Assessment of financial trends for metro public transport functions

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1 Introduction

The memo is intended to put forward a structure and some assessment of trends with respect to the projected financial implications for metros associated with pubic transport. This is addressed here as public transport is seen, along with housing, to be a function with the highest risk both for generating new expenditure on metro accounts and for revenue security.

2 Methodology

This paper is prepared based on a limited time budget and, therefore, can only deal with reference to existing work and high level analysis. So an attempt has been made to focus on high level numbers which will be useful in assessing future trends in financial viability. This requires and understanding of passenger transport systems as a whole, recognising that much of this is in the private realm but with the potential for it to shift into the public realm as cities take on more responsibility for public transport.

The analysis uses several sources of information:

- Information form Integrated Transport Plans for three of the metros.
- A national public transport finance model developed, to 'preliminary' status, for National Treasury in 2005, based on data from the National Household Travel Survey which was current at the time.
- A public transport model developed for Cape Town.
- A new City Efficiency Cost Model (CECM) developed for the Fiscal and Finance Commission and applied, in a preliminary way, to Cape Town.
- State of the Cities report, 2006, which contains modal split information.
- PRASA annual report.
- Information from DoT on bus subsidies (use of this information still to be cleared with them).
- Report prepared by Hunter van Ryneveld for the Institute of Transportation and Development Policy.

3 Passenger transport patterns

Based on the various information sources listed above, the overall picture of passenger travel in the metros is shown below with the proviso that the numbers are based on many assumptions as the data available is mostly inconsistent.

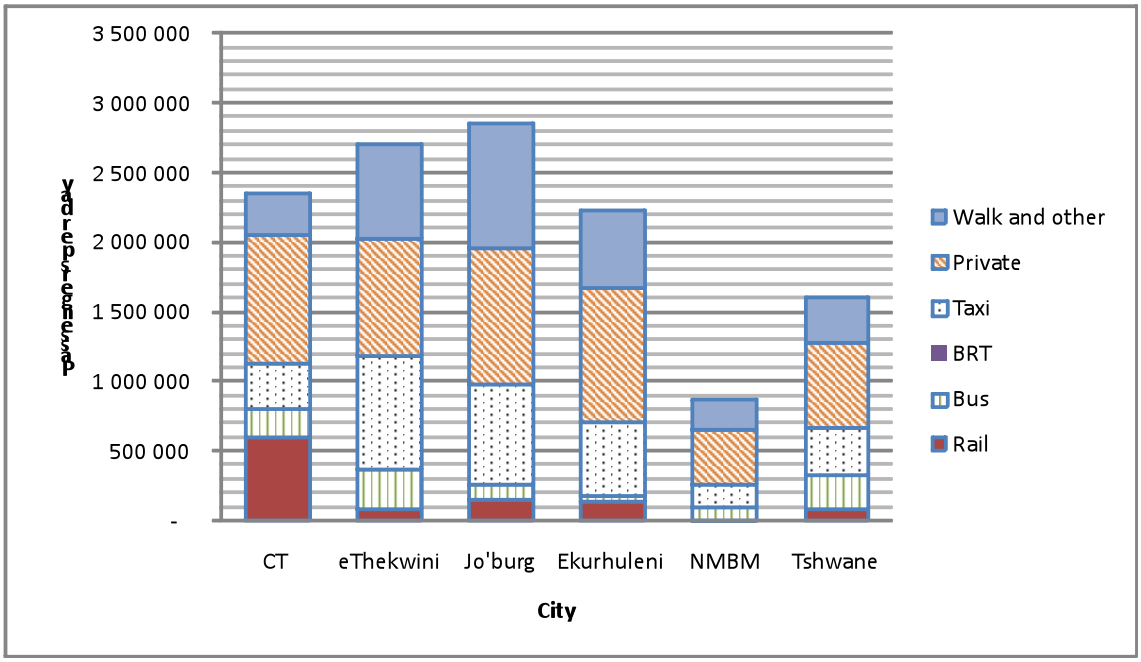


Table 1: Passengers per day in each metro, split by mode

Taking the 6 metros as group the splits look as follows:

	Rail	Bus	BRT	Taxi	Combined Public Transport	Private	Total motorised transport	Walk and other
All metros	8.4%	7.6%	0.0%	22.9%	39.0%	37.4%	76.4%	23.6%

The major goal in public transport planning is to shift passengers, firstly, from private cars onto public transport and, secondly, from taxis and conventional buses to mass transit systems (rail and bus rapid transit, with the latter just starting to make an impact in SA cities). With only 8.4% of passengers using mass transit at present this leaves much to be done. Another way of envisaging this shift is that passenger transport will shift from the privately owned and managed realm (private cars, taxis and conventional buses) to the publicly managed realm (rail and BRT systems). This is not to say that the private sector will not have a role to play with operating buses as part of BRT systems, but the system as a whole will be publicly managed with a substantial shift in risk from private operators to public bodies, cities in particular.

The extent of this shift is difficult to predict but one extreme is illustrated below for a typical city aiming for a high level of penetration by BRT :

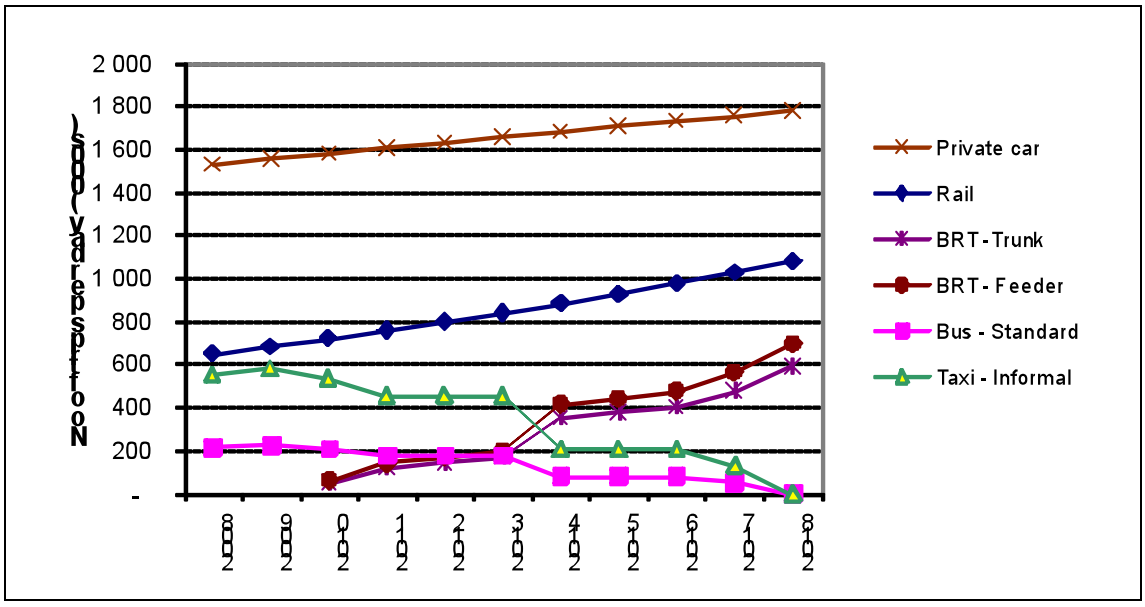


Figure 1: Illustrative trend in trips by mode with high level mass transit intervention

This projection is based on a complete replacement of the current informal taxi and conventional bus system, to be replaced by rail and BRT as part of a single integrated system with the BRT system managed through 'gross' cost contracts and an integrated ticketing system managed by the city with revenue collected by the city or its agents. This scenario, based as it is on an ambitious mass transit intervention does, nevertheless, have an increase in the number of travellers using private cars although the modal split moves away from private car transport:

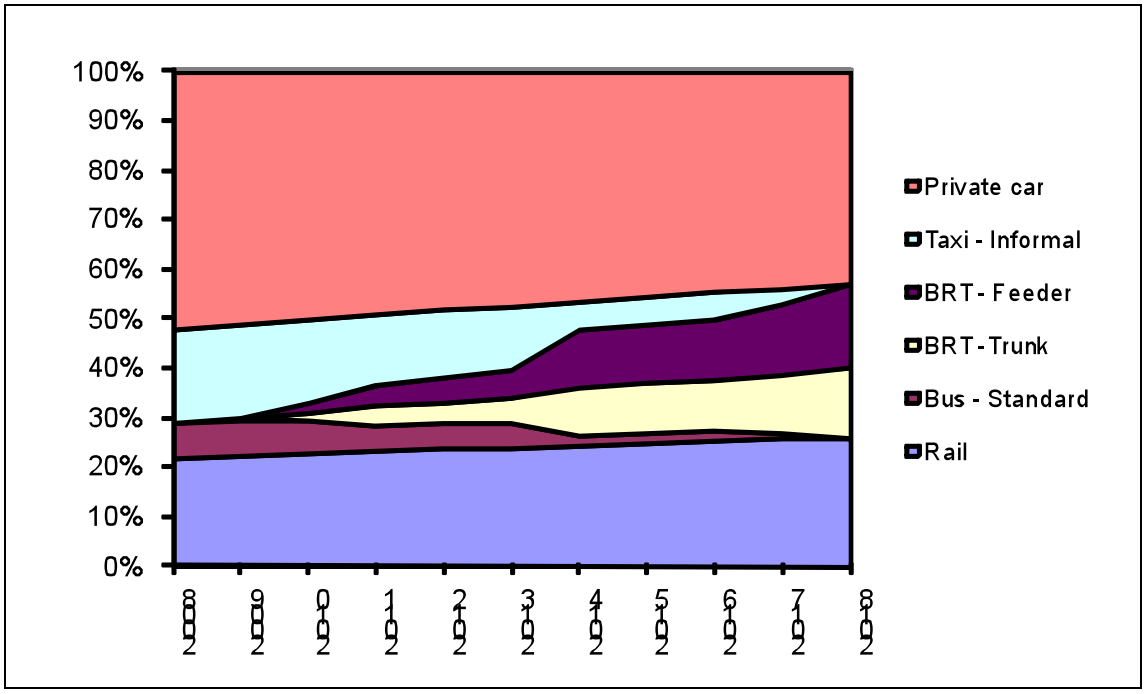


Figure 2: Illustrative change in modal split with high level mass transit intervention

This shift implies:

- A shift by passengers using 'publicly managed' motorised transport from 22% to 57% over a 10 year period.

- An increase of more than double (113%) in the number of passenger trips on publicly managed transport systems.

This may be an extreme example of the potential for shifts in modes but it is useful for illustrating the shift in financial obligations onto the public sector and cities in particular.

4 Current financial picture

Estimating total recurrent cost of passenger transport in metros

Putting together a picture for the public transport finances for the cities at present is difficult as there is little sound national analysis on this topic. However, by using existing modelling work for individual cities and the national public transport finance model developed by PDG in 2005 for NT, supplemented by current information on subsidies, a rough profile of recurrent expenditure for motorised passenger transport for all modes has been developed:

	Motorised passenger trips (million per day)	Current cost per yr (R bn)	Cost per pass per trip (R)	Basis for calculation of cost
Rail	2.0	6.1	12.3	Expenditure by PRASA adjusted to get estimate of expenditure on commuter rail (assuming 5% for Autopax and Shosholoza mail and 10% of passengers outside metros)[1]
Bus	1.74	4.4	10.2	Expenditure on bus subsidies estimated for metros based on DoT information and figures for the percentage to which the service is subsidised is used to calculate total cost.
Taxi	5.8	12.2	8.4	National PT model used with adjustments based on figures for individual cities, together with an estimate of vehicle operating cost.
Car	9.4	85.6	36.4	Figure from national PT model used, adjusted for improved information on trip distances and vehicle operating cost.
Total	**18.9**	**108.4**	**22.9**	

It is acknowledged that this estimate of a recurrent total of R108 billion a year spent on passenger transport is approximate. For example, it is possible to debate the relative cost per passenger per day, taking into consideration that the trip lengths for each mode are different. But it is argued that it is sufficient for assessing the major trends which are likely in the passenger transport sector in the future.

Subsidy arrangements

The extent to which passenger transport is subsidised is obviously an important consideration with respect to the way costs and the associated risks are shared. The two major sources of operating subsidy are transport operating subsidies (previously

[1] The PRASA Annual Report is very little use with regard to understanding expenditure on different business units and data on passengers, trips, splits by areas etc.

bus subsidies and still applied largely to conventional buses) and subsidies to PRASA which are applied to commuter rail. Figures for metros are estimated as follows[2]:

- ***Rail***: R2.7 billion a year based on PRASA operating subsidy figure of R3.1 billion adjusted to allow for 5% to go to Autopax and Shosholoza Meyl and 10% spent on non-metro routes.
- ***Bus****:* R2.3 billion a year based on national total figures of R3.5 billion adjusted to deduct for routes external to metros.
- ***Taxis:*** National taxi recap provision of R500 million assumed to be an operating subsidy for the purposes of this analysis, 58% in metros.

In the case of capital subsidies the key figures are:

- ***Road based***: The average figures over the coming three years for Public Transport Infrastructure and Systems grant allocations to each metro are used, giving a total of R3.1 billion.
- ***Rail***: PRASA capital subsidy of R5.6 billion assumed to go to commuter rail for both infrastructure, systems and train-set finance.

Focusing on operating subsidies for this analysis, the results for current cost and current subsidies look as follows:

Mode	Trips per day (millions)	Total operating cost (Rbn/yr)	Cost per trip (Rands)	Cost split	Subsidy (Rbn/yr)	% subsidised
Rail	2.0	6.1	12.3	6%	2.7	44%
Bus	1.7	4.4	10.2	4%	2.3	52%
Taxi	5.8	12.2	8.4	11%	0.3	4%
Car	9.4	85.6	36.4	79%	0	0%
Total	**18.94**	**108.4**	**22.9**	100%	**5.3**	**5%**
Total PT	**9.54**	**22.8**	**9.5**	**21%**	**5.3**	**24%**
Convertor from daily to annual trips			250			

This indicates that the average amount of subsidy applied to public transport trips presently is 24%[3].

Variation across metros

While it is not an central to the arguments in this paper, it is interested to assess how subsidies are currently distributed between metros. It is possible to do this for bus subsidies based on an assessment of where the operators which are subsidised operate geographically (DoT commissioned an analysis of this in 2005/6). In the case of rail subsidies the split by metro can be made in proportion to passenger numbers which are roughly estimated based on model split data foe each metro. This is probably accurate enough for operating subsidies to PRASA but may overestimate the capital subsidy allocations to high rail use cities such as CT (the rail capex may be

[2] Taxi re-capitalisation figures are ignored here.

[3] Earlier analysis and an review of levels of subsidy are contained in a previous paper prepared by PDG for NT.

more closely related to length of line, for example, rather than passenger numbers). The results are shown below for operating and capital subsidies separately:

Table 2: Estimates of operating subsidy flows to individual metros

	Bus subsidy (Rm/yr)	Rail subsidy (Rm/yr)	Total	Amount per capita per annum[4]
CT	594	1 494	2 088	641
eThekwini	280	215	496	146
Jo'burg	165	384	549	154
Ekurhuleni	41	333	373	134
NMBM	127	26	153	140
Tshwane	1 131	199	1 330	606
All metros	**2 338**	**2 651**	**4 989**	**306**

The disparity in access to operating subsidies is obvious. Cape Town and Tshwane are clear winners, Cape Town as is has by far the greatest rail passenger numbers as well as a considerable sized bus service and Tshwane because of high bus subsidies associated with a large number of operators and routes which are largely a legacy of historic services linking the city to former border areas. At the other extreme, Buffalo City, not included in the tables, gets virtually no subsidy (hardly any commuter rail and minimal subsidised bus service). From the point of view of the operating subsidy system the subsidy system is clearly not based on economic logic and is essentially a legacy from the past combined with a favouring of parastatal operators.

Table 3: Estimates of capital subsidy flows to individual metros

	PTISG allocation (Rm/yr ave)	Rail subsidy (Rm/yr)	Total	Amount per capita per annum
CT	1 116	2 699	3 815	1 172
eThekwini	123	389	512	151
Jo'burg	1 023	693	1 716	480
Ekurhuleni	20	601	621	222
NMBM	362	47	409	373
Tshwane	481	359	840	383
All metros	**3 125**	**4 788**	**7 913**	**485**

Again there is considerable inequity between metros, Cape Town being a big winner because of the scale of its rail service and the advanced stage of planning for a BRT system. eThekwini and Ekurhuleni are losers, the latter mainly because their own BRT proposals have not been sufficiently advanced to get funding allocations and the latter because of the low level of rail use and limited access to PTIS grants, perhaps because of the limited opportunities for new mass transit systems.

[4] Taking the full population of the city into consideration, not only mechanised passenger transport users.

5 10 year projections

Based on the costing and subsidy analysis presented above, it is possible to make projections of cost, based on assumptions about how the use of various modes grows, including provision for a new mode: BRT. This needs to be related to an overall growth of passenger trip per annum which is assumed to be 3.5%. With regard to each mode the assumptions made for a 'base' analysis are:

- Rail trips will increase at a rate of 5% per annum.
- Conventional bus trips (non BRT) will decrease at a rate of 5% as they are purposefully replaced by BRT or rail trips.
- Minibus taxi trips will decrease by 5%, also as a strategy to increase use of mass transit systems.
- Private car trips will be kept to a growth rate of 2% per annum.
- The balance after all these adjustments will be taken up by BRT.

The results are shown below:

Table 4: Estimates of operating costs by mode

	Motorised passenger trips (million per day)	Increase in pass per year	Passenger trips in year 10 (million per day)	Current cost (R bn/yr)	Cost per trip - current (Rands)	Cost per trip - yr 10 (real) (Rands)	Costs in year 10 (Rbn/yr)	Subsidy in year 10	% subsidy applied to mode
Rail	2.0	5.0%	3.3	6.1	12.3	13.6	11.1	4.4	40%
BRT			7.5	-	8.0	8.8	16.5	5.0	30%
Bus	1.7	-5.0%	1.0	4.4	10.2	11.2	2.9	0.9	30%
Taxi	5.8	-5.0%	3.5	12.2	8.4	9.3	8.1	0.0	0%
Car	9.4	2.0%	11.5	85.6	36.4	40.2	115.3	0.0	
Total	18.9	3.5%	26.7	108.4	22.9	25.3	168.8	10.3	
PT total	9.5		15.3	22.8	9.5	10.5	40.2	10.3	26%
Escalator on trip price in real terms (% per year)						1%			

Note that figure of 7.5 million BRT trips in 10 years time is very high and is open to debate. It will come down if the total growth in passenger trips is lower, if car use is higher or if the reduction in conventional bus and taxi figures is not as great. However, it is useful to keep this figure for BRT here to illustrate the impact of desirable shifts in other modes.

The shaded figures in the table above are key assumptions which drive modal splits, estimates of cost and subsidy levels. In particular:

- A cost of R8 per trip for BRT, on average for all future routes in all metros is a thumb-suck.
- The extent to which levels of subsidy of rail and conventional buses can be reduced is open to debate.
- The application of subsidies to BRT systems is obviously debatable as well: the ideal is still held to be zero subsidy but there is already a commitment to subsidise bus purchases which can be taken as an operator subsidy and is included as an operating subsidy in this analysis.

Overall the level of operating subsidy in this analysis remains close to the initial 24% calculated earlier. But the total amount of operations subsidy (in real terms) increases from R5.3 billion currently to R10.3 billion in 10 years time and the extent to which taxis are willing to continue to accept that they are largely excluded from getting subsidies is debatable.

6 Implications for the metros

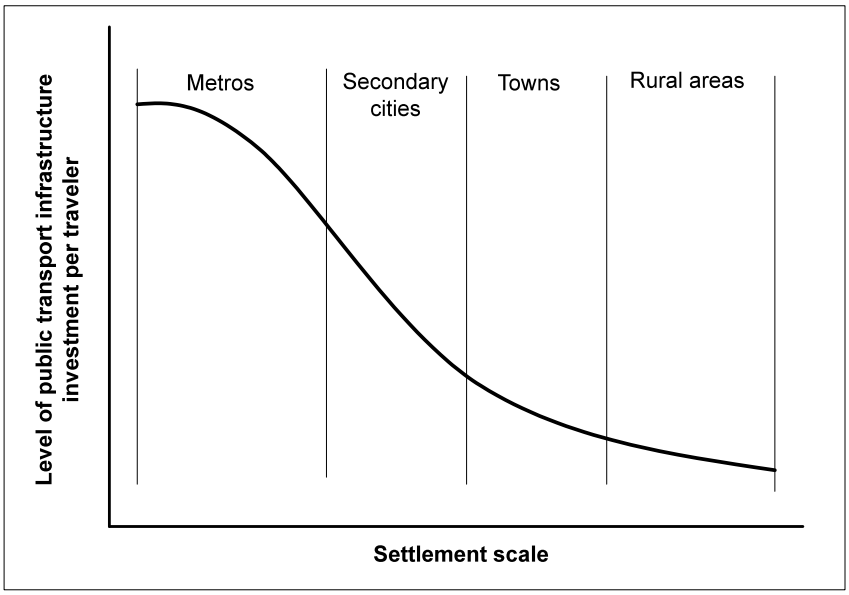
6.1 Capital account

It is arguable that investment in public transport infrastructure has the biggest impact, by a considerable margin, of any capital investment, on the transformation of city structure aimed at promoting higher densities and on the cost efficiency of cities. While there are public transport interventions which do not rely on capital spending on infrastructure, these will bring relatively modest gains. What is really needed in the lager SA cities is more road and rail 'space' and this requires quite high levels of capex.

Road-based systems

With a wide range of geographic circumstances with SA cities and differing mixes of modes, it is not possible to 'model' the required capital investment in public transport infrastructure and associated systems. But the following figures can be used as a guide:

- Larger metros are coming up with road-based mass transit systems, based on BRT, which require about R1 billion a year in investment which needs to continue for at least 10 years. Taking this as applicable to a city with 3.3 million people this comes to a figure of about R300 per capita per year.
- For smaller cities, with populations of, say, less than 1 million, the requirement for capital investment on infrastructure gets smaller as the level of congestion gets lower, trip lengths are smaller and mass transit systems using dedicates road or rail space are less appropriate. This is illustrated below:



While there are not exact numbers, the level of investment per capita in secondary cities may be about half that of the larger metros.

At this level of spending – about R1 billion per large metro per year – the indications are that the State is willing to contribute a large proportion of this amount through the PTIS grant. However, there is the policy intention of requiring the city to contribute 20% of this amount. Indications, which need to be validated through research, are that this contribution has not been forthcoming and that, in fact, the PTISG is being used for purposes other than infrastructure and systems, particularly to include financing of vehicles and possibly other 'operating' costs.

For purposes of modelling, it is important to differentiate between infrastructure (including related systems) and vehicle finance and the assumption made here is that the R1 billion a year goes to infrastructure with 80% funded through PTISG.

Rail based systems

As noted earlier in this report, PRASA is currently allocated R5.6 billion a year from the national fiscus for capex, including infrastructure, systems and trainsets. The data on how this is actually being applied is probably available in the rail plan but has not been unpacked for the purpose of this memo which deals primarily with municipally managed transport systems. But it is notable that the State is currently allocating more capital finance to rail-based systems than road-based, even through the indications are that rail-based will have a lower impact. This is not included in the financial modelling undertaken for this municipal viability assessment.

6.2 Operating costs

From the point of view of the metros, the most important issue in the field of public transport is the planned shifting of operator risk from the parastal and private sectors onto the metros. Ignoring rail for the meantime, or assuming it remains in the parastal realm, the focus of current BRT planning is on using gross-cost contracting models which, with integrated ticketing systems included, means the city as the 'authority' taking responsibility for collecting revenue from ticketing is taking substantial risk.

The financial assessment needs to be based on the following structure:

- '***Regulatory costs'*** associated with the regulation of operators not included in the city managed services (taxis and conventional buses currently).
- ***'Planning costs'*** associated with planning of infrastructure and operations.
- '***Operating system costs***' are incurred in running those activities not associated with bus operations directly: ticketing systems, signalling systems, station management, marketing etc.
- ***'Vehicle operating costs'***: the cost of operating and maintaining vehicles including vehicle finance and profit, where applicable.

The build-up of cost structure is estimated to be 2.5:2.5:15:80 for regulation, planning, operating system and vehicle operations respectively.

The figures given in Table 4 are intended to be all costs for vehicle and operating systems. But they exclude regulatory and planning costs which may add another 5% to the total cost of an integrated transport system. So for the 6 largest metros the total operating cost of a public transport system is estimated to be R23.9 billion (R22.8 bn plus 5%) rising to R42.2 billion (R40.2 plus 5%) in real terms in 10 years time.

The next step is to assess the long term trends on the operating account of metro public transport undertakings, with the assumption of urgent roll-out of BRT or similar systems. This is based on the following:

a) Current risk is only taken on municipal bus services, with BRT systems not yet properly on municipal accounts.

b) Good numbers on operating costs of municipal bus services have not been sourced. But figures for Jo'burg (Metrobus) and eThekwini (Durban Transport Services) of R563 million and R451 million respectively are dominant, with other metros assumed to have much smaller numbers (R270 million assumed[5]).

c) In year 10 the metros are assumed to be fully responsible for BRT systems on 'gross cost' contracting arrangements.

d) In addition, in year 10 the metros will be responsible for planning and regulating all road based public transport systems (including minibus taxis and conventional buses which are not part of 'gross cost' contracts.

The table below gives an indication of the sort of operating expenditures which could land up on the budgets of all 6 metros. They are based on the ambitious roll out of BRT systems descried earlier in this document.

Table 5: Indicative figures for projected increase in PT operating costs on city budgets

Costs in R bn	Current year	Year 10
Regulation	0.03	0.7
Planning	0.03	0.7
Operating systems	0.06	2.5
Vehicle operations	1.16	14.1
Total	1.28	17.9

Converting this figure of R17.9 billion to one for a large metro with 3.5 milllion people gives an expenditure of R3.8 billion per year.

6.3 Operating revenue

The key question with respect to this analysis, on the operating account, is: with rapidly increasing PT costs on city budgets what proportion of these costs will be covered by revenue taking operating subsidies and fares into consideration?

The starting point for the current year does not inspire optimism: municipal bus services typically cover well below 50% of their costs through fares and have been getting little or no subsidy, with the exception of Durban Transport.

Looking forward, it is evident that costs will rise rapidly as BRT or equivalent systems are rolled out and only some of these will be covered by subsidies. A subsidy level of 30% is assumed in the analysis above. Will it be possible to cover the remaining 70% through fares, taking the typical length of routes and relatively low passenger volumes into account? The existing privately run bus services have, in general, not been able to do this.

[5] Van Ryneveld, 2010, table 6-2 gives data for number of buses indicating eThekwini and Jo'burg have 79% of total.

7 Conclusion

There are a number of conclusions which can be drawn from this analysis, complemented by the broader understanding of the PT sector by team members.

Inequity of current subsidy arrangements

The current subsidy arrangements are obviously a major concern to cities as they drive the viability of PT operations, affect livelihoods of poor people and impact on the spatial structure of cities. It is clear that these arrangements are inequitable both in terms of access to subsidies by particular cities and in terms of modal neutrality. Further, it is easy to demonstrate that subsidies are not well targeted, with the poorest people living in the most marginal positions in cities often not benefiting at all.

The viability of PT undertakings in the future is dependent on having a much improved subsidy environment, something that DoT is dealing with at the moment.

Quantum of operating subsidy (including vehicle finance)

Currently the level of operating subsidy to the PT sector as a whole is about 25% and applies primarily to bus and rail. Obviously there are key questions relating to the extent to which the State will continue to make subsidies available. Specifically, will operating subsidies be made available to BRT systems, something which will have a big impact on cities in the future. (It is arguable that with the type of BRT routes and the volumes on these routes that subsidy will be necessary if poorer people are to benefit).

With a level of subsidy continuing at about 25% and assuming subsidy of BRT systems are eligible for subsidy at a level of about 30%, the amount of subsidy will have to double, in real terms, from the current level of R5.3 billion.

Risk to cities

The point has been made that if the 6 metros are to take on expenditure at a level of R17.9 billion (about R3.8 billion for the three largest metros), there is a large risk that they will not be able to raise sufficient revenue from fares to cover this expenditure, even assuming that levels of subsidy are at 30%. Other forms of revenue will become important to cover the potential shortfall after subsidies and fares are applied, with uncertainly over the scale of such revenues.

Further, the politics of public transport in South Africa is complex, characterised by politicised negotiations with operators and high risk of strike action by drivers.

To conclude, it is arguable that cities are taking on considerable risk as they expand municipally managed PT systems.