cITIEs SUPPORT PROGRAMME

# Towards sustainable city transport systems

## BRT and city bus systems


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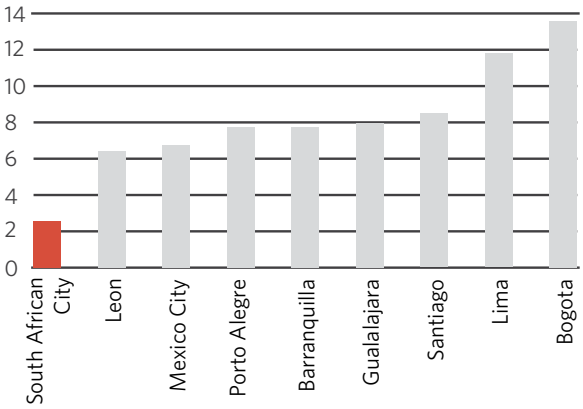
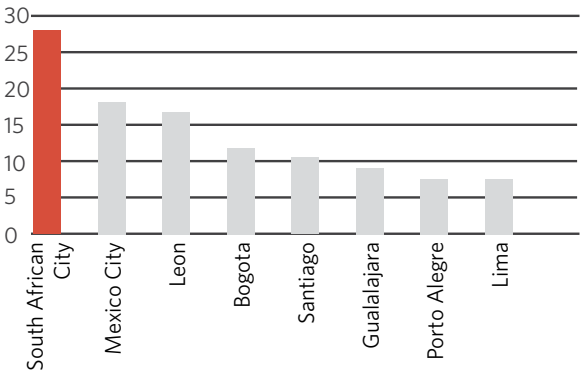
# The challenge of public transport in South African cities

South African cities are characterised by an inefficient spatial form where the poor are located far from opportunities. Compared to many cities across Latin America, we have lower densities and longer trip lengths.

***Urban density (1000s per km²)***




***Average public transport trip length (km)***




The challenge of public transport in South Africa is therefore felt particularly by them. More than 60% of the lowest income earners spend more than 20% of their income on public transport. In some cases, this can be as high as 40% of household income. Efficient and effective public transport systems is one of the strategies of government to develop more integrated cities with better access, connectivity and mobility. In the medium to long term, cities will also need to undergo significant spatial reorganisation to address the Apartheid legacy. Most cities are planning for integrated public transport networks (IPTN) consisting of a number of different modes, but largely based on implementing bus rapid transit (BRT) systems and utilising rail capacity where it exists. Experience from the cities that are currently operating BRT and city bus systems shows that the running costs are significantly more than predicted. This, along with fare revenue falling short of initial projections, is challenging the future sustainability of such systems.

# Improving the efficiency of BRT and city bus systems

In terms of the Division of Revenue Act, BRT projects must be based on a nancially sustainable IPTN and operational plan. To achieve a nancially sustainable BRT and city bus system, cities must strive to achieve a fare revenue to direct operating cost ratio as close to 100% as possible. But the reality is that cities in South Africa currently operating BRT and city bus systems are not achieving this target, and revenue to direct cost ratios range from 45% to as low as 11%. The implication of this is that if changes are not made to improve the operational e ciencies of these systems, cities will be required to keep funding very large operating de cits on an annual basis. This is not sustainable.

# The Cities Support Programme

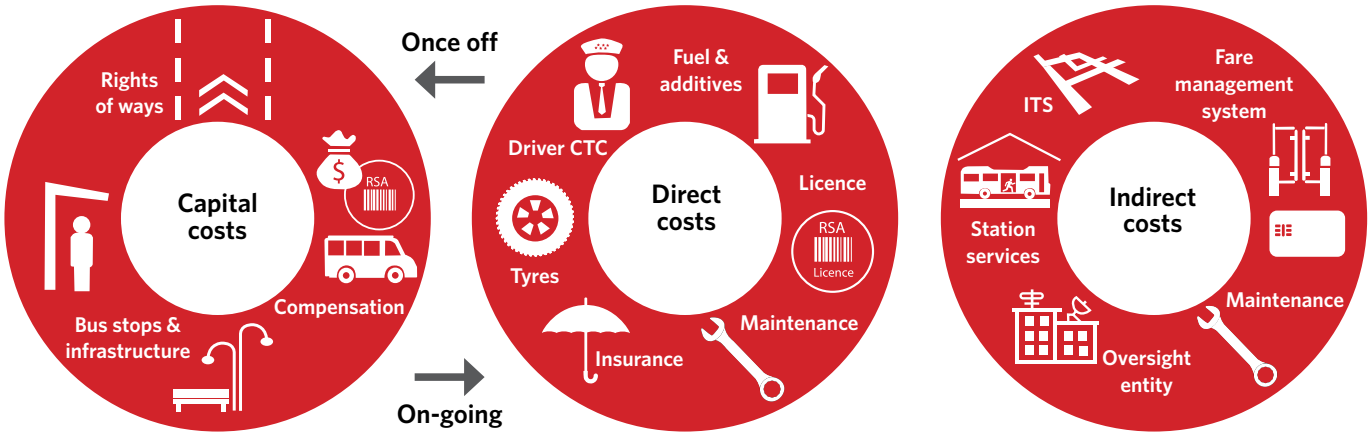
The Cities Support Programme (CSP) in the National Treasury is providing technical support to selected large urban municipalities to pursue a programme of urban spatial transformation to support inclusive economic growth and poverty alleviation. An important aspect of this support is directed by the public transport programme. There are three broad areas around which the transport programme is structured:

1) Creating national legislative, institutional and policy environment conducive to the development of city public transport systems
2) Ensuring that city public transport systems that are planned for, built, and operated are efficient, effective, provide value for money and offer transport services to the most deserving
3) Ensuring that public transport systems are drivers of spatial change.

This brochure summarises the work done by the CSP to improve efficiencies with regard to bus operations, station management and Intelligent Transport Systems (ITS). **However, these operational efficiencies only provide a partial solution; the long-term solution involves spatial changes resulting in greater and mixed use densification and shorter travel distances for commuters.**

Additional materials with more technical detail, such as toolkits, guidelines and policy notes, will also be produced. See the CSP website (https://csp.treasury.gov.za) for continuous postings of materials.

# Public funding for BRT and city bus systems



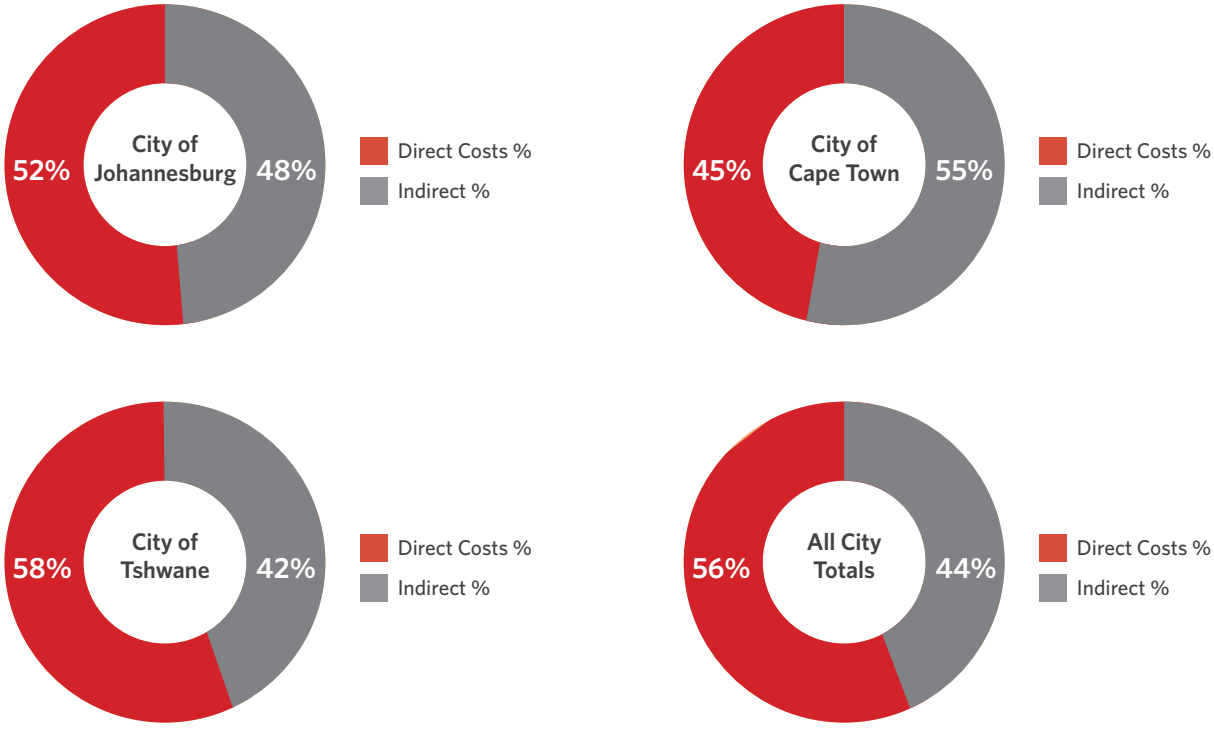

BRTs and city bus systems are funded through the Public Transport Network Grant (PTNG). However, this grant can only be used in certain circumstances. Systems have both capital costs, as well as direct and indirect costs and the PTNG only covers capital costs, as well as a portion of indirect costs. It does not cover direct costs.

Bus operations, such as petrol, vehicle licenses, tyres, insurance and maintenance, are a direct cost. According to regulations, municipalities are obliged to cover these direct costs from fare revenue, municipal funding and other system revenue (e.g. advertising). Efficient operations mean a reduction in operational costs and an improvement in fare revenue. **As a direct cost, bus operations cannot be covered by the Public Transport Network Grant (PTNG).**

Indirect costs, such as station management and ITS, may only be paid for for three years using the PTNG. For the first two years, 70% of the costs can be covered, and in the final year 50%. Beyond that, each city needs to cover the costs from fares or from its own revenues. Ultimately, this means that cities need to cover most of the costs of operations from their own coffers, and not through the grant.

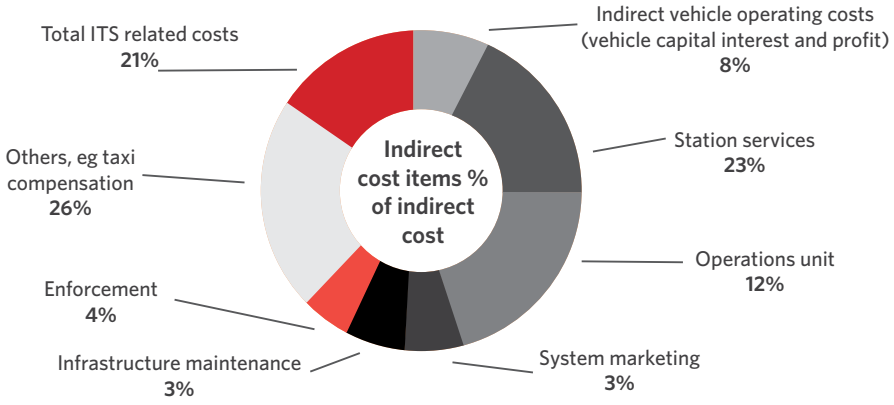
The chart below illustrates the split between direct and indirect costs for cities with BRT and city bus systems in South Africa — noting that bus operations (the direct cost) constitute approximately 50% of the total cost related to bus systems.

### *Percentage of direct and indirect costs*



### *Indirect costs breakdown*

The indirect costs breakdown chart illustrates the individual cost items as a percentage of the total indirect cost of operating a BRT system - noting that BRT stations (management) and ITS are by far the highest cost elements. For example, Cape Town's monthly indirect cost to manage all of its 42 stations is R6.6 million, and its direct monthly operational costs are close to R38million.




## Benchmarking operations among the cities

Specific operational statistics and ratios for the four operational BRT systems have been compiled and used to calculate a number of key performance indicators. The key indicator is, of course, the monthly operating deficit or put another way, the amount of subsidy required. Cape Town's annual property rates collected are close to R7 billion and 4% of this amount is required to subsidise the deficit. A smaller city such as George would require 43% of rates generated to sustain its system. Thus Cape Town, as a large city, is more able to subsidise its BRT system than smaller cities such as George. To afford the cost, George has had to seek alternative funding through a provincial subsidy, as it cannot afford to pay. It is important to note that there are indirect costs not included in the deficit, which can only be partly covered by the subsidy.

### Smaller cities operate BRT and city bus systems at a higher fiscal risk

Smaller cities require a much greater commitment of their rates income to run a city bus system. The significance of this risk to smaller cities cannot be over-emphasised. In the 2015-2016 financial year, George had a rates income of R172 million. Compare this with Johannesburg, with 50 times that. Other cities seeking to implement such systems with similarly modest rates income include Polokwane (R255 million), Rustenburg (R264 million) and Mbombela (R335 million). All these cities face a significant fiscal risk if they decide to establish BRT and city bus systems, and it is critical for them to seek alternative funding mechanisms outside of the national grant.

| Operational statistics and ratios | Cape Town MyCiTi (April 16) | Johannesburg Rea Vaya (April 16) | George Go George (April 16) | Tshwane A re Yeng (April 16) |
|---|---|---|---|---|
| No. of routes | 37 | 21 | 14 | 5 |
| No. of peak buses | 250 | 247 | 67 | 18 |
| No. of drivers | 549 | 396 | 206 | 47 |
| No. of passengers per day | 67 778 | 60 312 | 13 065 | 5 054 |
| Monthly operational km | 1 441 944 | 969 965 | 306 247 | 77 286 |
| Monthly fare income | R15 892 152 | R11 081 413 | R2 855 360 | R1 098 601 |
| Direct monthly operating cost | R37 988 222 | R32 233 551 | R9 106 557 | R8 427 213 |
| Monthly operating profit / (-deficit) | -R22 096 070 | -R21 152 138 | -R6 251 197 | -R7 328 612 |
| Annual rates collected by city (R000s million) | 6 791 085 | 8 600 991 | 172 061 | 5 490 819 |
| % of rates revenue against direct deficit | 4% | 3% | 43% | 1.6% |
| Revenue to cost ratio | 42% | 34% | 31% | 13% |
| Operating cost per passenger | R23.10 | R23.70 | R26.26 | R68.03 |
| Revenue per passenger | R9.66 | R8.18 | R8.23 | R8.87 |
| Operating deficit per passenger | -R13.44 | -R15.61 | -R18.03 | -R59.16 |

The revenue to cost ratios above have shown that in practice, a target of 45% for BRT and bus systems is the norm. Cities should budget for this realistic target.

The deficit, and thus subsidy per passenger, varies among the cities. The costs per passenger across most of the operating cities is similar; however, there is a significant variance in the deficits. This is indicative of the different levels of effort among the cities with regards to revenue income. In other words, for the cities with a higher subsidy per passenger, there is room for greater efficiency by raising revenues and reducing costs. Tshwane is a case in point, where greater cost reduction and revenue effort needs to be made.

Also worth noting is that the efficiency in the cost of bus operations can only be extracted within the current contracting system, which is on a per kilometre basis. These tariffs were entered into with the vehicle operating companies through a negotiated settlement. Going forward, the per kilometre tariff needs to be subjected to competitive bidding or other process that can build in greater value for money into the contracts.

# Bus operations: moderation and optimisation

Bus operations are at the heart of public transport systems, providing a scheduled transport service. The cost of running and operating buses in a BRT and city bus system are carried by the cities.

Bus operations efficiency needs to be constantly reviewed to ascertain if what was budgeted for is in fact affordable. An operational efficiency review can be carried out during the initial planning phase – and subsequently periodically, during operations. Cities must gather and analyse information and identify key performance indicators against which to measure efficiency, in order to make recommendations on operational interventions to improve the system. The reviews allow an assessment of achievements in terms of both efficiency of the system and of the user experience.

### System moderation and optimisation

*Moderation* is a transport industry norm. The initial service level is based on projected passenger demand and intended service standards. New services requires moderation **after six to eight months** to test actual take-up and match actual demand of services versus projected demand i.e. add services where demand is high and curtail routes and frequencies where demand is low. *Optimisation* processes are to improve efficiencies, cut costs and improve income measures.

### Experience your BRT and bus system first-hand as part of your review process.

From here, you can assess the condition of buses and shelters; how drivers are interacting with passengers; passenger behaviour; sections of routes which carry more passengers; whether buses run on schedule, and the overall experience of the service. This is a very valuable tool for assessing the system.

## Challenges

- Return trips in peak times are low
- Poor seat turnover
- Automatic fare control (AFC) systems are not operating optimally
- Poor performance of feeder routes
- Traffic control on BRT routes not operational
- BRT lane encroachment by illegal vehicles
- Taxi competition

## *Tips to enhance efficiencies*

*Are commuters alighting mostly at just a few stops? Are some stops poorly utilised?*

Introduce express buses and short turns (where a bus doesn't complete a full route, but rather stays in a core section).

*Are commuters predominantly boarding along a feeder route?*

Feeder routes are expensive. Consider redirecting trunk route buses to start on the feeder route and continue along the trunk routes.

*Is there poor off-peak demand?*

Consider cancelling or reducing services to these routes.

*Is there excessive peak demand in the morning?*

Consider peak capping, thereby forcing commuters to take earlier or later buses, or even alternative transport.

*Are some of your feeder routes costing you too much?*

Consider using minibus taxis as an integral part of the public transport supply in the network. Minibus taxis can be used on certain routes such as feeders, or during off-peak times.

*Are some of your routes competing with illegal taxis?*

Implement better enforcement to prevent illegal operations by taxis.

# Bus station management

The station is usually the first point of contact with the system for a customer. Stations and the personnel who work in them set the stage for customers' transit experiences. The service and treatment received in the stations are influential factors in developing customer loyalty. They are the most visible part of the service, and represent the 'brand' of the service. The success or failure of the system lies heavily upon the frontline staff, who are present throughout. A balance needs to be found between well-managed stations where costs are kept to a minimum, while still providing a satisfactory customer service.

### Understanding the terminology

BRT stations are either 'closed', where there is staff present and a physical barrier controlling where passengers may enter the station area; or 'open', where there are no barriers to entry and very little staff (if any) present.

## Challenges

The main challenges with regards to station management are the high staff costs and loss of fare revenue. For the operational cities, station management represents more than 20% of costs. This is an indirect cost that, according to the rules of the grant framework, must be shared between the city and the national grant.

The number of personnel assigned to a station depends on the size of the station and the functions that need to be performed. Closed stations in South Africa typically have ambassadors, cashiers, security, marshals, cleaners, customer relations personnel, roving supervisors and operational control centre staff. Open stations need far less staff (if any), therefore closed stations will always be expensive to run, while open stations will be relatively inexpensive. Closed stations are useful when there are high volumes of passengers in that specific location. In choosing closed stations, it is therefore critical to ensure that the volumes justify the significant additional cost.

Revenue security processes are vulnerable to embezzlement, card skimming, fraudulent disbursements, reselling of tickets, and unrealised revenue. To combat weaknesses in the system, revenue collection systems need to be accountable and rigidly controlled.

Manual surveys are critical for understanding and monitoring the system. Not only do they check the numbers produced by the automated fare collection system, they also identify issues such as fare evasion.

## *Tips to enhance efficiencies*

### *Staff*

- Closed stations should only be an option when the passenger volumes justify it
- Deploy roving security teams as a cost effective alternative to station-based security guards
- 'Team-cleaning' is faster, more efficient and less costly than having one person doing all the cleaning
- The job performance of station personnel should be closely monitored by a roving supervisor, noting that this can often be done remotely

### *Technology*

- *Ticket vending machines:* To eliminate cashiers and queuing, the use of ticket vending machines (TVMs) should be investigated. These TVMs can provide passengers with an alternative means of purchasing tickets or reloading their smartcards. These systems may also reduce fraud.
- *Integrated ticketing solutions:* As commuters sometimes make use of different transport modes, a 'one card' system can improve the travel experience. Many cities are exploring integrated ticketing solutions that go beyond merely transit services to also include special offers, discounts on shopping, access to museums, events etc.
- *Increased use of wayfinding devices:* To minimise staff costs, wayfinding devices are important to help passengers orient themselves.
- *Introduction of web apps:* Increasingly, passengers use web or cellular-based technologies to obtain information and even 'non-smart', cellphones have the ability to receive service information. Cities that are rolling out free public Wi-Fi should consider installing in BRT stations as this could be a strong motivation for commuters to shift transport modes.

### *Fare Collection*

- Improve control over the misuse by station staff of 'override' cards
- Use inspectors to verify correct tap-ins and outs by passengers
- To ensure all revenue is collected, ensure that validation equipment is always working
- Ensure correct fare tables are always loaded in the fare system

# BRT Intelligent Transport Systems

Intelligent Transport Systems (ITS) is the use of information communication technology in transport systems. ITS is used to describe a wide array of transport system elements that use technology to measure, communicate and analyse events such as smartcard transactions, bus tracking and scheduling, CCTV, mobile apps and more. Within the context of BRT and city bus systems, ITS is typically used for:

- Advanced management of bus operations
- Passenger information
- Automatic fare collection
- Reporting and forward planning

BRT and city bus systems typically utilise a wide array of technologies, equipment and software, used at various scales by passengers, frontline staff and back-office personnel.

ITS are expensive and due to their complexity will not necessarily provide the required solutions and efficiencies. Also always explore non-technical options.


## Challenges

- Poor functioning systems that are often amended at a high cost
- The procurement of non-essential ITS components at a high cost
- Very expensive procurement contract values, particularly of maintenance contracts
- Over-specification of equipment, as well as an over-designed and inefficient system
- Inflexible fare products and constant failures of the fare collection systems have resulted in poor bus services, payment evasion and illegal sales
- ITS systems that are fit for purpose in Europe but not suitable for the South African context
- Unnecessarily high standards imposed by policy at a national level resulting in costly and difficult to implement systems at a city level

## *Tips for managing ITS*

- Follow a minimal or 'bare bones' approach
- Spend time learning and understanding available technologies
- Issue requests for information or expressions of interest as a precursor to tendering
- Follow a step-by-step, incremental and modular approach
- Know the available technologies
- Ensure all technologies are integrated and can speak to each other
- Use internal and external experts throughout the procurement process

For further information :
Email: Michael.Kihato@treasury.gov.za
Visit: https://csp.treasury.gov.za
Tel: +27 (0)12 315 6515

**NATIONAL TREASURY**
Private Bag X115, Pretoria, 0001 | 40 Church Square, Pretoria, 0002
**Tel:** +27 12 315 5944 | **Fax:** +27 12 406 9055

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