National Treasury

Modelling the infrastructure investment needs in South African metros: 2016 to 2025

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Executive summary

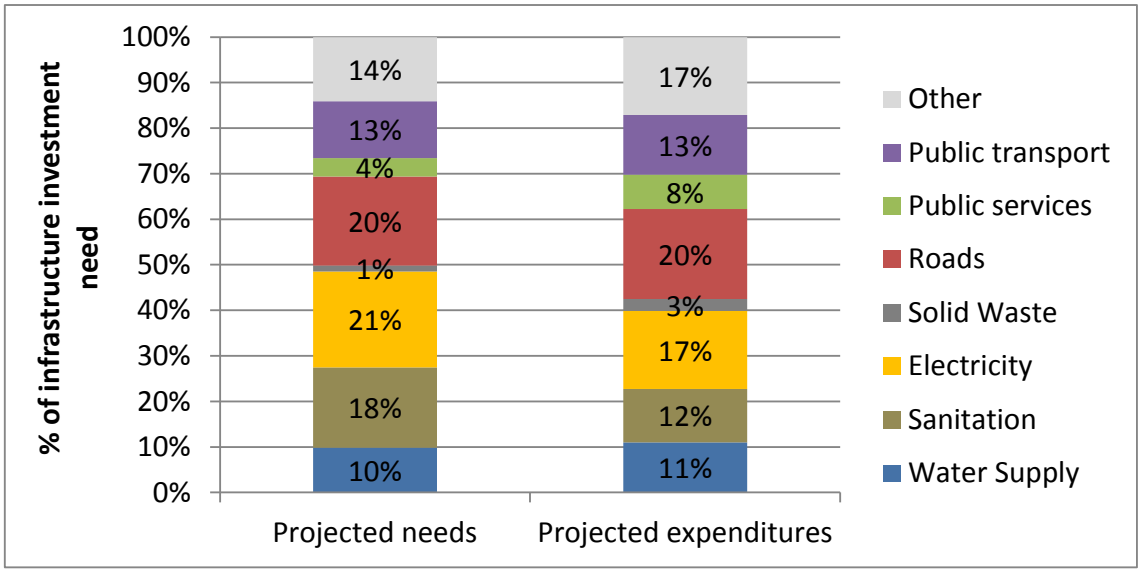
Recent modelling of the need for infrastructure investment by metropolitan municipalities finds that an aggregate amount of around R431 billion for all eight metros is required over a ten year period (in 2014 Rands). A number of assumptions were made in arriving at this figure, most significantly that household growth in the metros will be 2.0% per annum on average over the next ten years; that economic growth in the metros will rise to 4.1% per annum by 2025; and that the R632 trillion metro infrastructure base will be completely renewed over 35 years. A second model scenario, with economic growth in the metros rising to 5.8% per annum by 2025 was also run. This higher growth scenario results in a higher projected investment need, of R450 billion over ten years (in 2014 Rands). Further detail on the model approach and assumptions is available in Section 2 of the report.

Projected infrastructure investment need compared to current projected expenditure

The average projected investment need is R43 billion per annum. On average, metros are budgeting to spend R27.5 billion per annum (in 2014 Rands) over the MTREF period, and so projected expenditures are 64% of the projected need.

Infrastructure investment need by service

While the size of the projected need is greater than projected expenditures across the services, the composition of this need is relatively similar.



Composition of projected infrastructure investment need in the metros over 10 years compared to projected expenditures

Key differences are that the modelling suggests that, compared to the projected needs estimated in the modelling, projected metro expenditures currently under-provide for sanitation and electricity, and over-provide for public services and 'other' infrastructure. There are a number of possible reasons for this. Inaccurate unit costs are one possibility (see the discussion on the unit capital costs in Section 2.4 of the report). Projected expenditures are based on three year metro capital budgets, and it is possible that metros are planning to spend more on electricity

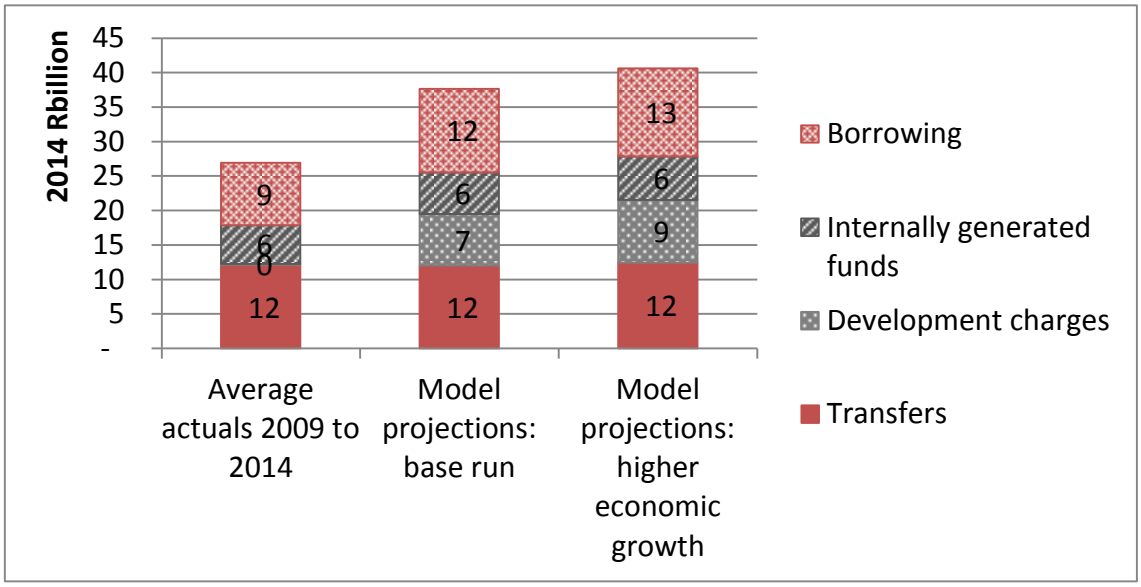
and sanitation and less on public services and 'other' infrastructure in the outer years. It is, however, also possible that metros are not prioritising expenditure based on need and are underspending in areas where it is difficult to spend (such as sanitation, for many reasons including difficulties in providing sanitation in informal settlements) and overspend in areas where it is easier.

Projected infrastructure investment need by driver: backlogs, growth and renewal

The modelling indicates that only R24 billion (5%) of the projected need is for backlog eradication. Growth, both household and economic, is the most significant driver, accounting for about R228 billion (53%) of the projected need over ten years. The remaining R179 billion (42%) is for renewal.

Sources of capital finance available

The model assumes that capital transfers and internally generated funds will remain approximately as current. It finds, however, that there is the potential to increase financing from development charges, and that levels of borrowing can increase.



Possible funding mix suggested by model compared to average actual funding mix from 2009 to 2014

Note that the figure above shows the *average annual* actuals over the past five years and the *average annual* model projections over the next ten years. In fact, the finance mix that is possible in each year will vary. Borrowing in particular is a long term programme, not an annual finance source. Metros may borrow a lot in some years and none at all in others. The figure above does not indicate that metros can take up an additional R12 billion in borrowing every year under the base scenario, but rather that they can potentially take up R120 billion over ten years. Annual averages are provided simply to allow comparison with the actual capital finance mix over the past five years.

In viewing the figure, it is important to note that the borrowing estimates are based on rough (and fairly conservative) rules of thumb relating to loan book as a percentage of operating revenue and total debt service payments (interest and redemption) as a percentage of the operating budget, and not to a full borrowing capacity assessment.

In addition, the development charges figure shown above is the maximum possible, and indicates the amount that could be raised if the full cost of bulk and connector infrastructure for high income households and non-residential consumers is recovered through development charges. This represents a best case scenario that is probably not achievable in reality[1].

Recall that the higher economic growth scenario results in a higher projected investment need (R450 billion over 10 years compared to R431 billion over 10 years in the base scenario). The figure above shows that higher economic growth scenario also results in a better projected ability to raise capital finance.

A remaining infrastructure funding gap

The modelling finds that a funding gap of R54 billion (in 2014 Rands) remains over the 10 years in the base scenario, 13% of the projected need. This gap exists even with the additional borrowing and optimistic assumptions regarding development charges that are assumed in the base scenario. The higher economic growth scenario finds a smaller projected funding gap of R43 billion (in 2014 Rands) over 10 years, 10% of the need. It is notable that the higher economic growth scenario results in a higher projected need for infrastructure investment, but also a better ability to raise finance and thus a lower funding gap.

South African metros are not alone in facing the challenge of funding gaps on infrastructure. Internationally, there has been significant recent attention on infrastructure funding gaps. Two possibilities for reducing such gaps have been identified.

The first is to increase the efficiency of infrastructure and thus reduce the need. In a recent review of best practice, McKinsey Global Group (2013) has suggested that improving project selection and optimising infrastructure portfolios; streamlining project delivery; and making the most of existing infrastructure assets can make a significant impact on the efficiency of infrastructure and reduce the need for additional infrastructure investment.

The second option is to unlock additional private finance for infrastructure[2]. Institutional investors are a possible under-utilised source of finance here, and Standard and Poor (2014) notes a number benefits of infrastructure for such investors, including higher yields, the ability to match long-dated assets and liabilities, comparatively low default totals and higher recovery rates, and the chance to diversify the asset portfolio.

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[1] In reality, metros will always use some mix of borrowing and development charges to cover the cost of infrastructure that could potentially be funded through development charges.

[2] There are two sides unlocking loan funding for municipalities. The first is increasing the capacity of municipalities to borrow. As noted earlier in this report, the assumptions underlying the borrowing capacity estimates in the modelling undertaken here are conservative, and there may be capacity for higher levels of borrowing than those indicated in this report. There are also actions that municipalities can take to improve their ability to borrow, namely enhancing revenues, managing expenditures and ensuring that their balance sheets and cash flows are sufficiently strong to support borrowing. The second side is increasing the willingness of lending institutions and investors to lend to municipalities. It is in this second space that international developments are of interest.

Contents

Abbreviations

CPAF: Contract Price Adjustment Factor

CRC: Current Replacement Cost

DBSA

GAPD

GVA

MIG: Municipal Infrastructure Grant

MIIF: Municipal Infrastructure Investment Framework

MSFM: Municipal Services Financial Model

SAFCEC: South African Forum of Civil Engineering Contractors

USDG: Urban Settlements Development Grant

Table of Figures

1 Introduction

Recent modelling of the need for infrastructure investment by metropolitan municipalities (metros) finds that around **R431 billion is required over a 10 year period** (in 2014 Rands) to eliminate backlogs, to accommodate household and economic growth over the period, and to make progress in renewing the existing infrastructure base.

This paper unpacks the R431 billion figure, looking at how it was arrived at (Section 2), how it can be disaggregated (Section 3), and how it might be funded (Section 4). The paper then draws some conclusions with regard to the implications for investment in municipal infrastructure by the public and private sectors (Section 5) and makes recommendations for further study (Section 6).

The paper finds that there is a funding gap on municipal infrastructure in the metros, but that this is in common with most infrastructure investment programmes internationally. Based on literature, the paper suggests that there may be ways to reduce the need through greater efficiencies in infrastructure investment. Internationally, there is significant attention on unlocking increased private sector funding from institutional investors in particular and this is an opportunity here in South Africa, both for institutional investors in search of ways to match long-term assets and liabilities while still achieving high yields, and for metros in search of innovative ways to finance their infrastructure programmes. Unlocking this finance is an imperative if we wish to see improved economic growth and continue to deliver a better life for all South Africans.

Note that the R431 billion figure was arrived at through a model that evaluated the eight metros as a group. Models were also run for four individual metros, namely the City of Johannesburg, City of Cape Town, eThekwini Metropolitan Municipality and Nelson Mandela Bay Metropolitan Municipality. The results from these models are shown in boxes throughout the report, in order to demonstrate that there is variability in the projected infrastructure needs and access to finance in the different metros.

2 Model overview and assumptions

The Municipal Services Financial Model (MSFM) is a modelling tool originally developed for work on the Municipal Infrastructure Investment Framework (MIIF) for the Development Bank of Southern Africa (DBSA) and the then Department of Provincial and Local Government (now the Department of Cooperative Governance and Traditional Affairs).

The MSFM has been used to undertake national level analysis of infrastructure investment requirements as part of the MIIF[3], and has also been applied in over 35 individual municipalities to date.

The model calculates:

- The amount of capital expenditure required by municipalities on infrastructure over a 10 year period in order to eliminate backlogs, to accommodate

[3] The MIIF was a useful source of information on municipal investment needs in all categories of municipalities in South Africa. However, it has not been updated since 2009 and its findings are thus now very out of date.

household and economic growth over the period, and to make progress in renewing the existing infrastructure base;

- The amount of capital finance that can be raised; and

The impact that the capital expenditure and capital finance mix will have on the operating account.Detail on the model approach is provided in an annexure to this report, but it is important to note here that the model takes a 'top down' approach, estimating infrastructure investment needs based on high level parameters such as household growth and economic growth, and making use of unit consumptions (average amounts of a water and electricity consumed and wastewater and solid waste generated per customer) and unit costs (average cost of infrastructure per unit of capacity or per customer and average operating cost per customer)[4].

When making use of the results of a model, it is useful to bear the following in mind:

All models are wrong, but some are useful.

George E.P. Box

Models are not accurate predictors of what will happen in the future and do not provide an 'answer' in terms of creating certainty. Good models deepen understanding and inform decision making. They are most powerful when testing different scenarios in order to deepen understanding of the relative impact of model parameters on a result.

The MSFM is a very useful tool for understanding the macro drivers of infrastructure investment need and estimating the overall magnitude of that need over a ten year period. If the unit capital costs used are accurate (and the extent to which that may not be the case in the modelling conducted here will be discussed later on in this section), the projected infrastructure investment needs are reliable at a high level, subject to the model assumptions made. The MSFM can be a very useful tool for making comparisons between municipalities and understanding why investment needs differ.

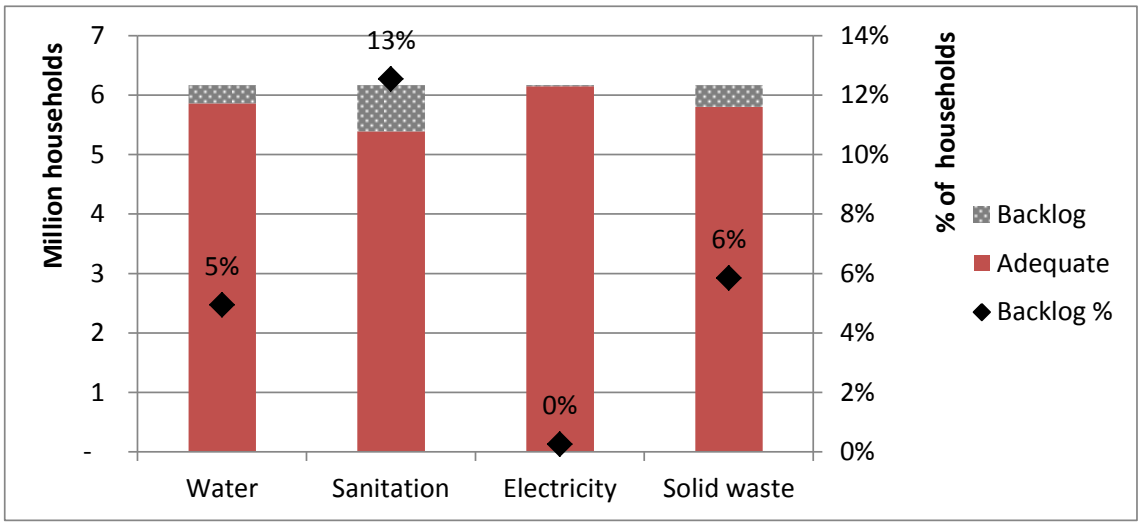
While the MSFM highlights some important issues with regard to how the required infrastructure investment might impact on the operating account over time, it is not an accurate predictor of operating performance. Similarly, it provides one possible view on the availability of capital finance, but the actual availability will be subject to a very large number of factors that the model does not and cannot account for.

A sound understanding of the assumptions underlying any model is critical when interpreting its results, and so the remainder of this section outlines the key assumptions made in the modelling conducted for this paper.

2.1 Backlogs

The model assumes that backlogs as a percentage of households are as estimated in Census 2011.

[4] This is differentiated from 'bottom up' estimates of infrastructure investment needs typically generated through municipal Master Planning processes, which are based on detailed assessments of the condition and capacity of existing infrastructure. It is a useful and interesting exercise to test 'bottom up' municipal estimates of investment needs against 'top down' estimates produced through models such as the MSFM.



Data ex Statistics South Africa Census 2011

Figure 1: Access to services in the metros in 2011[5]

These percentage backlogs are applied to estimates of household numbers in the metros in 2015 in order to provide estimates of backlogs as numbers of households.

2.2 Household growth

There are about 7 million households living in the metropolitan municipalities in 2015. StatsSA mid-year population estimates indicate average population growth per annum in the metros of around 1.8% per annum. Household growth is higher than population growth and has assumed to be around 2.0% per annum on average over the model run[6].

[5] Note that backlogs in housing are not shown in this figure. Housing is not a municipal function and is thus not included explicitly in the modelling. A subsidised housing programme is, however entered, because the rate of provision of subsidised housing is a key driver for the need for associated municipal infrastructure such as water, sanitation and roads.

[6] The 2.0% figure was arrived at as follows. Population growth in the metros was 2.43% p.a. on average between the Statistics SA census years of 2001 and 2011. Household growth in the metros over the same period was 2.81% p.a. on average, 15% higher than population growth. According to the Statistics SA mid-year population estimates, population growth in the metros between 2011 and 2014 has been 1.8% p.a. on average. It was assumed that household growth has remained 15% higher than population growth, giving an estimate for household growth of 2.0% p.a. on average. It is of course possible that population and household growth rates will continue to decline. Scenarios related to lower household growth were not included in the modelling.

Table 1: Population and household growth figures

	Average annual growth 2001 to 2011	Average annual growth 2011 to 2014	Average annual growth assumed for model
Population growth	2.43%	1.77%	
Household growth	2.81%	*2.04%*	*2.04%*

Average annual growth between 2001 and 2011 ex StatsSA Census figures.

Average annual population growth between 2011 and 2014 ex StatsSA mid-year population estimates.

Average annual household growth between 2011 and 2014, and assumed for model, estimated.

2.3 Economic growth

Economic growth is a key driver of infrastructure investment needs in the model. There are two pathways by which economic growth drives need. Firstly, higher rates of economic growth are assumed to result in a higher demand for municipal services from non-domestic (industrial and commercial) customers. Secondly, higher rates of economic growth relative to household growth are assumed to result in shifts in the relative proportion of low income and high income households, with the proportion of households that are high income growing[7]. Together, these

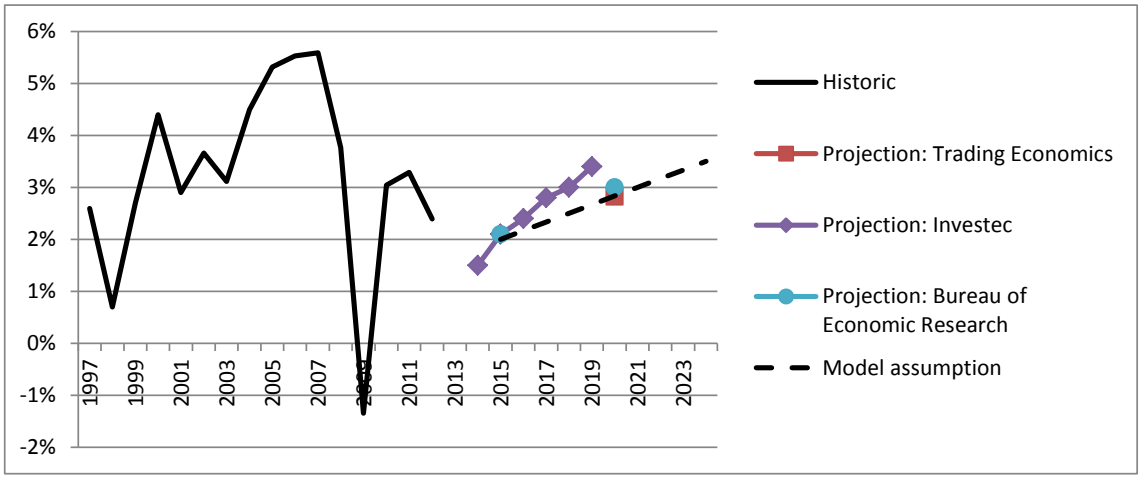
[7] This is essentially a 'trickle down' effect. The model assumes that if economic growth exceeds household growth, household incomes will rise across the income groups. With 'low income' defined as household income of up to R3 500 a month (fixed in real terms), the result is that the proportion of households that are low income declines. The existence of a 'trickle down' effect is controversial and the extent to which economic growth translates into household income growth, and the distribution of that growth in household income, is the subject of much debate. Analysis of the proportion of households in different income groups in the Census years does support the model assumption that the proportion of households that are low income declines in times when economic growth exceeds household growth (as it did on average between 2001 and 2011), although the reliability of Census income data has also been questioned.

	Number of households			% of households		
	Census 2001	Census 2001 adjusted for inflation	Census 2011	Census 2001	Census 2001 adjusted for inflation	Census 2011
Low income	3 203 713	2 844 035	3 289 807	69%	61%	55%
High income	1 469 299	1 828 977	2 723 424	31%	39%	45%
Total	**4 673 012**	**4 673 012**	**6 013 231**			

impacts have positive implications for the financial performance of municipalities on the operating account, as they are able to cross-subsidise financial losses made on providing services to low income households with financial surpluses made on providing services to higher income households and to non-domestic customers.

Economic growth in the model is also assumed to result in higher rates of growth in property rates revenue[8].

There are a number of projections of GVA growth rates for South Africa available. Even the more moderate of these assume that growth will increase. GVA growth of 3.5% per annum by 2025 seems to be a representative expectation.



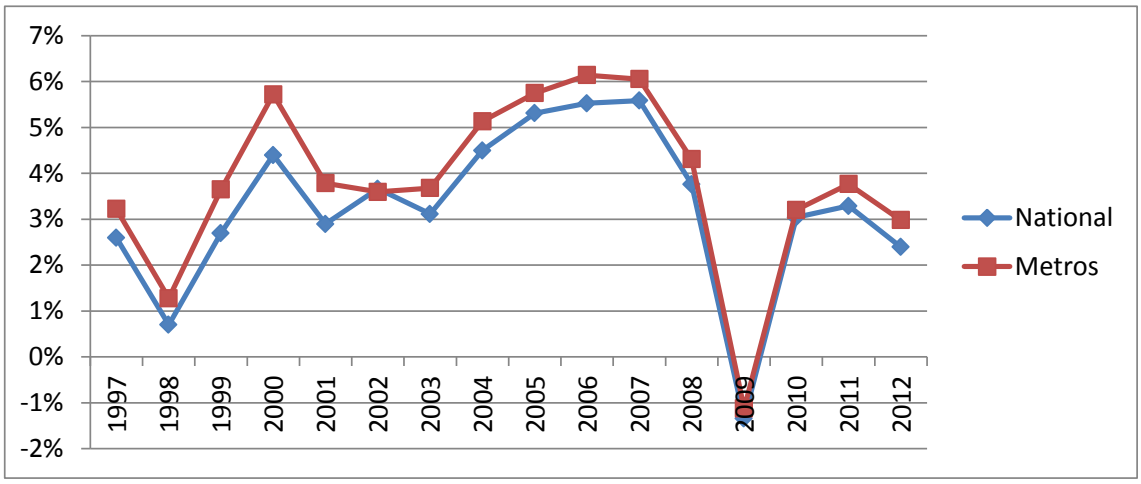
Historic data ex IHS Global Insight Regional eXplorer 674 (2.5n)

Figure 2: Economic growth projections for South Africa[9]

As may be seen in the figure below, metro economies grow more rapidly than the national South African growth rate.

[8] Property prices in South Africa are very responsive to economic growth, with Lightstone Properties (2012) indicating that a 1% rise in economic growth results in a 3.5% rise in house prices on average. The extent to which property price rises are captured in property rates depends on the frequency with which valuation rolls are updated, and the willingness of municipalities to maintain cent in the Rand property rates at levels that capture the growth in the value of properties.

[9] Trading economics accessed via http://www.tradingeconomics.com/south-africa/gdp-growth/forecast; National Treasury accessed via http://www.treasury.gov.za/documents/national%20budget/2015/review/chapter%202.pdf; Investec accessed via https://www.investec.co.za/research-and-insights/economy/economic-research/macro-economic-forecasts/quarter-2---economic-forecasts--2014---2019.html; and Bureau of Economic Research accessed via http://www.ber.ac.za/DocDescription/2023.aspx?documentidref=6306&documenttype=Economic%20Outlook. All accessed on 14 August 2015.



Data ex IHS Global Insight Regional eXplorer 674 (2.5n)

Figure 3: Historic GVA growth rate in metros compared to national South Africa

The base model run has thus assumed that GVA growth will reach 4.1% per annum in the metros by 2035.

A second, more optimistic, growth scenario was run with national economic growth reaching 5.2% per annum by 2025, and metro growth accordingly higher at 5.8% per annum. This is in line with the current trajectory of projections by Investec (see Figure 2).

Box: Detail from individual metros

Individual models were run for four metros, here called Metro A, Metro B, Metro C and Metro D. Data from actual metros were used. This data indicates very different growth paths in the different metros.

	All metros	Metro A	Metro B	Metro C	Metro D
Number of households in 2015 (thousand households)	6 977	1 523	1 140	347	1 031
Average annual household growth	2.0%	2.0%	2.1%	2.1%	1.5%
Economic growth 2016	2.6%	2.6%	3.2%	1.6%	3.4%
Economic growth 2025	4.1%	4.1%	4.7%	3.1%	4.9%

In Metros A, B and C average annual household growths are similar to those in the metros as a whole, at around 2% per annum (with Metro B and C seeing growth rates that are marginally higher). Metro D, however, has average annual household growth rates that are significantly lower than the average.

With regard to economic growth, Metro A has experienced growth similar to the metro average, while Metros B and D have had higher growth rates and Metro C lower.

In comparing overall growth patterns, we thus see:

- Economic growth rates that are below household growth rates in Metro C.
- Economic growth rates that are above household growth rates in Metros A and B, with Metro B seeing slightly more positive economic growth relative to household growth.
- The highest rates of economic growth in Metro D, combined with the lowest rates of household growth.

2.4 Capital unit costs

The model makes use of capital unit costs to estimate the cost of infrastructure investment. The unit costs are average costs per customer or unit of capacity and historically have been developed by consulting engineers based on data on the costs of capital projects from around the country.

The last time that a full unit costing exercise was done was 2009 as part of the last round of the MIIF. For the purposes of analysis here, the 2009 figures have been inflated using the Contract Price Adjustment Factor[10] (CPAF) as reported by the South African Forum of Civil Engineering Contractors (SAFCEC). This indicator suggests that contract prices have risen by almost 30% between the end of 2009 and the end of 2014.

[10] The Baxter Contract price Adjustment formula (or CPAF), is widely recognised as an accepted set of indices to adjust contracts for payment escalation. It is a composite index based on Stastistics South Africa indices. It is published regularly by SAFCEC in their quarterly 'State of the South African Civil Industry' reports, which may be downloaded from www.safcec.site-ym.com.

Table 2: Year on year percentage change in CPAF between 2009 and 2014

	2009	2010	2011	2012	2013	2014
% change p.a.		2.3%	4.7%	4.5%	8.7%	6.2%
Index	1.00	1.02	1.07	1.12	1.22	1.29

Data ex SAFCEC (2014)

Using these inflated unit costs, the model finds that the Current Replacement Cost of all metro infrastructure is R623 billion in 2014 Rands. This aligns well with other available estimates of Current Replacement Costs, which suggests that the inflated unit costs are roughly valid[11].

2.5 Rate of infrastructure renewal required

The model calculates the rate of infrastructure renewal required based on assumed Estimated Useful Lives for the various classes of assets owned by municipalities. On average, the model assumes that the full value of the metro asset base will be replaced over 35 years[12]. This is sufficient to accommodate on-going wear and tear on infrastructure, but does not allow for the rectification of any existing renewal backlog. The latter is an important point to note. There is widely accepted anecdotal evidence of a significant backlog in infrastructure renewal in South African municipalities. However, the data on the current condition of municipal infrastructure is so limited that there are no reliable estimates on the size of this backlog. For this reason, the modelling here has focussed on on-going renewal and set the renewal backlog aside for now.

3 The projected infrastructure investment need

The model run described in Section 2 above estimated that **R431 billion is needed** in infrastructure investment in South African metros over the next 10 years in 2014 Rands.

The average projected need is R43 billion per annum. On average, metros are budgeting to spend R27.5 billion per annum (in 2014 Rands) over the MTREF period, which is 64% of the projected need.

[11] Boshoff (2015) estimates the value of municipal infrastructure for *all* municipalities in South Africa to be R1.26 trillion at the end of June 2014. From budgets, the metros account for about 52% of the value of all municipal Property Plant and Equipment. 52% of Boshoff's estimate is R655 billion. This is within 5% of the R623 billion estimated in the model.

[12] Once again, this 35 year result aligns well with the estimates provided in Boshoff (2015), who suggests that South African municipalities need to spend R35 billion a year to renew the R1.26 trillion asset base; implying that the full value of the asset base will be replaced over 34 years.

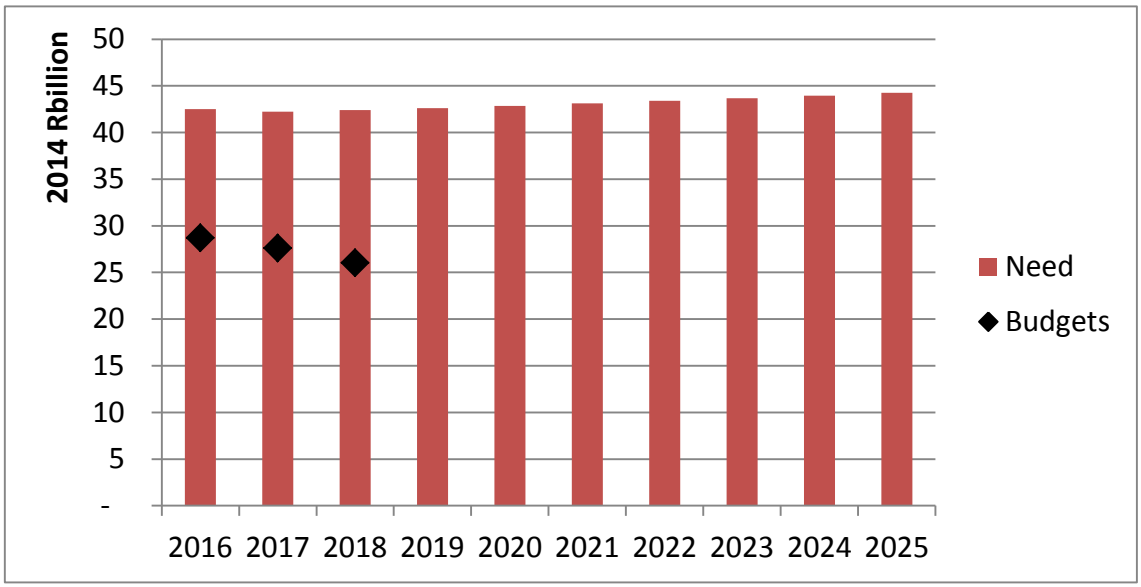


Figure 4: Projected infrastructure investment need per annum in metros compared to projected expenditure

Note that the projected infrastructure investment need per annum shown in the figure above is relatively steady over time. In reality, expenditure will be 'lumpy', particularly for individual metros, with lower levels in some years and higher in others. The analysis here provides an estimate of what must be spent on average over a 10 year window, not what must be spent in any individual year.

Box: Detail from individual metros

The combined projected infrastructure investment need in the four metros modelled individually is R287 billion over the 10 years, 67% of the total projected investment need for all metros. Together, their current budgets make up 68% of total metro budgets.

The variance between projected need and projected expenditures differs between these metros.

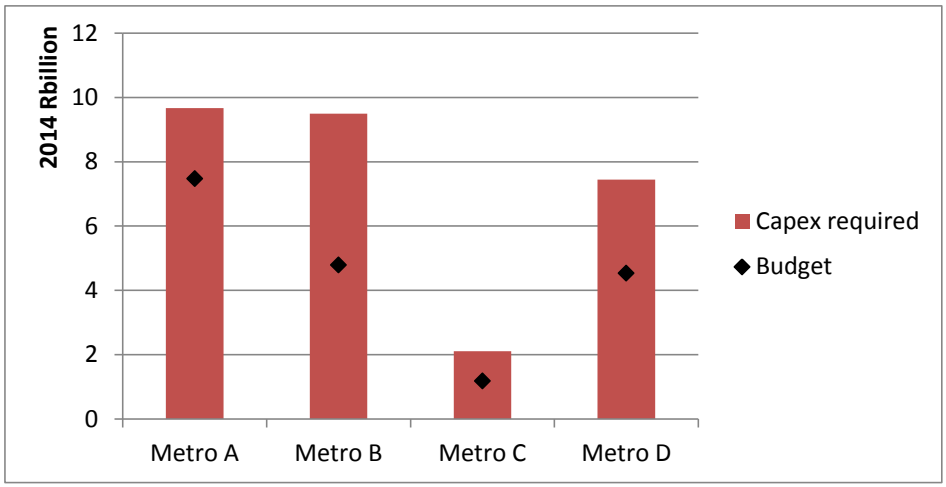


Figure 5: Average projected infrastructure investment need per annum over 10 years in four individual metros compared to projected expenditures

The current average annual MTREF budget is 77% of the average annual projected investment need in Metro A, 50% in Metro B, 56% in Metro C and 61% of the projected investment need in Metro D.

For comparative purposes, projected investment needs were normalised by the number of households.

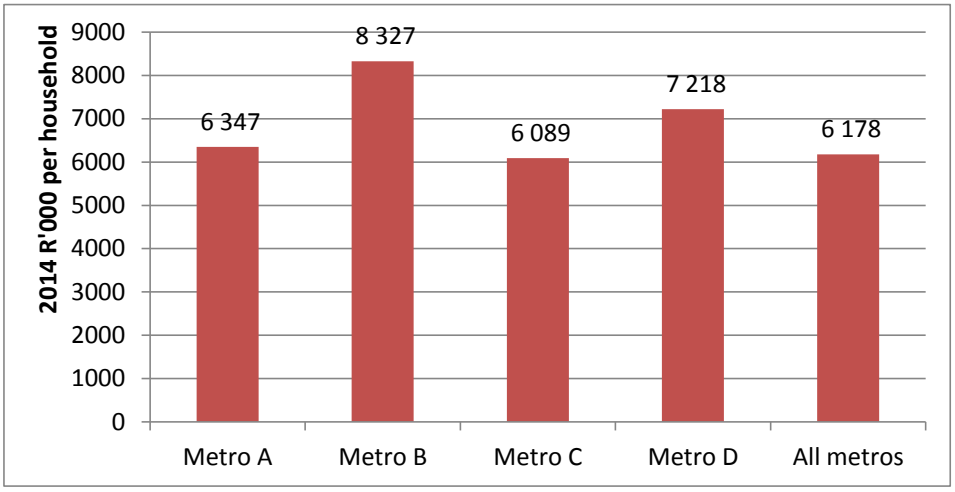


Figure 6: Projected infrastructure investment need per household per annum in four individual metros, as well as in all metros combined

Relative to their size, Metro B faces the highest projected infrastructure investment need followed by Metro D. The projected investment need per household in Metros

A and C is similar, and is also similar to the average in all of the metros combined. This is largely a function of the relative importance of the drivers of need in the different metros (the size of existing backlogs, projected rates of household and economic growth, and size of the existing asset base). Metro B, for example, has a larger infrastructure base than the other metros and thus faces a higher projected need for renewal. This drives the projected infrastructure need per household up.

3.1 Projected infrastructure investment need by service

The figure below shows the aggregate projected infrastructure investment need per annum in the eight metros, broken down by service.

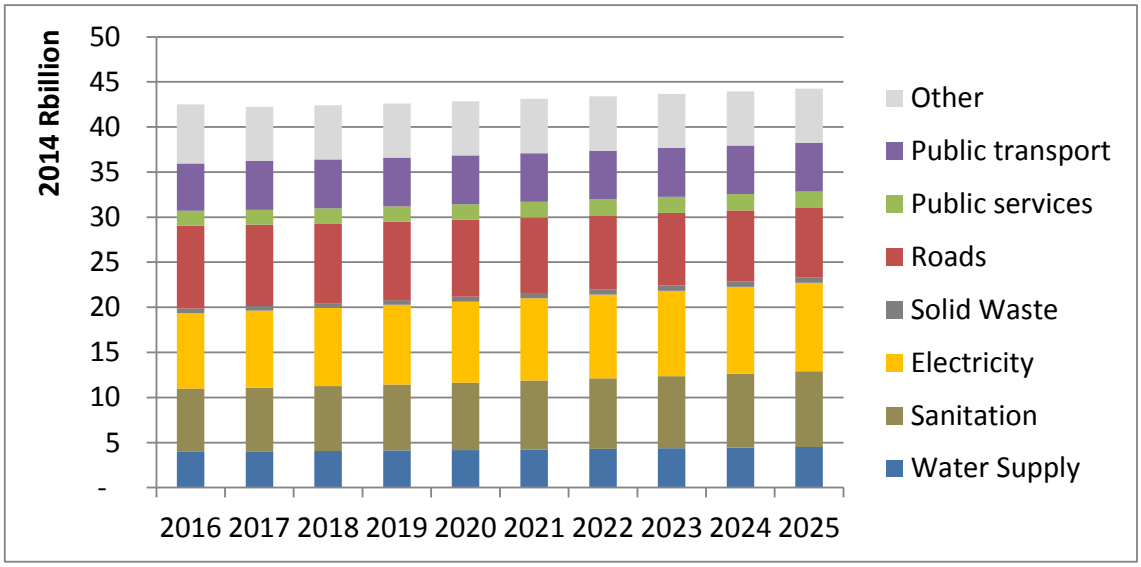


Figure 7: Projected infrastructure investment need per annum in the metros by service

The bulk of the projected investment need is for the sanitation, electricity and roads services.

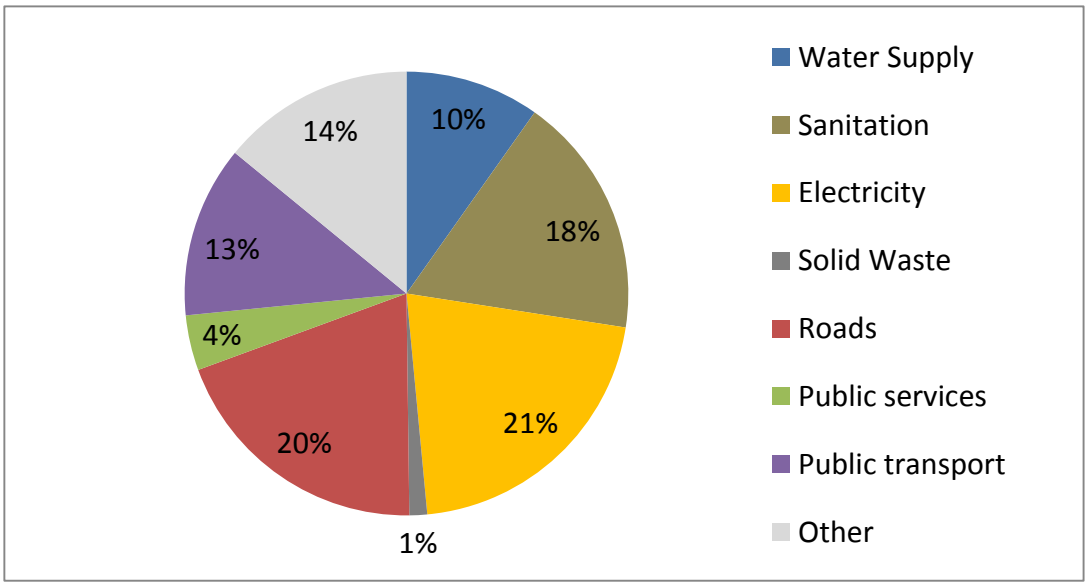


Figure 8: Composition by service of projected infrastructure investment need in the metros over 10 years

While the size of the projected investment need is greater than projected expenditures across the services, the composition of the projected investment need is relatively similar. Key differences are that the modelling suggests that projected metro expenditures currently under-provide for sanitation and electricity, and over-provide for public services and 'other' infrastructure compared to the projected needs estimated in the modelling.

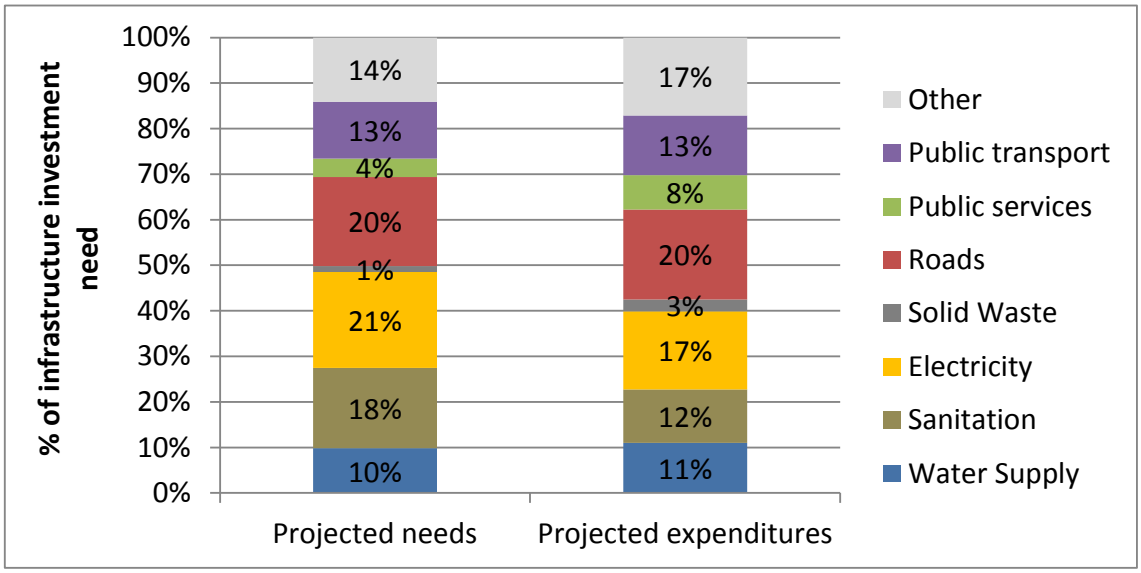


Figure 9: Composition of projected infrastructure investment need in the metros over 10 years compared to projected expenditures

There are a number of possible reasons for the differences in projected needs and projected expenditures:

1. The projected needs may be incorrect due to inaccuracies in the unit capital costs[13].
2. The projected expenditures may be incorrect. These are based on three year metro capital budgets, and it is possible that metros are planning to spend more on electricity and sanitation and less on public services and 'other' infrastructure in the outer years.
3. The projected needs and expenditures may be correct, and metros are not prioritising expenditure based on need. In particular, the figure may indicate that they are underspending in areas where it is difficult to spend, such as sanitation[14]

3.2 Backlogs, growth and renewal

There are three primary drivers of the need for infrastructure in metros.

Firstly, there is a need for expenditure on new infrastructure or expansions to existing infrastructure in order to provide infrastructure to those who currently do not have access; in other words, to eradicate infrastructure **backlogs**.

Secondly, there is a need for expenditure on new infrastructure or expansions to existing infrastructure in order to accommodate **growth**. This is growth both in the number of households in the metros as well as growth in the demand for infrastructure by non-residential customers, which is assumed in the model to be driven by economic growth.

Finally, there is a need for expenditure on the **renewal** of the existing infrastructure base. 'Renewal' is used here as a term that encompasses rehabilitation, refurbishment and replacement of existing infrastructure[15].

The modelling indicates that only R24 billion (5%) of the projected investment need is for backlog eradication[16]. Growth is the most significant driver, accounting for about R228 billion (53%) of the projected investment need over 10 years. The remaining R179 billion (42%) is for renewal.

[13] The report has previously noted that the unit costs are outdated. See the discussion on the unit capital costs in Section 2.4

[14] Provision of sanitation in informal settlements in metros, where the backlog is almost entirely located, is notoriously difficult. See for example SAHRC (2014).

[15] This is in line with Boshoff (2015), who defines 'renewal' as expenditure on an existing asset which returns the service potential of the asset or expected useful life of the asset to that which it had originally. Boshoff (2015) notes that renewal can include works to replace existing assets or facilities with assets or facilities of equivalent capacity or performance capability, and that expenditure on renewals is funded through the organisation's capital budget, and such expenditure is recognised in the organisation's Statement of Financial Position.

[16] Note that the expenditure for backlog eradication is expenditure required to provide adequate infrastructure to those households without access to adequate infrastructure at the start of the model run. The provision of infrastructure to any future households, including those in informal settlements, is classified as 'growth'.

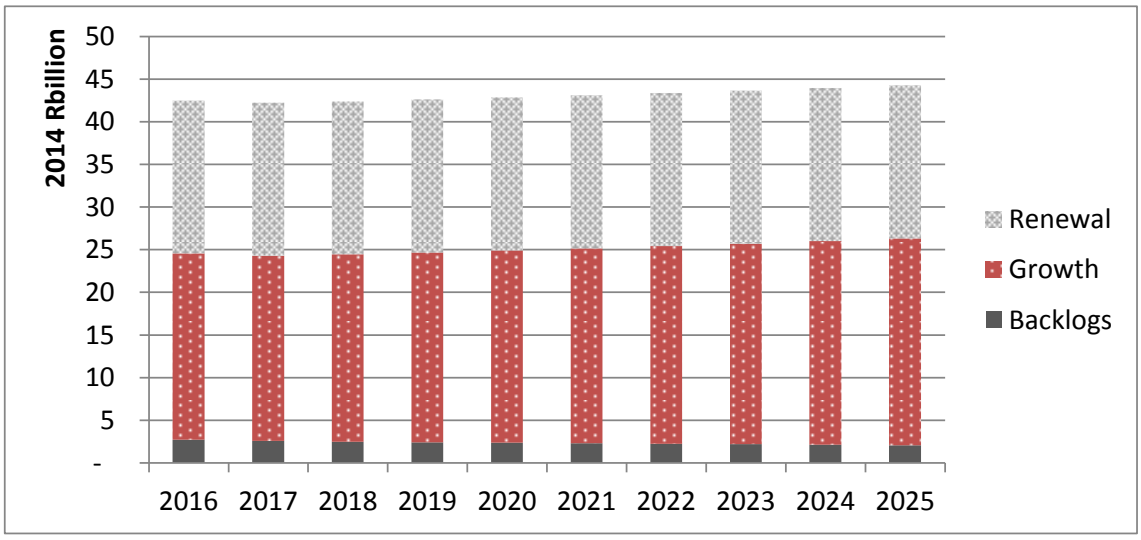


Figure 10: Projected infrastructure investment need for backlog eradication, growth and renewal per annum in metros in the model base run

Note that the annual projected investment need for renewal remains fixed over time in the model. This is a function of the way in which the renewal need is calculated. The model assumes that the value of the infrastructure must be renewed steadily over the useful life of the infrastructure. This is broadly true for an entire infrastructure system, where different system components will require renewal at different times. The projected investment need for renewal per annum in the model is thus calculated by dividing the Current Replacement Cost of the infrastructure by its Estimated Useful Life. As is the case for the projected investment need as a whole, in reality, renewal expenditure may be higher or lower in a given year[17].

It should also be noted that the distinction between 'backlog eradication', 'growth' and 'renewal' is somewhat artificial. Individual projects often overlap between these categories. Take the example of a project that upgrades an existing wastewater treatment works, refurbishing it and increasing its capacity. This project allows for both growth and renewal.

Under the higher growth scenario, the projected need for renewal expenditure remains the same but the projected need for expenditure to allow for growth is higher.

[17] Renewal needs will of course grow over time as the infrastructure base grows. However, this is assumed not to have an impact over the model time period because of the average Estimated Useful Life of infrastructure assets. This average Estimated Useful Life is typically 20 years or longer. Assets typically only require renewal once 50% or more of their Estimated Useful Lives are depleted. For infrastructure installed in the first year of the model run, renewal will thus start in year 11, which is outside the ten year model time period.

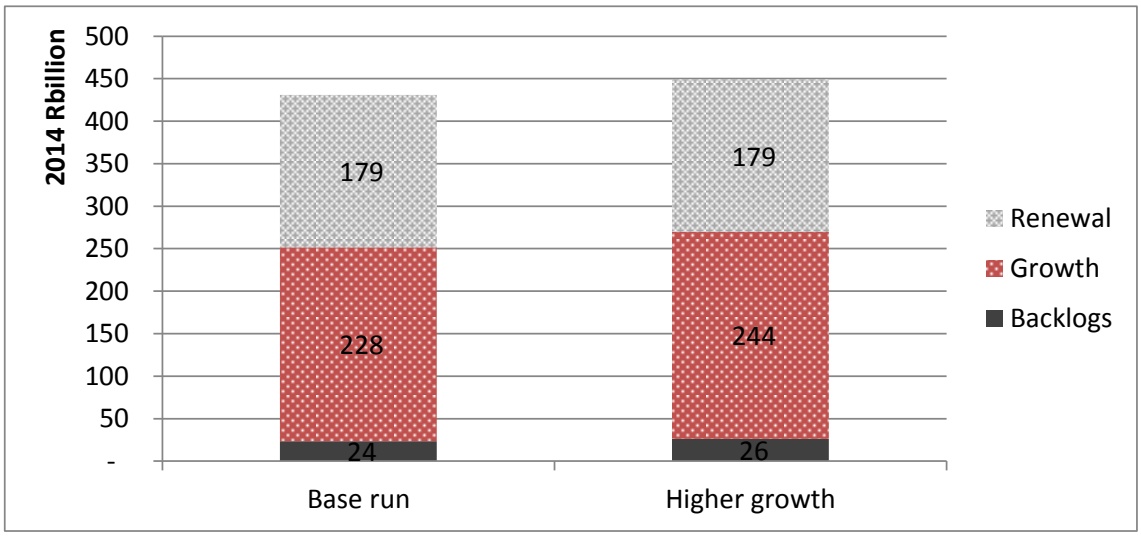


Figure 11: Comparison of projected infrastructure investment need for backlog eradication, growth and renewal over 10 years in the metros under the base run and higher economic growth scenarios

Box: Detail from individual metros

The mix of projected investment needs for backlog eradication, growth and renewal differs in individual metros as shown in the figure below.

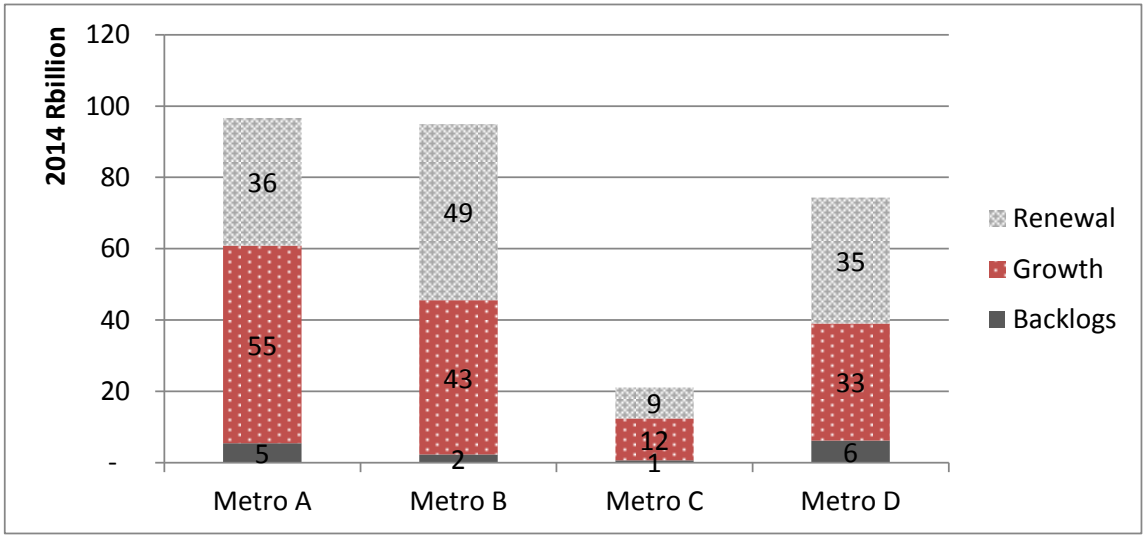


Figure 12: Projected infrastructure investment need for backlog eradication, growth and renewal over 10 years in four individual metros

The differences in projected investment needs are due to differences in the drivers of infrastructure need in the different metros: the size of the backlogs, rates of

household and economic growth, and existing infrastructure bases.

The projected investment need for renewal is notably high in Metro B[18].

3.3 'Social' and 'economic' infrastructure

The extent to which infrastructure is being provided to low income households, who face severe affordability constraints, as opposed to high income households and non-residential consumers, is significant in terms of the ability of the municipality to raise funding for the infrastructure programme.

In this paper, the term 'social' infrastructure is used to refer to that proportion of the infrastructure that will service low income households, earning less than R3 500 a month. Note that this is different to the definition of social infrastructure applied elsewhere in the literature, as infrastructure that is largely focussed on social objectives (housing, health, water, sanitation and education, for example). Low income customers can typically not afford to pay a tariff that covers the full cost of operating and maintaining the infrastructure, and so a loss is typically made on the provision of services using social infrastructure.

'Economic' infrastructure is used here to refer to that proportion of the infrastructure that would provide service to high income households and non-residential consumers, as opposed to the definition used elsewhere of infrastructure focussed on services that directly benefit the process of production and distribution in an economy (typically electricity, transport and communication). High income customers and non-residential customers frequently pay a tariff that is higher than the cost of operating and maintaining the infrastructure providing them, and so a profit is made on the provision of services using economic infrastructure. This profit is used to cross-subsidise the losses made on social infrastructure.

It is important to note that there is not in fact a clear distinction between 'social' and 'economic' infrastructure. Bulk and connector infrastructure in particular (things like water and wastewater treatment works, collector and distributor roads, high voltage electricity distribution lines or landfills) serves both low income households, high income households and non-residential consumers and so individual infrastructure items cannot be neatly separated into 'social' or 'economic'. That said, the differentiation is useful for analytical purposes.

The modelling indicates that about R171 billion (40%) of the projected investment need over 10 years is for social infrastructure, while the remaining R260 billion (60%) is for economic infrastructure.

[18] Note that this is largely due to a very large roads network in Metro B according to the data provided by the metro. It must be noted that data on municipal roads lengths in South Africa is very poor. The data provided by municipalities themselves is often very different from that kept by National Department of Transport. There is a need for more reliable municipal roads data based on an agreed and consistently applied classification.

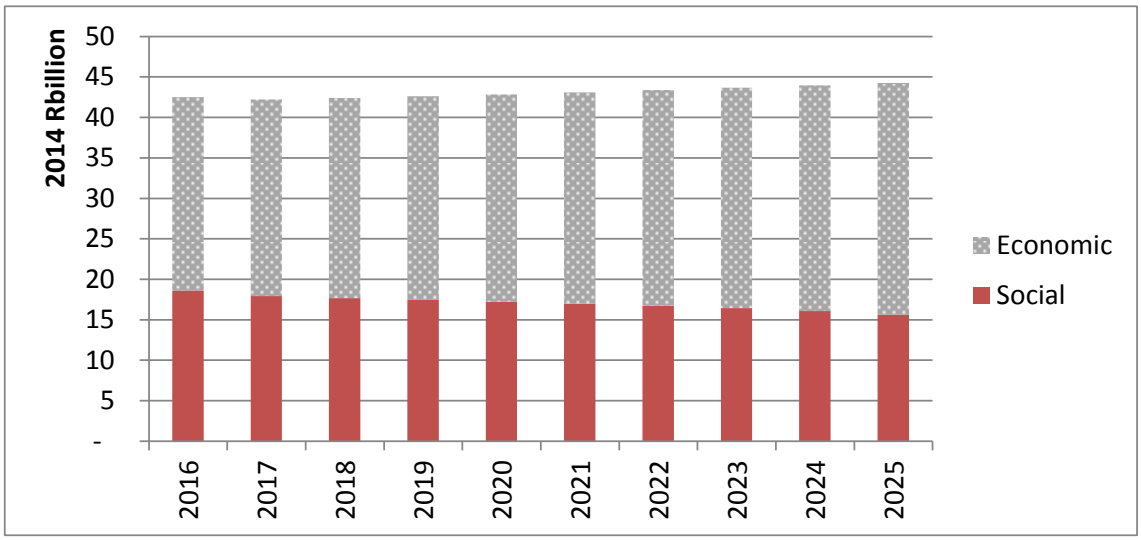


Figure 13: Projected infrastructure investment need for social and economic infrastructure per annum in metros in the base model run

The model shows the projected investment need for social infrastructure declining over time. This is because of the model assumptions regarding the impact of higher economic growth over time on the proportion of low income and high income households, discussed in Section 2.3.

Under the higher economic growth scenario, the total projected investment need for social infrastructure is the same as that under the base run, but the projected investment need for economic infrastructure is higher.

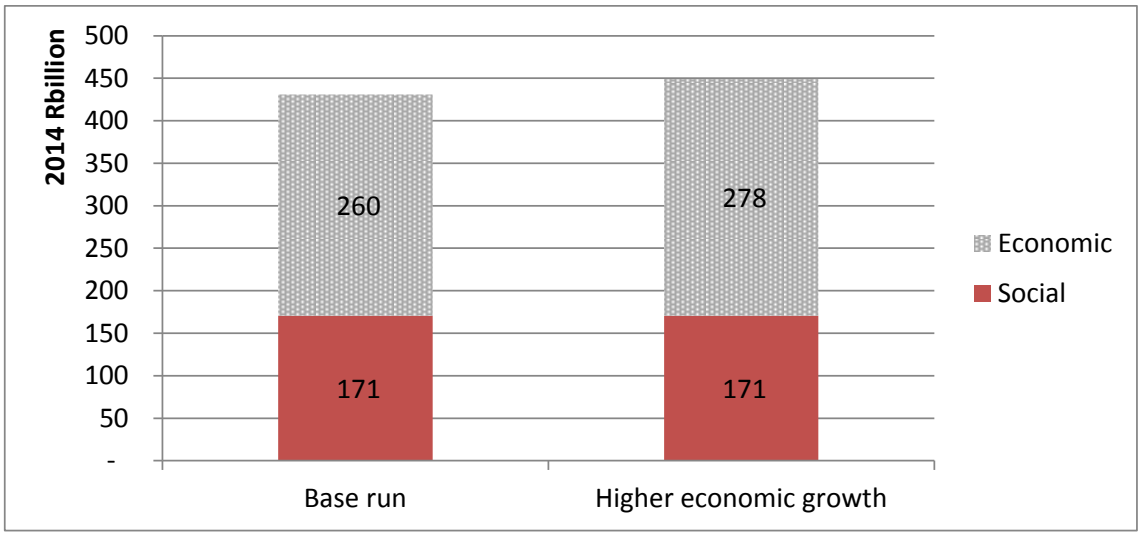


Figure 14: Comparison of projected infrastructure investment need for social and economic infrastructure over 10 years in the metros under the base run and higher economic growth scenarios

Box: Detail from individual metros

The mix of social and economic infrastructure differs in the different metros. In Metros A, B and D, the projected investment need for social infrastructure is small as a proportion of the total compared to the metros as a group. Recall that these three metros all have relatively high economic growth rates.

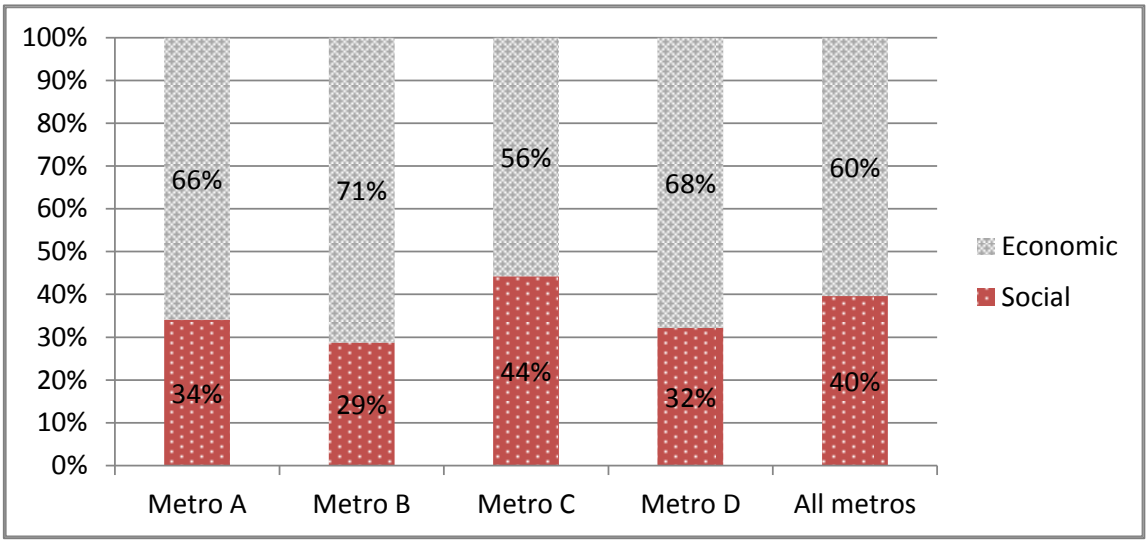


Figure 15: Proportion of projected infrastructure investment required in social and economic infrastructure over 10 years in four individual metros compared to all metros as a group

In Metro C, with a relatively low economic growth rate, economic infrastructure makes up a comparatively small proportion of the total projected investment need.

4 Sources of capital finance available

Municipalities have four broad sources of capital finance for infrastructure: transfers; public contributions and donations; internally generated funds; and borrowing. Each source of funding is discussed below.

4.1 Transfers

Transfers in the metros are dominated by the Urban Settlements Development Grant (USDG). On average between 2009 and 2014, the metros funded 45% of their capital programmes through transfers (grants and subsidies). They received about R12 billion per annum in capital grants and subsidies.

Indications from National Treasury are that this level of transfers will remain available, but that transfers are not expected to increase. The metros can thus expect to receive about R120 billion in transfers over the 10 year model period, which is 28% of the identified projected investment need under the base scenario.

4.2 Public contributions and donations

Public contributions and donations are primarily 'development charges'. The modelling suggests that if the full cost of bulk and connector infrastructure for high income households and non-residential consumers is recovered through development charges, R75 billion could potentially be raised in over the 10 year model run under the base scenario, sufficient to finance 17% of the total projected

investment need. Development charges are financing sources for economic infrastructure, and so under the higher economic growth scenario, the potential finance available from this source rises to R90 billion over the 10 years, 20% of the projected investment need.

According to National Treasury (2009) a development charge is:

"a once-off infrastructure access fee imposed by a municipality on a developer as a condition of approval of a land development. The development charge is levied to recover the cost of an intensification of land use and an increase in the use of existing municipal engineering services (i.e. brownfield developments) and/or to finance the provision of new municipal engineering services (i.e. greenfield development)."

Development charges are thus a form of land based financing, along with Tax Increment Financing and Betterment Levies or Taxes.

To date, development charges have largely been levied on a development by development basis based on negotiation. There has been a degree of competition between municipalities with regard to the levels of development charges, as keeping these low has been seen as a way to attract private development and thus stimulate economic growth. Development charges are typically significantly under-recovered by municipalities. The National Treasury policy on development charges referenced above, which remains in draft form, is an effort to introduce more uniformity with regard to the way in which they are calculated and to encourage municipalities to utilise this capital funding source more fully.

On average between 2009 and 2014, the metros raised about R160 million per annum in development charges.

It must be noted that the assumption that the full cost of bulk and connector infrastructure for high income households and non-residential consumers is recovered through development charges is very optimistic. This represents the maximum possible finance available from this source. Optimistic though they may be, however, the model estimates for development charges do indicate that there is currently significant under-recovery from this finance source and this is a source of finance that metros can make better use of.

4.3 Internally generated funds

Internally generated funds refer to cash surpluses generated by municipalities and used directly to fund infrastructure. The model finds that metros can raise about R60 billion from internally generated funds under the base scenario, a similar magnitude of funding to that currently raised. This is sufficient to finance about 14% of the projected investment need in this scenario. The ability to raise internally generated funds is slightly higher under the higher growth scenario, at R63 billion over the 10 years.

Between 2009 and 2014, metros funded about 21% of their infrastructure investment through internally generated funds, about R5.5 billion per annum on average.

The extent to which internally generated funds will be available in future depends on the extent to which the metros will continue to generate cash surpluses on their operating accounts. The modelling suggests that operating accounts will come under some pressure over the next five years. However, over the full 10 year model run, this trend turns around and metros are once again projected to move towards the ability to generate operating surpluses.

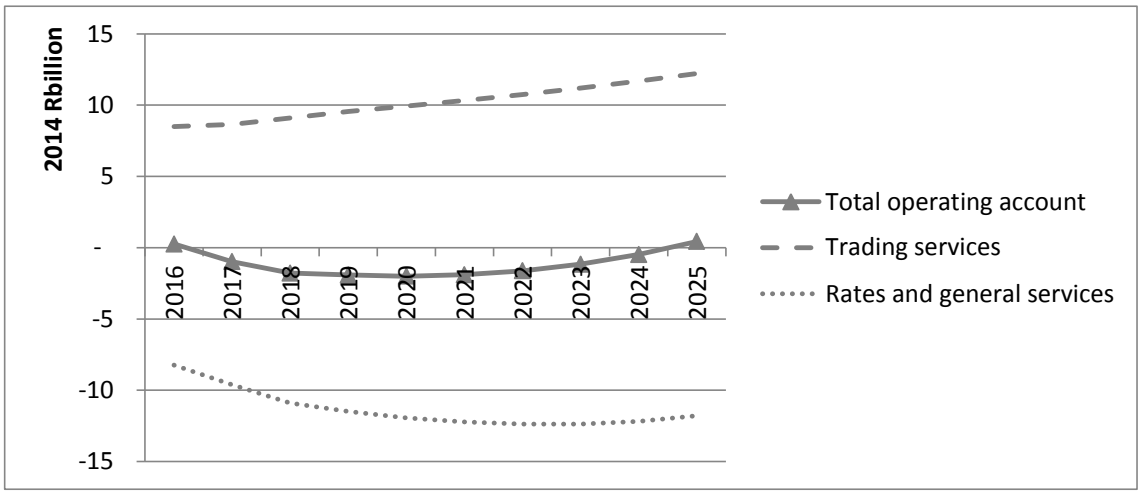


Figure 16: Projected operating surplus or deficit on the operating account over 10 years, as well as operating surplus or deficit on the trading services and rates and general accounts

The operating account can be disaggregated into the trading services (water, sanitation, electricity and solid waste, which are largely tariff funded) and the 'rates and general' account (publicly accessed services such as roads and community services, which are largely property rates funded). In the base year of the model run, the metros made operating surpluses on the trading account that were used to subsidise deficits on the rates and general account. In other words, property rates and allocated subsidies were insufficient to fully fund the publicly accessed services.

The figure above shows that the trading services continue to make surpluses and the model finds that these surpluses grow over time. This is largely due to the shift towards the provision of a higher proportion of economic infrastructure as opposed to social infrastructure (see Section 3.3) which improves the ability of the municipality to cross-subsidise on the trading services.

The deficit on the rates and general account increases initially before stabilising and ultimately starting to decline. Initially, the model finds that the rate of growth in property rates revenue is insufficient to keep up with the rate at which publicly accessed services must be rolled out in order to maintain service levels to the growing metro customer base. Over time, however, the model finds that economic growth results in rising property rates revenue and thus declining deficits on the rates and general account.

The picture on the operating account is more positive under the higher economic growth scenario, due largely to the more rapid rise in property rates revenues over time. As a result, the model indicates a better ability to raise internally generated funds.

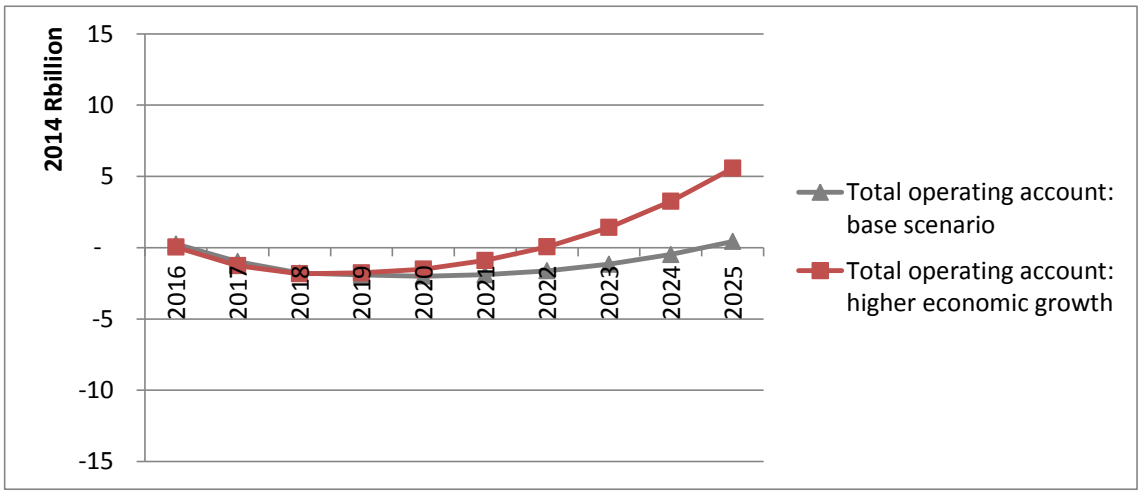


Figure 17: Comparison between projected operating surplus or deficit on the operating account over 10 years for the base scenario and higher economic growth scenarios

The extent to which municipalities choose to use cash reserves to fund infrastructure internally depends on a number of factors, including the extent to which they need to retain cash reserves for liquidity purposes. The MSFM makes some rough assumptions in this regard and thus generates a view with regard to the level of internal source funding that might be available. As already noted earlier in this report, this is one view only and is not an accurate of the availability of internally generated funds in future.

Box: Detail from individual metros

The trends in projected operating surplus or deficit for the different metros differ significantly.

In Metro D, with low household growth and high economic growth, the operating surplus improves over the full model run.

In Metros A and B, with moderate household growth and high economic growth, the operating surplus or deficit declines initially but then improves as economic growth rates increase. Note the different starting points in these two metros: Metro A starts with an operating surplus and is able to maintain this; while Metro B starts with an operating deficit and remains in a deficit position.

Metro C, with household growth similar to that in Metros A and B, but economic growth at a lower level, sees a continued decline in its performance on the operating account.

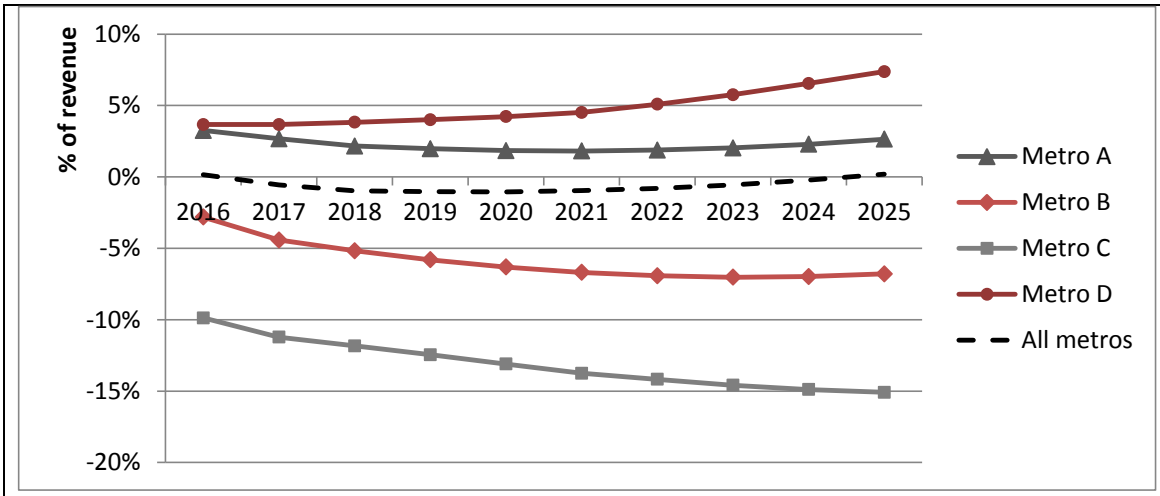


Figure 18: Projected operating surplus or deficit over 10 years in four individual metros as well as in the metros as a group

4.4 Borrowing

The final source of capital finance is debt. The modelling suggests that the metros can raise R120 billion in borrowing over the next 10 years under the base scenario. Under the higher economic growth scenario, R127 billion can be raised.

The metros currently have around R44 billion in long term liabilities recorded on their financial statements. They borrowed R9 billion per annum on average between 2009 and 2014, and budgeted to borrow a further R9.7 billion in 2015.

Borrowing capacity assessments are complex exercises. However, there are some rough rules of thumb that can be used to estimate, at very high level, the level of borrowing that might be possible. The MSFM uses a rule of thumb that the total loan book should not exceed 45% of operating revenue and that total debt service payments (interest and redemption) should be between 6 and 8% of the operating budget. These indicators are in line with MFMA Circular 71 and are conservative parameters, not prudential limits. The borrowing projections in the model are broad estimates only and do not consider the extent to which lending institutions will in fact be willing to lend to municipalities.

4.5 Capital finance mix compared to current

In summary, the model suggests that development charges are potentially a significant source of finance, and that higher levels of borrowing are possible.

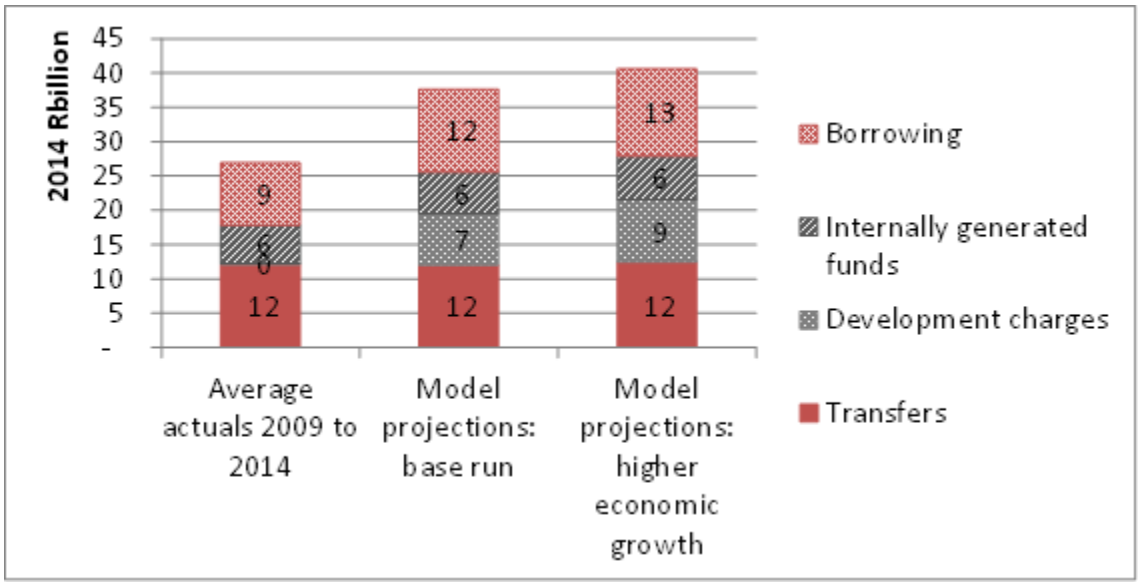


Figure 19: Possible funding mix suggested by model compared to average actual funding mix from 2009 to 2014

Note that the figure above shows the *average annual* actuals over the past five years and the *average annual* model projections over the next ten years. In fact, the finance mix that is possible in each year will vary. Borrowing in particular is a long term programme, not an annual finance source. Metros may borrow a lot in some years and none at all in others. The figure above does not indicate that metros can take up R12 billion in borrowing every year under the base scenario, but rather that they can potentially take up R120 billion over 10 years. Annual averages are provided simply to allow comparison with the actual capital finance mix over the past five years.

In viewing the figure above, it must be borne in mind that the model does not include a full borrowing capacity assessment and that the development charges figure presented above is optimistic, representing the maximum that is possible from this finance source.

Recall that the higher economic growth scenario results in a higher projected investment need (R450 billion over 10 years compared to R431 billion over 10 years in the base scenario). Figure 20~~Figure 19~~ above shows that higher economic growth scenario also results in a better projected ability to raise capital finance.

4.6 Projected capital finance mix compared to projected investment need

Even with maximum use of development charges and higher levels of borrowing, the model finds that there is a gap between the projected infrastructure investment need in metros and the available finance sources in both the base model scenario and the higher economic growth scenario. The gap is, however, relatively small; R54 billion over the 10 years, or 13% of the projected investment need in the base scenario; and R43 billion over the 10 years, or 10% of the projected investment need in the higher economic growth scenario.

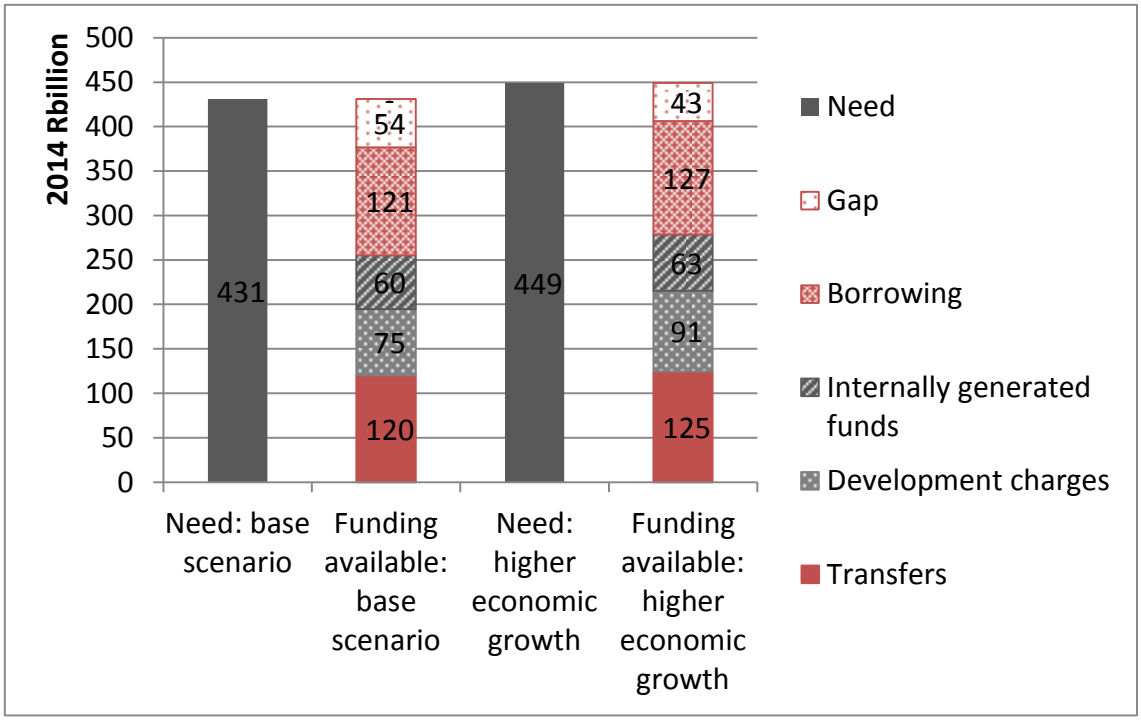


Figure 20: Available capital finance compared to projected infrastructure investment need over 10 years under the base and higher economic growth scenarios

Box: Detail from individual metros

The size of the funding gaps in individual metros varies based on the size of their projected infrastructure investment needs and differences in the extent to which they are able to raise capital finance.

The individual metro models find a significant funding gap in Metro B, which faces high growth, a high projected renewal need and comparatively poor operating account performance.

The funding gap in Metro A is also relatively large, although its stronger performance on the operating account means that it is better able to generate internal funds and raise borrowing than Metro B.

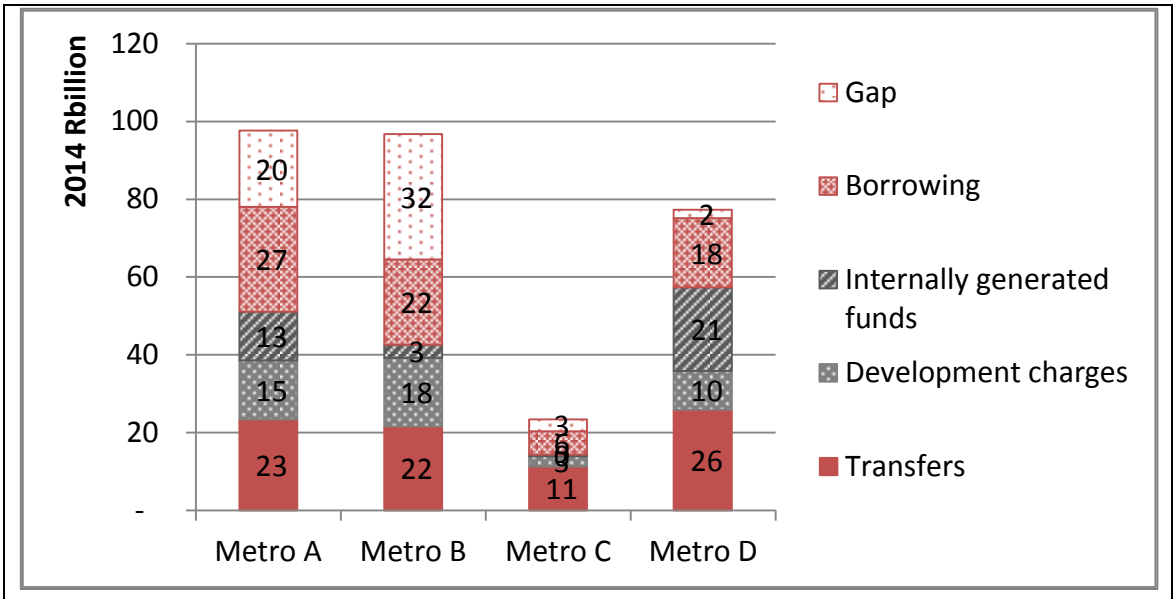


Figure 21: Available capital finance compared to projected infrastructure investment need over 10 years in four individual metros

The funding gaps in Metro C and Metro D are relatively small.

In Metro C, transfers are sufficient to cover 54% of the projected investment need, although the ability of the metro to generate internal funds and raise borrowing is limited by poor performance on the operating account.

In Metro D, the funding gap is only R2 billion over 10 years, 3% of the projected investment need. This metro has the highest economic growth relative to household growth. The resulting strong performance on the operating account means that it is able to generate significant internal funds and raise borrowing. In addition, the level of transfers received by Metro D is higher than that in Metros A and B.

5 Discussion and conclusions

The modelling conducted for this paper finds that R431 billion (in 2014 Rands) is needed for municipal infrastructure in the metropolitan municipalities over the next 10 years under a 'base' scenario that assumes that economic growth nationally will reach 3.5% per annum by 2025.

The infrastructure finance mix currently allowed for in metro projected expenditures is sufficient to fund infrastructure investment about R27 billion per annum, only 62% of the projected investment need. The modelling suggests that metros can make better use of finance from development charges (and potentially other land based financing instruments) and that levels of borrowing can be increased. Even with a more optimistic view on these funding sources, an infrastructure gap of about R54 billion over the 10 years remains, 13% of the projected investment need.

A second scenario was run assuming higher economic growth, with the national growth rate reaching 5.2% per annum by 2025. This scenario found a higher investment need (R450 billion over 10 years) but also a better ability to raise capital finance. A funding gap of R43 billion remains, 10% of the projected need.

South African metros are not alone in facing the challenge of funding gaps on infrastructure. The World Bank reports that there is an under-supply of infrastructure finance of about US$1 trillion per year through to 2020 in developing economies (World Bank, 2013) while Standard and Poor's estimate that the gap between investment needs and available public funds is around US$500 billion annually internationally (Standard and Poor, 2014).

What then can be done?

Firstly, there is the opportunity to reduce the investment need through improving the efficiency of infrastructure. The projected needs estimated in this paper are based on unit capital costs developed in 2009 based on the cost of actual infrastructure projects collected by consulting engineers. A paper by McKinsey Global Institute in 2013 suggests that infrastructure investment needs internationally can be significantly reduced by improving the efficiency of infrastructure projects through three primary drivers:

1. Improving project selection and optimising infrastructure portfolios.
2. Streamlining project delivery.
3. Making the most of existing infrastructure assets, which includes increasing asset utilisation, optimising maintenance planning and expanding the use of demand management measures (MGI, 2013).

While not possible to reliably quantify, such efficiencies are also possible in South Africa; implementing them would reduce the projected R431 billion investment need[19].

Secondly, there are exciting developments internationally with regard to private funding of infrastructure[20]. A September 2013 survey by Prequin, quoted in Standard and Poor (2014) indicated that 58% of institutional investors planned to increase their funding allocation for infrastructure in the long term; while almost two-thirds of respondents indicated that they planned to allocate more capital to infrastructure in the next 12 months than in the previous year.

The Standard and Poor (2014) paper notes a number benefits of infrastructure for investors, including higher yields, the ability to match long-dated assets and liabilities, comparatively low default totals and higher recovery rates, and the chance to diversify the asset portfolio.

In closing, as noted in Lu and Lin (2014):

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[19] It is important, though, to bear in mind that there are other pressures increasing the need to above R431 billion, such as the need to make up a renewal backlog (the size of which is not well understood due to poor asset management systems currently in place) and additional investment to ensure that infrastructure investments are climate resilient.

[20] There are two sides unlocking loan funding for municipalities. The first is increasing the capacity of municipalities to borrow. As noted earlier in this report, the assumptions underlying the borrowing capacity estimates in the modelling undertaken here are conservative, and there may be capacity for higher levels of borrowing than those indicated in this report. There are also actions that municipalities can take to improve their ability to borrow, namely enhancing revenues, managing expenditures and ensuring that their balance sheets and cash flows are sufficiently strong to support borrowing. The second side is increasing the willingness of lending institutions and investors to lend to municipalities. It is in this second space that international developments are of interest.

"In a post-crisis world in search of growth drivers, infrastructure development creates jobs, increases connectivity and paves the way for economic growths in many sectors."

Infrastructure investment in the metros in South Africa provides exciting opportunities for the private sector, and ensuring the efficient delivery of this infrastructure is an imperative if we wish to see improved economic growth and continue to deliver a better life for all South Africans.

6 Recommendations

This paper has provided an estimate of projected infrastructure investment needs in the eight metropolitan municipalities over the next ten years. This estimate is high level and is based on a number of assumptions, some of which may be the subject of some debate, but it is a useful starting point for a discussion about infrastructure investment needs and the availability of capital finance in the metros. There are a number of activities that will take this discussion forward, and these are summarised as recommendations below.

Update unit capital cost data

Up-to-date unit capital costs are fundamental to any discussion of infrastructure investment needs. Nationally valid 'average' unit costs are a useful starting point for discussions about the efficiency of infrastructure investment spending. It is recommended that work be commissioned to develop an up-to-date set of unit capital costs. The modelling conducted for this paper should then be re-run using these up-to-date unit costs.

Quantify renewal backlog

The modelling conducted here omitted infrastructure investment required to rectify the existing renewal backlog because there is no reliable estimate with regard to the size of this backlog. It is recommended that work be commissioned to obtain an estimate of the current size of the renewal backlog in metros. The modelling conducted for this paper should then be re-run to include the rectification of this backlog.

Run Municipal Services Financial Models for each of the eight metros

Municipal Services Financial Models (MSFMs) were run for four of the eight metros in preparation for this paper. These metros were selected because they all had previously existing MSFMs that could be updated. It is recommended that MSFMs be prepared for the four metros not covered under this paper.

Interrogate model results with the metros and compare to 'bottom up' estimates of infrastructure investment need

The model updates for the four metros included in this paper were done in a 'hands off' manner, with no discussion with the metros. It is recommended that the results be discussed and interrogated together with the individual metros. In particular, the model estimates of projected infrastructure investment need should be compared with 'bottom up' projections of need available from municipal Master Planning or long term capital budgeting exercises.

Use the models as inputs to long term financing strategies for the metros

With accurate data and model assumptions discussed and agreed upon by affected metros, the MSFM provides a sound 'top down' projection of infrastructure

investment need, as well as a sense of the relative size of projected needs for different services, for different drivers of need (backlog eradication, growth and renewal) and for social versus economic infrastructure. This makes the model outputs very useful inputs for long term financing strategies.

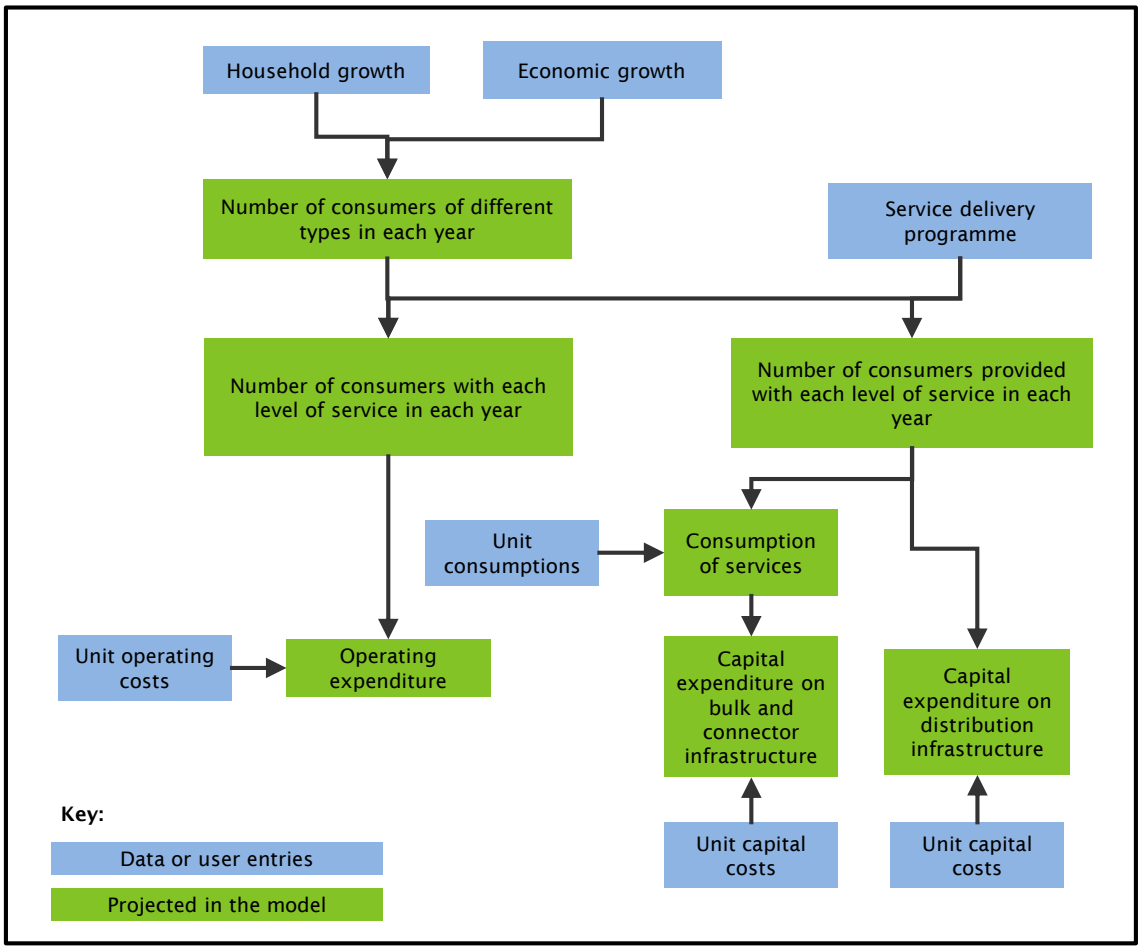
Annexure A: more detail on the MSFM approach

The Municipal Services Financial Model (MSFM) is a modelling tool designed to assist municipalities to complete Infrastructure Investment Plans. It was developed for the Development Bank of Southern Africa (DBSA) and the then Department of Provincial and Local Government (now the Department of Cooperative Governance) and has been used to undertake national level analysis of infrastructure investment requirements, as well as to develop Infrastructure Investment Plans for individual municipalities.

The MSFM projects the full operating and capital accounts associated with infrastructure provision in a municipal area over 10 years. The user can choose to model all infrastructure provision (by municipal and external service providers) or to model provision by the municipality only. The analysis shown in this paper is for municipal-owned infrastructure only.

The starting point for the model is a projection of the number of consumers in a municipality, based on household and economic growth rates. A user-defined service delivery programme is then used to determine the numbers of consumers that have 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. Once the service delivery programme is known, the model estimates operating expenditure and capital expenditure required using unit consumptions, operating costs per consumer and capital costs per new consumer connected for each level of service.

The approach is illustrated in the figure below.



Note that the more recent versions of the MSFM take 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); housing; water services; electricity; solid waste; roads and stormwater; public services. Housing is not a municipal function, but is included as a driver of municipal infrastructure provision.

Modelling 'demand' for services

The model projects 'demand' for services (demand for bulk water and electricity, and generation of wastewater and solid waste) based on unit consumptions calculated based on current demand and access to services. Demand is projected forward based on anticipated household growth, growth in non-residential demand (which is typically related to economic growth), and any planned reductions in operational losses in the case of water and electricity.

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); on the renewal of existing infrastructure and on demand management programs. It allows for the inclusion of capital required for 'special' infrastructure projects

New infrastructure

'New' refers to expansions to infrastructure in order to increase capacity.

Renewal of existing infrastructure

Renewal in the model refers to all capital expenditure to extend the useful life of infrastructure by refurbishment or replacement of components.

Demand management programmes

Expenditure on demand management programmes would include items such as retro-fitting or expenditure on new metering systems.

'Special' infrastructure projects

This includes items such as major public transport infrastructure. The MSFM does not model this. Rather, the user must estimate the value of this expenditure in each year of the model run.

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 development charges where available and their 'own sources' of finance, namely internal reserves and borrowing.

Capital subsidies

Capital subsidies are projected forward based on growth rates per annum entered by the user.

Development charges

Development charges are modelled based on an assumption, entered by the user, regarding what proportion of the bulk and connector infrastructure for high income households and non-household users is financed from this source.

'Own source' financeThe ability to raise own source finance depends on the performance of the municipality on the operating account, and is estimated based on some rough 'rules of thumb' with regard to levels of cash reserves that must be retained by the municipality, and maximum loan book possible as a percentage of operating revenue.

The municipal funding gap

If available funding sources are insufficient to cover required capital expenditure, then the model identifies a municipal funding gap. This gap will need to be filled either by scaling back expenditure or by identifying alternative funding sources.

Modelling operating expenditure

Operating expenditure in the model is 'tuned' in the model to match current budgeted expenditure levels. Operating expenditures are then projected forwards as outlined below.

Bulk purchases

Bulk purchases are modelled based on the projection of demand discussed above.

Operations and maintenance

Operations and maintenance expenditure is modelled using unit costs. These costs are tuned to the operating budget in the base year. The unit operating cost (cost per customer) is then assumed to remain fixed over the model run. Operating and maintenance costs will thus increase as the number of customers served increases.
'Governance, planning, administration and development facilitation' costs

Municipal overheads (called GAPD, or 'Governance, Planning, Administration and Development Facilitation' in the model) are projected forward on a unit cost (cost per customer) basis. The model allows for increases in the unit cost or for reductions due to efficiency improvements.

Interest payments

Interest payments are projected forward based on the assumed interest rate and loan period of loans taken up over the model run.

Depreciation

Depreciation is projected forward based on the growth of the asset base over the model run.

Other expenditure

The user can specify any other expenditure items and a percentage real growth per annum.

Modelling operating revenue

The revenue side of the model considers Equitable Share allocations and other operating grants, user revenue and other sources of rates and general revenue. Operating revenue available is 'tuned' in the model to match current operating budgets and then projected forward as discussed below.

Operating grants

Operating grants are projected forward based on growth rates entered by the user.

User revenue

User revenue is calculated based on affordability assumptions, and not based on tariffs. It is assumed that low income households can pay the lesser of an 'affordable bill' (specified as a percentage of household income) and the cost of providing the service. High income households and non-residential consumers pay the cost of providing the service plus a surcharge. User charge revenue is thus projected forward based on changes in the customer base.

Property rates

Property rates are projected forward based on a multiplier of economic growth.

Other revenue sources

Other revenue sources are projected forwards based on a percentage real growth per annum specified by the model user.

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