# URBAN VEHICLE RESTRICTION AND THE PROSPECTS FOR CONGESTION PRICING IN LATIN AMERICA

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# Urban vehicle restriction and the prospects for congestion pricing in Latin America

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**Abstract**

In an effort to reduce the adverse impacts of the car and promote sustainable transport in Latin America, some governments have either implemented travel demand management policies or have considered ways of directly reducing the number of vehicles in congested areas. While demand management measures have been promoted in a small number of countries, including vehicular restrictions as well as the promotion of public transport modes, there are currently no congestion pricing programmes in operation in Latin America. This paper begins with an overview of travel demand management, including its principal aims as well as its primary objectives within the Latin American context. It discusses past efforts to promote traffic restraint and perspectives for developing congestion pricing schemes in both São Paulo and Santiago. Finally, it examines the potential role of congestion pricing as a demand management tool. While it is one of the most effective demand management measures in the industrialised world, a number of barriers currently prevent it from being widely adopted in Latin America. This paper concludes that it is essential that local governments and programme planners coordinate with public sector agencies, transport experts and the general public to ensure that local issues are taken into account. This process can inform planners as they explore the various alternatives for implementing a programme within an established set of constraints.

**Key words:** Alternative Modes, Congestion Pricing, Traffic Restraint, Travel Demand Management (TDM)

## 1. Introduction

In recent decades, transport planners have become increasingly aware of the need to promote Travel Demand Management (TDM) strategies, particularly in light of the decentralisation of activities away from urban centres. The negative impacts of increasing private vehicle use (e.g., rising levels of traffic congestion, deteriorating air quality conditions) on cities and suburban areas have caused a great deal of concern among local residents (WHO, 2011). As a result, many local governments have sought to curb private vehicle use, employing practical, low-cost solutions.

Governments have found that while it is necessary to build urban infrastructure for the movement of goods and services, it is also important to make efficient use of existing facilities when designing mobility programmes and promoting alternative modes to the private vehicle. This is especially true in low density communities where public transport is limited. In order to be effective, vehicle restriction and/or congestion pricing should form part of a comprehensive transport plan.

This paper proposes to explore the past development of TDM strategies in Latin America, particularly traffic restraint measures and proposals to implement congestion pricing schemes in cities in the region. In many cities throughout the Americas, efforts have focused on introducing TDM plans that provide accessible alternatives to the private vehicle.

We begin with an overview of TDM and the potential role of one of its key elements: congestion pricing. This innovative form of vehicle use rationalisation has been implemented in a number of European and Asian cities. The paper reviews attempts to mitigate growing traffic congestion in two Latin American cities: São Paulo and Santiago. In addition, it explores the prospects of introducing congestion pricing in these cities, to better manage traffic congestion and generate new revenues for transport.

In both cities, there has been a focus on developing sustainable transport strategies that can effectively achieve the broader objective of greater access for all. The following section provides background on public transport integration, its goals and objectives and its significance in regionwide transport planning.

## 2. Travel Demand Management

In its efforts to promote sustainable transport options, TDM and its supporting programmes are designed to provide the traveller with a wide array of alternatives to the private vehicle. Collectively, these alternatives offer the traveller multiple transport options, reducing dependence on the private vehicle.

### 2.1. Overview of TDM

Essentially, TDM comprises a diverse set of transport strategies that collectively promote the effective, efficient and equitable use of existing and renewable resources (VTPI, 2010; TRB, 2012). Increasingly, local authorities and planners have embraced TDM as a viable link through which to strengthen and coordinate regional transport, for the purposes of managing traffic congestion and reducing both vehicle emissions and traffic fatalities/injuries.

In general, TDM strategies have focused on producing changes in travel behaviour, improving access to public transport and non-motorised modes. These strategies aim to decrease vehicle occupancy, often placing restrictions and/or fees on private vehicle use. TDM measures are often centred on

education, promotion and outreach, as well as travel incentives, which are complemented by sustainable travel options and supportive land use practices (Transport Canada, 2012). Under this framework, vehicle restrictions and congestion pricing are complemented by enhanced urban public transport.

In retrospect, many of the concepts central to TDM evolved from programmes implemented during World War II, when U.S. residents were required to reduce their consumption of energy. Today, TDM measures include employer-based programmes as well as demand-side applications for schools, special events, recreational centres, emergency situations (FHWA, 2004).

In the past decade, Latin America has become increasingly aware of the need to seek low-cost solutions to curb explosive growth in motorisation. The following section reviews efforts made implement TDM.

### 2.2. TDM in Latin America

In Latin America, TDM provides an opportunity to develop sustainable transport options, tailoring strategies to local conditions. Many countries in the region are economically constrained and cannot finance high capital investments in transport without assuming a significant level of debt (Diaz Olvera et al., 1997). In response, TDM offers a general framework through which to make more efficient use of resources, providing travellers with a set of mobility options through which to perform activities (Vasconcellos, 2001).

Many transport policies in Latin America have been linked to supply-side measures, including investments in road infrastructure, highway management and technology. However, in some cases, these have been complemented by demand-side measures that are linked to improvements in transport organisation, traveller information and awareness campaigns. In addition, demand-side measures have included marketing efforts, such as the promotion of alternative modes (Bovy, 2000). These have been found to stimulate sustainable transport, i.e., in response to social exclusion and economic hardship. (Vasconcellos, 2001).

We now turn our attention to congestion pricing, a tool that has proven to effectively reduce traffic flows during key periods of congestion.

## 3. Congestion Pricing as a TDM Tool

Different types of disincentives to vehicle use, including congestion pricing, have proven to be an effective form of travel demand management. By pricing roadways according to the relative level of traffic congestion at specific times, it provides greater choice to the traveller.

### 3.1. Overview of Congestion Pricing

In essence, congestion pricing encompasses a set of strategies and techniques aimed at developing charges that will effectively discourage motorists from entering a congested area during certain periods of high traffic congestion (Vickrey, 1969; Hau, 1992). In conjunction with other TDM measures, congestion pricing is an effective way of discouraging private vehicle use, especially where other alternatives exist.

The concept behind congestion pricing is derived from the economic theory of efficiency and externalities, which states that people make socially efficient decisions if they fully consider social costs and benefits. The optimal congestion tax is the marginal external cost at the point where the marginal social cost is equal to the marginal social benefit (Button, 1993). An analysis of pricing

schemes ensures that congestion taxes are appropriately set.

Multiple forms of congestion pricing have been implemented, including schemes covering the core city (London), a significant part of the metropolitan area (Singapore), or a wider, perimeter area (Oslo). Other proposals have looked at charging on the basis of such factors as time of day or vehicle type.

According to GTZ (2002), the principal objectives of road and congestion pricing are the following:

- Produce a shift in routes;
- Bring a change in the time of travel;
- Generate revenue;
- Mitigate negative environmental impacts; and
- Improve quality of life.

This paper explores the potential for implementing congestion pricing schemes in Latin America. Thus far, most city-based congestion pricing schemes have either employed cordon charges, where fixed or variable amounts are charged within a congested area; or area-wide charges, where distance-based amounts are charged on all roads in an area (Mahendra, 2008; Larson and Sasanuma, 2010). In the past few decades, a number of other forms of congestion pricing have evolved, including:

- Variable Roadway Tolls, charging tolls on an entire road or highway;
- Variably-Priced Lanes, such as high-occupancy or express toll lanes; and
- Variably-Priced Highway Ramps, charging traffic to enter/leave a freeway.

These strategies have been shown to reduce traffic congestion, decrease vehicle emissions, increase public transport patronage, improve service reliability, and importantly, reduce the number of vehicle accidents on areawide roadways. In addition, the proceeds from congestion pricing can serve as a source of revenue for transport programmes (Litman, 2006). For example, revenues have helped fund public transport services (Rivasplata, 2006).

Congestion pricing has had a significant impact on traffic volumes in some areas. In London, it resulted in a 26 percent reduction in congestion delays. A recent study in the U.S. estimated that congestion pricing can bring reductions of up to 5.7 percent in vehicle kilometres travelled (VKT) and as much as 4.2 percent of vehicle trips in a region (TRAC, 2007). In the past few decades, advances in technology have facilitated the design and operation of electronic toll and congestion pricing facilities, eliminating the need for booths.

Thus far, congestion pricing has been implemented in a limited number of cities, including London, Singapore, and Stockholm, while proposals have been rejected in Manchester, Birmingham, and Edinburgh. In New York, a pricing scheme was rejected not by a metropolitan body, but by the state legislature (Larson and Sasanuma, 2010). Nevertheless, areawide congestion pricing proposals are currently being considered in a number of cities, including Beijing and San Francisco (SFCTA, 2010).

London introduced a congestion charging system in 2003, requiring that most motorists leaving or entering the city's congestion zone on weekdays pay a congestion fee at vending machines, the Internet, or by phone. The system employs a network of cameras that record licence plates both entering and leaving the congestion zone (Litman, 2006), allowing for motorists to be charged accordingly.

The Singapore scheme also provides a model for areawide congestion pricing. In 1975, the city introduced the Singapore Area Licensing Scheme, the world's first pricing system, which was converted in the late 1990's into an electronic road pricing scheme (GTZ, 2002). Recent advances in technology have permitted real-time variable pricing to be introduced as well.

While congestion pricing features a clear set of benefits, critics have argued that it generates equity

issues. On the one hand, it assigns costs to middle and high-income travellers that contribute most to congestion; however, it can also be financially burdensome to low-income residents that are automobile-dependent, particularly if they have few viable alternatives (Ecola and Light, 2009). In some areas, efforts have focused on discounts or free passes for low-income households (Frick, Heminger and Dittmar, 1996).

Despite equity concerns, there is evidence that in some cases, the public is ready to accept congestion pricing. In the U.S., a study commissioned by the Transportation Research Board (TRB) found that in the aggregate, there is significant support for tolls and road pricing. Based on quantitative analysis, this study determined that some important factors influencing public opinion include the type of pricing, the use of tolling revenues, and the clarity of information provided to the public (Zmud and Arce, 2008).

In addition, other research indicates that equity issues may not be as much of a concern in practical applications. According to a Federal Highway Administration (FHWA) study on the income-based equity impacts of congestion pricing in value pricing projects, the perception of unfairness may have been exaggerated in projects funded under the early phases of the programme.

### 3.2. Congestion Pricing in Latin America

While no congestion pricing schemes have yet been implemented in Latin America, a number of cities have discussed managing congestion. Some cities in the region, including Bogotá, Medellin, Mexico City, La Paz, Quito, Santiago and São Paulo, have attempted to alleviate congestion by strategically imposing restrictions on vehicles. In other cases, governments have imposed fuel taxes.

In most cases, these cities have prohibited vehicle use on a given day of the week, based on the last digit of a vehicle's licence plate (Mehendra, 2011). These schemes, locally known as "pico y placa" in Bogotá, "restricción vehicular" in Santiago, and "Rodizio" in São Paulo, limit the number of vehicles on the road, but are heavily dependent upon ongoing enforcement (Hidalgo, 2004).

Vehicle restriction schemes are still very much in practice in these cities. Despite some opposition, often from groups linked to the automotive industry, it is believed that these schemes still provide limited relief from increasing congestion. While congestion has worsened in cities such as São Paulo, Santiago or Mexico City, without some form of vehicle restriction, conditions would probably be worse than they are. What is needed is a more effective alternative for restricting traffic during congested periods.

While vehicle restriction has had some success, in time motorists have found ways to circumvent the system. In all of these cities, many of the residents living in high-income communities (where car ownership is higher) have simply bought a second car, effectively doubling their level of access to the city. In Mexico City and Bogota this pattern has been particularly evident and is a key reason why some experts in these cities have turned to other schemes for reducing traffic congestion (Mahendra, 2011).

In the past few years, there have been ongoing debates on congestion pricing in Santiago, Bogota and São Paulo. In Santiago, a study directed by Francisco Martinez and a team from the Economic Commission for Latin America and the Caribbean (ECLAC) found that Santiago can expect drastic consequences by 2030 if nothing is done. The authors of the study recommended that congestion pricing be introduced along with improvements to the Transantiago scheme. The Office of Transport Planning (Sectra) is now developing a strategic transport plan for Santiago (Valencia, 2011).

Similarly, in Bogota newly-elected Mayor Petro intends to introduce a congestion pricing scheme that would involve charging a fee for the use of corridors. While this proposal is still under discussion, it is envisioned that fee revenues would go toward improvements to the public transport system. One

idea is to establish route concessions with private companies that would collect tolls and transfer revenues to the city (Juaber, 2011).

Clearly, in the cities with vehicle restriction, these measures alone cannot reduce or even stabilise congestion levels. Experts argue that congestion pricing is an effective way of restricting access to heavily congested areas. It can introduce a price mechanism to limit vehicle entry to congested areas, and generate revenue to cover administrative costs and investments in alternative transport. The fact that congestion charges can be increased or decreased to control traffic volumes is especially attractive.

That is not to say that there aren't serious barriers to adopting a congestion pricing scheme, particularly in Latin America, where incomes are lower and resources are scarcer than in Europe. Depending on the size of the congestion zone and the tolling technology used, these pricing systems can run millions of dollars to design, set up and operate. In the case of London, the initial costs were sizeable (Litman, 2006) -- start-up costs totalled over £160 million ($250 million) in 2007 currency (BBC, 2007).

In addition, the provision of additional public transport service provides an alternative to the car. In London, a significant increase in public transport was provided in support of the congestion pricing scheme (Rivasplata, 2006). There are also grounds to believe that BRT can play an important role, as it is highly competitive with the private vehicle.

Similarly, in Latin America congestion pricing schemes will need to secure design and start-up funding as well as initial operating funds. They will require the installation of sophisticated tracking systems, including electronic facilities and equipment, as well as the placement of cameras (CEPAL, 1999). The introduction of congestion pricing will also require coordination between municipalities or districts, as well as political commitment, public acceptance, institutional capacity and community education.

In addition, a number of economic and institutional issues will need to be overcome. For example, an expensive congestion pricing programme may deprive other projects, sectors and geographic regions of important investments. On the institutional side, one key hurdle will be to ensure that the lead agency and consultants implementing these schemes have the capacity to successfully set up and operate such a programme. The implementing agency will need the support of cooperating agencies.

While assessing the pros and cons of congestion pricing, another issue that needs to be carefully considered is the choice of a pricing scheme. Each city is unique in its geography, socioeconomic structure and set of travel patterns, and distinct from cities where congestion pricing has been implemented (Hook and Ferreira, 2004). It is important that planners study potential congestion zones and based on a number of factors (e.g., traffic levels, size, and density), target areas for implementation. In addition, thought should be given to combining congestion pricing with other TDM measures.

Certainly the argument that congestion pricing generates inequities between income classes carries less weight in Latin America and other areas of the developing world. In these countries, car ownership is largely a privilege of the high-income resident and to some extent, the middle-income resident. In Latin America, most low-income residents have very low levels of purchasing power and often, do not own a private vehicle (nor have access to one). In most countries of the region, low-income residents are public transport-dependent and/or heavily reliant on non-motorised transport for most of their daily trips.

In order to gain a greater perspective concerning some of the issues involved in deciding whether or not to introduce a congestion pricing programme, the next section explores congestion-related issues in two Latin American cities where such a programme has been seriously discussed.

## 4. Case Studies: São Paulo and Santiago

This section provides a profile of each case city, its urban transport network, past attempts to restrict traffic in different parts of the city and more recent proposals for introducing congestion pricing. In São Paulo, traffic restrictions have been introduced, but toll facilities are not widely used. In the case of Santiago, electronic toll roads provide a mechanism for recouping the costs of infrastructure investments.

### 4.1. São Paulo

Over the past few decades, the issue of traffic congestion has become a central issue in São Paulo. International news sources have commented on this problem, with *Time* magazine noting that the city has the world's worst traffic jams (Downie, 2008). The following paragraphs provide background on Greater São Paulo, its regional network and past attempts to implement vehicle restriction.

With close to 19 million inhabitants, Greater São Paulo is the principal population and commercial centre of Brazil (see Table 1). It has an average density of just over 8,300 persons per square kilometre, comparable to the densities of some European cities, but lower than a number of other cities, such as Bogotá or Caracas. Over the years, a relatively high level of car ownership has led to urban sprawl away from downtown and longer average trips.

**Table 1. Urban Characteristics of the Case Cities**

| Indicator | Greater São Paulo | Greater Santiago |
|---|---|---|
| Population (thousands) | 18,784 | 6,039 |
| Density (per square kilometre) | 8,333 | 8,814 |
| Total Employment (thousands) | 10,369 | 3,471 |
| Tertiary Sector Employment (%) | 79 | 71 |

Sources: CAF, 2010; Instituto de Seguridad y Educación Vial, 2009; Sectra, 2001

Despite its high levels of congestion, São Paulo does have a comprehensive set of public transport modes. Currently, the network consists of standard buses, trolley buses, minibuses, heavy rail metro, commuter rail and vans. Collectively, public transport carries about 12 million daily trips (over one third of the region's 35 million daily trips): 75 percent by bus or van, and 25 percent by rail (see Table 2).

**Table 2. Daily Travel Characteristics of the Case Cities**

| Indicator | Greater São Paulo | Greater Santiago |
|---|---|---|
| Trips: All Modes (thousands) | 35,807 | 17,822 |
| Trips per Capita | 1.91 | 2.95 |
| Mode Split (percent)* | | |
| Private Transport, incl. taxi | 32 | 27 |
| Public Transport | 33 | 36 |
| Non-Motorised | 35 | 37 |
| Public Transport Trips (thousands) | 11,838 | 6,503 |
| Public Transport Modes (percent) | | |
| Rail | 25 | 35 |
| Bus | 75 | 58 |
| Other (Shared Taxi) | 0 | 7 |
| Private Vehicles | | |

| | | |
|---|---|---|
| Cars (thousands) | 4,386 | 819 |
| Motorcycles (thousands) | 652 | 23 |
| Private Taxis (thousands) | 39 | 27 |

*Mode Split includes all trips

Sources: Malbran et al., 2003 ; CAF, 2010

Greater São Paulo grew at a relatively rapid pace between the 1950s and 1980s. During this period, new roadways were built and car-oriented development was encouraged, much as it was in the U.S. (Vasconcellos, 1997). In the past few decades, a lack of coordination between transport investments and land use planning has characterised many world cities, including Sao Paulo. An increase in car ownership without adequate travel demand management has often resulted in severe air pollution and congestion during extended periods of the day (Anas and Timilsina, 2009).

Traffic congestion has become an increasingly pressing issue in São Paulo, particularly in the past few decades, when vehicle ownership has outpaced population growth in the region. The total number of cars in São Paulo grew from approximately 2 million in 1985 to 3.4 million in 2002 and almost 4.4 million in 2007 (Mahendra, 2008; CAF, 2010). In 2007, there were approximately 230 cars per thousand inhabitants, a relatively high ratio when compared with other cities in Latin America (CAF, 2010).

In response to rising congestion and poor air quality conditions, the Secretary of the Environment of the State of São Paulo introduced a set of programmes in the 1990s. One of these included the "rodizio" programme, which sought to reduce pollution levels by restricting the circulation of one-fifth of the private vehicle fleet on weekdays (Hochstetler and Keck, 2004). While the programme was initially developed by the State of São Paulo, the City of São Paulo and its powerful transport agency initially opposed it, based on its strong ties with auto-supportive companies (Mahendra, 2008).

The rodizio programme was initially considered to be successful in improving air quality, as it encouraged users to modify their behaviours. Compliance with the rodizio programme was said to be good, as many residents joined authorities in an effort to improve the environment (Hochstetler and Keck, 2004; Mahendra, 2008). By the mid-1990s, however, elections brought an abrupt end to rodizio. In 1997, the City adopted a less-stringent programme to reduce congestion in São Paulo (Mahendra, 2008).

In the past ten years, increased motorisation has inhibited the effectiveness of the rodizio programme, prompting many to consider alternative schemes for controlling congestion, including a pricing programme. Many residents have circumvented the system through the purchase of additional cars, a trend that has proven difficult to thwart (Mahendra, 2011). Subsequently, São Paulo authorities established a task force of experts to evaluate a set of pricing proposals (Hook and Ferreira, 2004).

One option discussed by this task force was the development of a three-ring pricing scheme focused on Central São Paulo. Motorists would not be charged for travelling in the economically-depressed, inner ring, but would be charged for operating in one or more of the two outer rings. Issues to resolve include method of payment, vehicles to exempt, and enforcement (Hook and Ferreira, 2004).

### 4.2. Santiago

For decades, Greater Santiago has attempted to mitigate high levels of pollution and congestion. In 1986, the city introduced a vehicle restriction scheme. Almost two decades later, Santiago implemented tolls on a segment of its freeway network as part of a larger transport plan. The following paragraphs provide background on Santiago, its regional network and attempts to implement vehicle restriction measures.

Santiago, capital and principal commercial centre of Chile, is a city of close to six million inhabitants (see Table 1). The average population density of Greater Santiago is more than 8,800 persons per square kilometre, slightly higher than the rate for São Paulo. Despite the historic predominance of public transport, motorisation rates have increased in recent decades, particularly in the middle to high-income residential areas. While the downtown is still a centre of commercial activity, transport infrastructure investment has supported commercial and residential decentralisation (Rivasplata, 2006).

Despite this decentralisation of activities and continued growth in car ownership, nearly 75 percent of all trips in the region are by public transport or one of the non-motorised transport modes. The public transport network consists of bus services, shared taxi services, a heavy rail metro system and urban segments of the national rail network. The road-based systems are privately-operated, whereas the rail-based modes are publicly-operated. Collectively, public transport carries over five million daily passengers: 80 percent by bus, 6 percent by shared taxi and 14 percent by rail (see Table 2).

Santiago has witnessed significant growth in private vehicle ownership, from a rate of 60 cars per thousand inhabitants in 1977, to more than 165 in 2010 (CAF, 2010; Mahendra, 2011). In fact, between 1991 and 2001, the number of private vehicles in Santiago grew at an annual rate of more than 10 percent (O'Ryan et al., 2002). As in the case of São Paulo, explosive growth in car use during the late 1980s and 1990s was driven by increases in personal income and a gradual decline in the overall quality and reliability of public transport in Santiago, further contributing to congestion and air pollution.

Santiago was one of the first cities in Latin America to introduce a vehicle restriction programme, largely in response to worsening air quality. This licence-based programme prohibited cars, buses and taxis from circulating between 6:30 a.m. and 8:30 p.m. at least one day a week (Fresard, 1998; Mahendra, 2008). It effectively removed one-fifth of the region's vehicles on days of severe pollution.

In general, results were mixed, with some initial congestion relief, but a gradual worsening of conditions as car use continued to rise. As in other cities, numerous middle and high-income residents purchased a second or third vehicle to avoid the restriction, further contributing to increased congestion and air pollution in the city. With the return of democracy in 1990, however, local authorities studied new ways of mitigating congestion and environmental degradation in Santiago. In 1994, the National Commission for the Environment (CONAMA) was established to develop air quality plans (Lee and Rivasplata, 2001).

Since 1990, Sectra has played a role in the design and planning of transport in Santiago, including the establishment of the city's first competitive tendering scheme for public transport. Subsequently, Sectra released its *1995-2010 Development Plan*, which set system goals for limiting car use and maintaining public transport mode split (Sectra, 1995). The *Development Plan* was multi-modal, coordinating enhancements to the roadway system with the expansion of public transport (Rivasplata, 2010).

A principal element of the *Development Plan* has been the construction, improvement and operation of a comprehensive network of roadways. Through an elaborate set of Public-Private Partnerships (PPPs), this set of thoroughfares and freeways has provided improved connectivity throughout the area. In the past decade, many of these freeways have been financed through electronic toll systems, providing some of the tools necessary to also introduce congestion pricing.

The *Development Plan* introduced market-oriented mechanisms for electronically charging freeway users, requiring that all vehicles, except buses and other essential fleets pay a user charge (US$4). Subsequent proposals called for implementing a variable road use charge of up to $4 per kilometre, based on time of day and level of congestion; as well as parking charges, based on trip purpose and duration of stay (O'Ryan et al., 2002; Mahendra, 2008). Thus far, supporting legislation has been

stalled in Congress.

## 5. Discussion

While São Paulo, Santiago and other regional cities have implemented vehicle restrictions to offset growth in car use, no city in the region has adopted and implemented a congestion pricing programme. There appears to be growing interest in some areas and experience has shown that congestion pricing schemes can achieve desired results. However, the political will to proceed is lacking (Mahendra, 2011).

In both case cities, transport experts are fully aware of the costs and benefits of implementing a congestion pricing scheme (Mahendra, 2008). Prior to implementing a programme there are clear issues that need to be resolved, including:

- the geographic area or areas to be targeted for congestion pricing;
- the granting of exemptions to certain groups;
- the reliability of existing car registration information;
- the method of electronic pricing;
- the funding strategy for establishing a programme and providing for operation and evaluation;
- the estimation of costs and revenues, based on pricing scenarios; and
- the strategy for covering administrative costs and applying programme revenues to other projects.

These issues may prove challenging, but can be resolved, either in favour of implementing a congestion pricing programme, or in support of not implementing such a programme. After all, not all cities in the region would necessarily benefit from such a scheme and a great deal of caution should be taken. First, we have seen that these systems are expensive to establish and maintain and some countries cannot afford them. Second, it may be problematic to implement this programme where there is little information linking vehicles to their owners. Third, estimated programme costs may be too high to recover through a variable fee schedule. Finally, in light of political uncertainty, there may not be a solid commitment on the part of authorities to see that these charges are enforced.

In the event that congestion pricing is determined to be a viable alternative, what may be most challenging is securing solid, long-term political support. Experience has shown that it is essential that one or more influential political figures strongly support them, and that a long-term political commitment is secured. Without this vital support, a congestion pricing programme cannot be expected to survive, particularly where there is a strong car lobby. The political champion must take a strong and unwavering stand in favour of congestion pricing, convincing the public of its benefits and costs (e.g., Ken Livingstone in London).

In the past year, there have been indications that the mood may be shifting. There appears to be a growing acceptance of the need to implement congestion pricing in congested cities. Some decision makers, hesitant in the past to support congestion pricing, have either promised to seriously consider it, or have gone on record in favour of it. In Colombia, the Deputy Minister of Transport and the Mayor of Bogota now support congestion pricing. In Chile, the Minister of Transport commissioned an in-depth study to determine the merits of a congestion pricing scheme (Pinochet and Sottorf, 2012).

## 6. Conclusion

Latin America, like other regions in the developing world, has seen explosive growth in motorisation, resulting in increasing levels of congestion; ongoing traffic fatalities and injuries; and pollution. Nowhere has this been more evident than in the primary urban centres, where daily travel is

challenging. Recently, planners and decision makers have explored low-cost, demand-side strategies of managing congestion.

While many TDM measures are incentive-based, vehicle restrictions and congestion pricing are intended to discourage private vehicle use. In particular, pricing can be a very effective tool for discouraging the use of the private vehicle in many industrialised countries of the world. In this sense, congestion pricing can effectively discourage a resident from entering a specific area (or even from using the car), especially where other, supporting measures are employed. In the case of congestion pricing, it is essential that an integrated set of public transport services provide the general public with alternative means of transport.

In their efforts to make transport more sustainable, São Paulo and Santiago have attracted interest in vehicle restriction, capturing the attention of environmentalists, as well as metropolitan decision-makers. Perhaps, the fact that these cities are located in emerging, middle-income countries strengthens the argument in favour of establishing a congestion pricing programme. Each city has a network of regional roads, highways and public transport for testing and implementing congestion pricing.

Based on an analysis of these cities, this paper concludes that congestion pricing may offer an alternative to some of the cities experiencing severe traffic congestion and/or environmental degradation. However, each city is unique and should be carefully assessed to see whether congestion pricing is an appropriate alternative. If certain constraints prevent provisions from being implemented, congestion pricing may fall short of its expectations.

While vital, the mere adoption of a programme does not guarantee widespread success. First, it is essential that programme planners seek input from government agencies, transport experts and the public. This process will help planners explore the alternatives for implementing a pricing programme within a set of constraints. Second, it is important to analyse the impacts of congestion pricing schemes on the transport system and to compare future system scenarios with and without congestion pricing. A major step in this analysis will be to estimate the general costs and benefits of specific congestion schemes and their role in reducing congestion, improving air quality and reducing traffic injuries and deaths.

Past experience has shown that the success of a pricing programme is often dependent upon the level of commitment on the part of all parties involved. Where congestion pricing strategies are embedded in a larger transport plan process, it is easier to maintain that level of commitment, as long as there is political and financial support. In contrast, stand-alone congestion pricing schemes can discourage driving, but without accompanying measures (e.g., an enhanced set of public transport services), they may be limited.

Finally, implementation of a congestion pricing programme should be carefully planned, and if appropriate, carried out in stages. While there are advantages to bringing everything to fruition (e.g., equity, economies of scale), staged programmes can reduce the risk of failure and allow authorities to claim success. A large part of the initial, London pricing zone was implemented at one time, requiring a concerted effort on the part of planners, technicians and authorities to ensure its success. Not all cities in Latin America have the resources to pull off such an effort.

Regardless of these limitations, all major urban regions should pledge to improve the quality of life of residents and visitors through the development and implementation of TDM measures that include some form of congestion management.

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