The use of financial models for Infrastructure Investment Planning

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The use of financial modelling associated with long term investment planning has evolved in South Africa over the past 15 years[1] primarily through two processes:

1. The efforts by the water sector, supported by the Water Research Commission (WRC) and the Development Bank of Southern Africa (DBSA) to improve the understanding of the financial viability of water supply and sanitation programmes at municipal level.
2. The Municipal Infrastructure Investment Framework (MIIF) which was initiated in the early 1990s.

In the case of the water sector the work on financial modelling was undertaken by PDG and funded largely by the WRC and resulted in two models: the Water Supply Services Model (WSSM) and the Sanitation Services Model (SSM). These models were completed in the late 1990s and are still available and still being used.

The MIIF originated in the early 1990s under an initiative of the World Bank who were providing support to what was then the ANC government-in-waiting on municipal infrastructure delivery which was a very high priority issues at the time. The MIIF is about to enter its sixth round of review and has been supported over the years primarily by the Department of Provincial and Local Government (dplg) and the DBSA, with the involvement of all other national departments that are responsible for municipal infrastructure.

As the MIIF has progressed modelling tools have evolved to allow for the impact of capital investments to be assessed. The most important such models are the Combined Services Model (CSM) and the more recent Municipal Services Finance Model (MSFM), both developed by PDG. These models are designed to be used by municipalities as high level, long term planning tools suited for Infrastructure Investment Plans (IIPs) and are also well suited to the new Consolidated Infrastructure Plans (CIPs) being promoted by national government currently. The models have also been used to undertake national scale analysis of municipal viability which is done by aggregating all municipalities, or groups of municipalities with common characteristics, together. This provides a very useful means of assessing the impact on municipalities of national policy and the associated financial transfers.

[1] An investment planning model is a set of calculations, typically done in a spreadsheet, that projects capital investment requirements, assesses financing options associated with this investment programme and then determines the impact on the operating account of the entity responsible for the managing the resulting services. The aim of such modelling is to ensure that the investment programme is viable. The term 'model' implies that certain key variables which impact on the programme, and the associated operating account, can be changed to establish a set of scenarios to be considered by decision-makers.

The Municipal Services Finances Model

The Municipal Services Finances Model (MSFM) projects the full operating and capital accounts associated with infrastructure provision in a municipal area over 10 years. If desired, municipalities can be combined to generate aggregate accounts for a district or province or to model the country as a whole.

The MSFM is based on a user-defined service delivery programme. This is used to project the numbers of consumers with different levels of service in each year of the model run, as well as the numbers of consumers that are provided with different levels of service in each year. The approach is illustrated in the figure below.

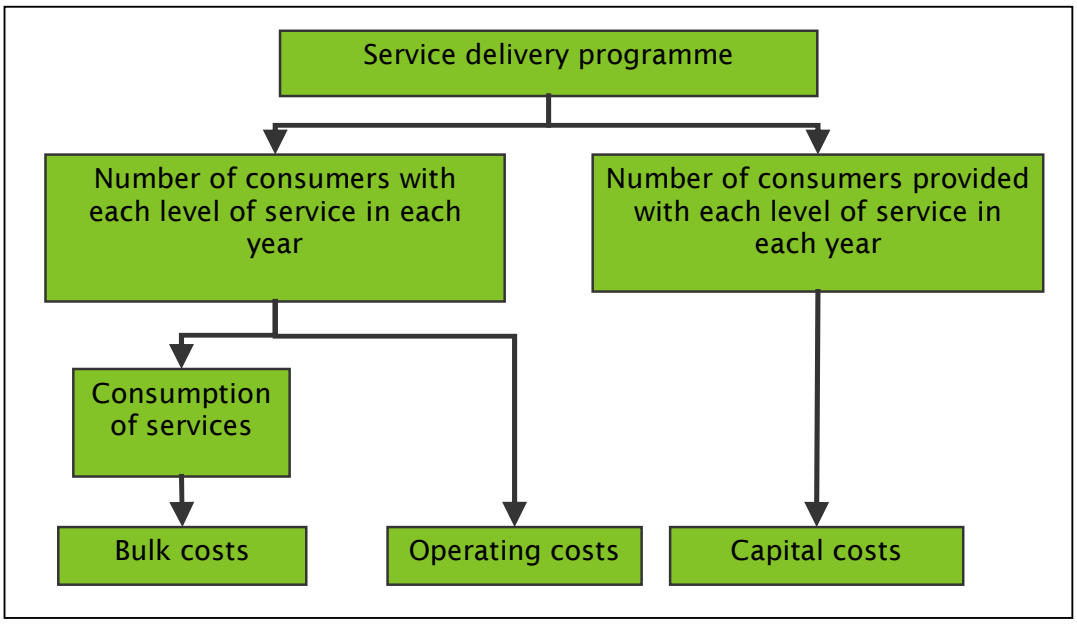

Figure 1: MSFM model approach

Once the service delivery programme is known, the model estimates bulk costs, operating costs and capital costs using unit consumptions, operating costs per consumer and capital costs per new consumer connected for each level of service.

Note that the latest version of the MSFM, produced for work on the 2007 round of the MIIF, takes explicit account of the fact that (in urban areas in particular) most service delivery happens through the housing programme. The model considers infrastructure services delivered along with housing separately from services delivered independently from the housing process.

Services modelled

The model looks at seven functional groupings, namely: governance, administration, planning and development facilitation (GAPD); public services; housing; water services; electricity; roads; and solid waste. Services can be switched on or off in the model so that individual services can be modelled separately.

Modelling capital expenditure

In the case of capital expenditure, the model considers expenditure on new infrastructure (bulk and connector as well as internal infrastructure financed through housing subsidies) and on the rehabilitation of existing infrastructure. It allows for the inclusion of capital required for 'special' infrastructure projects (such as major public

transport infrastructure), but does not model this as such. Rather, the user must estimate the value of such expenditure in each year of the model run.

The model estimates a total 'envelope' for capital expenditure. Individual projects must be fitted into this envelope.

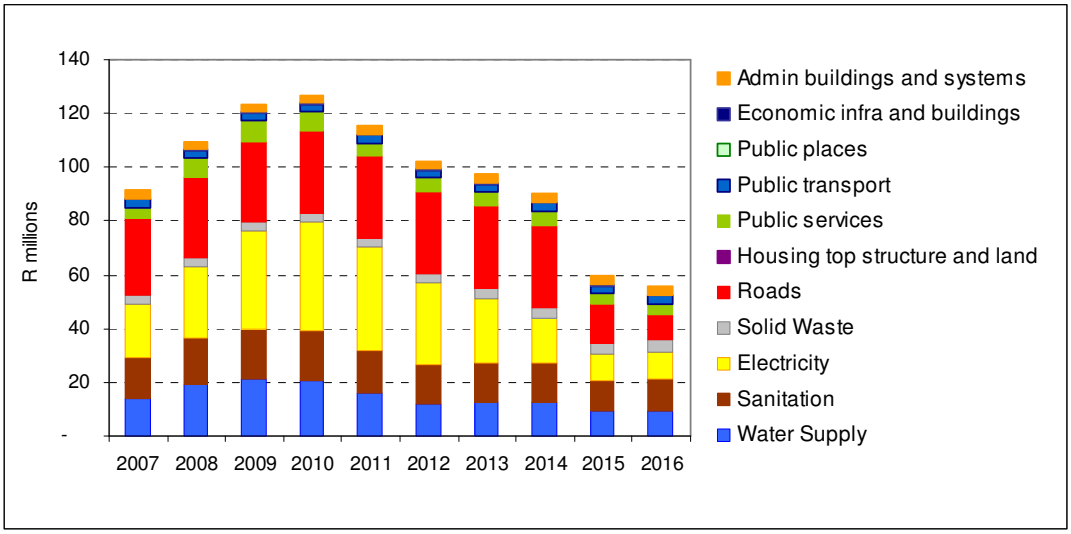

Figure 2: Capital expenditure as estimated by the MSFM

The shape of the capital expenditure curve shown in Figure 2 is characteristic, and is due to the way in which the achievement of service delivery targets is modelled. Typically, there is a target year set for the elimination of backlogs. This will require a lot of expenditure in the short or medium term, and results in an expenditure 'hump' in the earlier years of the model run. Once backlogs have been eliminated, capital expenditure is required only to provide services to new households. This is the lower, flatter profile towards the end of the model run shown in Figure 2.

Modelling capital finance

On the capital finance side the model provides for current capital subsidy arrangements and assumes that municipalities will have to finance all capital expenditure through such subsidies complemented by their 'own sources' of finance, primarily borrowing. The model treats borrowing as a residual. So borrowing must fill any gap that exists between capital expenditure and the capital finance that is available from subsidies, property owners, external service providers or municipal reserves.

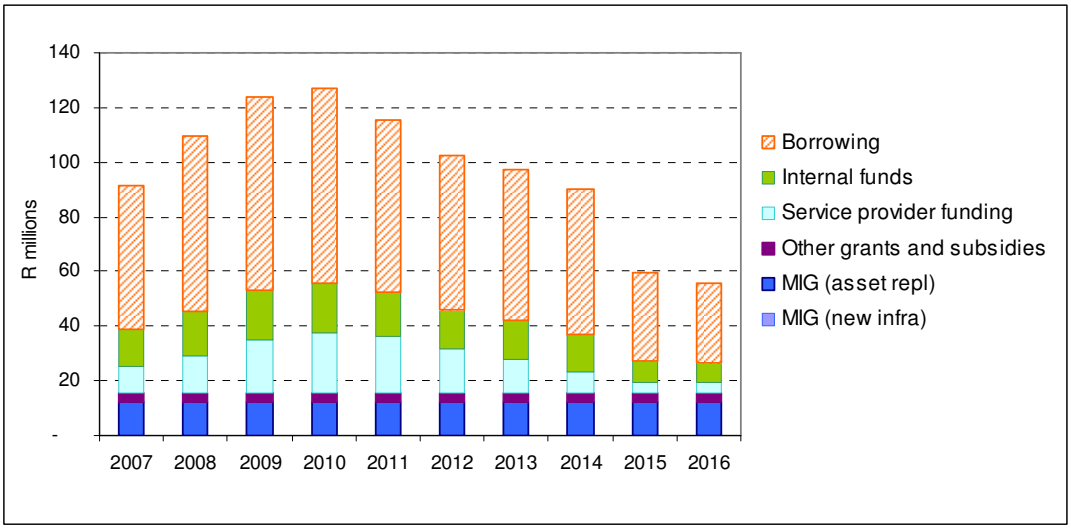

Figure 3: Capital finance utilised

Of course, if the planned capital programme requires a large amount of borrowing, there will be implications for the operating account, because borrowing results in interest payments in future years.

The model makes no comment on whether the projected amount of borrowing is possible. It is up to the user to assess this taking the debt servicing ratio[2] (which is calculated by the model) into consideration. In the model run shown in Figure 2 and Figure 3 above, a very large amount of borrowing is required. The user may decide that this is not possible or desirable. In that case, the user will have to alter the service delivery programme in order to ensure capital expenditure that can be financed more fully through available funding sources.

Modelling operating expenditure

Operating expenditure is modelled using unit costs. These costs include both operations and maintenance.

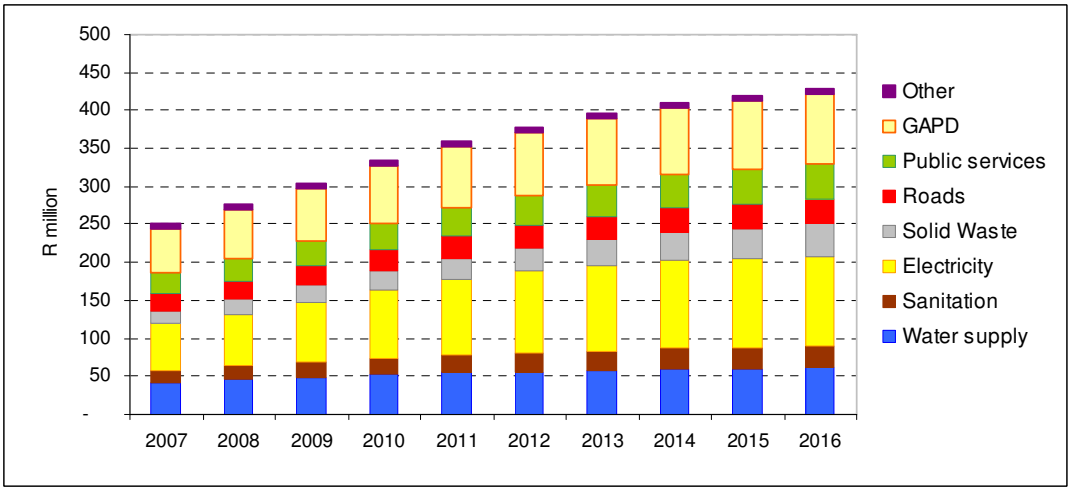

Figure 4: Operating expenditure as estimated by the MSFM

[2] Ratio of interest payments on long term loans to revenue.

Modelling operating revenue

The revenue side of the model considers Equitable Share allocations, user revenue and other sources of rates and general revenue.

User revenue is modelled based on what consumers can be expected to pay for services, given their income levels and expected patterns of consumption. Low income residential consumers are assumed to pay no more than an 'affordable' amount, which might be less than the cost of providing a service. High income residential and non-residential consumers, on the other hand, are assumed to pay a surcharge over and above the cost of providing services to them. This allows for cross subsidisation of low income consumers by high income consumers, as shown in the figure below.

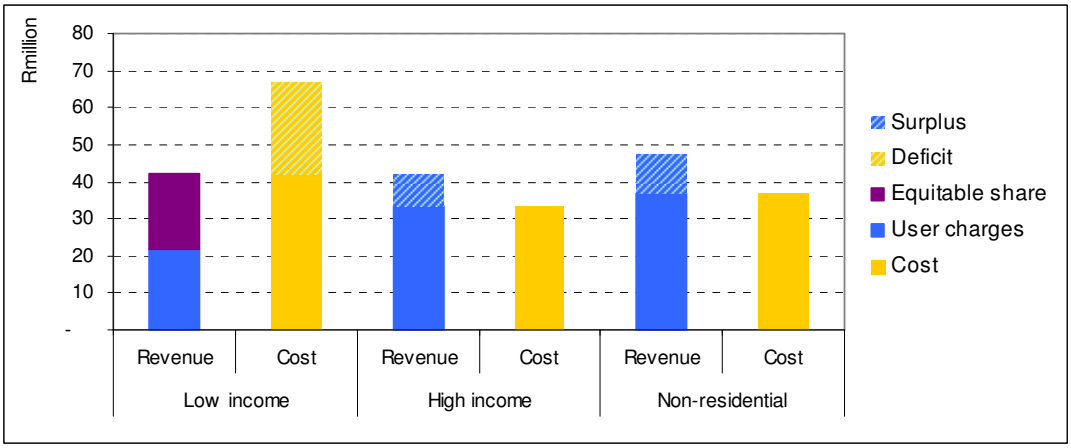

Figure 5: Cross-subsidisation approach applied in the MSFM

Viability on the operating account is assessed by balancing operating expenditure against operating revenue to determine whether a surplus or deficit results. If the operating account is in deficit, the user might need to make alternative service delivery choices, such as providing lower levels of service that users are better able to afford.

Further information

Financial models are useful tools for municipal officials involved in IIP. They allow the viability of a capital programme to be assessed over the long term, both in terms of whether sufficient capital funding is available and in terms of impacts on the operating account.

The MSFM is one such tool that is available for use by municipal officials. Access to the model can be obtained through the DBSA or dplg. The sixth round of review of the MIIF is envisioned to include training of municipal officials on IIP in general and on the use of models such as the MSFM in particular.