sustainable Approach to Managing Infrastructure. Edition 1. November 2004. ISBN: 0-476-01151-5. NZ National Asset Management Steering Group.

term financial sustainability given existing asset portfolios, the characteristics of the customer base, revenue capacities, the organisation's capital structure, legal and operating constraints, organisational strategy and changes to these in the medium to long term. Additional complications include cross-subsidisation between customer groups and services, varying levels of national and provincial allocations over time, external supply cost risk, local market responses to changes in the cost of municipal services and a multitude of other factors. Similar arguments could be posed in respect of the corporate risk exposure related to infrastructure in asset-rich organisations.

CONCLUSIONS

Organisational strategy in the public sector is often driven by ideology and/or community wish lists as opposed to robust strategy. Such strategy tends to coincide with electoral cycles and is subject to change in political leadership, and thus either tends to favour short term political gains, or provides an utopian long term vision. Similar to Ekurhuleni, the remainder of metros in South Africa are in the early phases of asset management, and must still prepare detailed long term infrastructure investment plans – a host of literature around the globe confirm that this is not an uniquely South African problem, and the worsening condition of many infrastructure networks, even in the developed world, serves as further evidence.

A service-specific asset management plan tends to formulate tactical responses to the organisation's strategy. This is however not true of a comprehensive municipal infrastructure plan that interacts with key organisational strategic planning instruments and policies. The Ekurhuleni case certainly showed the value of elevating asset management to the level of strategic planning in a municipality, where it integrated multiple planning streams across the municipality, and tested and strengthened existing strategy through risks assessments and infrastructure investment planning, and causes changes in policy direction through informed, integrated decision support.

The physical size and lay-out of urban spaces, urban expansion, changes in land use and factors such as topography and geology have a major impact on infrastructure network size, configuration, and lifecycle costs. There is a definitive need to integrate asset management planning within the urban planning and strategic management of a municipality's affairs.

From a sustainability point of view, and also to best influence future city shapes and managing lifecycle costs, there is little option but to improve the quality of infrastructure investment planning, and to raise the level of investment planning from individual project assessment to total municipal financial impact.