

## PUBLIC TRANSPORT SYSTEMS IN METRO AREAS

### 1 Introduction

South Africa's approach to the provision of public transport is encapsulated in the Public Transport Strategy and Action Plan (2007) and the National Land Transport Act (2009). Together, these envisage city-wide, fully integrated, multi-modal, mass rapid public transport networks delivered and managed largely by local governments. The aim is to shift the delivery of public transport away from the present model, which is based on operator-controlled, commuter-based, unimodal routes.

The goal is a transport system that conveys users where and when they want to travel, while minimising their total journey time and maximising safety and comfort, at an affordable price. In practice, this translates to a system that would be competitive with the use of private cars, helping to limit peak traffic flows. It would have the following characteristics:

- At least 85% of all city residents would live within 1 km of the network by 2020 (although not necessarily within 1 km of a stop).
- The system would operate between 16 and 24 hours a day, with peak frequencies of 5–10 minutes and off-peak frequencies of 10–30 minutes.
- Fleets, facilities, stops and stations would all be upgraded and fully accessible to passengers with special needs.
- Electronic fare integration would facilitate intermodal transfers.
- The system would be integrated with metered taxi services and long-distance intercity services.

If these are the goals of transport policy, it is unclear how much it would cost to achieve and whether this would be affordable. The key challenge is the high cost of public transport stemming from the apartheid spatial layout of cities, which has not changed substantially since 1994. As a result, the main role of public transport is to ferry people between townships on the urban periphery and workplaces within the urban core. The planning of new commercial and residential developments, as well as of freeways, has taken for granted the continued heavy reliance on private vehicles. Thus they have exacerbated urban sprawl and low spatial densities, and intensified the challenges faced by the public sector.

This performance and expenditure review (PER) was commissioned to assess the efficiency of expenditure on public transport across the different modes used in the metropolitan areas. It was conducted by Hunter van Ryneveld (Pty) Ltd between April and October 2014, using data for 2012/13. The full report and costing model are available at [www.gtac.gov.za/programmes-and-services/public-expenditure-and-policy-analysis](http://www.gtac.gov.za/programmes-and-services/public-expenditure-and-policy-analysis).

### 2 Institutional context

The efficiency and effectiveness of public transport systems are driven by a complex set of factors relating not just to the level of demand for transport but also to its shape – the ratio of peak to off-peak demand, the extent to which demand is uni- or bidirectional, and the rate at which seats turn over during rides. Supply-side factors also matter, such as the size of vehicles, the cost of employing drivers and other staff, whether roads have dedicated lanes or make other concessions to public transport, and the average speed of travel. Finally, more general environmental conditions, such as the state of the roads or the extent to which travel is start-stop, also have an impact.



This PER assesses current spending on the major public transport systems in the metropolitan areas (see Table 1) and the challenge of achieving greater efficiency and effectiveness in these systems.

*Table 1: Transport systems included in the PER*

System	Johannesburg	Tshwane	Ekurhuleni	Cape Town	eThekweni	Nelson Mandela Bay
Conventional bus	Mainly PUTCO	Mainly PUTCO	Mainly PUTCO	Golden Arrow	13 different contracts	Algoa Bus Company
Municipal bus	Metrobus	Tshwane Bus Company	Brakpan and Germiston Bus	n/a	Multiple contracts	n/a
Bus rapid transit	Rea Vaya	Planned, but not yet implemented at time of study	Planned, but not yet implemented at time of study	MyCiTi	Planned, but not yet implemented at time of study	Planned, but not yet implemented at time of study
Minibus taxi	Largely informal	Largely informal	Largely informal	Largely informal	Largely informal	Largely informal
Gautrain	Provides services across all three metros			n/a	n/a	n/a
Metrorail	Metrorail Gauteng			Metrorail Western Cape	Metrorail KwaZulu-Natal	Metrorail Eastern Cape

Currently, integrated land use and public transport planning are undermined by a fragmented institutional architecture that reduces efficiency across the system. Municipalities are responsible for land use planning; the Passenger Rail Agency of South Africa (PRASA) manages commuter rail; and provinces contract subsidised bus services and regulate operating licenses (mostly for minibus taxis). The National Land Transport Act tasked the 12 largest municipalities with implementing bus rapid transit, financed by conditional grants. As a result, operators' interests prevail over those of municipalities and commuters. A key finding of the PER is that this institutional architecture is not optimal, and revisiting it is critical to improving system-wide performance.

### 3 Performance analysis

South Africa's cities are characterised by population densities that are among the lowest in the world. One consequence of low density is long commutes, and another is that firms and households must spend a much higher proportion of their incomes on transport and logistics. A recent estimate suggests, for example, that a substantial minority of poor households spend as much as a fifth of their monthly income on transport.

In 2013, almost 40% of all trips taken by commuters were on public transport, and of these, two-thirds were on minibus taxis. Only private vehicles and walking accounted for more individual commutes. Between 2003 and 2013, the number of daily commutes rose by 35%, but only the growth in the number of trips taken in private vehicles (63%) exceeded the growth in the use of taxis (51%) (see Table 2).



Table 2: Main modes of daily travel for work and education in the six metros, 2003 and 2013

		Total daily trips (2003)	Total daily trips (2013)	Change (2003 to 2013)	Change (%)
Public transport	Train	651 000	823 000	173 000	26.4%
	Bus	689 000	768 000	79 000	11.5%
	Taxi	2 064 000	3 110 000	1 046 000	50.7%
	<b>TOTAL</b>	<b>3 404 000</b>	<b>4 701 000</b>	<b>1 297 000</b>	<b>38.1%</b>
Private transport	Car	2 610 000	4 242 000	1 636 000	62.5%
	Walk	2 958 000	3 198 000	242 000	8.1%
	Other	198 000	254 000	55 000	28.3%
	<b>TOTAL</b>	<b>5 766 000</b>	<b>7 694 000</b>	<b>1 928 000</b>	<b>33.4%</b>
<b>Total daily trips</b>		<b>9 169 000</b>	<b>12 395 000</b>	<b>3 233 000</b>	<b>35.2%</b>
Estimated city population		15 551 000	19 800 000	4 249 000	27.3%
Trips as % of population		59.0%	62.6%	3.6%	6.2%

## 4 Public expenditure on transport

Subsidies for public transport from the national fiscus – whether for infrastructure, equipment or operations – will amount to nearly R140 billion between 2012/13 and 2016/17 (see Table 3). Within this resource envelope, key initiatives are the planned recapitalisation of Metrorail services and the establishment of bus rapid transit systems in the larger cities. These will be financed through the public transport infrastructure and systems grant, amounting to R24.7 billion in this period.

Table 3: Spending on public transport capital and operating subsidies by national government

(R billion)	2014/15	2012/13 to 2016/17	% of spending: 2012/13 to 2016/17
Public transport operating grant	4.83	24.07	18.0%
Public transport infrastructure and systems grant	4.97	24.72	18.5%
Public transport national operating grant	0.90	4.19	3.1%
Taxi recapitalisation	0.42	2.53	1.9%
Total PRASA subsidy	14.95	73.25	54.8%
<i>Of which, current subsidy</i>	3.89	19.44	14.6%
<i>Of which, capital subsidy</i>	11.06	53.81	40.3%
Gautrain ridership guarantee paid to operator	0.99	4.81	3.6%
<b>TOTAL</b>	<b>27.06</b>	<b>133.57</b>	<b>100.0%</b>

Subsidies are not the sole source of income for transport services, and the PER provides estimates of income and expenditure for all forms of public transport. Total public and private expenditure on public transport services in the six largest metropolitan areas amounts to about R26.2 billion per year (see Table 4). In financial terms, the minibus taxi industry is the largest service, with about half of total revenues. It is followed by commuter rail (18%), conventional buses (16%) and the Gautrain (9%). The operating expenses of public transportation in the five metros were estimated at R26.2 billion in 2013 and revenue at R25.3 billion. Of this revenue, about R18.4 billion (70%) was generated through passenger fares, while R6.7 billion (26%) was provided as operating subsidies. An operating deficit, covered by the responsible metros, accounted for 4% of expenditure.

Table 4: Comparative expenditure indicators of public transport modes in the six metros

	Conventional	Municipal	Bus rapid	Minibus	Gautrain	Metrorail	Total/
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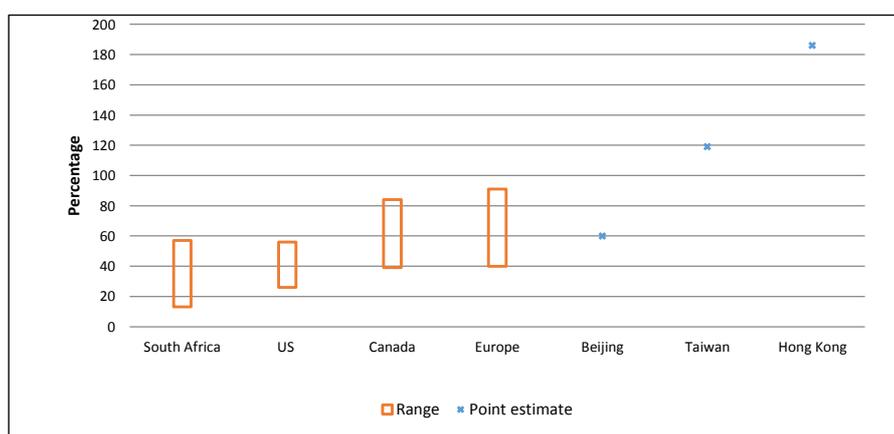


	bus	bus	transit	taxi			average
Operating expenditure (R million)	4 269.4	783.4	850.6	13 087.6	2 417.9	4 783.0	26 191.8
Operating revenue (R million)	4 269.4	754.6	850.6	13 087.6	2 417.9	3 878.7	25 258.8
Operating subsidy (R million)	2 599.6	590.6	522.4	0.0	1 035.9	1 940.1	6 688.6
Fare revenue (R million)	1 669.8	140.9	316.2	13 087.6	1 341.7	1 882.2	18 438.4
Other revenue (R million)	0.0	23.1	12.0	0.0	40.3	56.4	131.7
Operating deficit (R million)	0.0	28.8	0.0	0.0	0.0	904.2	933.1
Fare revenue/operating costs (%)	39%	18%	37%	100%	55%	39%	70%
Passengers carried per year (million)	194.1	32.1	40.7	1 617.2	17.3	519.6	2 420.9
Passengers carried %	8%	1%	2%	67%	1%	21%	100%
Operating cost/passenger carried (R)	22.00	24.42	20.90	8.09	140.11	9.20	10.82
Fare revenue/passenger carried (R)	8.60	4.39	7.77	8.09	77.75	3.62	7.62
Subsidy/passenger carried (R)	13.40	18.41	12.84	0.00	60.03	3.73	2.76
Deficit/passenger carried (R)	0.00	0.90	0.00	0.00	0.00	1.74	0.39

## 5 The allocation of public subsidies

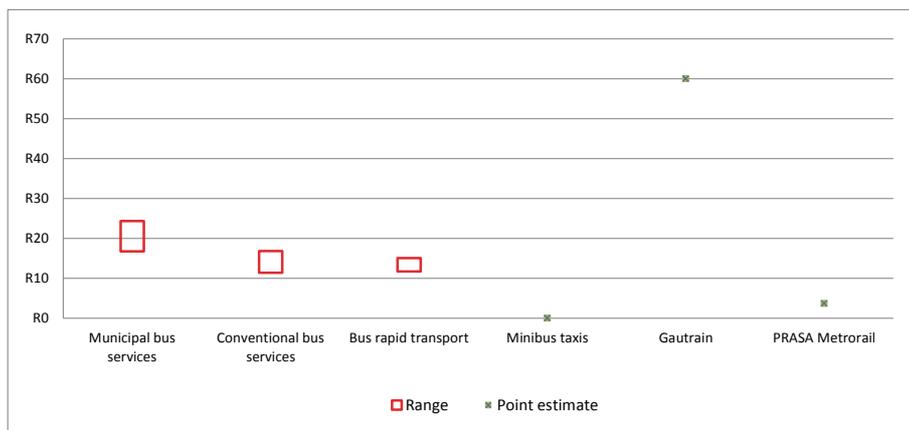
Because of the spatial structure of the cities, public transport services are characterised by long distances, high peak demand, minimal off-peak use, and unidirectional travel patterns. This makes public transport expensive for both users and government, and is a key driver of the heavy use of private vehicles (which account for 35% of all commuter trips, and 45% if walking is excluded). These high costs, combined with affordability constraints that set tight limits on fares, require proportionally more subsidies for public transport in South Africa than in other countries. Passenger fares cover a smaller share of the operating costs of public transport (between 13% and 57%, depending on mode) in South African cities than in the rest of the world (see Figure 1).

Figure 1: Fares as a % of operating costs (various regions, countries and cities)



Subsidies for public transport amounted to R10.2 billion in 2012/13, covering about 60% of the operating costs of the subsidised sectors. High as they are in international terms, these subsidies make no contribution to the operating costs of the services provided by minibus taxis. In addition, even among those modes of transport that do receive subsidies, the value of the subsidies is very unequal: the highest subsidies per passenger trip, for example, are for Gautrain (R63 per trip), with much lower subsidies for bus services (R11–R24 per trip) and Metrorail (R4 per trip).

Figure 2: Rand values of operating subsidies to various forms of public transport (rand per trip)



Despite these relatively generous subsidies, public transport continues to consume a significant amount of poor households' budgets. Part of the reason is that these households rely disproportionately on unsubsidised public transport – minibus taxis.

### 5.1 Minibus taxis

The main reason for the success of minibus taxis (which receive no operational subsidies) is that they are more efficient in providing public transport, particularly over shorter routes where there are few competing services and none that are subsidised. The efficiency of the system stems from:

- The use of cheap, reliable mass vehicle technology that does not require significant complementary infrastructure;
- Small vehicle size, which means that they can profitably serve relatively low-demand routes at acceptable headways, and are flexible enough to respond quickly to market demands; and
- Informality (including working conditions that do not comply with the relevant legislation), which permits a very low cost structure.

The efficiency of the sector, combined with the marginal nature of many individual businesses, is fuelling demands for taxi subsidies beyond the current taxi recapitalisation programme. While subsidising the sector offers the potential to strengthen its regulation, there is a danger that this could increase costs without a concomitant improvement in output. Formalising the taxi industry and requiring it to comply with the relevant legislation (including labour laws) would entail substantial financial costs to taxi owners, and might put taxi fares out of the reach of its users.

### 5.2 Buses

Three bus systems operate in South African cities. The first, subsidised by provincial government, arose under apartheid and serves long-distance commuters from townships established far from work opportunities. Operations are costly, because vehicles – which are often full at peak time – carry few passengers during the rest of the day. Nevertheless, they travel many kilometres a day. The subsidy system supports high-frequency users because it is attached to the use of a clip card.

A separate bus service is provided by metropolitan governments either directly or through subcontracted suppliers. These services operate within city boundaries and on shorter routes. While not as full as the provincial buses, they carry more passengers during the day. Subsidies

remain high because of high operating costs and because the buses are used disproportionately by pensioners and scholars, who are entitled to discounted fares.

The third bus system – bus rapid transit – is the newest. It is being introduced by most metros, but progress is most advanced in Johannesburg and Cape Town. Bus rapid transit systems are designed to increase speeds and improve customer service, while reducing costs by reducing cycle times. It also allows a more competitive supplier environment, as the system can be used by more than one operator. To date, these systems have proved popular, with greater-than-expected uptake by users. They have also been more expensive than anticipated, with operating revenues at the early stages covering only about 60% of the cost of operations, excluding capital and infrastructure costs. Operating costs are expected to fall, however, particularly as initial contracts may have been at prices elevated by the commitment to include affected minibus taxi operators in the new system.

### 5.3 Trains

In recent years, South Africa has committed significant resources to improving and expanding its railway infrastructure, on both Metrorail and Gautrain.

Metrorail provides commuter rail services in the six metropolitan areas, and its zonal fare system means that passengers can travel very cheaply. The PER estimates that in 2013/14 Metrorail's revenue, at R1.9 billion, covered less than 40% of its operating costs (of R4.8 billion). Thus it ran a R900 million deficit despite receiving nearly R2 billion in subsidies. A substantial upgrade of its infrastructure is currently under way, including:

- Acquisition of new rolling stock at a cost of R123.5 billion over 20 years;
- Improved signalling systems (R6.9 billion over five years);
- Upgrading and refurbishment of old rolling stock (R6.4 billion over three years);
- The modernisation of 134 stations (R 5.4 billion);
- Expansion of the network in KwaMashu, (R1 billion), Soweto (R2 billion), and Nelson Mandela Bay (R1.4 billion); and
- A feasibility study for a possible rail line for the Moloto corridor (R12 billion).

Initial capital costs for Gautrain – which opened in June 2012 – were around R27 billion and represented about a third of all public transport spending by all spheres of government between 2005/06 and 2010/11. The system is popular and ridership numbers have grown, particularly after the introduction of e-tolling. Nevertheless, operating subsidies in the order of R1 billion a year (averaging about R64 a trip) are required to cover costs.

## 6 Costing model

The PER developed a costing model to assist policymakers in testing the implications for public spending of changes to policy parameters, and assessing the costs, benefits and trade-offs of public transport options. The model allows users to test how changes to key policy parameters – such as whether to construct dedicated roadways – affect the system and its costs, and is used to support expenditure decisions. It recognises that the cost-effectiveness of public transport depends on (i) the level and pattern of demand, and (ii) modal and other supply-side characteristics, including service level requirements (e.g. headways) and rights of way (e.g. whether dedicated roadways exist). Other contextual features, such as road conditions, can be also be important.

The interaction of these elements is complex, but modelling demonstrates how changes in patterns in demand towards shorter distances, bidirectional flow, higher seat renewal and more even peak-



to-off-peak demand would improve the economic and commercial viability of transport services even without changes in the cost structure of the service provider. Modelling of a typical bus route, for example, shows that as reverse flow increases, the differential between peak and off-peak falls and seat renewal increases, a loss-making service can instead generate significant surpluses.

## 7 Findings

A central insight of this study is that changing the pattern of demand is a key element of improving financial viability. Having large, dense urban settlements far from work opportunities perpetuate the spatial legacy of apartheid. Instead, cities need to be densified, bringing residential and economic activity areas closer to each other, within existing urban boundaries.

It has been widely accepted since 1996 that the responsibility for public transport should be assigned to local government in large cities and metros to ensure the integration of public transport with land use planning. However, apart from the transfer of conditional infrastructure and network operating grants to these municipalities, little progress has been made in assigning either regulatory functions or the management of rail and subsidised bus contracts to them.

Because such a sizeable proportion of public transport in the six largest metros is provided by minibus taxis, enhancing this sector could yield significant benefits. However, the competitiveness of the sector depends in part on its informal character, and increased regulation and formalisation could raise costs without raising productivity. This could create a strong demand for substantial subsidies while putting taxi fares beyond the reach of many users.

Ultimately, optimising transport-related spending would require considerable investment in reshaping and densifying cities. Without such investment, public transport will remain expensive for both users and government, because of its long distances, high peak demand, minimal off-peak use, and unidirectional travel patterns. Addressing these patterns must be the primary goal of planning both public transport and land use.

