1. Determining What Level of Service Customers and Funding Agencies Can Afford

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INTRODUCTION / BACKGROUND

Modern society demands a high standard of living. Infrastructure services provide a significant part of this standard. The provision and management of this infrastructure contributes significantly to the cost of living. The effectiveness and efficiency with which these asset portfolios are managed is therefore critical to economic performance, and the future standard and cost of living. Because of the existing environment, most municipal infrastructure will be required for decades or even centuries to come. Municipalities across South Africa are responsible for over 200 billion Rand worth of community assets. They are part of the community's public wealth. These infrastructure assets provide the large number of basic services that all modern cities require. Their performance and costs are critical to the country's economic performance and growth. The National Government has recognised the importance of these assets but has only regulated the valuation and depreciation of same, under the Generally Recognized Accounting Practices GRAP 17 regulations, rather than their best appropriate management. Knowing the replacement value of their assets is useful. It helps organisations to understand the current value of these large community owned assets, and by understanding the depreciation of them, one gains a better understanding of their rate of consumption. However, it is less than 15% of the data one needs to know to better manage these valuable assets and ensure that they are being managed sustainably. The current national focus is squarely directed at the 'infrastructure backlogs' to provide a greater equity of service to disadvantaged members of the population. Basic housing, water supply, sanitation, electricity and roads are being built at a significant rate, but is allowance being made for the maintenance and renewal these new assets will require in the future? The answer is "no".

What about the existing assets that are owned? What is being done to manage these legacy assets that are critical to the nation's future prosperity? Well, one can tell the value and depreciation thereof. That is good, but it is far more important that one knows:

- What maintenance is justified to ensure that existing assets reach their effective lives,
- How much life is left,
- What capital needs are going to be required to renew assets to ensure system reliability, and
- How/when to augment those that will suffer capacity failures.

In short, one is not managing one's assets effectively until one has an integrated asset management plan that enables one to understand how one should take advantage of the work done in the GRAP17 programs and deliver something that tells all stakeholders what they really need to know:

- What assets they own
- What levels of service they deliver and how they perform
- What is the future demand for these services
- What will it cost over the next 20 years if one keeps building new assets, and therefore
- Can the ratepayers and Government funding agencies afford it?

The first steps have been taken with the asset valuations. Now one must look at how to make better use of this effort and information. This paper looks at the way that eThekwini Municipality (EM) has approached this issue.

WHAT DOES GOOD ASSET MANAGEMENT ENTAIL?
A Best Appropriate Practice (BAP) Overview

Most municipal infrastructure systems are made up of a mixture of asset categories, sub systems or facilities, which in turn includes assets and the components or parts of these assets. One must be able to understand the performance and cost of the lowest level components to fully understand the performance and cost of the major parts, and ultimately the whole of the asset service portfolio.

To achieve BAP a municipal organisation operates with uniform / aligned business processes and good data to ensure that they can manage their diverse service programs effectively across the "whole of city". Each business unit should be able to:

- Understand the real demand on both quantity and quality terms for the services that are supported by the infrastructure assets, both historically and predicted for a suitable long term planning period. (Minimum 20 years)
- Assess the existing assets involved in delivering these services and understand their economic costs, condition and recent performance
- Determine the optimal maintenance and operational strategies for the immediate future timeframe
- Predict how these assets will fail to perform at the future demands and levels of service required, e.g. Identify their failure mode – capacity / reliability / levels of service and new regulations
- Understand the economic, social and environmental or triple bottom line (TBL) impacts of these failures
- Develop the asset management programs by predicting the optimal renewal, augmented or additional asset programs needed to overcome these predicted failures using life cycle cost analysis techniques and full TBL costing. That is, identify the most effective process (planning) and efficient practices (doing) to identify the optimal and other (optional) solutions e.g. reduced capital, take greater risks etc.
- Predict the operations and maintenance costs in line with these capital strategies also known as the optimal asset management strategies
- Determine the future estimated expenditure for operations, maintenance, renewal and augmented or new assets, and assess the options to fund these costs for the planning period
- Show the levels of service that will be achieved and the full costs of these asset management programs using Average Annual Annuities (AAA) for the whole planning period in today's Rands
- Roll up these individual business unit programs and associated asset management plans (AMPs) into a 'whole of city' AMP so that stakeholders can better consider all program needs at once
- Debate these proposals with all key stakeholders including ratepayers, government (National and Provincial), elected members, and regulators involved in the service delivery / program
- Determine the expenditure and service levels they are willing to fund
- Modify asset management strategies and therefore expenditure to meet the budget and business objectives / vision as required from the above stakeholder consultation program. It is working within the democratic framework for the public good that makes sustainable infrastructure asset management in the municipal arena so much more difficult than in the private and utility service sectors.
- Revisit this asset management planning process and create revised AMPs every four years as a minimum

This asset management program is undertaken to a level of maturity of sophistication that is warranted by the asset values, complexity and performance achieved and desired. This is known as the "Best Appropriate Practice" (BAP) level. To better understand how these principles are applied to the various asset services or programs please refer to the BAP overviews for the different asset groups or programs available via the IMESA Asset Management Web Site. This covers the following asset services: Roads, Water, Wastewater, Electricity, Gas, Parks and Gardens, Recreational Facilities, Buildings, Solid Waste, Fleet, Information Systems and Office Equipment.

WHAT SHOULD AN INITIAL AMP CONSIST OF?
Ultimate Table of Contents
The International Infrastructure Management Manual (IIMM) clearly outlines the accepted global standard for developing an AMP. The recommended table of contents includes:
- Executive Summary
- Introduction and Background
- State of the Assets
- Levels of Service
- Future Growth and Demands
- Life Cycle Asset Management (LCAM) Strategies
  - Operations Program
  - Maintenance Program
  - Renewal Program
  - Growth and Augmentation
- Risk Assessment and Management
- Financial Analysis
- Asset Management Improvement Program
- AMP References and Appendices

Municipalities don't need to complete a total AMP at this initial stage. However, one does need to set a reasonable planning horizon of at least 20 years. In the short term one should be aiming at producing the parts of the plan that are critical for use in advising stakeholders on the big issue, thereby identifying:
- The state of the existing assets
- Levels of service and growth
- The future costs of delivering the services desired– See LCAM Strategies above
- The likely impact on rates and charges, and other funding / grant sources.

To see the detail involved in a typical AMP please refer to the AMP Guidelines as available on the IMESA web site. These can be modified to suit one's individual requirements.

DEVELOPING FUTURE EXPENDITURE MODELS
Which Elements are Critical?
With a sound knowledge of the data that is now available from the asset valuation exercise and other sources, each organisation can look at the most cost effective way it delivers these outcomes.

Although the ultimate objective will be to produce asset management plans in accordance with the model defined by the IIMM it was realised that the eThekwini Municipality (EM) and their business units will need to develop these over a period of time. The framework outlined in the manual is ideal from a format perspective, however it must be realised that this model is the result of many years of advanced asset management development. The AMPs described in the IIMM often take 5 years to develop to that level of sophistication and level of confidence. It should be recognised that the EM business

units (BUs) are producing their first / initial AMPs, and as such, one needs to set these initial deliverables to a level that suits the resources and capabilities of the organisation taking into account the:
- Restricted human and data resources available; and
- Short timeframe of 6 months.

To effectively set these deliverables, they needed to consider the key purposes of an AMP, which are to:
- Present a clear state of the assets report on the total asset portfolios used to deliver the relevant public service. E.g. Roads / Water etc. including:
  - Asset categories and quantities
  - Replacement valuations, written down valuation and annual depreciation
  - Condition and performance of the assets and their service delivery
- Set the levels of service / performance targets that are required from the assets
- Identify the principal modes by which these assets will fail to deliver the required level of service, namely:
  - Growth resulting in new and augmentation of existing assets
  - Reliability failures, resulting in both the:
    - Rehabilitation and replacement of existing assets
    - Maintenance programs to deliver more reliable outputs, using both preventive and corrective maintenance (PM and CM) programs
- Present a Future Asset Strategy (FAS) for the management of these assets and these failure modes over a long term planning horizon of 25 to 30 years including:
  - Capital Programs for:
    - Growth
    - Renewal
  - Recurrent Programs
    - Administration / management
    - Operations
    - Maintenance
      - Planned / preventive
      - Unplanned / corrective
- Develop a Future Expenditure Model (FEM) that includes all the costs of these FAS and gives an indication of the average annual annuity of this expenditure
- Identify the long-term gap between current income levels and future long-term sustainable expenditure. This in turn will:
  - Focus on those existing assets and new asset projects that will require capital investments in the next 5 years and review these strategies and the resulting investments from a Business Risk Exposure (BRE) perspective. Optimise these to produce the FEM required for the next 5 years. This will give the EM a better idea of the actual future cash flows that will be required by the individual BUs and then 'city as a whole'

The key issues for many of the BUs will be that:
- Their current asset registers do not include all of their assets, and so these BUs cannot present a total picture of their asset needs unless they make an estimate of the assets that are yet to be included using average figures from what they know and extrapolating them to produce gross estimates
- Many people who have the greatest knowledge of the assets are also the busiest in these departments, and as such, human resource management will be critical

AMPs are basically a single record of all that is involved in the management of a service using infrastructure assets. They are predominantly a text book that describes the services required, the assets that provide them and the way in which the organisation proposes to manage them to deliver this level of service.

The difficult part is producing the FAS and predicted FEMs to a suitable Confidence Level Rating (CLR) that enables the organisation and their key stakeholders to have confidence in these predictions and resulting cash flows. The written aspects of the AMPs are really useful, however the initial plan needs to concentrate on developing the cash flows. The full AMPs can then be developed and improved over the following 3 years. For the purposes of these initial plans one should restrict the failure modes to existing asset renewal and growth only. More sophisticated FMs should be left to future AMPs.

The EM has concentrated the outputs on producing the most accurate and complete FAS and FEMs for the initial AMP (2010). The EM believes that the following methodology will deliver the best outcomes in the timeframe available.

Recommended Methodology for Production of FAS and FEMs

It is recommended that the following methodology be followed for the production of the key financial predictions for the organisations initial AMP 1 plans.

Renewal Capital Demands

Assuming that all assets have effective physical lives and replacement valuations, use the asset register and valuation database to complete the following tasks:

- Produce a list of assets based on their expected Residual Effective Lives (REL) using their Effective Lives (EL) minus their Life To Date (LTD) e.g. (REL = EL - LTD).
- Rank these assets from shortest to longest residual lives up to a planning horizon of 20 years.
- Produce an initial cash flow or FEM based on the replacement of the asset at the end of its physical life, using the replacement valuation.
- Determine the AAA of this cash flow and record it graphically.
- Review the assets identified (in ranked order) and select those that are not broken down or componentised to a suitable Maintenance Managed Item (MMI) or hierarchical level.
- Use the asset register database system to break up/componentise these assets to suitable hierarchical levels using a 'Delphi Group' approach and estimate the residual physical life of the individual components and their replacement values. (Please note that 'Delphi Group' activities are explained later in this paper).
- Re run the data and produce updated outputs as listed above.
- Rank all assets with a residual life of less than 5 years and undertake the following reviews/assessments again using 'Delphi Group' approach.
- Repeat (if time and resources permit), but restrict this review to a 10 year planning horizon.

Growth Capital Demands – New and Augmentation Projects

This data will be derived from the organisations current demand analysis studies and growth strategies. This should list all current assets that will require augmentation or total replacement along with the new assets that will be required and will involve:

- Identifying all existing assets that will require augmentation (or

replacement with larger units) due to growth in demand and the date at which this will be required.
  - Remove their renewal cash flow (if identified in renewal program expenditures above to remove double counting)
  - Allow the existing asset renewal to remain if the asset will be retained
- Identifying all new assets that will be required to meet the growth and add these projects into the cash flow at the dates they are proposed or required

Estimating Future Maintenance Costs (Total Asset Portfolio)

This will be very difficult as the current maintenance programs are basically legacy budgets and are significantly distorted by legacy issues such as 'past budget reductions' and 'lack of detailed analysis.' However, it is important that these initial AMPs start to address this critical issue.

The best AMPs will have maintenance plans based on actual Computerised Maintenance Management System (CMMS) outputs and as such are part of their life cycle cost and FAS. These plans will make allowances for:

- The reduction in maintenance due to the capital renewal program (rehabilitating or replacing old assets)
- The increase in maintenance due to the new assets that have been added from the growth / augmentation programs
- The nominal increase in maintenance expected from the increase in average age of the remaining legacy portfolio

For this initial plan it was considered that most business units:

- Only have gross maintenance figures for both PM and CM for large regions or facilities
- Cannot justify these existing maintenance budgets in TBL life cycle cost terms.
- Can only make valued judgements / broad estimates of these impacts on the current budgets using 'Delphi Group' techniques. This will be the best way to handle this aspect until further more detailed analysis is possible and warranted.

Estimating Future Operating Costs (Total Asset Portfolio)

This is relatively easy for these initial AMPs as most organisations (including EM) have reasonable records of operating costs.

Each business unit can make allowances/estimates for:

- The increased demand on existing assets
- New demand and assets added to the portfolio
- Assets that have been disposed of or 'moth balled'

MAKING THEM 'WHOLE OF CITY'

It must be realised that the funding sources are limited. Only so many Rands are available for a whole range of public services. As such, no municipality, be it a metro or a small regional town, can afford to consider the large range of infrastructure services they provide individually. One needs to see the total picture. To do this, one must aggregate all one's asset management expenditure models into a single integrated model for the 'whole of city'. In EM the council is running the funding options using the National MIIF model to show the impacts on ratepayers and government subsidies. To do this effectively one needs an integrated asset management plan, or more importantly an integrated expenditure model. This needs to be supplemented by a funding model that shows the impact on rates and charges and government subsidies that would be required to fund this expenditure. It is only when one sees this total picture that one can then decide:

- Is one prepared to meet the future rates and charges to meet the costs of all these services?
- Are the Provincial and National Governments prepared to meet their share of these costs?

And if not:

- What service levels are they prepared to fund?
- What services do they want to cut?
- What are customers and stakeholders prepared to trade off?

PRODUCING THE AMPS COST EFFECTIVELY

The two biggest issues faced in completing these initial asset management plans are the lack of data and more importantly, the lack of human resources, which is a significant impediment to these programs.

There are two ways in which these issues can be overcome:

- Use the 'delphi group' process to collect the missing data needed to complete the plans to a reasonable level of accuracy.
- Make use of computer systems, the valuation data and the above data to produce the outputs required automatically, and therefore reduce the staff resources required.

There are many staff who are familiar with the assets and can make reasonably accurate estimates of the missing data required to complete the first AMPs. They will not be perfect, but they will be an improvement in terms of the information and outputs currently available.

The Use of Delphi Groups

What is a 'delphi group'? It is a term that has been derived from the legal and arbitration arenas and refers to a group of industry experts whose collective knowledge represents the 'best opinion' on a certain subject or process or (in this case) physical assets.

If asked a question then this group is most likely to give the most valid answer. A 'Delphi Group' is used when there are no formulae, rules, laws or valid data available upon which a person, group or organization can make decisions.

'Delphi groups" have been used extensively around the world, in the asset management arena in these initial phases. At least a level has been reached where the organisation's asset management has progressed to a point where they are getting high quality data from their practices and information systems (mostly automatically). Until that stage is reached (in about 10 years for most municipalities), most organizations need to employ this 'delphi group' approach.

Developing an initial Asset Management Plan (AMP 1) is a typical example of the need for this approach. The plan requires the development of a picture of the entire asset portfolio sufficient to be able to produce a 'State of the Assets Report'. To do this, the following information is required:

- A register of all the assets
- *The current replacement valuation of assets*
- *The condition and residual physical lives of assets*
- The performance and economic lives of assets
- The levels of service assets need to deliver
- The way in which assets will fail to meet these levels of service
- The risks represented by these failures to the organization
- The lowest life cycle cost solutions to extend the lives of assets to overcome the modes by which they will fail to meet customers and regulators expectations

Those items shown in italics have been completed during the GRAP 17 valuation program.

Most organisations have a reasonable list of assets, but even this is not

complete, nor is it broken down/componentised to a level (hierarchically) that really allows one to understand the consequences of failure and the costs to overcome or mitigate these.

As for the rest of these desirable outputs only some records are available and these are often not to the same standard across the business unit or the 'whole of city'. In many cases there are no records whatsoever. The cost of collecting this accurate data is significant and the time it will take is significant - maybe over 6 years.

One cannot wait that long. The use of 'delphi groups' is both quick and cost effective. It is vital that all municipal entities develop their AMP 1 as soon as possible so that the results can be used to:

- Identify those assets at risk (high BRE)
- Develop a sustainable renewal strategy
- Understand future growth and level of service issues
- Understand the future financial implications for the agency and the impact on its customers
- Identify those assets and system elements where the greatest benefits can be derived - by 'picking the low hanging fruits' or 'identifying the greatest risks to the organisation'.

Therefore it is essential to commence this process using 'Delphi - Group' techniques remembering:

- The answers will not be perfect
- Some information will still be incomplete, and
- It won't be a perfect model of the future.

But one will:

- Know far more than ever before
- Be able to report on all the issues and outputs/ deliverables outlined above
- Understand the strengths and weaknesses in what has been done
- Understand the CLR of what has been produced
- Be able to plan future improvements based on 'what will give the greatest bang for one's Rand'

Delphi Groups are therefore vital to the success of this approach. Readers can gain more information on this issue from the IMESA web site – Asset Management section

Using Computer Systems

Municipalities have a lot of assets. They have a lot of data. They have scarce resources and good AM staff is in short supply. If one can use computers to undertake the calculations and produce the outputs required, one can produce the AMPs very effectively and efficiently.

The processes described previously mean that much of the initial effort can be undertaken using the existing asset registers and the relevant computer systems. All municipalities should take advantage of this approach.

DISCUSSING RESULTS WITH KEY STAKEHOLDERS

Raising Stakeholder Awareness and Consultation

Stakeholder awareness and consultation now needs to take place. The NZ manual on "Developing Levels of Service and Performance Management Guidelines" covers these issues very well and should be referred to by all municipalities going down this path. These manuals are also available through the IMESA – AM web site. Raising awareness is very important for stakeholders to fully understand what has been produced, as well as the confidence in the outcome derived. One will never get all key stakeholders to accept the numbers derived, but what one wants is an informed debate. To do this, organisations need to keep all key stakeholders aware of what is being done, as well as how it is being done, during the AMP 1

project development. The best ways to do this are:

- Make regular reports to Councillors especially the 'capital works committee'. Show them what is being done and demonstrate the expected outcomes
- Include a report on this work in newsletters to ratepayers and make presentations at any suitable public meetings
- Make regular presentations to the key government funding agencies

Undertaking Stakeholder Consultation with Final AMP 1

To undertake this consultation effectively one needs an integrated asset management plan, the integrated future expenditure model and the future funding model that shows the impact on rates and charges and government subsidies that would be required to fund this expenditure. There should be alternative options in how to fund these programs and options should be discussed.

One then needs to assess this feedback and modify the AMP 1 to reflect these implications. This will indicate the order of budget. One then needs to reduce the expenditure to suit the expectations of stakeholders. Where the future cost/expenditure exceeds the ability and willingness to pay, one must plan to use the following strategies:

- Reduce the levels of service offered in the AMP
- Dispose of under-utilised and non-performing assets
- Manage the demand for services by using 'pricing mechanisms' where appropriate
- Adjust operations and maintenance to defer capital expenditure, remembering that capital is currently costing over 9% per annum and one can often double maintenance for far less than this
- Accept higher business risks (of failure and reliability) on non-critical (lower consequence of failure) assets
- Defer capital projects based on their real benefit or cost
- Work to increase other sources of income such as subsidies and grants

In the long term it is vital that future long-term programs be balanced with key objectives and the ability of the organisation to fund these sustainable programs. These AMP / FES processes are a vital step in doing this.

CONCLUSIONS

Where To From Here?

This paper was intended to raise awareness and to give municipal staff an idea of how to get the most out of the wonderful work done in producing their asset valuations. It represents a cost-effective approach and significant benefits for both the individual Councils that undertake this approach and the nation as a whole, through the potential to achieve better strategic planning. The eThekwini Municipality (Durban) has undertaken this approach and their senior asset management staff have made many of their materials available on the IMESA – AM web site in the near future.

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