FEASIBLE SOLUTIONS FOR REDUCING TRAFFIC FROM MEERAMAKKAM MOSQUE JUNCTION TO THOPAWANA TEMPLE AREA IN KANDY

A.M.Z. Zimar[1*], P. Sanjeevan[2]

[1]South Eastern University of Srilanka, Srilanka
[2]Central Engineering Consultancy Burae, Colombo, Srilanka
*E-Mail:zaraf.zimar@gmail.com, TP: +94778937777

Abstract: Road traffic congestion is a major problem in many cities all around the world. Motorists and passengers waste their valuable time in streets due to heavy traffic congestion and it increases the air pollution with more carbon emission. This is a common issue in many cities in Sri Lanka. However, Kandy city as the second largest city in Sri Lanka is severely impacted with lack of road facilities. It has been identified many difficulties to expand the existing road network in Kandy city due to the geographical and historical values. Road from Meeramakkam mosque to Thapowana temple is a very important area in Kandy Central Business District (CBD) since Many public and commercial buildings are located around this area. The heavy traffic congestion in this area destroy the energetic working hours during morning and evening peak hours and adversely impact on the economy. Moreover, the noise and emission of the vehicles contaminate the environment and affect the health of people. In this study, the possible causes of traffic congestion were identified by traffic survey in this area. Feasible solutions are presented based on the analysing of the research study to minimize the existing traffic congestion in the study area of Meeramakkam mosque to Thapowana temple.

Keywords: hours, traffic congestion and time delay survey

1. Introduction

Road traffic congestion is a major problem in many cities all around the world. Developing regions are highly affected by massive delays, high fuel consumption and monitory losses due to the improper remedies on traffic congestions. Traffic congestion is a condition on any road network as increases of traffic volume and it is characterized by slower speed, larger trip time and increased queuing.

The hill capital of Sri Lanka is Kandy, where there are several ancient places. It is the second largest city in Sri Lanka. Approximately 325,000 people enter the Kandy during day time of a week day which includes around 90,000 for employment and 60,000 for education. Presently, the share of public transport is around 64% of motorized trips while railway share is only 2%. Meanwhile, about 5000 bus trips are made every week day, carrying 200,000 passengers. In addition, 1000 school vans entering the city on school days carrying over 16,000 passengers and the rest of nearly 45,000 people are using their private vehicles (Kumarage, 2014). Road from Meeramakkam mosque to Thapowana temple is a very important area in Kandy Central Business District (CBD). There are several public and commercial buildings are located around this area. This area is heavily congested during morning and evening peak hours and significantly contributes on traffic congestion in Kandy city. These waste many effective hours of people making adverse impact on economy. Further, the accumulated emissions of the vehicles during congestions pollute the atmosphere which creates physical and mental health issues of the inhabitants. In addition to the general increase of the vehicles in Kandy, large number of people daily use these areas due to following institutes are located.

• Trinity college
• St. Sylvesters' college
• Badiudeen Mahmood college
• Hemamali girls college

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- Commercial buildings
- Banks
- Municipal council
- Railway station

Figure 1 shows the current scenario of the study area. It illustrates the number of roads, railway track, institutes are compacted in a small area. Many people utilize this area which creates large number of trips and make complex traffic congestion at rush hours. The waste time could have productively been used if there is a proper

2.2 Road surface condition

Between D S Senanayake Veediya & Thapowana Ramaya temple, road surface of Hill Street is in bad condition. Damages in the asphalt surface lead drivers to alter their driving path by reducing the speed and changing their correct track path.
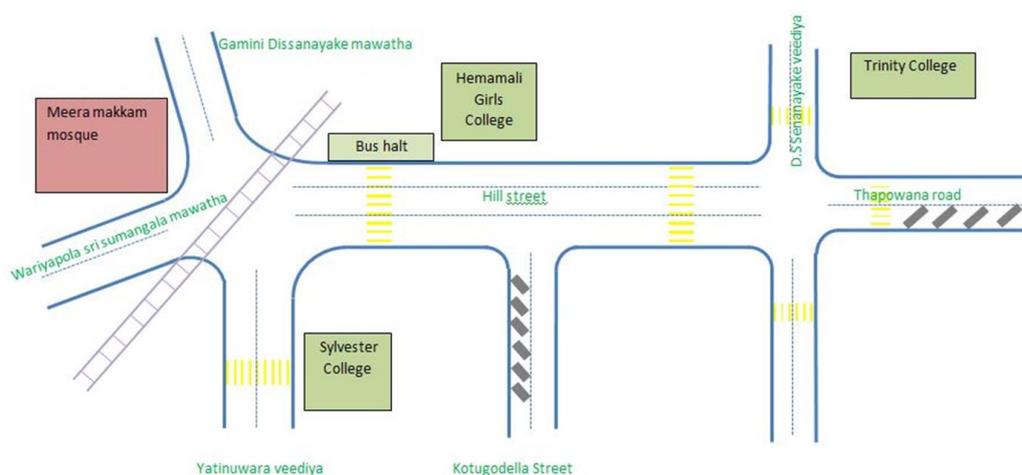
2.3 Existing bus halt

Figure 1: Current scenario of the study area

solution to manage this issue.

This study mainly focused to find out the possible causes of traffic congestion in between Meeramakkam Mosque and Thapowana Ramaya temple and suggest the possible solutions. The study initiated to identify the causes for the traffic congestion in the area and registration number plate survey was carried out to identify the traffic congestion.

2. Causes for traffic congestion
2.1. Illegal parking

In front of Trinity college primary school, road width is about 7.5m. Although, there are "no-parking" signs provided to avoid on street parking, drivers used to park both side of the road. This reduces the flow rate of vehicles in that road & leads to traffic congestion due to the insufficient space in the lanes to both sides.

Buses coming from Yatinuwara Veediya, try to change their lane at Meeramakkam mosque junction to reach the bus halt shown in Figure

Figure 2: Illegal parking in front of Trinity college primary school

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1, which creates traffic at the Hill Street.

2.4 Vehicles change their lane at Hill Street

Vehicles which are entering to Hill Street from Yatinuwara Veediya to go towards Katugastota, from Wariyapola Sri Sumangala Mawatha to go towards Kandy, and from Gamini Dissanayake Mawatha to go towards Kandy have to change their lanes within the 130m weaving distance, and from Kotugodella Street to go towards Katugastota have to change their lanes within 60m weaving distance. As these lengths are not long enough for lane changing requirement, drivers rush to change their lanes at junctions especially at Meeramakkam mosque junction which makes congestions.
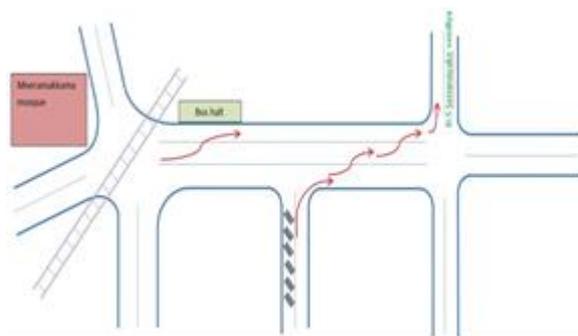

Figure 3: Vehicles change their lane at Hill Street

2.5 Pedestrian crossing

There are several pedestrian crossings in between Meeramakkam mosque junction and Trinity college primary school. Vehicle flow interrupts when pedestrian cross in operation. This will create shockwave in the vehicle flow & leads to delays.

2.6 Railway station

Asgiriya Halt is located near Meeramakkam mosque junction. When train stops at the station, Engine part of the train is in the road.

So, that Meeramakkam mosque junction is unusable until train leaves the station.

2.7 Schools (Hemamali Girls' College)

Hemamali Girls' College is located in the Hill Street. Vehicles use the part of left most lane to drop and pick up students, and park their vehicles. This reduces the space capacity of the Hill Street. This leads to reduction of flow rate&

Figure 4: Train stops at Asgiriya railway increase the traffic congestion.

2.8 Illegal crossing

At Meeramakkam mosque junction, vehicle flow is high. Due to high flow rate, velocity of the vehicles is low. Pedestrians used to cross through these slow moving vehicles in illegal way. This leads further reduction in the flow rate and velocity.

2.9 No channelization at mosque junction

There is no channelization at Meeramakkam mosque junction. So, drivers try to change their lanes even at the Meeramakkam mosque junction. This increases heavy traffic block at the junction.

After identifying the causes for the congestion, registration number plate survey was performed to identify the traffic characteristics.

3. Registration number plate survey

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Licence plate matching surveys are very useful methods to identify traffic characteristics, including origin and destinations, travel times and turning movements. If the traffic volume is low, one person can both read and record registration number plate but if the traffic volume is high or the vehicles are moving at speed then it will be easier if one person reads the number plate and other one records. As it was needed to record the registration of number plate in four locations to calculate the delay, three persons were assigned at three different locations (S1, S2, S3) and another two were assigned at the location (S4) where very heavy traffic condition exists as shown in Figure 5.
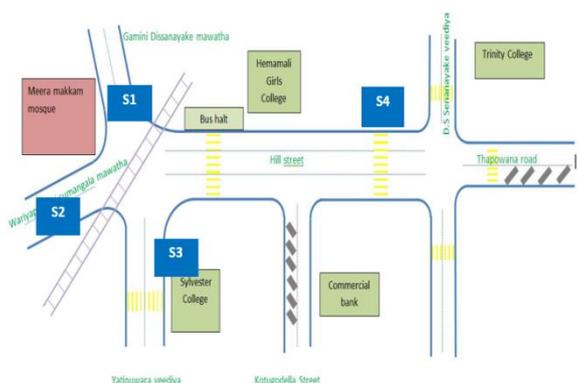

Figure 5: Location of registration number plate survey

The survey was carried out from 07.05 am to 07.40 am. The main types of vehicles using this lane during peak hours. Figure 6 illustrates the journey time of different types of vehicle.
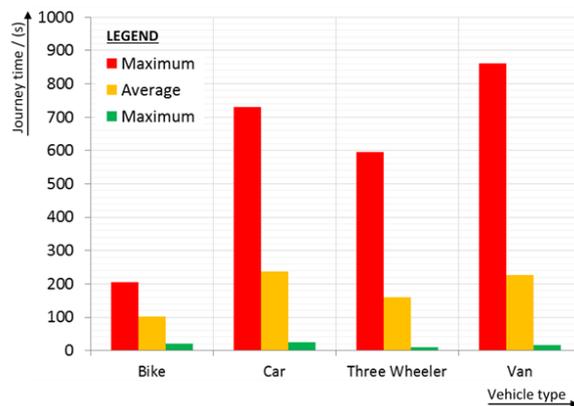
Figure 6: Journey time of different types of vehicles.

It can be seen that van has the highest maximum journey time of 862s to pass the hill street. Meanwhile, bike shows the lowest maximum journey time of 206s.

However, the average journey time of car is higher than all the vehicles while bike shows lowest average journey time. Over all, when the minimum and average time is compared, we can see a huge variation due to the heavy traffic jam.

Figure 7 presents the average speed of vehicles in each time duration. The average speed declines steadily from 4 km/h to 2 km/h between 07.05 to 07.20 pm. Again, the speed gradually increases from 07.20 to 07.40 pm and finally reaches 6.5 km/h.

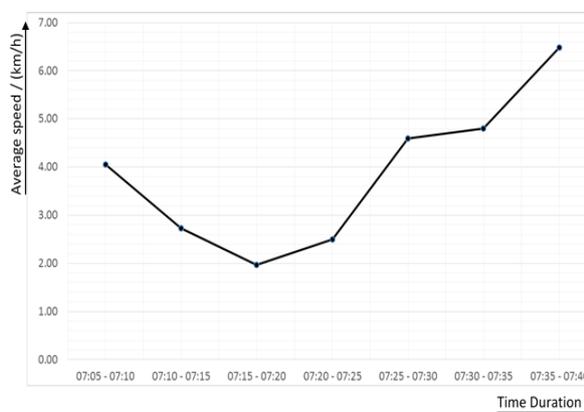Figure 7: Average speed of vehicles during 7.05 am to 7.40 am.

4. Feasible solutions

Traffic impact mitigation methods for new developments can be classified into two broad groups, land use related and transportation related. Transportation measures can be sub divided into two subgroups as traffic related measures and pricing measures (Hokao, 1999). Here, traffic related measures such as access improvements, internal circle and intersection improvements are discussed.

4.1 Roundabout design

Intersection is an area showed by two or more roads. Main function is to guide vehicles to their respective directions. The performances of the intersections play an important role in overall traffic flow. It urther affects the capacity of road.

Different types of intersections have different types of conflicts. The junction located near the Meeramakkam mosque and KMC junction has many traffic conflicts. There are four vehicle conflicts at Meeramakkam junction, a crossing conflict, a diverging conflict and two merging conflicts as shown in Figure 8. Meanwhile, there are three crossing conflicts, two merging and a diverging conflict at KMC junction.

The main reason for providing a roundabout at this area, near to Trinity primary college is making a calm vehicle flow. Because there is no sufficient space to take a U-turn in this area. So vehicles are trying to turn vehicles in normal sections and it disturbs to the other traffic flows in the road.

Figure 8: Traffic conflicts around the area

As well as the vehicles coming from and moving to Trinity school have no sufficient radius for the movements. This design is done according to the guidelines supplied by Roundabout, An important guide, US department of transportation.

According to the space available and capacity a small roundabout (mini roundabout) is sufficient for this location. The entry speed for the roundabout was taken as 25km/hr and the inscribed circle diameter was taken as 13m (Robinson, 2000). The circulating width and radius of the central island were assumed as 4.5 m and 3m respectively.

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Figure 9: Proposed round about near the trinity primary college junction.

4.2 Increasing the road curvature

When a vehicle is moving along a circular path it takes some additional space more than its actual width. Because of this reason the road must be wider at bends more than other straight areas. Acquiring the additional space by vehicles is depending on several reasons; length and width of the vehicle, radius of the movement, angle between entering and leaving and number of lanes for the particular direction.

Generally, the usage of road by long vehicles like busses is very high at Meeramakkam junction during peak hours. Hence, it was proposed to increase the road inner curvature at the junction to reduce the traffic congestion at Meeramakkam mosque junction. Design was accomplished using "roundabouts: an informational guide".

Figure 10: Proposed road curvature at meeramakkam junction

4.3 Shifting the railway station little away from the meeramakkama junction

Another main reason for the congestion is the railway station located closer to the Meeramakkam junction. The railway gate is closed six times per day. However, the situation become worst during the morning peak hour. The gate is closed at 0718h when the train departs from kandy station and train stops at the station around 5 min. The gate is closed totally around 10 min and this creates a heavy traffic jam at Meeramakkam junction.

This situation can be overcome, if the platform length is extended towards the Kandy side. Therefore, a modification to the existing platform is proposed as shown in Figure 11.

4.4 Change Wariyapola Sri-Sumangala Mawatha and Gamini Dissanayake Mawatha to one way

One of the main reasons for the congestion in this area is congestion caused near the Meeramakkam junction and the present vehicle movement is shown in figure 4.14. Many conflicts are created due to these improper movements. According to the observation,

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there is a queue of vehicles waiting to cross from wariapola sri sumangala mawatha to Hill street as seen in Figure. Most delay causing conflict here is crossing conflict. The delay time could be reduced by avoiding this crossing conflict.
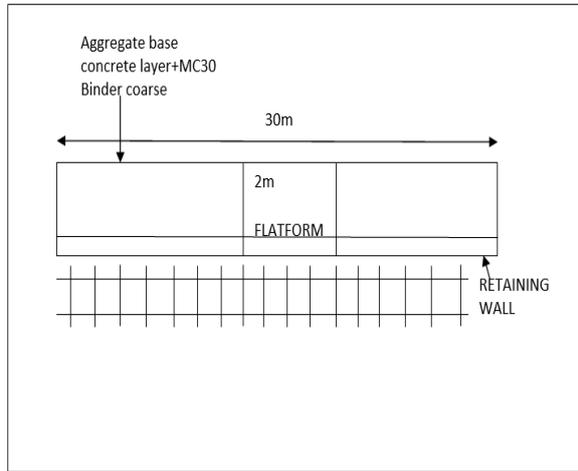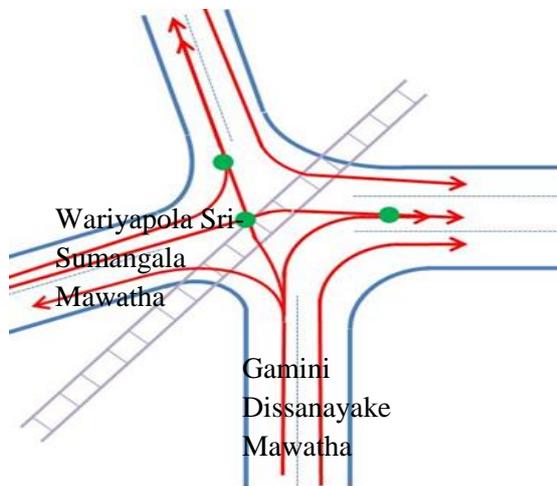

Figure 11: Proposed improvements in the platform

Figure 12: Vehicle conflicts at Meeramakkama Junction

In order to avoid the crossing conflict, Wariyapola Sri-Sumangala Mawatha and Gamini Dissanayake Mawatha is changed as one-way where vehicles movement is permitted to only one direction as shown in Figure 13.
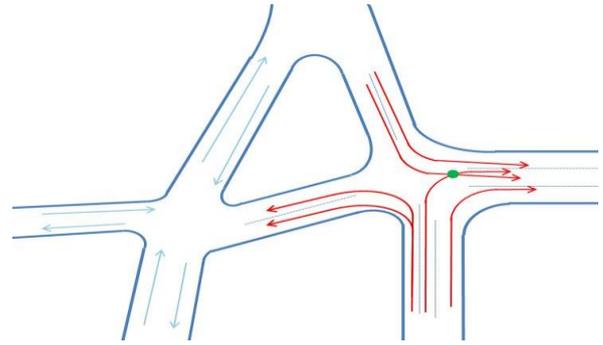

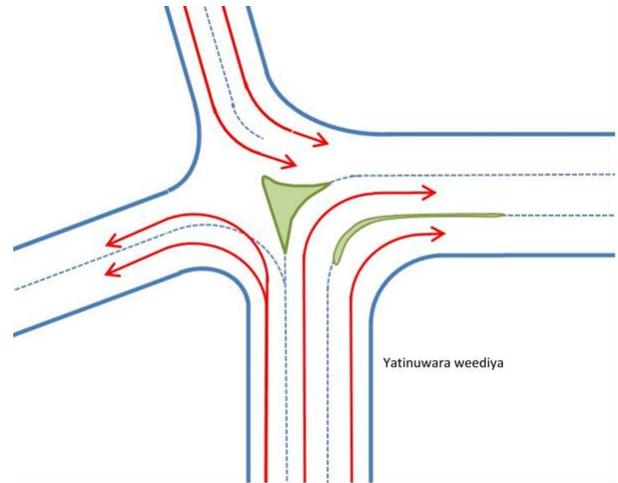
Figure 13: Proposed direction changes

Figure 14: Introducing channelization near the junction

4.5 *Introducing channelization near the junction*

The Hill Street is divided as three bays. Some vehicles, which come from Yatinuwara weediya, try to enter the third bay directly near the junction if they wanted to take left turning movement from Hill Street to D.S Senanayake weediya. This caused severe traffic problem near the Meeramakkam junction.

In order to avoid the driver behaviour channelization is designed near the junction. Therefore, it will be directed the traffics to flow through a bay near the intersection with the help of barrier.

5. Conclusion

The road in between Meeramakkam junction to Thapowana temple is an important area where there are several government and commercial buildings located. Now due to traffic jam, delay is caused and it causes losses in terms of economy and prone to environmental pollution. Since, the city is with several historical heritages, the expansion work is restricted.

The purpose of this study is to review various measures that can be implemented initially before carrying out large expansion works for the cities like kandy where the expansion works are restricted to reduce the traffic congestion. Solutions are based on two aspects. they are related with structural aspect and based on traffic management. If these solutions are implemented in the study area, then considerable congestion problems will be reduced and could be made a congestion reduced traffic flow without delay and healthy environment in this area.

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