

Traffic Flow Impact of Queuing of Public Utility Jeepneys at SM City Sta. Mesa

Christopher L. LABRADOR
Ryan James M. PALMA
Leonora Ma. Karyza A. SANTIAGO
Jovanni C. TORRES
Civil Engineering Students
Department of Civil Engineering
Polytechnic University of the Philippines
Email: ryanjames_19@yahoo.com,
karyza_07@yahoo.com, akosiac@yahoo.com

Manuel M. MUHI
Professor
Department of Civil Engineering
Polytechnic University of the Philippines

Nabor GAVIOLA
Special Lecturer on Transportation Engineering
Department of Civil Engineering
Polytechnic University of the Philippines

Abstract: Traffic flow conditions are the interaction of vehicles in the traffic stream and between vehicles, and the geometric and environmental characteristics of the roadway. This study intends to investigate the traffic flow impacts in the study area where commercial establishments like SM City Sta. Mesa located. Queuing of Public Utility Jeepneys in front of SM City Sta. Mesa for loading and unloading purposes is investigated in able to collect the necessary data needed for the investigation. Traffic flow impacts like congestion, delay and roadway capacity reduction are the main focus for this study. The scopes of this study are (a) Road section of R. Magsaysay Blvd. between V. Mapa Road. and G. Araneta Avenue where the said mall is located is the study area study, (b) afternoon peak hour is considered peak time for the study and (c) eastbound direction is the considered direction flow. Speed - Travel Time relationship of vehicles traversing at the specified study area is being quantified and observed. Quantification of the data is made possible through derived methodologies and aid of Synchro Ver.6 software designed for road/intersection traffic analysis. After a thorough research and experimentation, the researchers found out that queuing of PUJ affects the in-situ traffic flow conditions especially during afternoon mall peak hour. Oftentimes PUJ spent 50 seconds average stop time in front of mall base from experiment/observation to load/unload passengers. By this scenario PUJ blocks the road lane for certain period of time that causes irregularities in traffic flow in the area. Inadequate road traffic management is also a factor. The researchers concluded that queuing of PUJ at SM City Sta. Mesa is one of many reasons of congestion in the area. Still, the existing traffic flow deficiencies are associated to other traffic related factors.

1. INTRODUCTION

1.1. Background

Traffic flow conditions are the interactions of vehicles in the traffic stream and between vehicles and the geometric and environmental characteristics of the roadway. Describing traffic flow is considered to be complicated due to several factors such as road accidents, stalled vehicles, swerving, parking maneuvers, undisciplined loading and unloading of public transport vehicles, etc. The frequent occurrence of these events primarily causes traffic problems in specific road sections or intersection. However alleviating or completely eliminating these could probably yield a regular traffic flow.

Transportation of goods, freights and services are dependent on the traffic flow. The efficient circulation of raw and finished products in the market contributes good remarks to the economy. Effective traffic flow renders fast but safe access of workers/employees on their workplaces which increases their productivity.

The SM City Sta. Mesa which located at corner of Gregorio Araneta Avenue and Ramon Magsaysay Boulevard at-grade intersection with land area of 30,000 sq.m., floor area of 133,327 sq.m. and operates starting 10 a.m. until 9 p.m. everyday throughout the week.

Queuing of PUJ in front of SM City Sta. Mesa refers to a queue of PUJ using the outermost close lane of road beside of mall for loading and unloading purposes. Oftentimes especially during mall peak hour this movement of PUJ with respect to mall brings undesirable impact to the traffic flow at road section of Ramon Magsaysay Boulevard. This situation causes traffic flow irregularities like road lane congestion, unreasonable traffic delays and reduction of road capacity and commonly seen in spite of existing traffic management at the study area.

1.2 Main Problem

It is observed that PUJs clog the road lane by staying on the outermost lane over a longer period of time during afternoon peak hour. With this manner of PUJs often results a chain of effects on the vehicles traversing R. Magsaysay Blvd.

First effect is reduction of road capacity or commonly known as road congestion. Vehicles suffer with this traffic flow deficiency because road lane has been blocked that reduces the typical four lanes of R. Magsaysay Blvd. to three or sometimes two passable lanes only; obviously capacity has been reduced also.

Due to congestion delay results. This occurs when the vehicles stop for interruptions such as fixed delay because of traffic control system and generated delay by congestion. Example of this is the swerving of vehicles to evade the queued PUJs, as the vehicles swerve the succeeding vehicles stop to give way to the swerving vehicles with this maneuver; the succeeding vehicles have been immobilized so it generates delay. Delay is directly related to time likewise with travel time and travel speed. Therefore, occurrence of delay certainly affects travel time and travel speed since both of them are also related with time.

When the vehicles experience delay due to stated factors its travel speed and travel time will much be affected too. As the vehicles decelerate while travelling along R. Magsaysay Blvd. probably it is effect of congestion and delay brought by queuing of PUJ at the mall vicinity.

1.3 Objective and Significance of the Study

The main objective of this study are (1) to determine the actual travel time and travel speed of vehicles passing along the mall, (2) to estimate total generated time of delay of passing vehicles caused by queuing of PUJ at the mall, (3) to describe the irregular movement of PUJ within the vicinity of the mall, (4) to recommend possible mitigating measures to address the traffic problems generated by the said impacts.

The significance of this study are signified for the (a) Transportation Authorities for them to come up with a better traffic management and solution for abominable traffic system at specific road section/intersection caused by commercial establishments and (b) Road Users for them to follow transportation laws and regulations strictly and should be responsible for using transportation infrastructures and to enlighten them to execute good and well-disciplined driving behavior that will probably yield a better traffic flow.

2. CONCEPTUAL FRAMEWORK

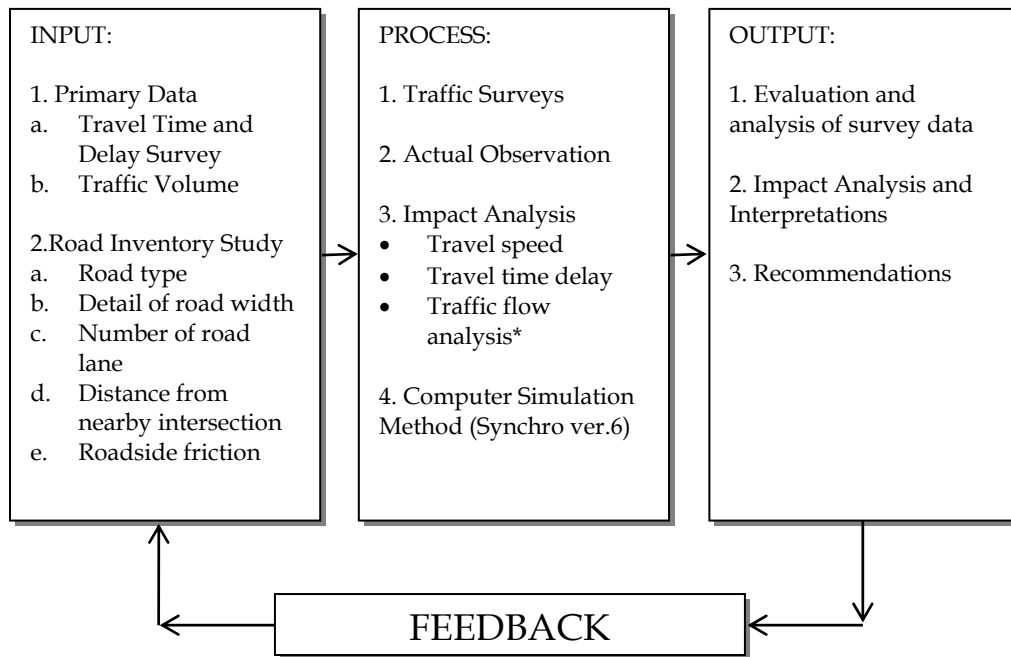


Figure 1. Conceptual Framework

3. METHODOLOGY

Review of essential literatures and studies will be the first stage of this thesis to be able to come up with proper concepts of the study. After the essential research about background of the study and developing study framework, data gathering will be carried out. Different traffic surveys will be conducted in the form Travel time and Delay Survey through on-board test car technique and license plate method, and Traffic Counting Survey. Other data is provided by the MMDA-TEC like road inventory and AADT as of 2009. From these surveys and data other variables are computed and enumerated. Aid of computer software like Synchro v.6 will be used for further analysis of in-situ traffic condition through ideal traffic simulation. Conclusion and Recommendation will take place after the analysis has been done.

3.1 Instrument Used

Actual traffic surveys as primary instrument for data gathering. These are the Road Inventory Study, Travel Time and Delay Survey, and Traffic Counting.

In Travel Time and Delay Survey, the researchers used the On-board Test Car Technique which makes use of a field sheet and an on-board test vehicle that is driven over the road section subjected for study. The on-board test vehicle travels at a speed that is representative of the actual speed of the vehicles in an actual traffic stream.

The License Plate Method, another technique used to quantify the travel time and delay, basically consists of observing and recording license plates of vehicles and time of arrivals at two points or more on the road where the vehicles are expected to pass, then the plate numbers are matched manually. The researchers weren't able to use on-board test car technique on trucks and

private buses, so as an alternative, this method was utilized. Travel time is determined by getting the difference of the time when the vehicle passed through the first and the last point. The recommended time interval is every 5 minutes until it reaches a limit of time (Sigua, 2008).

A video camera captured the actual traffic condition at the study area while the traffic surveys were conducted. The recorded video serves as evidence in describing the actual situation at the study area and was also used for traffic counting. Counted vehicles were tallied in a traffic counting survey sheet per specific direction of flow. It is summed up every after the specific time intervals. Recommended time interval is every 15 minutes (Sigua, 2008).

3.2 Validation of Instruments

All the instruments will be used are referred to different books, course notes and guidelines dealing with transportation and traffic engineering in the National Center for Transportation Studies (NCTS) at the University of the Philippines, Diliman, Quezon City. All field sheets were partially revised by the researchers but still it was based on a standard field sheet.

Consultations to Engr. Gaviola, the thesis external adviser, will be done for validity of the instruments, tables and equations that were used, to discuss the usage of all instruments needed and to seek guidance in conducting the actual traffic surveys.

3.3 Data Gathering Procedures

In on-board test car method, each surveyor rode on their assigned type of vehicle traversing the road section to record and observes its actual traffic movement along the study area. Travel time is being observed while the surveyor is inside the vehicle. Specified spots were marked at different interval distance over the subjected road section which served as stations, wherein the surveyor recorded the actual running time and stopping time of an on-board vehicle passing from one spot to another until it reaches the designated limit of the road section.

The data obtained from this survey was recorded on a survey sheet. The cause of delay was indentified and written down in the sheets through symbols. Again, this was done in the specified directional flow indicated in the study on PM peak hours. With this survey, the actual travel speed of different vehicle types has been calculated.

In License Plate Method, few of the surveyors have been appointed to record plate numbers of passing trucks and private buses (considered as trucks) as well as its time of arrival at entry and exit points. The entry point was located at V. Mapa then the three exit points were located in the indicated direction flows.

Traffic count survey, surveyors counted the vehicles passing through specified intersection legs by reviewing the recorded video. The traffic counts were recorded for every 15-minute time interval in a provided tally sheet.

The data obtained from traffic counting was used in Synchro to simulate the traffic situation. It helped the researchers interpret the impact especially the intersection capacity. Interpreted data serves as basis for drawing conclusions and recommending possible measures to minimize the undesirable impacts caused by the queuing of PUJ. It also allowed the researchers to test their recommendations and to evaluate its effectiveness.

The road inventory was based from the data gathered from MMDA and the researchers' road inventory study.

4. RESULTS AND FINDINGS

4.1 Traffic Volume Count

The traffic volume counts of R. Magsaysay Blvd. are shown which determines the actual traffic volume within the PM peak hour (5pm to 6pm).

Table 1. Traffic Volume Counts

Direction Flow: U - turn				
Time	Vehicle Class			
	Car	Bus	PUJ	Truck
5:00 - 5:15	20	0	4	0
5:15 - 5:30	11	0	6	0
5:30 - 5:45	20	0	6	0
5:45 - 6:00	17	0	3	1
Total	68	0	19	1

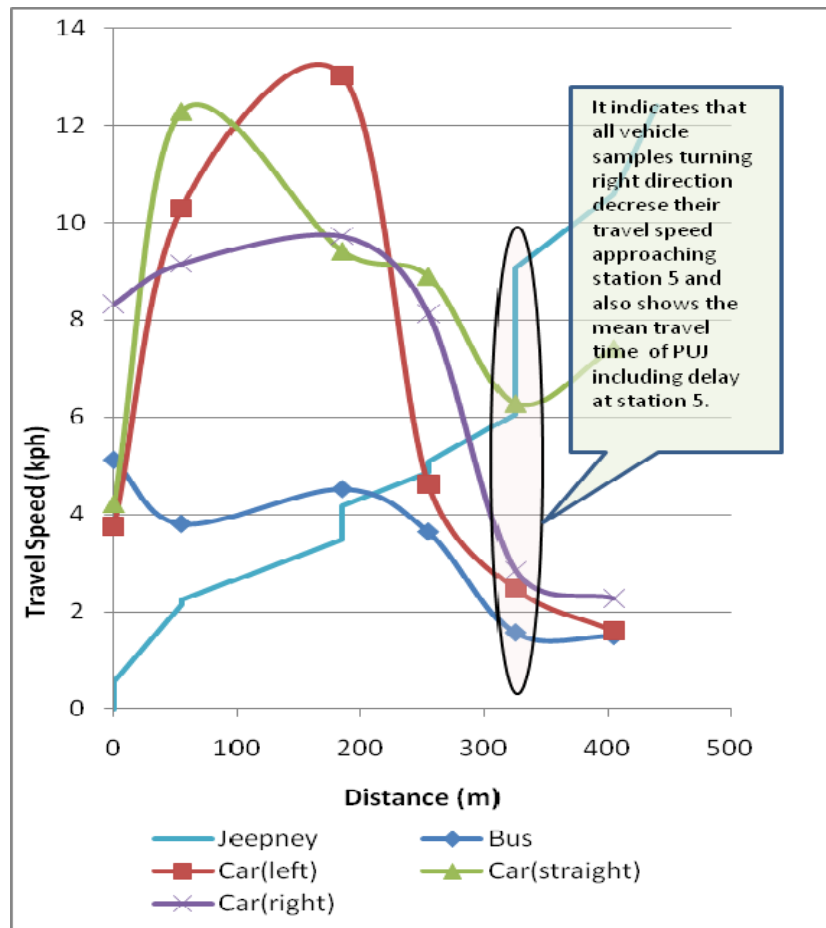
Direction Flow: going to Cubao (straight through)				
Time	Vehicle Class			
	Car	Bus	PUJ	Truck
5:00 - 5:15	199	0	52	3
5:15 - 5:30	179	3	43	10
5:30 - 5:45	212	0	44	6
5:45 - 6:00	210	2	55	10
Total	800	5	200	29

Direction Flow: going to N. Domingo (right)				
Time	Vehicle Class			
	Car	Bus	PUJ	Truck
5:00 - 5:15	67	3	0	6
5:15 - 5:30	64	8	0	4
5:30 - 5:45	78	11	0	0
5:45 - 6:00	78	8	1	2
Total	287	30	1	12

Direction Flow: going to E. Rodriguez Sr. Avenue (left)				
Time	Vehicle Class			
	Car	Bus	PUJ	Truck
5:00 - 5:15	220	3	0	19
5:15 - 5:30	181	1	1	17
5:30 - 5:45	215	0	0	9
5:45 - 6:00	172	3	1	10
Total	788	7	2	55

4.2 Vehicle Samples Data

The figure showed the effect of PUJ stop time in front of SM and how it affects the vehicle samples' speed. The speed of vehicle samples decreasing while traversing road section near the mall vicinity or in front of SM specifically as figure shown.



*Station 5 located in front of SM City Sta. Mesa

Figure 2. PUJ stop time and travel speed

4.3 PUJs' Vehicular Movement

The mean stop time of PUJ in front of mall is 48.3 seconds it showed this time was spent for unloading and loading of passengers. So it also denoted how long the PUJs oftentimes blocked the road lane where they stopped.

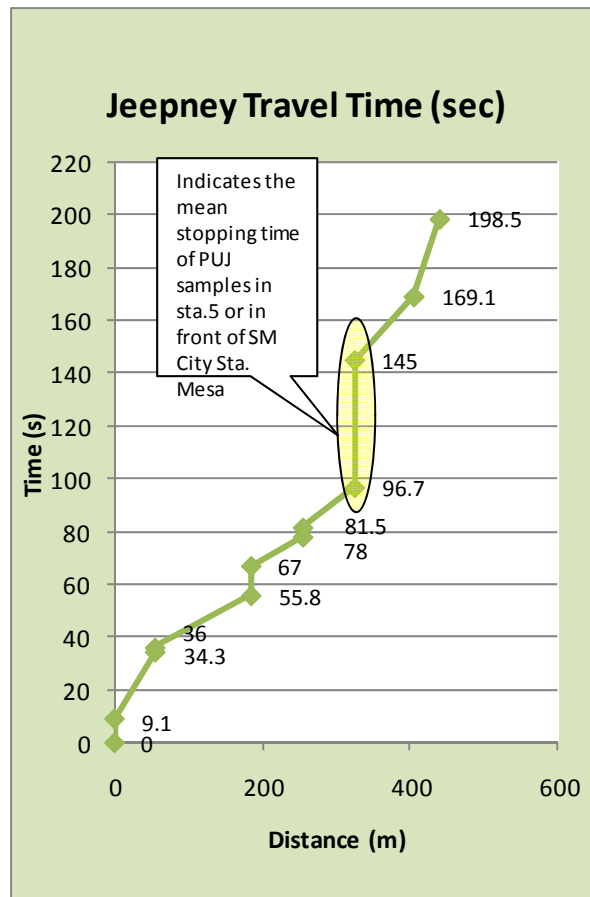


Figure 3. PUJ mean stop time at Sta. 5 of SM Sta. Mesa

4.4 Estimated Level of Service

Both methods were able to quantify the estimated level of service which has the same inputs gathered from conducted actual traffic survey. Although they differed in results but the descriptions and effects are somewhat related because it indicate unstable traffic flow during afternoon peak hour.

Table 2. Level of Service

	By Synchro Ver.6	By Actual Estimation
VCR	1.13	0.949
LOS	F	E
Description	<i>Traffic volumes near or at capacity. Flow is unstable with momentary stoppages</i>	<i>Forced or congested flow at low speeds. Long queues and delays</i>

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

After several researches conducted, actual observations and traffic surveys performed, the researchers found out that the queuing of PUJ at SM City Sta. Mesa contributed impacts in traffic flow along the road section. These impacts pertain to reduction of road capacity, decreasing of travel speed and unreasonable delays.

Based from our findings, all vehicle samples have experienced the said impacts especially with regards to travel speed. Although figures show that the travel speed per vehicle samples differs in value but is similar in graph behavior. It was clear that the graphs showed that all vehicle samples decreased their travel speed while approaching station 5 or in front of SM entrance. With this, the researchers concluded that queuing of PUJ brought an effect with reduction of travel speed. As support with this finding, it is observed in graphs of travel time, the longest generated average travel time of vehicle samples found also in station 5; and as we all know, as travel speed decreases, the travel time increases.

The assessed Volume - Capacity ratio of road section was categorized as "E" meaning the existing road traffic condition is unstable especially during peak hour, it denoted that queuing of PUJ had significant effects on road section as well as in traffic flow. Basically, it is referred to road congestion.

Based from the result of Synchro, the Intersection Capacity Utilization of R. Magsaysay Blvd. - G. Araneta Ave. intersection categorized as LOS F which meant that the intersection is over-capacity and likely experiences congestion periods of 15 to 60 minutes per day. Residual queues at the end of green lights are common. A cycle length of over 120 seconds is required to be able to mobilize all vehicles.

The researchers have quantified the actual mean delay or stopping time of PUJ in front of SM based from the values acquired. It is shown that PUJs stay for about 50 seconds in front of SM for loading and unloading purposes. The researchers concluded that this 50-second delay was the total delay due to said issue and fixed delay due to traffic signal.

Generally based on the findings, queuing of public utility jeepneys at SM City Sta. Mesa was one of the reasons of congestion in the subjected road section. Still, the existing traffic flow deficiencies were associated to different factors like ineffective geometric highway/road design, inefficient traffic management and other related factors.

5.2 Recommendations

The researchers would like to recommend possible mitigating measures concerning the undesirable movements of PUJs in front of SM such as staying in road lanes for loading and unloading purposes.

1. Improvement of existing traffic management by:
 - Deploying well-trained and highly skilled traffic enforcers within the area
 - Installing necessary traffic signs and markings
2. Development of geometric design of road
 - Widening of right turning lane
 - Providing channel for right turning vehicles

The researchers would also like to suggest that if these following recommendations implemented the traffic flow irregularities will probably minimize.

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