A Study on Urban Transportation Evolution in Latin American Mega-Cities

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Abstract: Urban transportation is one of the most important policy issues for many cities in the world, and Latin American cities are not exceptions. Urban population in developing countries has increased rapidly in the recent decades and there are more mega cities now in developing countries than in the developed countries because of the concentration of urban population into major cities. This paper examines the urban transportation evolution of Latin American mega cities and intends to identify specialties of those cities through the comparisons with world large cities, particularly, Asian mega cities. Some successful experiences to improve the urban transportation situation in Latin American cities are identified. But in general term, most of these cities are still facing a vicious circle of urban transportation problem. As the conclusion of this paper, some alternative policies will be suggested which can potentially turn the vicious circle into a positive spiral.

Key Words: Latin American Mega Cities, Urban Transportation, Transport Policy, METRO

1. INTRODUCTION

1.1. Back Ground of the Research

Urban transportation is one of the important policy issues in mega cities in the world. In Latin American cities, urban transport problems such as traffic congestions, traffic accidents and traffic related environmental pollution are threatening the prospect of sustainable urban transport. Policy makers have realized the importance of addressing these problems with utmost urgency. As in the case of other region, the mega cities in Latin America spread over an extended metropolitan area usually consisting of many administrative units such as cities and municipalities. This requires policy makers to deal with urban transportation issues at the metropolitan level rather than individual cities.

While discussing the recent evolution of urban transportation in Latin America, the case of Curitiba city in southern Brazil always comes first for the successful development of comfortable urban space by strict urban planning and innovation of public transport. Many
Latin American cities have followed Curitiba mainly by introducing public transport inspired by Curitiba’s Bus Rapid Transit (BRT) system. Although those attempts made certain improvement of the traffic congestion, given the increasing pressure from the use of private automobile, BRT alone may not be effective in providing long-term solution on a sustained basis (Cervero, 1998).

1.2. Rationale of This Study

The first author has lived in Latin America for seven years from year 1999 to 2007, visiting different cities. The different development of the cities; even though it is grouped as “Latin America”; motivated the author to carry out academic research on urban transport aspect of those cities.

This paper compares the indicators introduced in the Study named “Sustainable Transport for East Asian Megacities (STREAM)” by EASTS International Research Group which studies Asian rapidly emerging mega cities. This paper primarily intends 1) to identify characteristic of the Latin American mega cities by comparison with other cities in Asia and other region, 2) to research the evolution of urban policy and transport policy, and 3) to suggest required transport policy in Latin American mega cities.

Eight Latin America cities as shown in the Table 1 are considered in this study. First seven cities are the 7 largest cities by population, and Cuitiba is included because it has been a model in recent years for other cities for its successful experience with BRT based city planning.

<table>
<thead>
<tr>
<th>City (Metropolitan)</th>
<th>Country</th>
<th>Metropolis Population (hab. millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico City</td>
<td>Mexico</td>
<td>19</td>
</tr>
<tr>
<td>Sao Paulo</td>
<td>Brazil</td>
<td>19</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>Argentina</td>
<td>13</td>
</tr>
<tr>
<td>Rio de Janeiro</td>
<td>Brazil</td>
<td>11</td>
</tr>
<tr>
<td>Bogota</td>
<td>Colombia</td>
<td>8</td>
</tr>
<tr>
<td>Lima</td>
<td>Peru</td>
<td>8</td>
</tr>
<tr>
<td>Santiago</td>
<td>Chile</td>
<td>6</td>
</tr>
<tr>
<td>Curitiba</td>
<td>Brazil</td>
<td>3</td>
</tr>
</tbody>
</table>

2. LITERATURE REVIEW

World’s urban transportation trend is summarized by reviewing Urban transport and the environment written by ITPS and Managing Traffic Congestion written by International Working Group of OECD/ECMT Transport Research Center.

ITPS/WCTRS (2004) outlines that the world’s urban transportation policy trend has been continuously changing in order to respond the emerging issues at the given time. In 1970s, Traffic System Management (TSM) was the mainstream policy, which focuses on the improvement of road capacity at low cost by means of modifying intersections or introducing signal controls. In 1980s, TDM (Traffic Demand Management) entered the policy mainstream, which works on the cause of traffic demand. Recently, ITS (Intelligent Transportation System) is increasingly emphasized in order to improve the efficiency of automobile use. OECD/ECMT (2007), on the other hand, suggests that an extreme traffic congestion has to be avoided meanwhile a certain level of traffic congestion should be tolerated in mega cities. It emphasizes that only integrated or combined policies could deliver
an effective solution and not individual policies, although there are wide varied options to deal with such an extreme traffic congestion.

Sustainable Transport for East Asian Megacities (STREAM), an international collaborative research study, examined the cases of Asian mega cities, which have experienced serious urban transportation problems together with a rapid increase of population and growth of the city. In order to present the underlying mechanism of the urban transport problems, STREAM study employ the concept of System Dynamics (Sterman, 2000) and explains the dynamics of urban transportation by a diagram as shown in the Figure 1. The figure depicts various feedback loop mechanisms, most are of reinforcing nature as indicated by positive loop polarization (only one of balancing nature). For example, the feedback loop consisting of car use, public transport ridership, service quality of public transport and back to car is a reinforcing feedback loop. If the magnitude of any element in this loop is increased or decreased, then the effect is transmitted through the loop and comes back to the first element with further increase or decrease in magnitude, that is change in any loop element produces reinforced effect (more change) through the feedback dynamics. If car use is increased, public ridership decreases causing decline of public transport service which further increases car use. In the diagram, the sign of arrow linking two elements indicate positive or negative causal relation. Polarity of loop (shown at the middle of loop) is determined by multiplying sign of all causal links. In the loop mentioned above there are two negative signs and one positive sign product of which (-, -, +) is positive. Hence the polarity of the loop is positive, which means the effect of feedback dynamics is to amplify changes in any part of the loop. That is why such loop is termed as a reinforcing feedback loop. In contrast, balancing loop has negative polarization which means the effect of feedback dynamics is to resist the changes in any part of the loop.

![Figure 1 Dynamics of Urban Transportation Feedback Structure (Source: STREAM)](source)
The positive and negative feedback loops should not interpreted as something good or bad. The positive feedback loop is of reinforcing nature and depending upon the situation can run
as a vicious or virtuous cycle. The reinforcing loop mentioned above is unfortunately running as a vicious cycle in most developing countries cities. The same feedback loop can also be run as virtuous cycle, for example if the quality of public transport is significantly improved (say by introduction of MRT system), then intensity of car use decreases leading to higher ridership of public transport and further improvement in the service quality of public transport. As we can see, all positive feedback loops shown in the diagram are running as vicious cycle in the case of Latin American mega cities. The policy challenge, therefore, is to implement policy measures (as shown in the diagram) in order to turn the vicious cycles into the virtuous ones.

Further more, STREAM study suggests that in order to realize a sustainable urban transport (high share of public transport in modal share), appropriate policy measures need to be identifies and what is even more important is to implement the policies at appropriate timing. This concept is shown in the Figure 2. The figure explains that under the business-as-usual scenario (do-nothing path), the modal share of public transport in mega cities is likely to decline and eventually hits rock bottom. However, it is possible to recover a high share of public transport if adequate policies are implemented at an appropriate timing, when the public transport modal share is started to decrease. But it may be impossible to go back on to the desirable path or even achieving a moderate level of mode share can become a big challenge (this mean that the city becomes car based city like US cities). For the practical purpose, the timing can be represented in different indicators such as population, income per capita, car ownership rate, and so on.

![Figure 2 Timing of Policy Implementation and its Effect (Source: STREAM)](image)

3. CHARACTERISTIC OF LATIN AMERICAN CITIES
Population density is one of the important factors for urban transport system. It has different effects on the competitiveness of private and public mode. While higher population density can make public transport operation competitive due to higher potential ridership, it can result in traffic congestion due to large number of car users. On the other hand, low population density does not support public transport and encourage motorization. Figure 3 shows the comparison of cities’ population density. Latin American cities are at around 90 inhabitants/ha that is similar to Tokyo, less than other Asian cities and higher than US/Europe cities.

![Figure 3 Population Density of Cities (Source: UITP, 2001)](image)

While examining the evolution of urban transport system, we must look at the historical pattern of urban development, particularly the speed of urbanization or city growth. The Figure 4 shows the time period taken by each city to become 5 millions population from 1 million. It took around 35 years to reach 5 millions in Latin American cities where a half or a full century in US/Europe cities. Latin American cities took little longer than that in Asian cities. This means that the speed of population increase in Latin America is at between US/Europe and East Asian developing countries. The direct implication of such higher speed of city growth in developing countries is that the government had to face with multiple needs of transportation and other social infrastructures simultaneously over a very short period of time.

![Figure 4 Years that City took to became from 1 millions to 5 millions Population (Source: Latin American Cities: Statistic Office in each country, Other Cities: STREAM)](image)

As the urban transport system is intricately related to city structure, what is also important is the spatial pattern of population growth in a city. The Figure 5 compares the trend of population in city core and suburban areas in Latin American cities. Y-axis shows population...
and X-axis shows the time in year. In Buenos Aires Metropolis, the population of Buenos Aires city (metropolitan core) was saturated by year 1940 and the growth in metropolitan population occurred in suburbs in the last half century. The same situations are observed in Mexico City, Sao Paulo and Rio de Janeiro since 1980s. The total population of suburbs in Mexico City Metropolis overturned the Mexico DF in 2000. It is likely happen in near future in Sao Paulo and Rio de Janeiro Metropolises too.

![Figure 5 Population Increment in Metropolis (Source: ECLAC Statistics)](image)

4. URBAN POLICY IN LATIN AMERICA

The large disparity in income distribution in developing countries poses special challenges in terms of providing affordable and efficient urban transport services. The equity issue has recently drawn much attention while discussing urban transport policy agenda (Vasconcellos, 2001).

As for poverty situation, Latin American countries’ inequality is more than that of Asia or US/Europe countries in the comparison of GINI Index. For the poor, public transportation is the only means of mobility other than on foot. In Latin American countries, the poor rural inhabitants go to big cities for job hunting and usually live in poor communities in suburbs with dismal public services such as public transport, roads, water and sanitation services and energy. Typical examples are favelas in Brazil or Pueblos Jovenes in Lima, and it is observed in other cities in Latin American countries’.
In this chapter, the evolutions of urban policies in the 8 candidate cities are summarized. Most of Latin American mega cities were established in 1500s as the administrative centers of colonial regimes by Spain and Portugal. Brasilia – the capital of Brazil is created in 1960 and it is unique to be such important city with very short history in comparison to other cities. Colonial style is observed in city centers that are represented by narrow paths. Inflow of rural population to urban city is started in the beginning of 1900 in Buenos Aires, and other cities followed it by the middle of 20th century (Figure 7). In comparison with Asian cities, physical damage by two world wars was insignificant in Latin American Cities. On the other hand, some cities such as Lima and Mexico city, experienced catastrophic damage in city centers by earthquakes. Bogota lost many building by the fires during farmers’ commotion due to a assassin of their leader in 1940s.

Those cities such as Sao Paulo, Buenos Aires where railway were developed from the end of 19th century and Rio de Janeiro where tram system was introduced, started its urban development along the railway. However the speed of urban population growth from the middle of 20th century was extremely fast and did not allow the cities to develop in an orderly manner. Lima and Bogota developed new urbanizations in the beginning of 20th century by the initiative of both government and private. Land use planning was not respected or did not exist and then the green areas were changed into built-up urban area (Figure 8).

The above mentioned cities had to struggle to catch up with the rapid increase in demand during the last half a century. The rapid spread of motorization from 1960s encouraged municipal governments to promote road oriented transportation. The lack of land use plan or control caused sprawl phenomenon. In 1970s, new inter municipal entities were created as metropolis emerged and the necessity of integral land use plan and transportation policy were pointed out. Among Latin American cities, an exception is observed in Curitiba from the year 1960 with its strong control and management of the land use together with the provision of high quality public transportation service.
5. URBAN TRANSPORTATION CHARACTERISTIC IN LATIN AMERICA

Discussion on the characteristics of cities in terms of urban development was made in the previous chapter. In this Chapter, comparison of urban transportation in Latin American cities is made with respect to 4 different indices. First, a comparison of environmental condition and average speed on public road is shown in the Figure 9.

Latin American cities’ average speed is at between 20 km/h and 30 km/h which is faster than Asia and slower than US/Europe. Particulate Matter (PM10) is used for the index of environmental conditions. As in the case of average speed, Latin American cities are
positioned between Asia and US/Europe cities when it comes to the environmental condition. The air pollution is a serious problem in all Asian and Latin American cities listed for the comparison because the values of PM10 in those cities exceed recommended value (20mg/m3) by WHO. It is possible to observe correlation between air pollution (reduction) and average speed (faster). This means that achieving faster average speed by reducing the traffic congestion could relieve environmental burden.

The third index is public transportation's modal share as shown in the Figure 10. Latin American cities has high share of public transportation which the same as in other developing countries. From the Figure 11, we can see that the public transportation modal shares in Latin American cities are even higher than in Asian cities. A contrast is observed in the two-wheeler (bicycle and motorcycle) use between Latin America and Asia. Two-wheeler share in Latin American cities is much lesser than 10% except Lima, and conversely it is one of the principal modes in Asian countries led by Ho Chi Minh City with over 90% of share.

Figure 10 Public Transportation Modal Share by Region (Source: UITP 2001)

Figure 11 Modal Split of Latin American and Asian Cities (Source: Latin America: Statistics Bureau, Others: STREAM)
Looking at the time series trend of modal split in a city, a more problematic pattern emerges. In Latin American cities, over the time, the share of bus tends to decrease and on the other hand, automobile’s share is in growth. The Figure 12 shows the case of Sao Paulo where the change is more significant than in other cities.

The last comparison in this Chapter is by car ownership. The Figure 13 shows the trend of car ownership in Asian and Latin American cities. All cities show a sustained trend of increasing car ownership rate. Figure 14 compares the number of passenger vehicles per kilometer of road in different cities. In some cities such as Sao Paulo, Mexico City and Bangkok, the roads seem to be saturated due to either too many vehicles in the city or lack of road space. On the other hand, Curitiba, Bogota and Shanghai compose a group of less saturated cities. The Figure 15 (left) is a comparison of car ownership and income per capita among worlds’ cities. Both of Asian and Latin American cities are distributed at low income level, and Latin American cities are positioned at higher car ownership rate in comparison with Asian cities. The graph shows a clear proportional relation telling that the increase of income per capita causes increase in car ownership rate. From the experience of developed countries in US, Europe and some Asian developed cities, it is natural to assume that the car ownership rate will increase in Asian and Latin American cities as income increases.
The Figure 15 (right) is a comparison between urban population density and car ownership rate in world cities. Latin American cities are at lower density than Asian cities. But the car ownership rate is not that high despite lower urbanized density. This pattern has important implications for urban transport policies in these cities. Depending on what types of policies and plans are going to be implemented, the future trajectory of urban transport system in these cities will be decided. They have options to make a choice between low density urbanization dominated by private automobile (patterns of most North American cities) or maintaining or increasing urbanized density promoting use of public transport (case of developed Asian cities).

Despite the car ownership is higher in Latin American cities than in Asian cities, the public mode share is still higher. Few cases it may be explained by a high quality service in public transport service which attracts car-owners to use public modes. If not, this can be explained by the way of transition of users from poor to rich. As it is shown in the Figure 11, two-wheeler mode is significant in Asian cities. The poor who does not have any choice than public transport shifts to two-wheeler users before getting own cars (Poor: public transport ⇒ two-wheeler owner ⇒ car owner) in Asian cities. This is not observed in Latin American
To outline the Latin American mega cities’ evolution, in the beginning of 20th century, the public transport mode was tram, which was replaced by motor engine. Private bus operating companies appeared in 1920s and the competition tends to decrease and on the other hand, the automobile’s modal share and car ownership are in increase trend. However, with appropriate policy measures, Latin American cities can follow the path of sustainable urban transport putting break on the increasing trend of motorization and resulting modal shift from public transport to private mode.

6. URBAN TRANSPORTATION POLICY IN LATIN AMERICA

The present urban transport system in each city is in fact a result of an evolutionary process which involved diverse policy measures implemented in the past in order to improve urban transport situation. The transportation policy evolutions in all 8 candidate cities from the beginning of 20th century are summarized in the Table 2.

<table>
<thead>
<tr>
<th>City</th>
<th>Policy Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buenos Aires</td>
<td>1932 - Start private bus service (Public transport option provided)</td>
</tr>
<tr>
<td></td>
<td>1950 - Urban Railway established</td>
</tr>
<tr>
<td></td>
<td>1960 - Metro construction</td>
</tr>
<tr>
<td></td>
<td>1970 - Integration of public transport service</td>
</tr>
<tr>
<td></td>
<td>1980 - Promotion of public transportation integration</td>
</tr>
<tr>
<td></td>
<td>1990 - BRT introduced</td>
</tr>
<tr>
<td></td>
<td>2000 - Public Transport Integration</td>
</tr>
<tr>
<td></td>
<td>2005 - Implementing BRT and public transport integration</td>
</tr>
<tr>
<td></td>
<td>2010 - TransMilenio (BRT) introduced</td>
</tr>
</tbody>
</table>

Table 2 Evolution of Transportation Policy in Latin American Mega Cities

To outline the Latin American mega cities’ evolution, in the beginning of 20th century, the main public transportation mode was tram, which was replaced by motor engine. Private bus operating companies appeared in 1920s and the competition
between tram and bus got stronger in 1940s. At that time, the bus service claimed the major share because of the flexibility in service routes. This competition ended in 1950s with the resulting bankruptcy of tram companies. After that the motorization era started in 1960s and the public investment policy for infrastructure was shifted quickly to road construction. In parallel to the continuous investment in roads in 1970s, in some mega cities, subway systems were introduced. In 1980s, urban transportation master plan was prepared in different cities. In the same time, long distance bus service and management were improved by construction of bus terminals. On the other hand, such long distance buses were prohibited to enter into the city center. The wave of privatization of public transportation including subway service reached Latin America in 1990s. The need of public transportation service integration was highlighted in the beginning of 21st century. Efforts were accordingly made in improvement of infrastructures to achieve seamless transfer among different modes, introduction of flat tariff or discount among different modes and so on.

There are also some special events or other specific characteristics of each city which exerted significant impacts on the evolution of urban transport system. Subway in Buenos Aires was opened in 1913 as the 13th subway system in the world. Dedicated bus lane was constructed in both Lima and Curitiba in 1970s. An interesting contrast is observed in the development of these two cities. Curitiba became world famous for the successful bus service introducing bi-articulated bus and strict land use plan, and Lima remained with an inefficient bus service with competition of taking passengers among route buses. In recent years under the process of public transportation service integration, BRT route are constructed to complement the subway routes in Sao Paulo, Santiago and Mexico City. It is a policy initiative taken in order to enhance the integrated public transportation service rather than to encourage the competition among public transportation modes.

The successful application of BRT system in Curitiba and Bogota contributed much in popularizing an innovative bus-based public transport system. Drawing inspiration from experiences of these Latin American cities, cities across the world are making efforts to implement BRT system. In both of these cities, BRT is implemented as the backbone of the public transport system. Features like lower capital cost, high quality service, higher capacity (than traditional bus) and flexibility in operation made BRT an attractive option for financially stressed developing cities. It should be recalled that Curitiba and Bogota enjoy its low number of vehicles per kilometer of road as shown in the Figure 14 that may have allowed BRT system to occupy road space. Some BRT proponents even claim that, through innovative design, BRT system capacity can reach as high as that of heavy rail citing the ridership of Bogota BRT system which recorded over 43,000 PHPDT in Caracas Route where full four lanes are dedicated only to the BRT service. However, many observers find such claim an exaggeration of effectiveness of BRT (Vuchic 2005). Gilbert (2008) pointed that Bogota BRT is already over-crowded due to lack of capacity and there is a constant debate on if the city needs to build high capacity rail-based MRT to serve as the major backbone. Likewise, Curitiba, which is smaller in population size, is experiencing rapid motorization and even BRT operator admits that without high quality MRT, it is not possible to compete with private car (Lubow 2007). BRT is therefore an innovative instrument to improve public transport system, but its limitation should also be realized. It may not be possible to dedicate multiple lanes of road space for BRT in every location of all cities, especially given the fact that the road traffic is already under severe congestion. It is interesting to note that Latin American mega cities are moving toward the combination of BRT (medium – low capacity) and MRT (high capacity) systems composing an integrated urban public transportation system even though the ways vary from the case by case.
7. PUBLIC TRANSPORTATION COMPANY OPERATION

Despite the fact that urban transport broadly falls under public goods category and is considered a responsibility of public sector, financial balance and commercial viability of public transport operation is recently debated as an important issue. Figure 16 shows the balance between revenue and operation cost of public transport operation. Latin American mega cities except Mexico City register surplus in the operation balance. In particularly, Bogota recorded revenue over 200% of operation cost. The service operation of subway system in Santiago and Buenos Aires is run by private company under concession contract for 20 years. Subway fare in Mexico city is one of the lowest for a ride (2 Mexican Pesos = US 20 cents) which recorded the same level of financial balance as NY, where the fare is 2 USD for a ride. Mexican subways’ efficiency is explained by the fact that the number of passenger per operative kilometer of subway is much higher than that of USA (Figure 16).

![Figure 16 Public Transportation Operation Balance (Source: UITP 2001)](image)

The Figure 17 makes a comparison of operation length of MRT system and number of passenger.
passengers among world’s mega cities. The lengths of MRT in Latin American cities are one-fourth to one-eighth of US/Europe and Asian developed cities. Passengers volumes in Sao Paulo, Mexico City and Curitba are at high level comparable with those in Tokyo and Seoul.

<table>
<thead>
<tr>
<th></th>
<th>Curitiba (BRT)</th>
<th>Sao Paulo METRO</th>
<th>Mexico City STC Metro</th>
<th>Rio de Janeiro Metro</th>
<th>Buenos Aires Metro/Conv.</th>
<th>Santiago METRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (km)</td>
<td>57</td>
<td>60.2</td>
<td>201.7</td>
<td>35.8</td>
<td>42.2</td>
<td>60</td>
</tr>
<tr>
<td>Ridership (millions/year)</td>
<td>446</td>
<td>1,936</td>
<td>1,416</td>
<td>129</td>
<td>253</td>
<td>267</td>
</tr>
<tr>
<td>Ridership rate (millions/km/day)</td>
<td>21</td>
<td>25.6</td>
<td>19.3</td>
<td>9.9</td>
<td>16.4</td>
<td>13.4</td>
</tr>
<tr>
<td>Operation Income</td>
<td>807,332</td>
<td>2,743,185</td>
<td>322,172</td>
<td>247,538</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income/Cost</td>
<td>0.88</td>
<td>0.39</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fare (local currency)</td>
<td>1.9 R</td>
<td>2.3 R</td>
<td>2 peso</td>
<td>2 R</td>
<td>0.7 peso</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>4.0 R (bus)</td>
<td>2 peso</td>
<td>3-3.7 R(bus)</td>
<td></td>
<td>0.7 peso</td>
<td></td>
</tr>
<tr>
<td>Fare (US$ Equivalent)</td>
<td>1.09</td>
<td>1.31</td>
<td>0.19</td>
<td>1.14</td>
<td>0.22</td>
<td>0.86</td>
</tr>
</tbody>
</table>

Table 3 Operation Record of Public Transportation (Webpage of Public Transportation Company)

The Table 3 compares price of subway (BRT for Curitiba). All cities used in the comparison offer a flat fare system. Fare levels in Mexico city and Buenos Aires stand out as one of the lowest. Sao Paulo and Rio de Janeiro employ a flat fare for BRT too, and offer discount price if the passenger transfers from one mode to the other mode of public transport.

8. CONCLUSION AND DISCUSSION

Latin American cities are positioned between US/Europe cities and Asian developing cities in the terms of historical evolution and actual situation according to the compared factors. The exception is inequality and Latin America is the worst. Sprawl phenomenon is more frequently observed in Latin American cities than others. Some cities in Latin America are facing a vicious cycle of worsening urban transport condition. The modal share of public transportation is in decreasing trend and, in contrary, the auto vehicles’ ownership and modal share is growing.

Finding of this research is summarized mainly in terms of three policy relevant insights generated. First, there is real possibility that Latin American cities might move along the trajectory of lower urbanized density and higher rate of car ownership eventually adopting a car oriented urban transport system with significant socio-economic and environmental costs. On the other hand, they can follow more sustainable path by implementing appropriate policy measures, such as controlling car ownership and usage rate and promoting urban development along MRT lines in order to avoid sprawl phenomenon.

Secondly, the trend of decreasing public transportation modal share may justify the implementation of policies to improve the quality of public transportation. The target population is the “selective” middle class who can own automobiles but do not demur to take public transportation if the service quality is at acceptable level. Mega cities in Latin America seem to go a right direction by integrating the public transportation modes since the beginning of 21st century. The challenge is how to make such efforts sustainable. Potential risk may come from flat fare policy with significant implication on financial condition of public transport operation. It appears that the underlying motivation for this policy is to offer
subsidized fare to the poor people who generally live in suburbs of large city. More efficient ways of subsidizing poor people need to be explored as the flat fare is, in principle, not an efficient fare.

Thirdly, sustainability and poverty is another issue. Operating companies or owners encounter a trade off between requirement of low fare considering the poor class users and the requirement of high quality of service level that require more investment and consequently the need of fare increase. It is demonstrated in Latin American cities such as Curitiba and Bogota in the recent decades that one of the most effective solution to this trade off is to apply medium (but larger than conventional buses) capacity BRT which initial cost is less than MRT for transition period. Special purpose taxation on the ownership or usage of automobile may be justified because richer people have more access to own automobile. Revenue should be redirected to subsidize public transport operation so as to make it affordable for poor people.

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