

Developing a Multimodal Transport Hub and Bus Service Improvements for Battaramulla

Waruni Jayawardane

University of Moratuwa, Sri Lanka

Amal S Kumarage

University of Moratuwa, Sri Lanka

1. Introduction

The term ‘multi-modal’ refers to the use of several modes. A multimodal hub is a place which provides ground facilities for multimodal transportation.

Battaramulla is a town located in the Western province, Colombo district under Kaduwela Municipal council which is 9.2 kilometres away from the commercial city centre of Colombo Fort. It is a junction connecting three major towns namely Rajagiriya, Kottawa, and Kaduwela. Currently, even though there are eight major bus routes passing through Battaramulla there are none which originate from or terminate at Battaramulla. This is because Sri Jayawardanepura Kotte which is also the administrative capital of Sri Lanka does not have a bus terminal.

Besides the Parliament, there are over 20 ministries located in this area providing employment to over 11,000 people. High trip-attractors such as the Department of Immigration and Emigration and the National Identity Card office are also located in Battaramulla. This area therefore attracts a large number of vehicles and passengers daily, resulting in average speed on main roads falling well below 20 kmph. As buses load and unload a large number of passengers along the roadside, this too contributes to traffic congestion. Growing passenger demand demonstrates that Battaramulla requires a better public transport network to provide better facilities and to attract more passengers to public transport. Hence, this study identifies the current demand and supply for Battaramulla and analyses them in order to propose potential bus service improvements. In addition, it focuses on selecting a suitable location among several candidate locations using multi-criteria analysis to develop the proposed multimodal hub which is also to connect to the proposed rapid transit system in the future.

2. Methodology

Thalangama North, Subhoothipura, Udumulla, Battaramulla North, Battaramulla South, Batapotha, Aruppitiya, Asiriuyana and Rajamalwatta Grama Niladari Divisions (GND) were selected as the study area, being the potential catchment

areas to be served by a transport hub. Primary data was collected from government institutions located within the study area to identify the passenger demand from employees and visitors. Secondary data from Household Visits Surveys (HVS) and Bus Volume Counts (BVC) data of Colombo Metropolitan Region Transport Master Plan [1] was also used. The plan of the proposed multimodal hub being developed by the Urban Development Authority (UDA) was examined to assess the suitability of the proposed location. Trip attraction and generations of the study area were identified together with their respective origins and destinations using the HVS data. Supply analysis of number of bus frequencies for each route serving Battaramulla was carried out using the BVC data. The JICA STRADA assignment model was used to identify the bus passenger demand and supply on the existing road network and Arc GIS was used to illustrate and identify the demand and supply for the new bus routes.

3. Results

The HVS data revealed that 85,833 household trips are attracted to Battaramulla daily. Of these, 26,185 are intra zonal trips: meaning they are within the same DSD area. Of these, public buses account for 37% and rail for 2%. The rest of the trips are based on various private modes. Primary data collection indicates that there are around 11,285 government employees in Battaramulla and a further 10,680 visitors are estimated to arrive daily to these institutions. On Wednesdays, which are public days, an additional 6,000 passengers arrive to Battaramulla to attend to official matters. Further, it shows that in the case of government employees, 61% use public transport as their travel mode with a further 25% using arranged transport services. A total of 56% of government employees arrive using the bus routes passing through Battaramulla which carry around 231 buses (both directions) during the morning peak period between 7 and 8 am. The load factor in buses at this time being around 120% reveals that bus supply is lower than what is demanded during the peak.

3.1. Analysis of the Adequacy of Bus Services

The STRADA output related to the current demand for bus passengers as per the supply in terms of the existing bus routes and service frequencies illustrates that a large number of bus passengers need to get a bus-to-bus transfer either from Borella or Pettah to connect to most of the major corridors that serve Colombo city and its environs. But there are other access roads to these corridors from Battaramulla which, though used by private vehicles, do not have a direct bus supply. Places such as Thimbirigasyaya, Maharagama, Kolonnawa, Gampaha, Orugodawatta are such locations which also have an adequate direct demand to Battaramulla to introduce new bus routes. Figure 1 below shows the attractions and generations to and from each zone along with the current spread of bus routes serving Battaramulla.

Based on the above, the following bus routes were found to be able to sustain a regular bus service based on the existing demand and potential for growth assumed at 20% p.a. over 10 years.

- Battaramulla to Bambalapitiya (via Borella and Thummulla)
- Battaramulla to Maharagama (via Japanese Friendship Rd and Pathiragoda Road)
- Battaramulla to Peliyagoda (via Angoda and Low-level)
- Battaramulla to Katunayake Airport (via Baseline and Expressway E03)
- Battaramulla to Panadura (via Expressways E02 and E01)
- Battaramulla to Gampaha (via Expressway E02 and Kadawatha)
- Battaramulla to Galle/Matara (via Kottawa and Expressway E01)

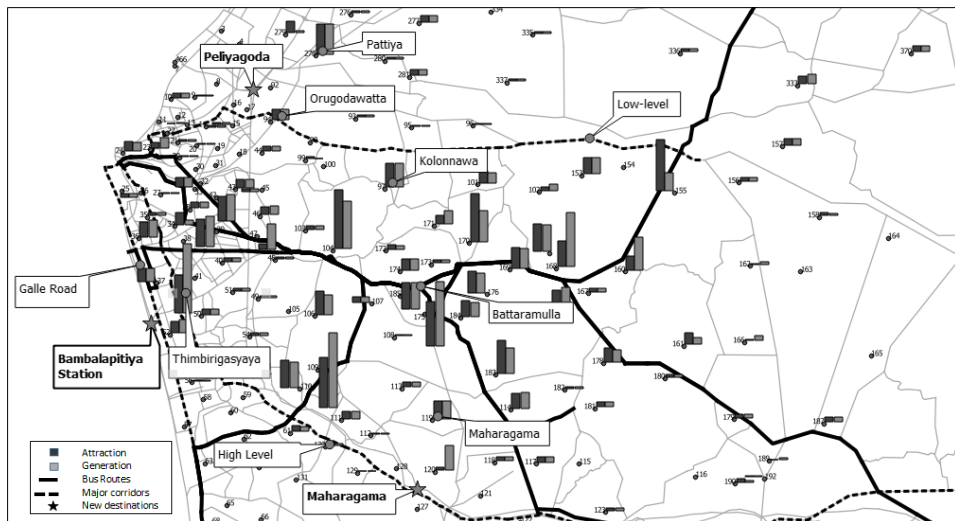


Figure 8: Demand and Supply comparison for Bus Passengers by Zone and Route

Furthermore, two routes namely Route 152 and Route 170 are suggested to be rerouted to start from Battaramulla with the latter operating along the Denzil Kobbekaduwa Mawatha from Koswatta to Battaramulla.

According to the calculations for the number of passengers that are likely to either board or transfer at Battaramulla based on the STRADA analysis, a total of 20 bus loading and unloading bays are required for the hub to facilitate the peak hour bus supply and passenger demand. The assumptions used for this calculation is that buses going through the hub will have a dwell time of two minutes while buses terminating at Battaramulla will unload in a common bay. All new local buses will take 10 minutes and expressway buses will take 15 minutes loading time.

3.2. Location of the terminal

Figure 2 below illustrates the selected location for the multimodal hub. Location 5 is the site selected by the UDA while others were selected on the basis of land availability in the study area.

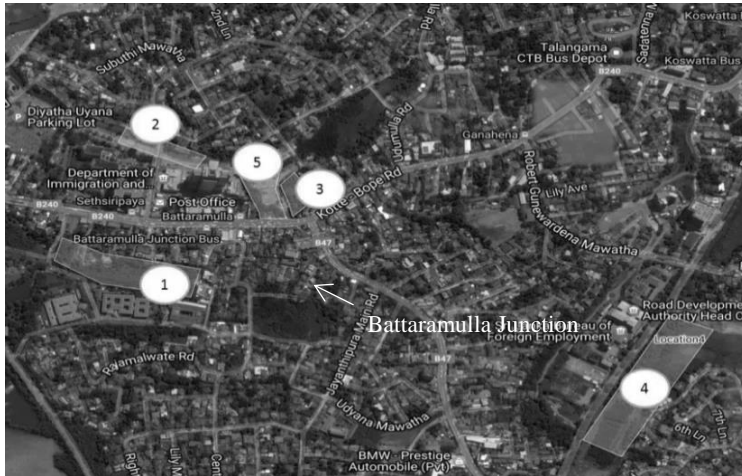


Figure 9: Alternative locations for multimodal hub development

All locations were ranked for each criterion given in Table 1 below, with the highest rank of 5 being given for the best result and 1 for the worst as judged by the authors. Weight for each criterion was also determined by the authors. Table 1 below presents the multi-criteria analysis for location selection. Accordingly, it was revealed that location L5 which is the site selected by the UDA was the best among all the sites compared.

Table 9: Multicriteria analysis for location identification

| Decision Criteria | Weight | Rating | | | | | Score | | | | |
|---|--------|--------|----|----|----|----|-------|-----|-----|-----|-----|
| | | L1 | L2 | L3 | L4 | L5 | L1 | L2 | L3 | L4 | L5 |
| Connectivity to existing bus network | 15 | 2 | 3 | 4 | 1 | 5 | 30 | 45 | 60 | 15 | 75 |
| Minimum distance to the bus route | 5 | 1 | 2 | 4 | 3 | 5 | 5 | 10 | 20 | 15 | 25 |
| Space availability (land size) | 15 | 5 | 2 | 1 | 3 | 4 | 75 | 30 | 15 | 45 | 60 |
| Proximity to users (employees and visitors) | 15 | 3 | 4 | 1 | 2 | 5 | 45 | 60 | 15 | 30 | 75 |
| Demand (trip attraction, trip generation HVS) | 10 | 3 | 4 | 1 | 2 | 5 | 30 | 40 | 10 | 20 | 50 |
| Minimum environmental impact | 10 | 2 | 5 | 3 | 1 | 4 | 20 | 50 | 30 | 10 | 40 |
| Minimum impact on traffic during construction | 5 | 5 | 3 | 2 | 4 | 1 | 25 | 15 | 10 | 20 | 5 |
| Possibility of land acquisition | 10 | 5 | 2 | 1 | 4 | 3 | 50 | 20 | 10 | 40 | 30 |
| Expansion for future demand | 10 | 4 | 2 | 1 | 5 | 3 | 40 | 20 | 10 | 50 | 30 |
| Cost of site development | 5 | 2 | 4 | 3 | 1 | 5 | 10 | 20 | 15 | 5 | 25 |
| Total | 100 | 32 | 31 | 21 | 26 | 40 | 330 | 310 | 195 | 250 | 415 |

4. Conclusions and Recommendations

As the main city within the developing administrative capital of Sri Lanka, Battaramulla has a growing demand for passenger transport but there are no bus terminals or services that originate from Battaramulla. It is seen in the analysis that while a majority of government employees use bus transport, a significant proportion of others also use bus transport. This research finds that there is sufficient demand for a multimodal transport hub with 20 platforms and that bus services can be further improved with seven new services and two service route changes. Moreover, a multi-criterion analysis conducted on several potential locations for the new terminal shows that the site selected by UDA has the best potential for service delivery. Future research can be focused on validation of the results of an improved bus network.

5. References

- [1] University of Moratuwa (2015), Colombo Metropolitan Region Transport Master Plan, Report for the Ministry of Internal Transport.
- [2] Japan International Cooperation Agency (2013), Urban Transport Master Plan for Colombo Metropolitan Region and Suburbs.

Keywords: multimodal, terminal, location, routes, Colombo Battaramulla