

PERPUSTAKAAN UMP



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**REGENERATION OF TRIPS AT PLAZA ALAM SENTRAL FOR THE
IMPROVEMENT OF TRANSPORTATION SYSTEM TO/FROM SHOPPING
COMPLEX**

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ABSTRACT

In recent years, there are rapid developments of shopping complex to fulfil the urban lifestyle. Based on the traffic impact assessment (TIA) practice, a shopping complex provides a parking space to meet the parking demand. However there is difficulty to obtain parking especially during noon at several major shopping complexes. Therefore, it entails some of the shopping center trip factor and indirectly affects the traffic system. The purpose of this paper is to determine the trip regeneration rate of the shopping center, in relation between the characteristic of shopping complex as independent variable with the estimated trip generation rate. In details, this study will determine the number of vehicle and pedestrian generated from the shopping complex for the purpose to compare between estimation trips with actual data. Level of service at the parking entering is determined by using link capacity analysis. Similar with the TIA practice, the approach to collect data are conventional by observation, taking picture and data recording. Besides that, a site inventory is conducted to determined number of shop and floor area. According to the analysis, during weekend produce more trip than weekday for both vehicle and pedestrian. Besides that, through the study the number of vehicle and pedestrian is higher during noon. It is obviously show, a shopping complex give differences trip rate based on the function and surrounding building of the study area. In the other hand, result of the observation showed, the estimation trip generation rate by regression equation are greatly differ by producing higher value than the actual data. Inaccuracy might be happened during the survey and an improvement is needed. In conclusion, this study successfully determined trip generation rate for a shopping complex. Further study should be conduct to improve this research. A model of regression equation should be proposed with variables model, in order to equally valid the estimation trip generation rate of shopping complex. Finally, by improving the provided transportation system it develop uncongested city and environment sustainability.

ABSTRAK

Dalam beberapa tahun kebelakangan ini, berlakunya pembangunan pesat kompleks membeli belah bagi memenuhi gaya hidup bandar. Berdasarkan kajian impak lalulintas, sebuah kompleks membeli belah menyediakan tempat letak kereta bagi memenuhi permintaan parkir. Walaubagaimanapun, berdasarkan pemerhatian di beberapa kompleks membeli belah berlakunya kesukaran mendapatkan parkir terutamanya pada waktu tengah hari. Oleh itu, ia melibatkan beberapa faktor yang melibatkan kadar perjalanan dan secara tidak langsung memberi kesan kepada sistem lalulintas. Tujuan kajian ini adalah untuk menentukan kadar perjalanan yang dihasilkan oleh sebuah kompleks membeli belah. Ia berkaitan dengan karakter kompleks membeli-belah sebagai pembolehubah bebas dengan anggaran kadar penjanaan perjalanan. Secara terperinci, kajian ini akan menentukan bilangan kenderaan dan pejalan kaki yang dijana dari kompleks membeli-belah bagi tujuan untuk membandingkan antara anggaran kadar perjalanan dengan data sebenar. Analisis kapasiti laluan juga dijalankan bagi menentukan tahap servis di pintu masuk tempat letak kereta. Selari dengan praktis kajian impak lalulintas, pendekatan untuk mengumpul data adalah secara manual dengan pemerhatian, mengambil gambar dan rekod data. Di samping itu, inventori tapak dijalankan untuk mendapatkan keluasan lantai dan bilangan kedai di kompleks membeli-belah. Berdasarkan analisis data, hujung minggu menghasilkan lebih banyak kadar perjalanan daripada hari biasa untuk kenderaan dan pejalan kaki. Selain itu, pada waktu tengah hari kadar penjanaan lebih tinggi jika dibandingkan pada waktu puncak belah pagi dan petang. Jelas menunjukkan kadar perjalanan sebuah kompleks membeli belah dipengaruhi oleh fungsi dan bangunan sekitar kawasan kajian. Selain itu, hasil daripada pemerhatian menunjukkan, anggaran kadar penjanaan perjalanan amat berbeza dengan menghasilkan nilai lebih tinggi daripada data dari pemerhatian. Ketidaktepatan mungkin berlaku semasa kajian dijalankan dan penambahbaikan diperlukan. Kesimpulannya, kajian ini berjaya menghasilkan kadar penjanaan perjalanan bagi sebuah kompleks membeli-belah. Kajian lanjut perlu dijalankan untuk meningkatkan hasil kajian. Dicadangkan model persamaan regresi dihasilkan dengan pembolehubah model, untuk menentukan anggaran kadar penjanaan perjalanan yang lebih tepat. Akhir sekali, penambahbaikan sistem pengangkutan dapat membina sebuah bandar yang tidak berlaku kesesakan dan kemamparan persekitaran.

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LIST OF ABBREVIATIONS

SC	Shopping Complex
TA	Trip Attraction
TP	Trip Production
TAZ	Traffic Analysis Zone
ITE	Institute Transportation Engineer
LOS	Level of Service
V/C	Volume Capacity Ratio
BC	Bearing Capacity
N	Number of lane
PHF	Peak Hour Factor
FLW	Lane Width Factor
FHV	Heavy Vehicle Factor
DHV	Design Capacity Analysis

CHAPTER 1

INTRODUCTION

1.1 Background

Shopping complex has become popular due to their one-stop shopping nature. It gives lot of advantage to community such as generate income and social life. According to Kocaili (2010), shopping complex become public magnets not only profit-oriented private properties but as safe and comfortable place to spend whole day there without buying anything. Shah Alam the capital city of Selangor Darul Ehsan have lot of shopping complex such as PKNS complex, SaCC mall and one of the oldest , favorite and largest retail destination are Plaza Alam Sentral.

Plaza Alam Sentral, opened in 1998, it provides department store, a house of broadcasting, recording studio and a few small office. Being close to residential precincts and surrounded by local landmarks like Taman Tasik Shah Alam, Laman Budaya and Wet World Theme Park has increased Plaza Alam Sentral's visibility and viability in terms of human traffic, market volume and easy accessibility. Figure 1.1 presented the building of Plaza Alam Sentral.

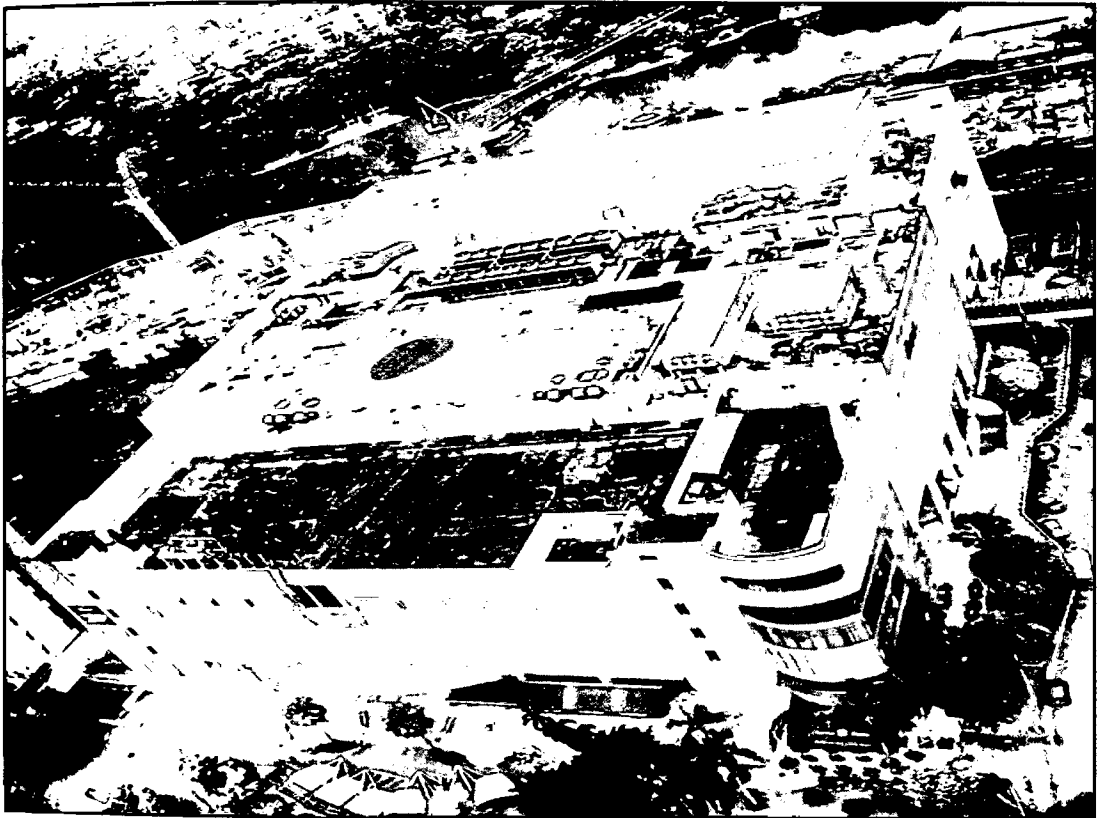


Figure 1.1: Plaza Alam Sentral, Shah Alam

Source: Google Image 2010

Despite close competition from mushrooming shopping centres in the vicinity, Plaza Alam Sentral still enjoys steady visitor numbers. Now, it captures over 8.5 million visitors a year, with 97% tenancy rate and gross floor area 335 '000 ft². In addition, the shopping complex provides a multistorey parking level to fulfill the parking demand and for comfortability for the user not only the shoppers but also the employee of MRCB tower beside this shopping complex. A base map of and provided facility around shopping complex are presented in Figure 1.2.

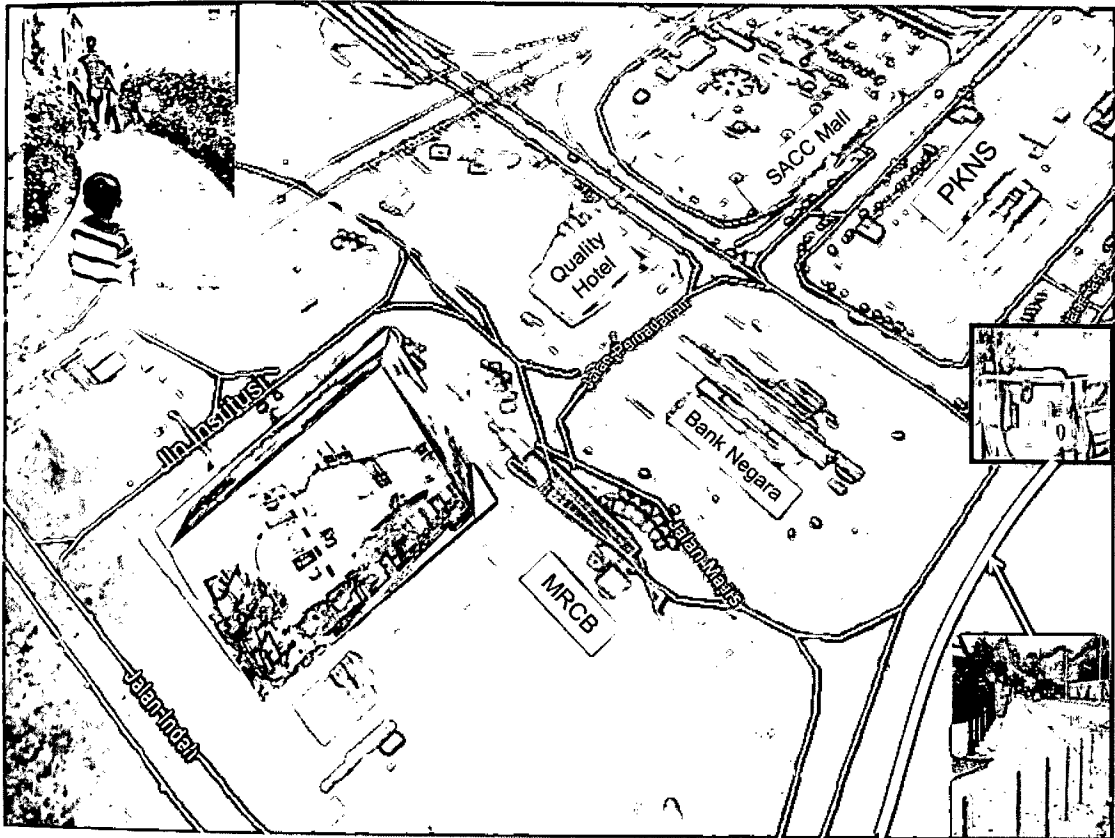


Figure 1.2 : Shopping complex, office and provided facility around Plaza Alam Sentral

Source : Google Earth 2014

1.2 Problem statement

According to Traffic Impact Assessment (TIA) practice, a parking space is provided to meet demand during peak hour morning (7.00 am – 9.00 am) and evening (5.00 am - 7.00 pm). However from observation several major shopping complexes, either on weekdays or weekend noon (12.00 pm - 2.00 pm) there is situation of difficulty in obtaining parking space. As a result it contributes to another problem such as congestion at parking entrance, and parking at illegal area. Moreover it becomes worsen when the provided parking shared with the next building. To counteract such predicament, a study on the trip regeneration rate and determination on how much vehicles does existing shopping center generates and give impact on traffic condition. In an effort to improve the transportation facilities is proposed. In Figure 1.3, shown a long queue at parking entry and vehicle parking at ilegal area in Figure 1.4.



Figure 1.3: Long queue at parking entrance Plaza Alam Sentral

Source: Project Data 2013



Figure 1.4: Vehicle parking at illegal area outside Plaza Alam Sentral

Source: Project Data 2013

1.3 Objectives

The study has been carried out in fulfillment of the following objectives:

- i) To determine the trip regeneration rate by conducting inventory of the site condition, in term number of vehicle entry and exist at parking, pedestrian survey, number of store and to determine volume capacity ratio (v/c).
- ii) To compare a theoretical (Regression Equation) value with the observed data.
- ii) To suggest a mitigation measure for balance public and private transport users to / from the shopping complex.

1.4 Scope of Study

The scope of the study is limited only for shopping complex of Plaza Alam Sentral. The survey will be conducted at parking entering/exiting and main entrance.

- i. To determines number of vehicle during noon and peak hour at entering/exiting parking.
- ii. To conduct a pedestrian survey at main and side entrance of shopping complex.
- iii. To collect reliable information such as gross floor area and number of shop of shopping complex.
- iv. To determine trip generation rate base on regression equation.
- v. To recommended a suitable mitigation measure for the improvement of transportation system.

1.5 Research Significant

Among the significant of the study are to improve the transportation system to/from shopping complex. With the increasing of the public transport user it can balance the traffic system by reducing congestion.

The trip generation rate is important to estimate the number of vehicle and person, as it very useful in future development of shopping complex in a city. The collection data, analysis and conclusion of this research can be used by local authority, developer and management of Plaza Alam Sentral.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to provide a review of past research efforts related to travel demand, transportation system, trip generation, trip attraction, trip production, development of trip generation study, regression equation and link capacity analysis. . This chapter can be source and reference in developing the study of trip generation of shopping complex.

2.2 Travel Demand

Travel demand is expressed as the number of person or vehicle per unit time that can be expected to travel on giving segment of the transportation system. Meanwhile the forecast of travel demand is essential for the design of transportation facilities and services, and also for planning, investment, and policy development (Kikuchi, Shinya; Marian Felsen; Anuj Gupta, 2004).

In other words, it can be used to establish the vehicular volume on future or modified transportation system alternative. Travel demand forecasting consists a four traditionally step process of trip generation, trip distribution, modal choice and traffic assignment. Meanwhile, Trip generation is the first step in the traditional traffic forecasting process. Figure 2.1 presented the flow of travel demand.

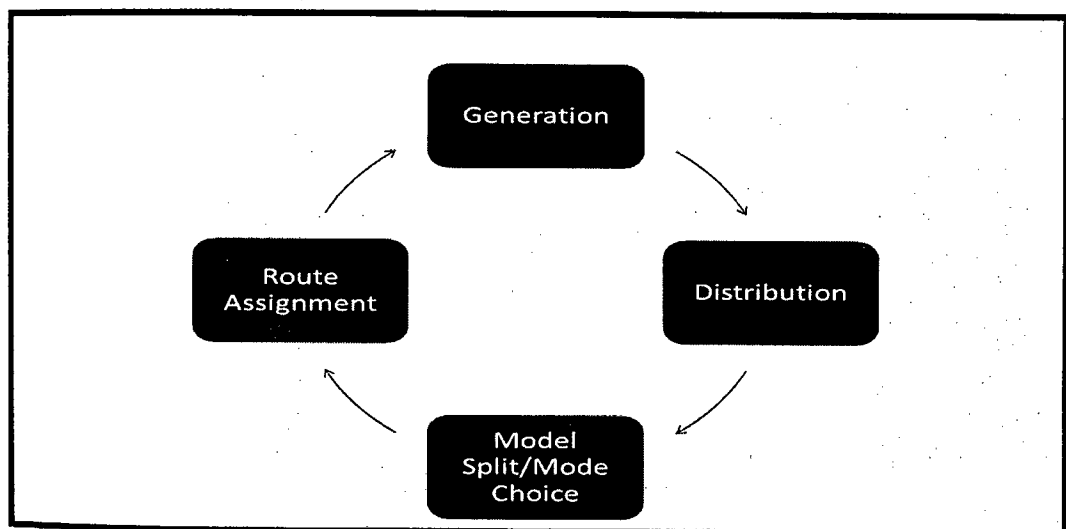


Figure 2.1: The four step model of travel demand

Source : Wikipedia 2012

2.3 Trip

Banks (2002) in most cases, the trip is considered to be the basic unit of travel behavior. Trip involve movement from a single origin to a single destination, and are usually describe in term their origins, destination, purpose, time of occurrence, travel modes, and routes. Trip also known as a single or one direction vehicle movement with either the origin or destination (exiting or entering) inside the study site (Committee, 1976)

2.4 Trip Generation

Trip Generation is the first traveler decision to be modeled in the sequential approach to travel demand and traffic forecasting (Fred L. Mannering, Walter P.Kilareski, Scot S.Washburn, 2005).

Trip Generation consists of the process to estimate trip attraction (TA) and trip production (TP) of a traffic analysis zone (TAZ). The purpose to conduct trip generation analysis is to collect and analyze data on the relationship between trip end and site characteristic.

Works by Jeihani M and Camilo (2009) proclaim that the general propose of trip generation study is to collect and analyze data on the relationship between trip attracted and produced to and from development as well as the characteristic of land use. It provides trip rates, equation and data plots based on traffic counts and characteristic of surveyed land. The trip rates are appropriate for planning purpose and traffic impact studies.

There are generally three methodologies which can be use to analysis to determine the average number of trip generated by land use Highway Planning Unit (HPU,2009)

- I. Weighted average trip generation rate or the number weighted trip ends per one unit of the independent variable.
- II. A plot of actual trips versus the size of the independent variable for each study. The numbers represented on the plots are actual trips plotted against the size of an independent variable.
- III. Regression equation of trips related to the size of the independent variable.

2.4.1 Trip Generation Non Site Traffic and Site Traffic

The selected sites to conduct trip generation studies should have at least 85 % occupancy, been established for at least two years, be able to isolated in order to collect the required data and have a limited number of driveways, ITE Manual (2004). Generally, there are two categories of increased trips;

i. Non Site traffic

Non site traffic includes all through trips of which neither the origin nor the destination is in the development site. This is usually the case for a development located by an existing main road, or whose access leads to an existing main road. In order to estimate the future through traffic in the existing main road, a historical trend in traffic volume changes of the road is needed (Guideline for Traffic Impact Assessment)

ii. Site Traffic

Site traffic refer to the traffic generated by the proposed development. It is estimated by means of the trip rates or trip regression equation, which relate estimated volume or generated trips to one or several independent paramenters. The trips rate vary with the type and size of the developments as well as different periods of a day and week. Site traffic is the estimate of the number of additional trips produced and attracted by the proposed development (Guideline for Traffic Impact Assessment)

Figure 2.2 presented type of trip generation.

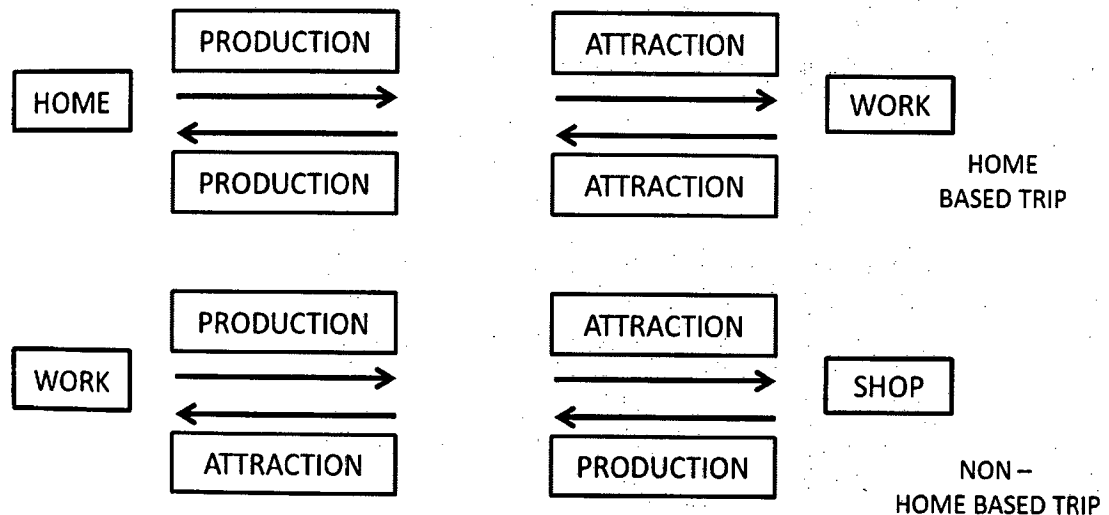


Figure 2.2: Type of trip generation

Source: Indian Institute of Technology Bombay 2011

2.4.2 Defining Trip Attraction and Trip Production

TA identifies the number of trips attracted by the various activity centers in the TAZ and trip production identifies the number of trips produced by the households in the TAZ development (Kikuchi, Shinya; Marian Felsen; Anuj Gupta, 2004).

Meanwhile for these studies, the type of trip regeneration is Non –home based trips. The trip attraction is number of person and vehicle attracts to study location. Then, the number of person and vehicle generate or produce by shopping complex is trip production.

2.4.3 Trip Generation Rate

Trip generation rate have been developed for the average weekday, Saturday and Sunday for the peak hours of the generator and of the adjacent street traffic. However, in some cases, only limited data could be obtained and thus may not be too indicative of a particular building type (Committee 6A6, 1976)

Different type of land use may have different trip generated, for example a trip generated from institutional area different with trip generated by shopping complex because it related to land use pattern. Due to that reason a study for different land use pattern should be conduct, as it can very helpful to forecast traffic in future.

2.6 Development of Trip Generation at Malaysia

Malaysia experiences high generated traffic volume as its economy expands. In many instances, these extra trips adversely impact existing levels of traffic demand. In Malaysia, the first documentation of trip generation was developed for Trip Generation Pilot Study with 212 sites surveyed. Then improvement by increase the site survey to 296 for Trip Generation Phase II Study, 315 sites surveyed for the Trip Generation Phase III Study and 355 sites surveyed for the Trip Generation Phase IV Study. The latest Malaysian Trip Generation Manual covers 10 main categories which is residential, institutional, religious, educational, burial, community, commercial, industrial, agricultural and terminal. For each main category there are several sub-categories listed with a minimum set of 5 figures for each sub-category that represent the relationship between the trip generations with one independent variable depending on the land use. (Trip Generation Portal)

2.6.1 Trip Generation Study Phase IV

The situation differs for commercial entities such as the hypermarkets or shopping complex. Most of the commercial entities open up early in the morning but only to provide access to workers, delivery trucks and cleaners. However, it is still possible to determine the peak hour of the generator which actually takes place after the hypermarket is open to public. Obviously, the timing of the AM peak hour of the generator (hypermarket in this case) does not coincide with the AM peak hour of the commuter road (Trip Generation Study Phase IV, November 2009).

Shopping complex trip regeneration rate should be define as the traffic impact analysis conduct during peak hour not off peak hour (noon). The different in independent variable can produce the different dependent variable also known as trip rate.

2.5 Trip Generation Previous Studies

Vivian determined the trip generation studies of free standing superstores in United States by looking at traffic condition related to five free standing superstores. The purpose she conducted the study to provide additional information for trip generation rate that published by ITE in 1990s and 2000 which cover the freestanding discount superstores averaging 161,000 square feet, which were sources of data for ITE Land Use Code 813 and compare to her studies that free-standing discount superstores with sizes greater than 200,000 square feet that have different rate (Vivian, 2003). This explains that relationship between area of superstore and trip generated.

Beside that, trip generation study has been conducted at shopping centre at Philippines at four locations. The significant findings of the study is the identification of variables like area of department store and groceries, number of users using private and public vehicle that may predict shopping centre pedestrian and vehicle trip generation (Ortiz, 1996).

Other efforts in establishing trip generation rates were done for the purpose to determine how senior housing and town center developments affect surrounding roadways and transit. The actual trips from nine developments in Maryland - five senior housing and four town centers were tracked for one week with counters installed at each development's entrances and exits (Jeihani, M and Camilo. 2009)