Reduction of Traffic Congestion in Colombo City by Improving Public Bus Transport

W. Janaka Weerawardana

PhD Student
Department of Transport and Logistics Management
University of Moratuwa
Sri Lanka

Abstract

The motorisation within Colombo city has increased with the increase of travel demand as many people refrained from using public transport mainly due to its inefficiency and poor quality. However, the increased motorisation has lead to many negative implications such as congestion, environmental pollution, road accidents, etc. Thus introduction of an efficient and high-quality public transport system capable of attracting private vehicle users has become an urgent need. This paper examines prevailing passenger transport demand, drawbacks and viable improvements required to the existing public bus transport in Colombo city.

Colombo City and its Transport System

Colombo is the largest city with an area of 37 km^2 and commercial capital of Sri Lanka with a city population of 647,100. Although the city limits are defined by the Colombo Municipal Council (CMC) boundary, its economic activities spread over Greater Colombo area which extends Kadawatha in the north, Kaduwela in the west and Moratuwa in the south.

It is also the centre of the economy in Sri Lanka as the major government and private offices, factories, hospitals, hotels, schools and a harbour are located within the city inducing a large daily regular travel demand towards the city. It also attracts a large number of irregular travellers since it links all parts of the country by keeping country's major road and rail passenger transport node within the centre of the city. Therefore, most of the passengers travelling between the western part and the rest of the country have at least to touch the Colombo city in their journeys.

Colombo has an extensive public transport system based on buses. The bus service is operated by both private and government-owned Sri Lanka Transport Board (SLTB). Train transport within the city is limited, carrying mere 10% of trips, since most trains are meant for transport to and from the city rather than within the city and are often over crowded. The central bus stand and the Fort railway station function as the island's primary hub for bus and rail transport respectively. Other means of transport includes three wheelers and taxi cabs. Three wheelers are entirely operated by individuals while cab services are run by private companies and are metered.

Travel Demand Management

There are 10 major entry corridors to Colombo city. An estimated number of 750,000 people arrive in the city by road in 200,000 vehicles daily. Of these, 11,000 are buses and 15,000 are goods vehicles. Presently, around 15% of the road space is utilised for bus transport even though it transports 62% of road passengers. On the other hand, 65% of the road space is used by private and hired vehicles which carry only 38% of the passengers[1]. Figure 1 shows the composition of city entry traffic flow and passenger share of each vehicle type.

All city entry corridors experience two major traffic peaks in the morning and afternoon. Obviously, school trips and work trips and jointly create the morning peak during 7.30 am to 8.30 am towards the direction of the city while the return school trips and work trips create congestion towards city outbound direction during 1.30 pm to 2.30 pm and 4.30 pm to 5.30 pm respectively. Typical representation of traffic flow on Colombo-Negombo is shown in Figure 2.

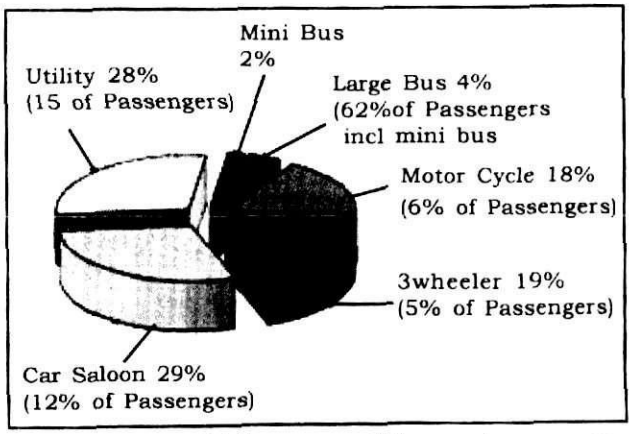

Figure 1 Vehicle composition and passenger share of each vehicle type at Colombo Municipal Cordon

Figure 2 clearly illustrates that the peak period congestion is purely created by private passenger vehicles such as motor cycles, three wheelers, cars and vans as their flow is always close to the total vehicle flow during the day. Therefore, congestion management should focus on reducing passenger vehicle entry to the city or else providing an adequate road way capacity for them.

Road capacity improvement is always a popular solution for mitigating traffic congestion. However, the road infrastructure in Colombo city and its suburbs cannot be further widened or new roads cannot be built to match with the rate of demand created by people who are shifting from public transport to private transport. The inability to obtain the required land for road space, parking spaces, etc. are fast becoming constraints, severely restricting the flow of vehicles exceeding the capacity of the road system. As a result, around 70% of the length of the national roads within the 10 km radius from the city centre is congested throughout the day.

Although restricting and discouraging using private vehicles especially during peak hours are considered as effective measures in traffic demand management, such intervention would not become popular unless good public transport system is ensured in the first place. Improvement of service quality of public transport would be another measure for attracting private vehicle users as they like to pay for their comfort. However, poor operational features associated with public bus transport at present will not encourage such modal shift.

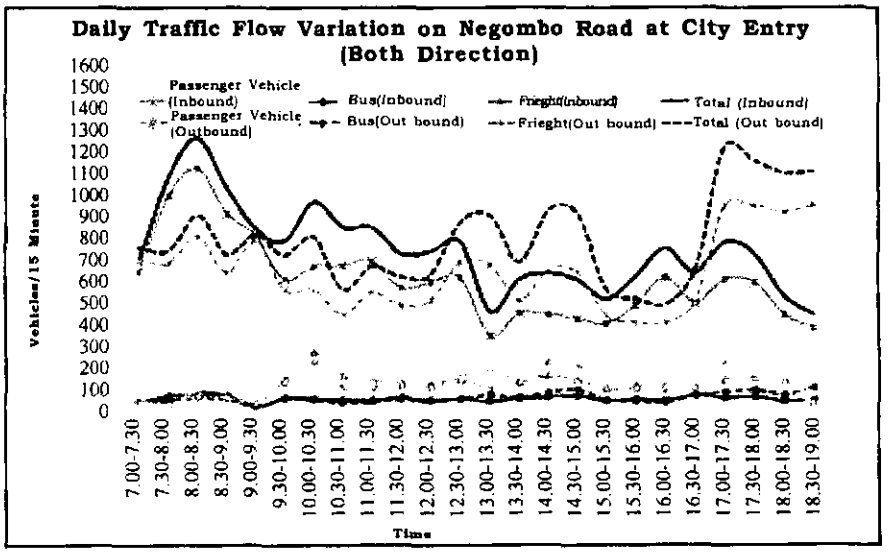

Figure 2 Traffic flow variation along Parliament road

Present Status of Public Bus Services

Colombo city is served by provincial and inter-provincial bus services operated by private- and State-sector buses. Individual operators in the private sector provide inter-provincial and intra-provincial services under the supervision of National Transport Commission and Western Province Passenger Transport Authority respectively. The Sri Lanka Transport Board functions as the State-sector operator and provides both types of services.

The following key weaknesses associated with the public bus transport at present make the people to go away from it:

i. Overloading and lingering: Although the operators tends to move from low-occupancy buses to high-occupancy buses during the last few decades, still both private and public sector operators have not been able to handle the growing travel demand, especially during the peak periods of the day. As indicated in Figure 3, the load factor (demand/supply) of public buses operating on major city corridors stay above 1 for most part of the day and exceeds 1.5 during the peak periods.

In addition to the demand increase, highly profit-seeking behaviour of the private-sector operators has made them to overcrowd their buses in each trip creating unpleasant experiences for the passengers. Overcrowding generally occurs at intermediate bus stops resulting in delaying journey unnecessarily. Thus, increasing passenger carrying capacity would not become effective unless it is supported by proper regulatory and monitoring framework.

ii. Inefficient orientation of city services: At present, buses from 166 of inter-provincial routes and 98 of intra-provincial routes enter the Fort and Pettah area daily. Among 98 intra-provincial bus services, 95 uses the bus stands in Fort and Pettah area as their one end of the route while other three routes just touching the area. Arrangement of intra-provincial bus service in Colombo city is illustrated in Figure 4.

Both inter- and intra-provincial bus routes within the city limits are arranged in a radial network concentrated towards the Fort and Pettah area. Such arrangement leads to overlapping of a number of routes on a single corridor, particularly close to the city centre. Overlapping of routes reduces the overall efficiency of the network and also increases the traffic congestion while leading to higher fuel consumption and emission especially during the peak periods.

iii. Detouring for passengers: As mentioned earlier, orientation of the bus routes within the Colombo city is almost a radial network with minimum distributional routes. Sixty six (66) routes are operated between Fort/Pettah and out of

Colombo while only 2 routes between Fort / Pettah area and rest of Colombo Municipal Area. As a result, trip length and the travel time of bus passengers increase compared to the private vehicle users since, most of the time, bus passengers have to travel up to city centre to transfer to a bus which runs to their anticipated destination. The increase of trip length of bus passengers also causes overcrowding of the buses as the passengers have to occupy the buses for a longer duration until they reach their destination.

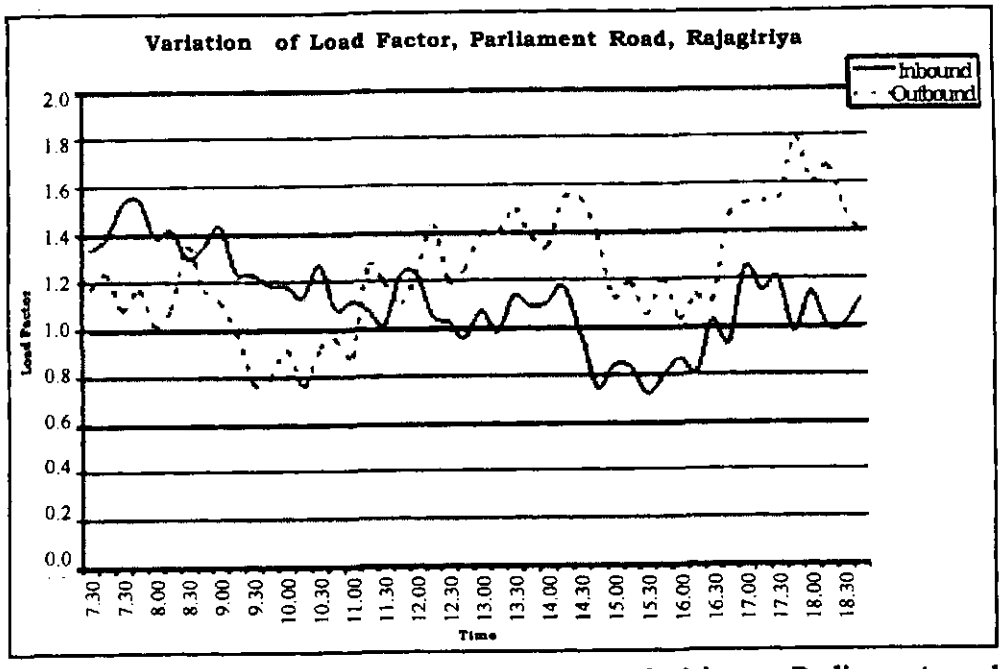

Figure 3 Typical variation of load factor at Rajagiriya on Parliament road

iv. Poor integration between long-distance and short-distance services: Generally, inter-provincial services do not intend to serve city while they are carrying passengers from outside of the province to the major terminals in Pettah and Fort. On the other hand, there are no proper transfer points to get their transfers to city service along the major corridors on which long distance services are operating. Therefore, such travellers coming outside also have to travel up to city centre or a near-by city centre to transfer to a city service.

Besides long distance bus services, rail also carries distant passengers from outside the city. None of railway station, at present, has been linked properly with a bus terminal to provide convenient transfer to a city service. Therefore, most of passengers, especially travelling on Puttalam and Kandy rail lines have used to come to Maradana and Pettah stations all the way in their journeys. Even the southern railway line passengers cannot have an easy transfer to a city bus service until they reach a near-by city centre stations such as Bambalapitiya or Kollupitiya as there is no any other close-by bus terminal before then.

Bus and rail passenger interviews conducted by the University of Moratuwa (UoM) in 2007 reveals that the intention of 43.2% of bus passengers and 46.9% of rail passengers arriving in terminals in Fort and Pettah is to transfer to local services as there is no proper integration of long distance bus and rail services with city services at any other bus and rail terminals within city limits.

In addition, transfer from one long-distance service to another is frequently happening at Fort and Pettah since inter-provincial services are also concentrated in the terminals in Colombo city centre. Therefore, a large number of passengers unnecessarily enter the city merely for the purpose of continuing their trips. The same interview conducted by UoM reveals that 53% of bus passengers and 37% of rail passengers come to Fort/Pettah with the intention of transferring to a bus going out of the Western Province. It reveals that there is a demand to decentralise long-distance bus services.

v. Poor service delivery: Besides overloading, the other key factor which takes high income group of passengers away from public bus transport is mental and other physical harassment inside the buses. The discipline-lacked bus crew often used to talk to passengers by harsh words and also they try to manipulate standees viciously. Noisy environment, abrupt breaking and turning also fed up the passengers enormously. Further, road revenue conflict among operators adds higher degree of contribution for the traffic congestion and accidents as well.

Measures for Improvement

Due to the continuous deterioration of the quality of public transport during the last few decades, it has been noticed that more and more passengers have been shifting from public modes to private modes and also some of them have been migrating to the city proximity to minimise the use of public transport for their travelling purposes. Such tendency has caused increasing the private vehicle fleet and the cost of living of people residing in Colombo

Metropolitan Region as most of them are daily Colombo city commuters. The household expenditure survey conducted by the Department of Statistics and Census in 2007 reveals that the people in Colombo Metropolitan Region spend higher amount of their earnings for housing, education and transportation compared to those in other provinces of the country. This indicates that public transport requires urgent reforms at present as an alternative intervention to reduce living cost.

Based on the worldwide practices and the country's own experiences, the following short-term and long-term interventions can be adopted for alleviating the above-mentioned shortcomings in the bus transport service:

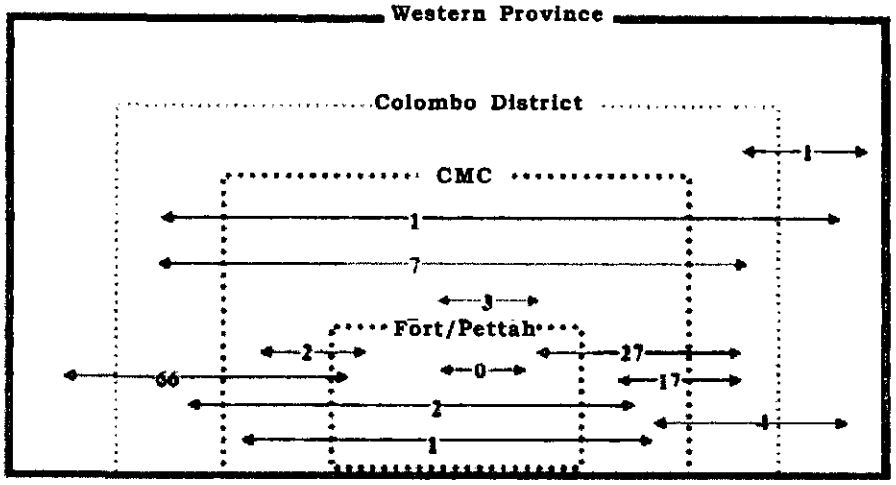

Figure 4 **Intra-provincial bus services serving Colombo district and Colombo city**

Short-term interventions

i. Premium services: Premium service is a luxury bus service targeting at high-income group of city commuters. Its main intention is to reduce the number of private vehicles which are having greater impact on traffic congestion especially during peak periods entering the city. Almost all private vehicle trips during peak hours are home-based trips and around 65% of them are home-based work trips. Such luxury service can be targeted at these regular travellers during the peak hours while the same buses can be operated for city shuttle service during the day time for official and business trips which also make local peaks. The high reliability and comfort of these services will be able to capture the targeted group of private vehicle users.

Due to the high quality of the service, operator has to charge higher fare than that for other public transport modes. As a result of higher fare, these services would not be able to capture the working population who are using public transport mode at present. A survey conducted covering several institutes in Colombo city revealed that, though present public transport users are interested in premium service, their "willingness to pay" for such a service is low compared to the private and hired vehicle users. As such, these services are limited for work and business trip makers who are presently using private and hired vehicles for their travelling needs.

Generally, these services should be started close to the city boundary where the congestion starts to build up and also parking facilities need to be provided for private vehicle users to park their vehicles at the terminal and switch to such premium service. Preliminary investigations of passenger behaviours revealed that Kadawatha, JaEla, Kaduwela and Moratuwa are strategically suitable locations to start these services.

ii. Development of bus terminals and overflow parks: Major bus terminals have to be upgraded with modern facilities for passengers and proper information display systems. Such interventions must also include facilities for bus crews as well. Terminal designs also should have proper traffic management plan to reduce conflict among passengers and buses within the terminal and congestion in the vicinity. Inter-linking Gunasinghapura, Bastian Mawatha and Central Bus Stands and rail station will considerably reduce the people on streets in the Fort and Pettah area while having comfort transfers to them.

Overflow parks should also be developed in parallel to the development of bus terminals. These parks should also be located in close proximity to the bus terminal with proper connectivity and communication with the terminal. If these overflow parks are located in reasonably away from the terminal, there must be a specific traffic arrangement plan for the movement of buses. This will reduce the unnecessary bus circulation within the city and consequently smoothing the traffic flow.

iii. Rail-bus coordination: As discussed earlier, majority of rail passengers now have used to come up to Maradana and Pettah to transfer to city service buses as there is no proper connectivity between rail and bus before then. Although places like Dematagoda, Kollupitiya and Bambalapitiya are having close-by rail station and bus station, there are no bus services covering rail passenger-desired destination at required frequency. Therefore, introducing coordinated bus services for rail passengers especially during peak hours would eliminate the congestion in the city centre bus terminals and stops. Related infrastructures such as terminals, parking places, waiting areas and information display systems also need to be included for such integration mechanism.

iv. Improvements to service delivery: Operational and non-operational interventions are required to improve the services. Introducing timetables which

eliminates road revenue conflict and unnecessary lingering at intermediate terminals and stops is a priority at present as an intervention for improving operational aspects of the public bus transport. For the effective functionality of such timetabling program, it is necessary to strengthen the prevailing regulatory and monitoring framework also. Further, introduction of high-capacity, buses for city services will also improve the operational quality of the services. Generally, now operators tend to shift to high-capacity buses as a result of relaxed taxation policy and concessions on high-capacity buses.

Training of bus crew for improving their public relation capabilities and professional skills are currently in progress with the National Transport Commission for inter-provincial buses. But, it needs to be strengthened to benefit the crews in intra-provincial services as well. As a part of this program, a code of ethics for bus operators is also needed to be introduced.

Long-term interventions

i. Re-planning of bus route network: As the Colombo city and its suburbs have undergone a significant land use changes during the last few decades, it is necessary to re-plan the existing bus route network to cater to the resulting change in passenger demands. Although, introduction of minor modification to the network for catering to the localised demand variations can be fairly effective in the short term, it is essential to conduct a total network analysis leading to complete revision to improve the performance of the overall network in medium to long-term basis. Such re-routing program should focus on the following aspects:

i. Minimising transfers by providing direct routes connecting potential trip generators and attractors

ii. Designing several city by-pass routes to minimise transfers at the city centre

iii. Minimising the number of overlapping routes to avoid congestion on city corridors

iv. Increasing the number of cross routes connecting to radial routes to make travel distance shorter and consequently to minimise travel time of passengers

v. Related infrastructure developments such as bus terminals and stops

vi. For the success of bus route re-planning, it is essential to assign required level of passenger carrying capacity and prepare fine-tuned time schedule for the services.

As route network revision is almost a planning and administrative intervention, it needs only a minimum level of financial investment.

ii. Bus Rapid Transit: Bus Rapid Transit (BRT) is a high-quality bus-based transit system that delivers fast, comfortable and cost-effective urban mobility through the provision of segregated right-of-way infra-structure, rapid and frequent operations, and excellence in marketing and customer service. BRT essentially emulates the performance and amenity characteristics of a modern rail-based transit system but at a fraction of the cost. A BRT system will typically cost 4 to 20 times less than a light rail transit (LRT) system and 10 to 100 times less than a metro system[2].

BRT needs to be operated in-between potential trip generator and attractors, and hence, operating such services from just outside the city and drive towards commercial and administrative centres within the city would be worthwhile. Therefore, services connecting Kadawatha, Pandaura, Maharagama to Fort/Pettah and Battaramulla would be appropriate. However, planning a BRT network should be carefully handled with proper assessment of passenger demand and ability to acquire dedicated right-of-way for the operation.

iii. Developing public transport services with Park and Ride: Park and Ride system allows people to park their vehicles and switch to the public transport. BRT and re-routing should become more effective as they are coupled with Park and Ride System. Such park and ride systems should be promoted outside the city where BRT and other major bus routes are started.

Conclusions

The poor performance of the public bus transport has become a major reason for traffic congestion during peak hours in Colombo city. The orientation of bus route network does not match with the passenger desires, and hence, leads to waste of thousands of man hours besides excessive use of infrastructure and limited resources such as fuel. In addition, poor quality of service delivery also takes people away from public transport and shifts them towards private transport modes. Such shortcomings associated with public bus transport can be eliminated effectively through several short-term and long-term interventions.

References

Institute for Transportation and Development Policy (2007). ***"Bus Rapid Transit Planning Guide"***, USA.

Kumarage, A.S., Weerawardana, W.J. (2009). ***"Research on Greater Colombo Traffic Management"***, Ministry of Transport, Sri Lanka.

Kumarage, A.S., Weerawardana, W.J., Liyanage, U.L. (2010). ***"Review of Sri Lanka Transport Sector"***, World Bank.

Pai, M., and Weerawardana, W.J. (2009). ***"Study on Bus Rapid Transit for Colombo City"***, Ministry of Transport, Sri Lanka.

Footnotes

[1] Research on Greater Colombo Traffic Management, Ministry of Transport, Sri Lanka, 2009.

[2] Bus Rapid Transit Planning Guide, Institute for Transportation and Development Policy, USA, 2007.