



INSTITUTIONAL AND REGULATORY OPTIONS FOR BUS RAPID TRANSIT IN DEVELOPING COUNTRIES

LESSONS FROM INTERNATIONAL EXPERIENCE - JANUARY 2005

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ABSTRACT

An increasing number of cities are looking at Bus Rapid Transit (BRT) as a lower cost alternative to meeting their mass transit needs. Less fully explored, however, has been the link between BRT and the implementation of transit system regulatory reforms. In a growing number of cities around the world, the introduction of a BRT system has also been used to implement some important long-term transit sector reforms. Because BRT makes bus operations more profitable, introducing BRT gives the municipality additional leverage to demand more from private operators.

This paper discusses how, in an increasing number of cities, BRT projects have been used to:

- a. Facilitate a smooth transition to a sometimes more efficient ‘trunk and feeder’ or ‘hub and spoke’ bus routing system.
- b. Increase private sector investment into the transit system.
- c. Change private bus operating contracts to include quality of service requirements.

INTRODUCTION

Internationally, an increasing number of decision-makers understand that many of the benefits of a metro system can be achieved at a fraction of the cost by using Bus Rapid Transit (BRT) technology. The relationship between BRT and regulatory and institutional reform, however, is less understood, but one of the most important elements distinguishing Bus Rapid Transit from normal busways. ***BRT has often been implemented in parallel with, and in fact as a means toward transit system regulatory reform.***

In Latin America and other developing countries, where the most successful BRT systems have been implemented, with a few exceptions, bus operations are dominated by the private sector. While publicly operated bus authorities continue to exist in a number of other developing country megacities, in all cases the state-owned operator is rapidly losing passengers to private formal and informal transit operators. In most developing country cities, bus operations are now entirely in private hands. In Quito, Bogota, and Curitiba, the most famous BRT, the systems were 100% in private hands when planning for BRT began.

Unregulated private control of transit operations brought with it a large number of problems, such as dangerous 'competition for the cent' killing pedestrians, deteriorating service quality, poor emissions standards, weak scheduling, insufficient service levels to lower income lower density areas, lack of security and benefits for workers. However, the efforts in the 1960s – 1980s to introduce public authorities in the developing country context largely failed to address these problems. Worsening congestion meant that the decline of public transit passengers translated directly into worsening public sector debt or deteriorating quality of service or both. Lack of accountability of public institutions often led to the misuse of public funds for political or other purposes, deteriorating maintenance, and lack of sensible investment into the system. BRT is one proven mechanism for addressing these problems and retaining public transit ridership levels over the long term in a developing country context.

Because BRT was introduced primarily in countries where bus systems were already almost exclusively in private hands, ***BRT was not a mechanism for privatizing bus operations: rather, it was a mechanism for allowing municipal government to establish effective regulatory control over largely privatized transit systems.***

This report reviews in depth how significant differences between institutional arrangements in different international BRT projects affected transit service delivery. Examples illustrate how municipalities have chosen the operational structure best suited for each system and how private sector involvement can be leveraged into benefits for municipality, bus operators and transit passengers. Recommendations are then given for application to new BRT systems.

REGULATION AND TRANSIT SYSTEM EFFICIENCY: BRT AND 'TRUNK AND FEEDER' SERVICES

When designing BRT systems, two distinct but related decisions need to be made. First, one has to decide whether to design a 'closed' busway with pre-paid enclosed bus stations at each stop, like in Curitiba, Quito, and Bogota, or an 'open' system, like in Taipei, Sao Paulo, Kunming, or Porto Allegre, where buses operate both inside and off the busway. Most BRT are either one or the other.

On 'closed' systems, like in Bogota and Curitiba, passengers pay when they enter an enclosed bus stop. Once inside the bus stop, passengers can board and alight from the buses quickly, and can transfer to other buses that stop at the same bus stop without paying again. The BRT systems with the highest capacity and operating speeds are all 'closed' systems, because pre-payment dramatically reduces the time it takes passengers to board. Closed systems, because they load from a boarding platform, require the use of special buses. Because the systems are physically 'closed,' it is easy to change the contracting and regulatory structures inside that system without changing everything about how buses outside the system are regulated and managed. Closed systems tend to have a clear marketing identity, using special buses and

a simple metro-like map of routes that constitute a fully separate system, usually served by special feeder buses.

The alternative is to design an 'open' system. In an open system, bus lanes are constructed in the road as in a 'closed' system, but all buses using the corridor generally must enter or exist the busway. Because such systems are open to normal buses that also operate on normal streets, they tend to lack a clear marketing identity, and often go unrecognized as a 'system' by the general public. Some 'open' systems also have platforms level with the bus floor to allow for rapid boarding and alighting as in closed systems, but payment is still generally on the bus. Boarding delay can be reduced by having a boarding platform, a boarding bay and a turnstile inside the bus, and only allowing passengers to exit from either the front or the rear, but boarding will still be slower than in 'closed' systems. 'Open' systems with boarding platforms increase capacity above that in normal open systems, but this requires buses that have multiple door-types. Because normal buses are not held to a higher maintenance regime, bus breakdowns inside 'open' busways are more frequent.

Closely related but independent of this decision is whether or not to re-route the bus services in the BRT corridor from direct services to 'trunk-and-feeder' services. 'Closed' BRT systems have normally been implemented at the same time as a reconfiguration of bus routes in the corridor from direct services to 'trunk-and-feeder' services. It is also possible to change to a trunk-and-feeder system in an 'open' busway. The recent bus regulatory changes in Sao Paulo are an example of transforming large sections of a bus system from 'direct' service to 'trunk and feeder' services while utilizing 'open' BRT corridors. Such systems frequently develop a system of free transfers, with smart-card ticketing systems, enclosed transfer terminals, or both to mitigate additional transfer costs.

Transit trip demand and the availability of right of way are two important indicators of whether direct services or trunk and feeder services are more appropriate in a given corridor. If the transit trip demand is above 6000 passengers per hour per direction on a given segment, a one lane busway using normal buses without passing lanes will congest.¹ Shifting to a trunk and feeder system is one option among many to deal with this capacity issue. A clear indicator that a transition to trunk and feeder services might be called for is when buses and minibuses constitute a high percentage of the vehicular congestion in a given corridor.

A second consideration is how long the identified corridor is in relation to most of the bus routes in the corridor. If the busway constitutes only a small part of most of the bus routes in the corridor, a closed busway is out of the question, as it will impose transfer costs on the majority of the users while offering limited benefit. Shifting to a trunk and feeder route system does not, however, have to be limited to the locations where exclusive bus lanes have been built. However, generally BRT systems are designed to encompass the entirety of a significant trunk line in exclusive lanes. Other factors for determining the costs and benefits of 'open' versus 'closed' systems have yet to be fully worked out.

Constructing 'open' BRT corridors with no Significant Changes in Bus Routes: The Case of Taipei, Kunming, Sao Paulo, and Bogota in the 1980s.

Taipei, Kunming, Bogota's Avenida Caracas (before TransMilenio), and Sao Paulo (before the recent reforms), all introduced BRT corridors without substantially altering the bus routing system. These systems resulted in significant improvements in road capacity, some modest improvements in bus speeds, and significant reductions in bus operating costs. These systems cost very little to construct, and required minimal disruption of existing bus routes and contractual relationships. In each of the cities, high volume transit corridors were selected. The results in each city were largely positive but with some visible limitations.

In Kunming, the system cost only about \$1 million per kilometer, half of which was paid for by advertising revenues at the bus shelters. Before the busway was implemented the mixed traffic lane was moving only about 2000 passengers per direction per hour. The bus lane is now moving 7500 passengers

¹ . Interview with Pedro Szasz and Paulo Custodio, based on their own counts.

per hour per direction. As a result, public transit mode share rose from 6% to 13%. Most of the modal shift was from bicycle to bus, however. Because of getting the buses out of traffic congestion, the busway reduced total fuel consumed by the buses by 7.7 litres per passenger. Bus speeds increased from 10km/hr to between 15km and 18km per hour in the corridor.² The signal timing in Kunming is simple but long: a four-phase system lasts roughly 3 full minutes. This significantly reduces intersection capacity and can probably be adjusted and simplified. During rush hours the busway becomes very congested, and bus speeds drop significantly. A large numbers of buses are less than fully occupied. The bus platforms are very long but still too short to accommodate the bus cues at rush hour. Currently, the problem of private motorists occupying the non-physically separated bus lane is worsening, and political support for the system remains weak.

In Taipei, the bus rapid transit system also significantly improved bus performance in the corridor. During peak hours, the system is moving roughly 6000 passengers per direction per hour, roughly triple the capacity of a mixed traffic lane. When bus volumes exceeded 200, as they do during peak hours at some stops, the bus lane begins to congest, and operating speeds decline. Also important to reasonable travel speeds on the Taipei system is a very simple two-phase, 3 minute signaling system gives the busway 110 seconds of green time. This two-phase system is possible by restricting turning movements at all but a small number of intersections. It works well for the buses but at the expense of crossing traffic and turning traffic.³

In Bogota, one busway existed already since the 1980s, more than a decade before the construction of TransMilenio. On this major arterial, Avenida Caracas, the municipality built an 'open' busway. It had two full bus lanes in each direction along the entire corridor which allowed buses to pass each other at station stops. This busway did relocate *buseta* or minibus routes off the corridor, but otherwise used normal buses and was designed in the absence of any other bus sector reforms. The Avenida Caracas bus lane was effective in that it moved over 30,000 public transit passengers per hour per direction, but because so many of the buses were operating less than full, the bus corridor had a capacity to move over 45,000. However, with so many buses congesting the corridor, this capacity was achieved at very low operating speeds, averaging some 15kph but occasionally at much slower speeds. This corridor was generally considered 'blighted' by the public because high concentrations of air pollution and noise had led to disinvestment in the shops along the corridor.⁴

Sao Paulo has many BRT corridors that were constructed prior to recent efforts to rationalize bus routes in these corridors. One good example is the Santa Amaru corridor. This one lane busway with a passing lane moved around 30,000 passengers per direction per hour at peak hour.⁵ It requires however, a very long station. At rush hour, this corridor is frequently experiencing operating speeds significantly below 10kph, and frequent breakdowns of the aging and uncontrolled vehicle fleet often brings the system to a standstill. The concentration of old, polluting, and poorly maintained buses on a single corridor has led to the public perception that the corridor is 'blighted', leading to some disinvestment.

The conclusions of this experience are quite clear. A busway without route rationalization can significantly improve the capacity of roads. Bus speeds may increase somewhat but not significantly. Because buses are less than fully occupied, the busway becomes much more congested than it needs to be based on the level of passenger demand. Because more buses are chasing fewer passengers than in systems where the routing structure was changed, the profitability of each bus line is far less than in the trunk and feeder systems. As a result, the level of investment into new buses has been lower. Because old, unregulated buses are still using the busway corridor, emissions problems are not resolved and in fact are concentrated in the corridor. In some of these systems, the buses using the BRT system are old, polluting, poorly maintained, and subject to frequent breakdowns.

² . Kunming General Bus Corporation, 2002; Interview with Lim Wei, Vice Chief Engineer, Kunming Urban Planning and Design Institute; Karl Fjellstrom, ITDP China Representative, Field notes.

³ . Author's field observations; discussions with Jason Chang.

⁴ . Interview with Pedro Szasz, Enrique Lillo, German Jeras.

⁵ . Wright, L. 2002. *Mass Transit Options, Sustainable Transport: A sourcebook for Policy Makers in Developing Countries, Module 3a.* (Eschborn: GTZ).

Constructing ‘Closed’ Trunk Services Without Feeders: TransJakarta

Jakarta’s new TransJakarta BRT system is a ‘closed’ trunk system without a functioning feeder system. Jakarta also converted an existing mixed traffic lane to a buslane and created a single ‘closed’ BRT line without regulatory reforms in the corridor. As a result, while new buses were used within the busway, almost all of the buses originally operating in the corridor continue to operate in the mixed traffic lanes, significantly increasing congestion.

There was an attempt by TransJakarta to introduce a feeder bus service using existing bus companies. Discounted transfer tickets were negotiated with the private bus companies who would be reimbursed by TransJakarta at a reasonably high fare price. However, because the bus operators are not employees of the bus companies, but only individuals who rent the buses on a daily basis, they were unwilling to trust that they would be reimbursed by the bus companies for the transfer tickets. As a result, ‘feeder bus’ operators were unwilling to honor the discount tickets.

Nevertheless, demand on Trans-Jakarta has been higher than projected, at roughly 50,000 passengers per day, or around 4000pphd.⁶ Some informal bicycle taxi feeder services have emerged along the corridor. Because of significant adverse impact on the mixed traffic lanes, Trans-Jakarta is attracting some 15% of passengers from private motor vehicles⁷ and from competing bus routes. At this level it is roughly able to cover its operating costs. However, the lack of a feeder system is still the main reason why TransJakarta is capturing less than half of the total transit passengers in the corridor.

BRT And Shifting to Trunk and Feeder Services: The Experience in Quito, Curitiba and Bogota

The number of ‘closed’ trunk and feeder BRT systems remains few, but continues to grow. Today, only Bogota, Curitiba, Quito, and Leon, Mexico are operational, but several others are in various stages of development. Public transit trips in Quito are heavily concentrated along a single high-density corridor in a narrow mountain valley. Quito’s BRT corridors crisscross in the CBD, a dense historical center protected by UNESCO. Previously, the narrow two-lane roads that wind through Quito’s CBD were perpetually jammed, and the economic revival of the city center was stalled. The majority of the vehicles on the road were private buses, some of them 35 years old, and they were the most visible source of air pollution. Quito developed two BRT lines, and a third line is being developed. Both existing lines are ‘closed’ trunk and feeder systems. Both completely changed the former bus routing systems from direct service to a ‘trunk and feeder’ service with free transfers at three out of the four terminals.

In the case of the Quito Trolleybus, the first BRT line in Quito, both the trunk and the feeder lines are operated by the same public authority. The first line used electric trolleybus technology, and the buses were purchased, owned, and operated by a public sector company, as were the feeder buses at both ends. The decision on the Trolleybus line to go with a public operator was in part because the cost of the electric trolleybus made it difficult to attract private investors for the rolling stock. Because the former bus operators on the Trolleybus route were completely displaced to parallel routes, the private operators staged a week of debilitating strikes that were only ended by intervention by the military. When Quito decided to develop its second, Ecovia corridor, it again decided to implement a ‘trunk and feeder’ system, but made some important changes. Along with changing from two right side-entry bus stops to once left side entry bus stop in the central median, they also dropped the electric trolleybus technology in favor of much less expensive diesel buses. Finally, in order to avoid further confrontations with bus operators, operations of both the trunk lines and the feeder buses on the Ecovia line were turned over to a consortium of the existing private bus operators controlling the corridor. On the Ecovia line, the trunk lines and the feeder bus lines are operated by the same consortium.

⁶ . TransJakarta, 2004.

⁷ . Two surveys were done since the opening of TransJakarta; one by JICA, a second by the NGO Intrans.

The first BRT system was developed in Curitiba in 1974, though the bus sector reform process was already since 1962. Then, there were 321 separate private, informal sector bus companies. That year, the Mayor forced them to consolidate into 10 separate collectives or companies that would operate as formal sector companies. During this controversial restructuring, the city gave licenses to new consortiums of private operators to operate a particular section of the city, or a 'slice of the pizza'. While the rights to operate the buses and bus routes were regulated by concession agreements that lasted for a finite period of time, control over specific sections of the city seems to have been de facto seeded to different private companies virtually into perpetuity, and this control continues until today. For lines that passed between two regions, operations were split between the two operating companies. These buses enjoyed a partial monopoly of full size bus operations in a particular part of the city, but until 1974 there remained many *colectivos* and independent private operators.⁸

Then, in 1974, Curitiba introduced several innovations. First, it introduced the exclusive bus lanes. Second, it changed the routing structure from point to point bus routing to a trunk and feeder system, called 'express' routes. Third, it introduced special, larger capacity buses that operated only on the trunk corridors. There was no conflict around shifting the operations from direct to trunk and feeder systems because this shift was undertaken within the control of the two companies that controlled the two sections of the city through which the trunk corridors passed. The only conflict came because of the need to procure new buses, as will be discussed in the next section.⁹

At first a system of transfer tickets was tried, but was abandoned because counterfeiting tickets emerged as a significant problem. Then, for a period people had to pay twice. This was also abandoned after one and a half years because the poor who lived on the cities outskirts had to pay twice. Then they tried providing free feeder bus services where passengers only paid once reaching the terminal but this was also abandoned because a lot of people just got off at the terminal but did not get on the trunk line. Then they developed closed free transfer areas just at the terminals, which were too small so they became overcrowded and unpleasant, and dubbed 'little pigpens.' It wasn't until after 1990, when Jaime Lemer returned for the third term as Mayor, that the current system, where the entire stations are closed to allow free transfers, and the pre-paid boarding tubes were also developed.¹⁰

Bogota's first TransMilenio corridor followed the very high-density corridor along the mountains, passing through the CBD. It was from its inception designed as a 'closed' system. Prior to TransMilenio, Bogota's bus system was entirely in the hands of small private bus operators offering point-to-point services. In 2000, just before TransMilenio opened, there were approximately 30,000 – 35,000 buses operating. Because of the breakdown of regulation, many roads were overcrowded with buses, many of them only partially occupied. A main objective of TransMilenio's planners was to rationalize bus routes in the corridor so that the number of buses in the corridor could be reduced.

The trunk and feeder system in the first phase of TransMilenio, consisting of three corridors, allowed the number of buses operating in the corridor to be reduced dramatically, from 650 buses/hour direction on heaviest link, down to about 270. Because the buses were much larger and speeds much faster, the system's total capacity is probably above 45,000 pphpd.. Operating speeds at the time averaged 18kph, but often were much lower, whereas after the reforms average speeds rose to 26kph.¹¹

It is important to understand that ***ALL of the bus routes on the TransMilenio corridors were relocated onto other, parallel corridors.*** The removal of the old bus routes on the corridor was complicated by the fact that private bus 'enterprises' had some legal rights to control the allocation of bus routes in the corridor. As such, a complex negotiation process took place which on the one hand the Mayor

⁸ . Ardila-Gomez, A. 2004. Transit Planning in Curitiba and Bogotá. Roles in Interaction, Risk, and Change (PhD Dissertation, MIT: Boston) Interview w/ Euclides Rovani, former Director of URBS, Curitiba.

⁹ . *ibid.*

¹⁰ . *ibid.*

¹¹ . Interview with Pedro Szasz and Paulo Custodio , and data from TransMilenio.

made clear that the system would go forward but on the other hand the private bus ‘enterprises’ were ‘voluntarily’ brought into the new system.¹²

Because the transition to a trunk and feeder system was done at the same time as the construction of BRT, the provision of two special lanes for buses did not decrease operating speeds for mixed traffic in the remaining lanes, but significantly increased them even on Ave. Caracas where no capacity was added. This significantly contributed to the positive reception of TransMilenio as a win-win solution even for motorists. It did, however, push the remaining private bus operators onto parallel corridors, which became much more congested than they had been before. Nevertheless, the overall impact on traffic congestion was positive for both bus passengers AND private motorists.

BRT AND SHIFTING TRANSIT’S FINANCIAL BURDEN FROM THE STATE TO THE PRIVATE SECTOR

Many cities are trying to reduce the fiscal burden of transit systems while attracting new private investment into the system and maintaining good quality customer service. Achieving all three of these objectives is not easy. The public’s financial burden can be reduced by full deregulation and privatization, but this could just as easily lead to disinvestments as investment, and in the absence of safeguards, is almost certain to result in a deterioration of customer service. Ultimately, in any system there will be a tension between public interests and private interests. The ability of the public sector to negotiate a good deal for the public requires it to have access to very complete system information, a skilled staff, and sound advice. The more information the public sector has before the contracting begins, the better chance that the contracting will support the public interest.

BRT in Latin America has demonstrated a successful new paradigm of public sector regulation and private sector operation, combining the efficiency benefits of private sector management with social goals. However, the conditions under which these goals can be achieved are highly specific.

In most Latin American BRT, while the infrastructure and stations are paid for and maintained by the municipality with public funds, the investment into the buses and their ongoing maintenance, the investment in and maintenance of the ticketing systems, and other elements of BRT, all can be paid for entirely by the private bus operators. In this way, the public sector can insulate itself from inheriting a permanent financial burden.

Private Contracting of BRT Within City Zones: Curitiba

Curitiba’s BRT system is still one of the best-regulated bus systems in the world. Its contracting structure is very similar to that of TransMilenio, though TransMilenio made a few important improvements. Curitiba’s regulatory structure emerged over a period of four decades, whereas in Bogota it emerged over a period of 3 years. The corporatization of Curitiba’s bus sector was already completed in the early 60s when the ‘slice of the pizza’ system of monopoly private bus operators of specific urban zones first emerged.

When in 1974 Mayor Jaime Lerner constructed the famous busway system, he wanted the private bus operators to procure special, higher capacity buses to operate as ‘express’ buses on the trunk corridors. Naturally the private bus operators were reticent. The fact that the bus route licenses were up for renewal in 1974 gave Lerner some leverage over the private bus monopolies to insist on the new bus investment. He threatened to open the express bus operations to a competitive bid if they did not agree, and ultimately they agreed. While the continuation of this monopoly control over sections of Curitiba’s bus system ensured that the bus routes were sufficiently profitable to make investment in modern buses possible, it also compromised the ability of the municipality to control the quality of service and to some degree the fare price of the private operators.¹³

¹² . Presentation by Edgar Enrique Sandoval, ITDP Workshop, Bogota, September, 2004.

¹³ . Ardila-Gomez, op.sit.

Thus, in Curitiba the private bus operators have always financed the buses. Nor did the municipality provide loan guarantees to the private operators for bus procurement in the early years. Only in 1989 did the city arranged for a special line of credit for the bus companies from the state development bank, (BNDES) to buy the buses. This was in part to help finance buses with higher emission standards. Buses are amortized over 10 years, and BNDES loans are paid back in 8 years. Before, normal bank loans required the loan be repaid in 48 months.¹⁴

The Municipality of Curitiba paid for the entirety of the infrastructure. Initially, all the infrastructure costs were paid for out of municipal resources, and maintenance of the roads is still covered with municipal funds. In 1977, the IBRD (World Bank) gave a loan for expanding the system, and in 1990 they got another loan from the Inter-American Development Bank. Mayor Jaime Lerner was involved in the negotiations with Daimler and Volvo in Brazil and in the US when the technical specifications were being developed, but the procurement did not come from the city. Station maintenance was also the responsibility of the bus operator, and was covered by farebox revenue.¹⁵

As more trunk lines were added, a system of free transfers between different trunk lines operated by different companies was also introduced in 1979. Because there were inevitably some lines that benefited more than others as a result of the free transfers, the bus companies and the Municipality agreed in 1979 to set up a compensation fund to compensate the losers. URBS, which had been created already in the early 1960s, was given authority to manage this compensation fund. Until 1987, the private operators still collected the money from their passengers directly. Then, in 1987, URBS took over direct collection of the fares. It was only at this point that contracts with the operating companies were renegotiated with the private operating companies and URBS established the payment per bus kilometer system, monitored by URBS by simply looking at the odometers.¹⁶

Shifting to direct collection of the bus fare by URBS was a way of allowing the public sector to know the exact level of revenues and ridership. Because the private operators in Curitiba function as de facto monopolies over large parts of the system, with long-term lease rights to operate these lines, negotiations over the fare have been controversial. Unlike in Bogota, Curitiba never had any detailed traffic modeling information to give them a way to predict passenger demand on different routes. This work is only now being done. As a result, they had to take the word of the private bus operators about their operating costs and operating revenues. Many experts feel this compromised the ability of URBS to negotiate a fair deal for the public. While municipal control over fare collection solved the problem about the actual revenue, it still did not solve the debates over the companies' operating costs. Transit fares in Curitiba are now at \$0.55 per trip, compared to TransMilenio's \$0.40 and Quito's \$0.25. Operators claim with some justification that the high fare is because Curitiba requires the operating companies to operate bi-articulated Euro-III compliant buses, which cost about \$250,000.

Having the public sector collect the fare revenues, however, also created some risk that the trust fund would be raided by politicians for purposes other than maintaining and improving the BRT system, which has happened on occasion. Curitiba is now considering contracting out the fare collection system to an independent operator, to better insulate farebox revenues from being raided for political purposes. Furthermore, because the unlimited concession periods are being legally challenged as a violation of federal competitive bidding law, this is also being reviewed.

Private Contracting to a Monopolistic Consortium of Bus Operators: Quito's Ecovia Line, Leon, and Jakarta

When Quito began to construct a second line, the financial problems with the first electric trolley bus line convinced them to go with diesel technology for the second, Ecovia line. In the second corridor, all the small companies that operated on that corridor were formed into a consortium called TRANASOC.

¹⁴ . Interview w/ Euclides Rovani, former Director of URBS.

¹⁵ . *ibid.*

¹⁶ . *ibid.*

This consortium was “given” the concession. Ultimately, the municipality again assumed the responsibility for bus procurement. They signed an agreement with this monopoly consortium which obligated the operator to begin making payments for the buses only once a certain profit level was reached. Because the bus consortium collects the fare revenues directly, the Municipality does not have full control over the information about how profitable the company is. As a result, the company to date has argued that they have yet to turn a profit, and thus the Municipality had assumed the entire cost of the bus procurement. At least the consortium operates without operating subsidies, unlike the Trolebus line which doesn’t get subsidies but is accumulating debt. The current Mayor is talking about GPS control and better fare supervision.¹⁷

The new BRT that opened last year in Leon, Mexico, is also a trunk and feeder system. Leon succeeded in getting the private operators to invest in the buses and their ongoing maintenance; however, with significant sacrifice of customer service. Early on in the BRT negotiating process, Leon’s private bus operators formed themselves into a monopoly consortium, called the Coordinadora de Transporte, which undermined the bargaining power of the city. This single consortium at first resisted the whole BRT program. Ultimately, this consortium holds a monopoly over operations in the entire system, and there is no time limit on this concession.¹⁸

Based on initial demand studies done by the municipality, the consortium was able to secure bank financing to procure modern buses. They created a trust fund, into which they invested 20% of the bus procurement costs, and private bank loans provided the remaining 80% of the bus procurement cost. The buses, articulated buses like on TransMilenio, cost some \$225,000 each. On the trunk lines, the Coordinadora de Transporte consortium also owns and operates the feeder buses as well as other buses in the system, but the operators of feeder buses and the operators of trunk lines are paid differently. Even though the system has an integrated ticketing system and a single fare, fares collected by the feeder buses is kept by the feeder bus operators. Feeders income is hence based on the number of passengers. Fares collected on the trunk line go into the Coordinadora de Transporte Fund. The Coordinadora de Transporte collects the money directly, and pays themselves for the bus operations, supposedly based on bus kilometers operated, but in fact the payment method to bus operators is not transparent.

The system has several problems. On the positive side, the buses were procured by the private sector without government investment. On the negative side, customers are complaining about the quality of service. The buses are very congested during the peak hours, as the bus operators are trying to maximize their profits per passenger by jamming more people onto the buses. Secondly, home-bound afternoon feeder bus services are very poor. Because the feeder bus operators were initially only paid for the in-bound trip, and not for the outbound trip, the feeder bus operators initially cut back on service in the afternoon. The City has subsequently fixed the problem by creating a compensating fund. The only influence that the City and the State have over the regulation of the system is through a Technical Committee of the Coordinadora de Transporte. The Coordinadora de Transporte also paid very high prices for European manufactured Volvo chassis bought from Brazilian assemblers.¹⁹

Jakarta’s new BRT system is an example of where the entire cost and financial risk of the system has been assumed by the Municipality. Currently, demand is just barely sufficient to cover TransJakarta’s operating costs. TransJakarta just opened on January 15, 2004, so many of the problems may still be resolved. Currently, it is being operated by a consortium of the four bus companies that were already operating in that bus corridor, plus a public-sector radio taxi company, PT Ratax. TransJakarta was created as a public authority, and days before the first line opened it awarded the operating contract to a company, PT JET (Jakarta Express Transit). The President of PT JET is from Ratax, but shares are divided equally 20% for each participating company.

None of these companies operated like modern bus companies in the past, so they are having difficulties with scheduling, estimating the labor they need, and otherwise estimating their costs and

¹⁷ . Interviews w/ David Briggs, Cesar Arias, and Lloyd Wright.

¹⁸ . Field notes from Oscar Edmundo Diaz.

¹⁹ . *ibid.*

managing this business. As the buses were turned over to them at no cost by TransJakarta, which is under the control of the Department of Transportation, they were given only a two year operating contract. Because the buses are not owned by PT JET, they do not have a strong incentive to maintain the buses, and the buses are already suffering from routine maintenance problems. After the first year, the fare price can be renegotiated. The fare price negotiated was reasonable, at only about \$0.30, slightly lower than air-conditioned buses in the corridor, but the normal A/C buses travel much farther. PT JET is paid by the bus kilometer, so it absorbs no demand risk. The fares are actually collected by a third company, which is a consortium between a local Indonesian company and one of the turnstile suppliers in Bogota, Colombia. This company is supposed to ensure that the fares are collected and the revenues deposited into a trust fund. Currently the ticketing system is not working and tickets are being collected manually, undermining confidence in the financial integrity of the system. On the second line, scheduled to open in 2005, there is a good possibility that one or more private bus operators will invest in the buses in order to ensure monopoly control over the line.²⁰

Private Contracting While Maintaining Customer Service: Bogota's TransMilenio

The contracting in Bogota's BRT is currently a best practice example of balancing the desire for private investment and good management while maintaining good quality customer service. The bus system in Bogota at the time TransMilenio was introduced was composed of thousands of individual owner operators and a few powerful families of bus 'enterprises' that controlled the government-issued route licenses and rented them to private bus owners. When TransMilenio began, therefore, the process of transforming the bus 'enterprises' and individual bus owners into modern bus corporations was done at the same time as the introduction of the BRT system. TransMilenio regained public control over a dysfunctional, weakly regulated private system.

Public funds for TransMilenio were only used for planning and infrastructure. Funds for constructing the exclusive bus lanes, the enclosed bus stations, the terminals, the control center and part of its GPS, and the sidewalks and bicycle paths in the same corridor, were paid for by public funds, at a cost of about US\$5.3 million per kilometer, not including the cost of land acquisition. This infrastructure cost about \$196 million in Phase I. In Phase II, the cost was \$13.5 million per kilometer, though this figure includes the cost of several expensive bridges and interchanges that are also used by mixed traffic. TransMilenio requires no operating subsidies and earns substantial profits for its operators. Like in Curitiba and Leon, but unlike in Quito and Jakarta, Bogota did not spend any money on bus procurement. Nor did it provide any municipal bank guarantees.²¹

This long-term economic and financial sustainability beyond the initial capital investment resulted because it was the primary goal of the planning process from inception to implementation. At the same time, however, enormous care was given to ensuring that this did not simultaneously undermine the ability of the municipality to demand good quality service and reasonable fares.²²

Knowing that the system had to be financially self-sufficient, it was accepted from the outset that the introduction of TransMilenio would require a fundamental transformation in the existing route licensing system for private operators. Unlike in Curitiba, where private bus consortiums were given concessions over areas historically under their control, Bogota wanted more control over the contracting process.

Unlike in Curitiba, where the private bus companies held control over most of the bus system information, in Bogota TransMilenio invested about \$1 million in traffic demand modeling and planning. Steer Davies Gleave and their team of Brazilian sub-contractors, developed public transit trip demand estimates for the three initial corridors. This was a critical element in maintaining public sector control over the contracting process with the private operators.

²⁰ . Interview with Taufik Adiwanto, TransJakarta.

²¹ . Wright, L. 2002. *Bus Rapid Transit: Sustainable Transport: A Sourcebook for Policy-makers in Developing Countries*: (Eschborn, Germany: GTZ); TransMilenio data, interviews w/ Hidalgo and Sandoval.

²² . Presentation by Yaroslav Vlasak, formerly of McKinsey, TransMilenio Workshop, January 2003.

The decision to convert to a full ‘trunk and feeder’ system at the same time as implementing Bogota’s BRT system was largely motivated by a desire to maximize the profitability of the corridor. This also meant that bus size and bus occupancy could be maximized, achieving the maximum reduction in transit service cost per passenger kilometer. Finally, because more passengers were concentrated onto fewer buses, the number of buses in the corridor could be dropped substantially.

Once this decision was made, traffic modelers were able to predict with reasonable accuracy the number of passengers that the system was likely to carry. They essentially took the existing public transit trips in the corridor and added 25% for future growth.²³ These demand estimates were critical in two ways. First, they made it possible for the engineers to design a system that would have sufficient capacity to handle the projected demand. In this way, the engineers could avoid under-building the system and having it congest, or overbuilding the system and wasting resources on underutilized capacity. Secondly, the demand estimates were critical to negotiating with the private bus operators and securing private financing for the buses.

TransMilenio calculated the fare it needed to reach financial self sufficiency some one year before the system opened, it was \$0.40. At that time, bus fares in Bogota were only \$0.30. One year before TransMilenio opened, Bogota approved of an increase in the normal bus fare from \$0.30 to \$0.40 for private buses operating in Bogota. Naturally private operators supported this. There was considerable public outcry against this, but the outcry was against the private bus operators, and not so much against the city. By the time TransMilenio opened a year later, at a fare price of \$0.40, people had become accustomed to the new price and few people directly attributed the earlier fare price increase to the TransMilenio planning process. While independent private bus operators continued to operate in large numbers on parallel routes, hence competing for some of TransMilenio’s passengers, because the price of TransMilenio was at par with the private fare but the TransMilenio trip was much faster and of higher quality, these private independent operators quickly lost passengers on the parallel routes as well and cut back services.²⁴

TransMilenio’s contracts with the trunk line operating companies were written in such a way that the demand risk (the risk that ridership would be lower than anticipated) was reasonably evenly divided between the city and the operating companies. Because trunk line operators are paid by the bus kilometer, they are certain to be paid a certain amount regardless of demand. However, they ultimately bear some of the demand risk, because if the demand is lower than projected, TransMilenio has the right to reduce the total number of bus kilometers servicing the system. On the other hand, the contract allows for them to extend the period of the concession. The concession contract lasts for 10 years or until the average kilometers per bus reaches 850,000, whichever comes first. However, if after ten years the average is not achieved, the concession is extended until it reaches that average. So, the possibility of extending the concession allows the investor to eventually recoup their bus investment in the case of lower than estimated demand, although they would recoup it over a longer period of time. In practice this has not been a problem, as demand has actually been in excess of what was anticipated.²⁵

In this way, the operating companies had a vested interest in maintaining a good quality of service and promoting the system, in order to retain ridership. This was even more true for the feeder bus operators who were initially paid by the passenger during phase II. During Phase II, the feeder bus operators complained that they were exposed to the full demand risk, and successfully had the concession terms changed to a combination of payment per kilometer and payment per passenger.

The fact that the private operators were exposed to some demand risk initially made it difficult for the private operating companies to obtain loans from banks for the procurement of the buses. These were newly formed corporate entities with no formal credit history, and despite the personal appeals of the

²³ . Presentation by Enrique Lillo, SDG, TransMilenio Technical Workshop, January 2003.

²⁴ . Interview w/ former Mayor Enrique Penalosa.

²⁵ . **“Contrato de concesion para la prestacion del servicio publico de transporte terrestre masivo urban de pasajeros en el sistema transmilenio,”** TransMilenio SA, 2002, and interviews w/ Edgar Enrique Sandoval, former Managing Director of TransMilenio, and Dario Hidalgo, former Deputy Director, TransMilenio.

Mayor, the Colombian banks refused to finance their bus procurement. Ultimately, the loans were procured from the Brazilian export credit agency, as the buses being procured were initially assembled in Brazil. In the subsequent phases, after TransMilenio's profitability has been clearly demonstrated, private operators have had no difficulties securing private bank loans for bus procurement.²⁶

Unlike in most other systems, in TransMilenio neither the trunk line operators nor the feeder bus operators directly collect any fares. In Bogota they are collected by a separate company. The smart cards and turnstiles are amortized over the time of their concession and will later revert to TransMilenio. The revenues go into a trust fund controlled in the name of TransMilenio by another contractor, a financial service provider, who in turn invests the money and distributes it among the partners. The stations, meanwhile, are maintained by TransMilenio under contract to private companies.

The funds are collected by a private company not allied with any of the bus operating companies in order to ensure fairness between the various private operating companies. This private control also insulates the system somewhat from the political process. In the TransMilenio system, the profits cannot be diverted directly from the system to other public uses. The government is allowed to reduce the passenger fare below the technical fare, but in this case the government has to pay the operating companies compensation. In this way, TransMilenio is insulated from the threat of disinvestment from the system by politicians. The only part of the farebox revenue directly under the Mayor's control is that share that goes to TransMilenio, or now 4% of the total.

BRT AND QUALITY OF SERVICE CONTRACTING: LESSONS FROM BOGOTA

In many countries, BRT was a useful mechanism for introducing quality controls into licensing agreements. In completely deregulated transit markets, regulators have no control over many aspects of bus service that are critical to customer satisfaction. These include:

- a. predictable scheduling
- b. predictable routes
- c. accessible bus route information
- d. comfortable and safe vehicles
- e. vehicle maintenance
- f. safe driver behavior

By introducing competition between private operators, TransMilenio was able not only to demand that the private operators invest in the system, but also insisted on meeting other social goals as part of the points system for winning the operating contract. Furthermore, because firms compete for service within the same corridor, TransMilenio retained the power to penalize companies for poor quality service without disrupting service in a particular corridor by simply awarding more of the scheduled bus trips to rival companies.

Leveraging Social Objectives Through a Competitive Bidding Process

The competitive bidding process used by TransMilenio to select bus operators was a significant innovation that to date has not used in other BRT systems. Bogota's TransMilenio system used the competitive bidding process not only to minimize the amount of money TransMilenio had to pay the bus operators per kilometer, but also to force the bus sector to modernize, to encourage wider bus company ownership among drivers, and to promote other reforms. At the same time, the points system used also ensured that at least some of the existing operators in the corridor would profit substantially from TransMilenio contracts. Points were awarded to companies based on factors such as experience, bus quality, and emissions levels, allowing TransMilenio to encourage an efficient, modern and non-polluting vehicle fleet.

²⁶ . *ibid.*

The private bus operators, at the beginning of TransMilenio, were not yet formal bus companies. There were bus ‘enterprises’ that did not own buses but controlled the allocation of routes under the auspices of the Bogota Ministry of Transport, and these ‘enterprises’ rented routes to small, informal sector private bus owners and operators. By writing the eligibility criteria for bidding on TransMilenio operating contracts in such a way that required bidders to have a certain minimum working capital, and to be incorporated as formal sector businesses, TransMilenio forced these ‘enterprises’ to become formal sector entities. By requiring in the bidding contracts that each bidder had to ‘destroy’ a fixed number of old buses, the bus ‘enterprises’ were forced to give the individual bus owners equity in the new companies in exchange for acquiring their buses so that they could be ‘destroyed’ in compliance with the bidding rules.²⁷

BRT and Quality of Service Contracting

TransMilenio was able to use competition between private bus operators not only during the initial contracting period but also on an ongoing operational basis to ensure high quality service delivery. TransMilenio’s contracts with the private bus operators gives it the power to verify the accomplishment of all obligations, responsibilities and requirements listed in the contract, and gives them the power to fine the operators who don’t comply with their contract obligations. The fines can be as high as 10% of the operator’s total income in any given month.

Because TransMilenio pays by the kilometer and each week sets the schedule, fines are imposed by cutting back on the number of kilometers that a particular bus company is assigned in the weekly schedule. It is this quality contracting that assures the excellent maintenance of the TransMilenio vehicle fleet, which in turn has dramatically reduced the number of vehicle breakdowns in the system.

By giving the bus operators only the right to operate a part of total scheduled bus service, and allowing them to lose money for violating quality service guarantees by adjusting the schedule, TransMilenio’s contractual arrangements allow for much more continual monitoring and enforcement of customer service than is possible in the case where bus operators have monopolistic control over an entire territory or line for an extended period of time. TransMilenio, while creating the conditions for very profitable bus operations, at the same time is able to demand a very high standard of public service. If a private operator fails to meet this standard, their share of this lucrative market is immediately adjusted downwards.²⁸

CONCLUSIONS

While local circumstances may create exceptions, the following are the main conclusions of the institutional and regulatory structures of BRT systems in Latin America:

BRT Systems should be designed from their inception to be self financing

All BRT systems in developing countries should create the conditions for ensuring full cost recovery for their ongoing operating costs and the costs of bus procurement. Hence, operations can and should be contracted out to private operators.

Reaching Financial Self Sufficiency May Require Route Restructuring

Many BRT systems may require cutting competing routes in order to be self financing.

Private operators should pay for the cost of bus procurement.

By giving private operators partial or full exclusivity to operate in a particular corridor, and removing operating risk (congestion) and regulatory risk (uncertain fare policy, unclear legal status, unclear

²⁷. Presentation by Edgar Enrique Sandoval, ITDP BRT Workshop, Bogota Colombia, September, 2004.

²⁸. *Contrato de concesion para la prestacion del servicio publico de transporte terrestre masivo urban de pasajeros en el sistema transmilenio,* TransMilenio SA, 2002; and discussions with Dario Hidalgo and Victor Raul Martinez.

licensing procedures, etc), profitable operations even when bus procurement is included can be more or less assured by proper system design. If the municipality insists on a technical specification for the rolling stock for a vehicle that is not financially feasible, the municipality should find other mechanisms for subsidizing the vehicle procurement other than direct government procurement.

All operating contracts should be awarded based on fair competitive bidding. Operating contracts should stipulate rewards and fines based on clear service quality indicators to ensure high quality bus service, and more than one private bus company should operate on any given route.

The construction of dedicated bus lanes, which creates a low risk, high profit transit market, should be used to leverage investment in new buses and a high quality of service from private operators. Ensuring that this leverage can be applied on a regular basis rather than only when a contract expires requires having more than one bus company operating each route, and building a system of immediate rewards and fees for quality of service indicators into the contract.

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Enrique Penalosa, former Mayor of Bogota; Edgar Enrique Sandoval, former Managing Director, TransMilenio SA, Dario Hidalgo, former Deputy Director, TransMilenio SA, Angelica Castro, Planning Director, TransMilenio SA, Yaroslav Vlasak, IBM Consult (formerly of McKinsey, Bogota), Enrique Lillo, Steer Davies Gleave, Oscar Edmundo Diaz, advisor to Mayor Penalosa, Paulo Custodio, TransMilenio Project Director for Steer Davies Gleave; Victor Raul Martines, Director, Si99; Euclides Rovani, Director of Transport, URBS, Curitiba; Eraldo Luiz Constanski, Consultor, Logitrans, Curitiba; Arturo Ardila-Gomez, MIT; Wagner Colombini Martins, Logit; Eric Ferreira, ITDP Brazil Representative; Mr. Amaury Infante, EMTU, Estado do Sao Paulo; Carlos Henrique R. Carvalho, Associacao Nacional das Empresas de Transportes Urbanos, Sao Paulo; Hughson Paiva de Castro and Luiz Francisco de Rezende, SP Transporte S/A; Paulo Custodio; Lloyd Wright, UCL; Fatimah Sari, ITDP Jakarta; Fauzi Bowo, Lt. Governor, DKI Jakarta; Alvinsyah, University of Indonesia Center for Transportation Studies; Irzal Jamal, Director, TransJakarta; Taufik Adiwianto, TransJakarta; Cesar Arias, former Planning Director, Municipality of Quito; David Briggs, UNDP advisor to the Municipality of Quito; Diego Carrion, City Planning Director, Quito; Francisco Jijon, Hidalgo Nunez; Lim Wei, Kunming Urban Transport Institute; Ernst Joos; Genaro Torres, Sistema de Transporte Masivo, Ayuntamiento de León.