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Faculty of Graduate Studies

Trip Generation Models for Selected Land Uses in the West Bank

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– **Dr. Emad Dawwas / Internal Examiner**	**.....**

Dedication

This thesis is dedicated to my dear parents and my wife who have encouraged and supported me. Also, to my great family and friends.

Acknowledgment

First of all, I am thankful to the almighty God for granting me good health, strength and peace throughout the research period.

I would like to thank everyone who has contributed to accomplishing this thesis, especially; Engineer Jamil Hamadneh, Engineer Mo'taz Qafisheh, and the surveying teams in all Palestinian cities.

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الإقرار

انا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

Trip Generation Models for Selected Land Uses in the West Bank

اقر بأن ما اشـتملت عليه عليه هذه الرسـالة إنما في نتاج جهدي الخاص، باسـتثناء ما تمت الإشـارة إليه حيثما ورد، وأن هذه الرســـالة ككل، أو أي جزء منها لم يقدم من قبل لنيل أية درجة علمية أو بحث علمي أو بحثي لدى أي مؤسسة تعليمية أو بحثيه اخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the Researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: **إسم الطالب: أحمد محمود مصطفى**

Signature: **التوقيع:**

Date: **التاريخ: 2016 /5/20**

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Trip Generation Model for Selected Land Uses in the West Bank

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Abstract

Trip generation is the first step of the four-step transportation planning process, which is mainly used for travel demand forecasting. This research investigates and provides models (trip generation rates and equations) for Residential, Office, and Retail land uses, which are considered as the major land uses in the West Bank; each land use was classified into three major classes.

This study was conducted in accordance with the Institute of Transportation Engineers (ITE) procedures and methodology in terms of sample size, independent variables, site selection, and procedures for estimating trip generation model, taking into consideration the specific characteristics of the local land uses.

Special forms were designed to collect the required data about the developments and traffic counting. These forms were used by the researcher and well-trained surveying teams from all Palestinian cities.

At least 6 samples were surveyed for each land use class. On the other hand, only one site was found for "Shopping Center", which is Plaza Mall in Al Bireh City. Therefore, for this class, the trip generation rate will be used in this study.

Based on the analysis of the residential land use, the best independent variables that estimate trip generation are the number of persons and the number of occupied units. For office land use, the best independent variables that estimate trip generation are the number of employee and the occupied gross floor area. Based on the regression results of retail land use, the best independent variable that estimates trip generation is the occupied gross floor area.

Pass-by trips were considered only for retail land use. As for the pass-by analysis, it is clear that there is an inverse proportional relationship between pass-by trips and the occupied GFA for large supermarket land use with R^2 equals to 0.72, which is logical in the West Bank.

The study recommended to use trip generation equation for models with R^2 equal to 0.7 or greater. Otherwise, trip generation rates should be used. It is also recommended to adopt the mentioned methodology in this study for similar future studies and researches. Additionally, the study encourages other researchers to collect a new data in the future to increase the sample size so as to achieve higher accuracy regression results.

Chapter One

Introduction

1.1 Background

Land development has a strong relationship with transportation planning since any new development in any zone with specific land use will generate new trips due to the increment in population in that zone. These generated trips from the new development will be added to the existing traffic, and may cause congestion and additional conflicts on the adjacent roads. Therefore, it will affect travel demand and other characteristics of travel in that area.

Transportation agencies in general, or municipalities and Ministry of Transport in Palestine are responsible to approve the access and provide permits to new developments, and to make the required improvements in the adjacent networks in order to maintain efficiency and safe movement of traffic. In order to have a good assessment of the congestion level and the effects of the developments on the network, transportation engineers should have a good knowledge about the trips that will be generated by these developments.

Residential, Offices, and Retail land uses are considered as the major land uses in Palestine. These land uses are divided into several classes. For example; residential land use may contain various types such as apartments, villas, and lodging group. Each one of these types could be classified into classes; for example: lodging group could be classified into company or university accommodations, hostels, and different types of hotels, etc.

This research will investigate and introduce models (trip generation rates and equations) for specific land uses in Palestinian cities in the West Bank.

Trip Generation is the first step of the four-step transportation planning process, which is mainly used for travel demand forecasting.

The Institute of Transportation Engineers (ITE) defines the Average Trip Generation rates as "the weighted average of the number of vehicle trips or trip ends per unit of independent variable" (ITE, 2012). Residential Trip Generation rate also could be defined as "number of vehicle trips per household in a single residential neighborhood" (Miller et al, 2006).

As mentioned before, it's clear that trip generation is an important tool to predict future demand of transportation travel, which will be generated by new developments based on socio-economic factors such as number of vehicles owned, gross floor area, etc.

1.2 Importance of Study

Because of the lack of any comprehensive study that links the land use and the development with future demand of travel in Palestine, this research is considered vital in this field. In planning for a particular development, the developer should identify the possible traffic congestion within the development zone; due to the persons and vehicle trips generated (produced or attracted), which were resulted from the development. Therefore, these trips would add to the existing traffic in the adjacent roads. As such, the proper estimation of trip generation using appropriate trip rates or equations

on that development provides good management and solutions for the anticipated future traffic problems in the development zone.

The trip generation models that were developed in the other countries; either developed or developing countries may not be adequate to be applied in Palestine because of the different life-style, cultural, weather and socioeconomic factors of the populations. Therefore, it is important to develop proper models for different land uses within the Palestinian context.

The Transportation Impact Study (TIS) is one of the planning tools used to investigate and mitigate anticipated transportation and traffic problems before they occur. Trip generation is one of the first steps required in these studies. In Palestine, trip generation rates are not yet established and TIS are not yet adopted at the policy level. This research will estimate the trip generation rates for selected major land uses in the West Bank through field survey and statistical analysis. The results of this research will be used to promote the adoption of TIS at the policy level and be incorporated as part of the permitting process from the related agencies (municipalities or ministries).

Moreover, this study will be a valuable tool for the decision makers for establishing a cost sharing mechanism in Palestine where developers who participated in increasing the level of traffic and transportation problems would have to participate in the cost of mitigating its impacts.

1.3 Study Area

The study area in this thesis is the West Bank, but due to time limitation and resources; the researcher considers the samples from urban areas in the major cities in the West Bank.

The samples that were selected in this thesis cover all major cities in the West Bank, thus the results can be generalized for the entire West Bank. For some land uses, the researcher may find a suitable sample that satisfy the required criteria in some cities; however, the researcher was careful to have a good geographical distribution of the samples that reasonably cover north, middle, and the south areas of the West Bank as shown in Figure 1.1.

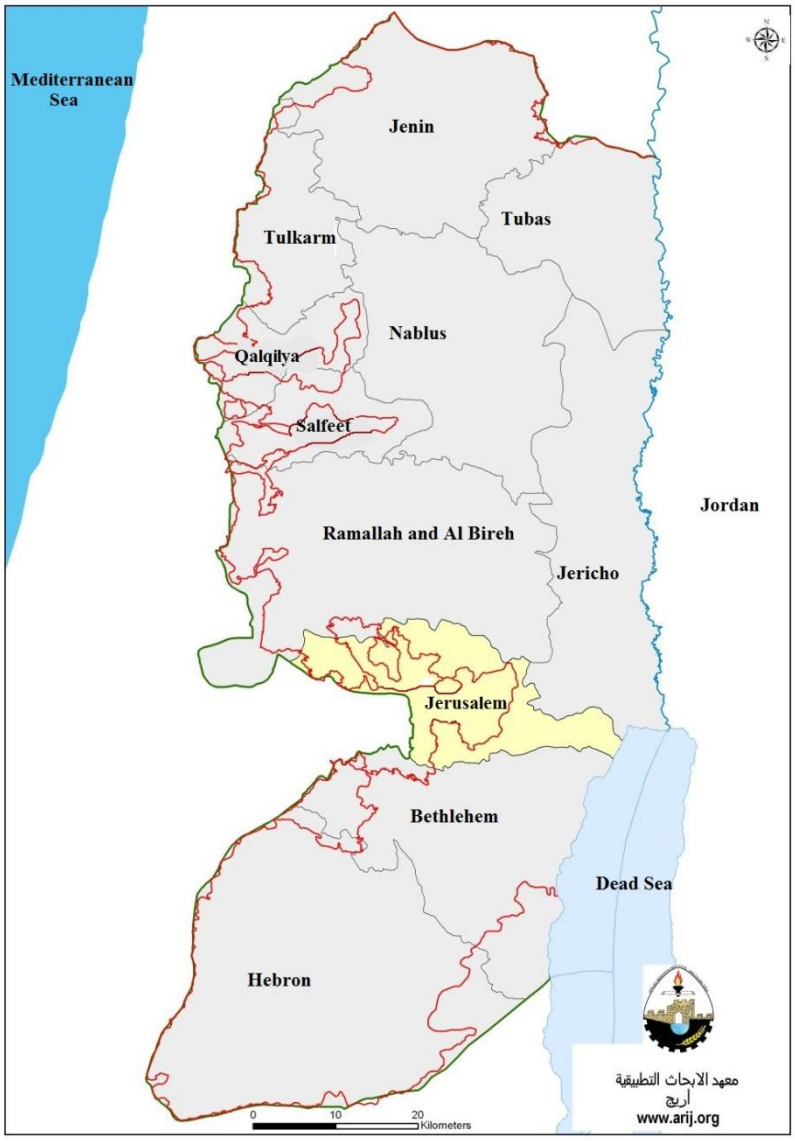


Figure 1.1: West Bank Map with Major Cities

Source: Applied Research Institute Jerusalem (ARIJ), Jerusalem, from: www.arij.org

1.4 Study Objectives

The goal of this study is to promote reliable and sound transportation planning as a way to manage transportation system and provide preventive solutions to transportation problems before they occur.

The main objective of conducting this study is to establish a local trip generation rates and equation for the various types of Residential, Office, and Retail developments based on socio-economic factors, in addition to determining the peak characteristics of trips generated by these developments. This is done by collecting and analyzing data about the relationship between trip generation ends and the site characteristics for a particular land use.

This study, as well as other related ones, would facilitate adopting TIS as part of the development permitting process through the introduction of steps and procedures required for the various levels of the TIS.

1.5 Thesis Structure

This thesis is composed of six chapters. Chapter One includes the background and importance of study, objectives, study area, and thesis structure. Chapter Two presents a review of definitions and components of trip generation and provides a brief description of the researches and studies about trip generation. Chapter Three outlines the data requirements and methodologies used to develop trip generation models. Chapter Four explores data collection used for analysis. Chapter Five is the presentation of analysis and discusses the results. Finally, Chapter Six provides the conclusions and recommendations of this study.

Chapter Two

Literature Review

2.1 Introduction

There are very limited studies that have been conducted regarding trip generation for land uses in Palestinian cities. However, there are a number of agencies and organizations, mainly in highly urbanized areas in developed countries, which have conducted trip generation studies and determined trip generation rates and equations for a variety of land uses.

The following sections present a summary of selected studies related to the thesis purpose.

2.2 Transportation Planning and Travel Demand Forecasting

Transportation planning is concerned with the development of a transportation plan with respect to the social, economic and environmental impacts of the populace to enhance positive goals. The fundamental goal of transportation planning is to accommodate the need for mobility in order to provide efficient access to various activities that satisfy human needs (Oyedepo and Makinde, 2009).

The transportation planning process depends on travel demand forecasting. Based on a review of the literature, there is a common basic approach that may be applied to all forms of transport planning, which may be summarized by three distinct stages (Rosinta, 2009):

i) A survey, analysis and model building phase.

ii) Forecasting phase.

iii) Evaluation phase

Travel demand forecasting is a sophisticated multi-stage process, which is mainly used to predict future demand of traffic, either for existing networks or for potential developments.

Travel forecasting as a formal process began in the 1950s; when the interstate highway system was first being built and post-war prosperity was making better housing and auto travel more widely affordable (Weiner, 1997). The process becomes known as the four-step method. Transportation policy was often used as a way of facilitating other social ends, namely better housing and less congested central cities (Hansoun and Giuliano, 2004).

Indeed, early researches viewed traffic forecasting as a particles physics problem; the fact that particles were human being was left by some to be basically irrelevent. In other words, people will be pulled toward attractors (places of work, shopping, entertainment, and so on) with the level of attraction for a given person roughly proportional to some combination of the total attractiveness of the place and the difficulty of getting there. Give the total number of trips, and the starting point of each trip (based on where people live), the total amount of traffic on every road can be predicted on this basis (Pas, 1990).

With this historical context, and to describe it very briefly, the four-step process method first predicts a total number of trips based on externally generated predictions about the people and the economy of the region and

on current patterns of behavior. Each trip is then assigned a specific origin and destination based on current travel patterns, expected locations of future homes and businesses, and expected characteristics of the road network. Finally, each trip is allocated to a specific highway transit route, based on the principle of minimizing the total time and money cost of each trip (Barnes and Davis, 1999).

There are several different techniques that can be used at each stage. Generally, Travel Demand Forecasting involves four interrelated tasks (Mousa, 2013).

1. Calculate the number of trips starting in each zone for a particular trip purpose (Trip Generation Analysis).
2. Produce a table of the number of trips starting in each zone and ending up in each other zone (Trip Distribution Analysis).
3. Complete the allocation of the various trips among the available transportation systems (bus, train, pedestrian, and private vehicles) (Modal Choice Analysis).
4. Identify the specific routes on each transportation system that will be selected by the travelers (Trip Assignment Analysis). Figure 2.1 illustrates the fundamentals of the four-step planning process.

Once these four steps have been completed, the transportation engineer will have a clear idea of the projected travel demand for an existing or proposed

transportation system. The focus in this literature is about the first step; trip generation.

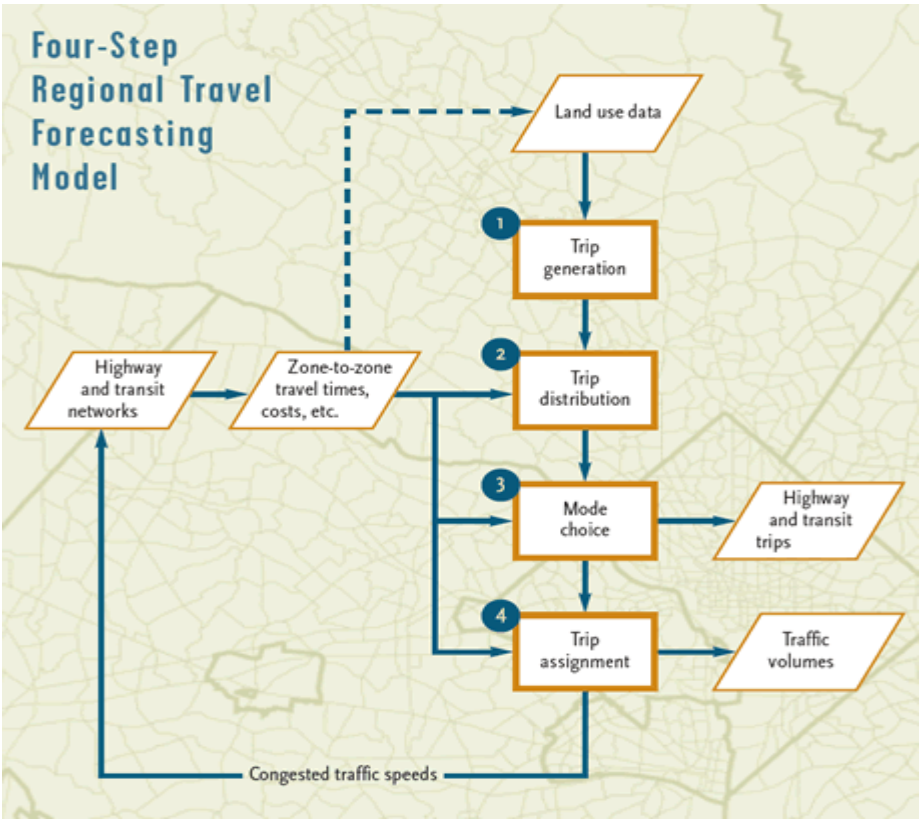


Figure 2.1: The Classical Four-Step Transportation Planning Model

(Source: Metropolitan Washington Council of Governments; Washington, DC; Available from: http://www.mwcog.org/transportation/activities/models/4_step.asp)

2.3 Trip Generation Concept

A trip is often defined as a one-way single journey made by an individual between two points by a specified or combined modes of travel and for a defined purpose (Ben-Edigbe and Rahman, 2010).

ITE (2012) distinguishes three types of trips:

1. Primary Trips: Primary trips are made for the sole purpose of visiting a specific destination and are the main reason for the trip. Such trips go from the origin to the development or generator and then return to the origin (such as home to shopping and then back to home). Upon exit, primary trips will travel back in the direction from which they came.

2. Pass-by trips are made as intermediate stops on the way from an origin to a primary trip destination without a route diversion. Pass-by trips are attracted from traffic traveling on an adjacent street or highway that chooses to stop and visit a development. Direct access to the development site is provided from the adjacent street and thus, pass-by trips are not diverted from another roadway.

   Pass-by trips are commonly made to retail-type developments such as shopping centers, discount stores, restaurants, banks, service stations and convenience stores located adjacent to busy streets, and attract motorists who are currently traveling in the traffic stream. Such land uses attract a portion of their trips from the adjacent street traffic and are not considered to be new traffic added to the system; however, this traffic is considered as new traffic at the site driveways. Upon exit, pass-by trips continue to travel in the same direction they were traveling before stopping at the site.

3. Diverted Linked Trips: trips are trips that are attracted from the passing traffic on nearby roadways in the vicinity of the development,

but require a diversion from their intended travel path to another roadway to access the site. Diverted-link trips add traffic to the streets directly adjacent to a site and at the site entrance, but may not add traffic to the nearby roadways; see Figure 2.2.

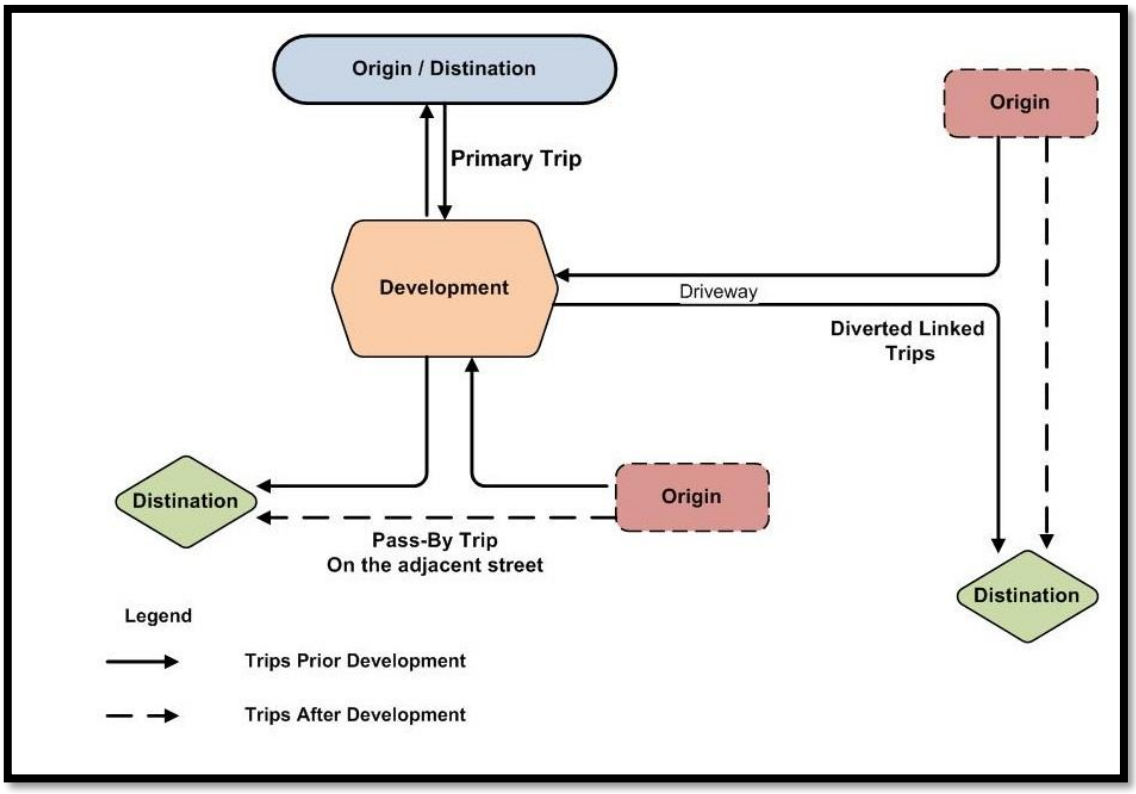


Figure 2.2: Types of Trips Generated by the Development

Source: ITE, 2012

Trip generation analysis involves estimation of the total number of trips entering or leaving a parcel of land as a function of the socioeconomic, locational, and land use characteristics of the parcel. The function of trip generation analysis is to establish meaningful relationships between land use

and trip making activity so that changes in land use can be used to predict subsequent changes in transport demand (Ashford et al, 1982).

The explanatory variables set, which has been found in the literature regarding trip generation analysis ranges from socio-economic and demographic attributes of the household to the built environment characteristics and land-use patterns. In this respect, researchers found that the automobile trip generation rate for the neo-traditional neighborhood is significantly lower than the conventional neighborhood, because individuals rely on automobiles partly to travel from place to place in conventional communities because land uses are separated and spread out. By contrast, when certain design features such as higher development densities and continuous sidewalks are combined with the mixed land uses typically found in neo-traditional communities, many expect residents of these communities to drive less and walk and bike more, on average (Mousavi et al, 2012).

2.3.1 Trip Generation Modeling

A model can be defined as a simplified representation of a part of the real world, the system of interest, which concentrates on certain elements considered important for its analysis from a particular point of view. Model building is a mathematical process used to formula relationships between two or more variables.

Trip generation model is an examination of the relationship between the number of trips made and certain quantifiable parameters. Trip generation rates are used to predict the number of vehicle trips generated by specific

land use when further planning of any developments is to be carrying out. Most traffic studies involve the estimation of the trip generation of a particular land-use (Mousa, 2013).

Two general classes of trip generation models have traditionally been used in practice: regression models and cross classification models (Meyer and Miller, 2001).

2.3.1.1 Regression Analysis is a technique used for the modeling and analysis of numerical data consisting of values of a dependent variable (response variable) and of one or more independent variables (explanatory variables). The dependent variable in the regression equation is modeled as a function of the independent variables, corresponding parameters (constant), and an error term. The error term is treated as random variable (Mousa, 2013). It represents unexplained variation in the dependent variable. The parameters are estimated so as to give a "best fit" of the data. Most commonly, the best fit is evaluated by using the least squares method, but other criteria have also been used.

Trip generation models may take the form of linear (simple or multiple) or non-linear regression equations. In linear regression, the model specification is that the dependent variable, y_i is a linear combination of the parameters (but need not be linear in the independent variables). For example, in simple linear regression for modeling N data points there is one independent variable: x_i, while in multiple linear regression there are more than one independent variable x_1, x_2, x_3 to be used in modeling N data points.

The following equation is an example of a multiple linear regression equations:

$Y = B_0 + B_1x_1 + B_2x_2 + B_3x_3$

Where

y = dependent variable representing trip generation

B_0 = the constant included to represent the portion of the value of y not explained by the independent variable

B_n = coefficients

x = independent variables – production (number of households, number of vehicles, population, etc.) and attraction (number of retail, commercial, and industrial employees)

While the simple linear regression has the form of

$Y = B_0 + B_1x_1$

Nonlinear regression is a form of regression analysis in which observational data are modeled by a function which is a nonlinear combination of the model parameters and depends on one or more independent variables. The data are fitted by a method of successive approximations. Nonlinear regression models may be presented in several shapes such as exponential, parabolic, log, etc. (Seber and Wild, 1989).

Regression models are easy and inexpensive to construct from data that are typically available in the planning studies (Meyer and Miller, 2001).

2.3.1.2 Cross Classification or Category Analysis is a technique developed by the Federal Highway Administration (FHWA) in the late 1960s. This approach recognizes the linkage between trip production and the characteristics of individual households (Rhee, 2003).

The Cross-Classification Analysis has become most widely accepted. This procedure provides the planner or the highway engineer a basic model structure. This structure can be altered for local situations by substituting or adding variables. There are separate recommended model structures for each type of trip as trip productions, trip attractions and internal-external trip generations (Rahman, 2009).

A cross-classification table shows the number of daily trips produced per household whose characteristics stratified by a combination of household attributes, such as the number of automobiles per household (car ownership) and the number of people per household (household size). Each element (or cell) of the table is multiplied by the number of households in the same category, and the product is summed for all categories in the table to obtain the number of total trips generated in the traffic analysis zone (Rhee, 2003).

The values predicted should also be plotted and smooth curves be drawn through the data observation. It is considerably more difficult to provide zonal counts or forecasts of households in multi-dimensional cross-classification systems than in a one-way and simple two-way matrix (Al-Taei and Amal, 2006).

2.4 Trip Generation Studies

This section addresses the literature of trip generation studies and researches that are conducted in both developed and developing countries.

2.4.1 In the Developed Countries

1) Trip Generation in the United State of America (USA)

Trip generation studies have been conducted since 1960s in the USA and Canada, and from that time vehicular trip generation data were collected and analyzed until the Institute of Transportation Engineers (ITE) published the first edition of Trip Generation Manual in 1976, which contained trip generation rates for 50 land uses, and more than 500 studies without graphical plots. In 2012, ITE published the 9th edition of this manual with 172 land uses and more than 5200 studies (ITE, 2012).

This manual could be used in several studies, such as; traffic impact analysis, impact fees, roadway design, signal timing, and in environmental assessments.

Trip Generation Handbook, which is part of the Trip Generation Manual, is an important guide. It describes the methodology and procedures to conduct trip generation studies, in addition to other important items (ITE, 2012).

Since the ITE (2012) is a primary reference for conducting trip generation studies, the following are details presented in the ITE handbook; most of these steps are followed in this thesis.

1. Selection of Land Use to be studied

2. Sample Size Determination; ITE suggested to have sufficient sample size to enable the analyst to draw valid conclusion from trip generation study. Common practice in the traffic planning has been to collect trip generation data at three to five sites that truly meet the recommendation of site selection criteria (ITE, 2012).

3. Site Selection: Site selection is a sophisticated step, since the failure to select the site appropriately may lead to incorrect trip generation rates and equations. The following criteria are suggested by ITE for site selection (ITE, 2012).

    a. The Development should have reasonable full occupancy;

    b. The Development should be mature (at least two years old and located in a mature area), so it represents the ultimate of a successful development;

    c. The Development should be selected on the ability to obtain accurate trip generation; and

    d. Typical of sites in area with no unusual activities underway.

4. Independent Variables Selection: ITE suggests to consider several points when identifying potential independent variables for local trip generation study, as follows:

    a. The data for the independent variable should be readily available and accurate for the survey site and any potential proposed development.

b. The number of trips generated should be influenced in a logical way with the independent variable.

c. Variables should be provided directly for the survey site, not derived from other variables.

Several independent variables were used in this manuals, for example dwelling units, persons, and number of owned vehicles are used for residential land use, while employees, gross floor area (GFA), and leasable floor area are used for office and retail land uses.

5. Survey Periods: site generated traffic should be counted, if feasible for a full 7-days period to determine when total site generated traffic volumes peaks. Furthermore, ITE suggests conducting manual traffic counts for a minimum of 2 hours for each peak period. In this research, manual traffic counting was conducted for both AM and PM periods for at least 2 hours.

ITE classified the trips generated by the development into two classes; Pass-By trips and Non-Pass-By trips. Pass- By trips can be defined as the trips made as intermediate stops on a way from an origin to a primary trip destination without a route diversion. Non-Pass-By trips are defined as all trips generated by the site that are not pass by trips (ITE, 2012). Traditionally pass-by trips analysis have attempted to correlate pass-by trips percentage (percentage of the total number of trips generated by the site). The ITE provides percentage of pass-by trips for retail and commercial land uses only.

According to the ITE, the number of pass-by interviews should meet the minimum sample size requirements. Table 2.1 illustrates the minimum sample size for pass-by trip survey for 95% level of confidence.

Table 2.1: Minimum Sample Size for Pass-By Trip Survey

(95% level of confidence)

Max. Error in Mean	Expected Percentage Pass-By Trips						
	20%	30%	40%	50%	60%	70%	Unknown
10%	61	81	92	96	92	81	96
15%	27	36	41	43	41	36	43

(Source: ITE, 2012)

Kimley-Horn and Associates (2009) conducted a study about Trip-Generation Rates for Urban Infill Land Uses in California. The most applicable outcome of this study is the production of an initial set of quantitative information on travel characteristics of urban infill land uses for traffic impact studies and environmental assessments in this state, and intended to establish a standardized data collection and analysis methodology.

The study covered the following types of land uses located in urban infill areas of California (and potentially elsewhere):

- Commercial and office developments,
- High density housing, and
- Mixed-use and transit-oriented developments.

The term infill is commonly used to describe the development of vacant or underutilized land in areas surrounded by existing development. The collective term “urban infill” usually describes the redevelopment of areas within cities. Although transit proximity is not explicitly included in the common definitions, many practitioners believe that access to transit, transit-oriented development (TOD), and mixed-use development are typically associated with urban infill development. (Kimley-Horn and Associates, Inc., 2009)

The preliminary data collected and evaluated from 27 sites indicate that the observed trip generation rates are generally lower (in some cases significantly) when compared to ITE trip generation rates, although some individual sites show trip rates equal to or higher than ITE rates.

Miller et al (2006) indicated that the residential trip generation rates are a fundamental component of transportation planning. To investigate discrepancies in these rates, residential trip generation rates for nine suburban neighbourhoods were computed using four different methods: ground counts conducted at the neighbourhoods, household surveys distributed to the neighbourhoods, application of national trip generation rates published by the ITE, and rates derived from the trip generation component of regional urban travel demand models for the neighbourhoods.

Agencies generally use one of these rates, and by determining all four for the same set of neighbourhoods in a controlled study, one can ascertain the extent to which these rates are likely transferable. Rates based on the first

three methods were not significantly different. For developments composed solely of single-family detached homes, the daily average residential trip generation rate was 10.8 (trip / dwelling unit) based on the site-specific ground counts, 9.2 based on site-specific household surveys, and 9.6 based on ITE's trip generation rates. However, rates based on the fourth method were significantly different, with a mean rate of 6.4.

The greatest differences occurred when the long-range regional model used person trips that were converted to vehicle trips rather than estimating vehicle trips directly. Although the summary statistics presented in this paper will not surprise transportation planners, they illustrate two caveats for balancing data collection costs and need for site-specific information. First, a subtle change in how some rates are calculated limits their utility elsewhere. Second, even when equivalent methods for determining rates are used for similar neighborhoods, differences will occur because of the large and random variation inherent in trip generation. Borrowing rates may indeed be tolerable, but only if one gives the full range of rates possible from this probabilistic process rather than just the expected mean rate (Miller et al, 2006).

Based on San Diego Trip Generation Manual (2003), the process of conducting trip generation study includes a selection of several (usually four to seven) sites that can be categorized as having the same land use. Data to be collected varies according to the specifics of the subject land use. The collected data could include several different physical parameters attributed

to the subject site such as location, lot size, structure size, number of employees, and other units of interest. The traffic counts are taken for a period of up to seven days. The results of these counts are compiled to determine daily and peak hour trip generation rates per the independent variable(s) for the subject use. Depending on the specific land use, the independent variable(s) may be square feet, acre, number of employees, dwelling units, rooms, etc. (Trip Generation Manual, San Diego, 2003).

The results of this manual (trip generation rates) are presented in tables for each land use for both AM and PM peak periods. Furthermore, the manual presents trip generation equation for special land uses. Natural logarithm; fitted curve logarithmic equation is used for commercial office and regional shopping center.

The manual indicates that city center trip generation rates are expected to generate less trips in city center than outside downtown for the following reasons: in city center mass transit has a higher percentage of mode split; due to high density; “walk” trips are a greater percentage of internal trips; parking availability and costs (people do not necessarily park where they work or visit).

Vermont Trip Generation Manual, 2010 contains trip generation rates and equations, which relate the number of trips for a specific land use, defined by a Land Use Code (LUC), to some measure of land use intensity. The Vermont Sate produces its own trip generation manual because the ITE Trip Generation rates are not truly reflective of rural and small urban areas of

Vermont, because most data collected by ITE are located in suburban and medium sized urban areas, which are not representative of small urban and rural areas, such as Vermont.

Data Analysis consisted of calculating Trip Generation rates for the various land uses and, where enough data exists, deriving equations relating the intensity of land use to trip making propensity.

The manual selected more than 30 land uses of several types such as retail, service, housing, etc. Also, the manual used a manual counting for AM, PM, and MD peak periods that is conducted by trained teams.

Data Analysis were conducted in accordance with ITE standards. The analyses consisted of estimating the trip generation rate, estimating its standard deviation, determining if the rates derived are statistically differed from the ITE rates, if the rates derived from Chittenden County are statistically differed from those rates derived from sites outside Chittenden County, and estimating regression equations where appropriate.
Over 1000 individual sites were surveyed. The results of individual land use trip generation analyses are presented in a way that is similar to ITE.

Regression equations were prepared for all instances but are shown only in accordance with the guidance in the Trip Generation Handbook, User's Guide. For example, equations are shown only where $R^2 > 0.5$ and $n > 3$. Where these criteria are not met, the data page in the "Fitted Curve Equation" portion shows "Not Given" (Vermont Trip Generation Manual, 2010).

2) Trip Generation in Europe

In the UK and Ireland, Trip Rate Information Computer System (TRICS) is the national standard system of trip generation and analysis, and is used as an integral and essential part of the transport assessment process. It was launched in 1989, and through continuous investment and development it has expanded into a comprehensive database for trip generation analysis.

TRICS is a database that contains traffic count information for over 7150 individual sites and 110 land-use sub-categories. Furthermore; the individual site records within the database contain a comprehensive, detailed information on a site's local environment and surroundings, the composition and functions of a site, and its on-site and off-site parking facilities, etc. Most land-use categories have one to four variables, or parameters, by which trip rates can be calculated. GFA, employee numbers, parking spaces, and site area are extensively applied to a wide range of land uses when calculating trip or parking rates. The most common parameter fields in the TRICS database are GFA, parking spaces, and site area (Douglass and Abley, 2011).

2.4.2 In the Developing Countries

The Department of Transport (DoT) in Abu Dhabi has prepared a manual for trip generation named “Trip Generation and Parking Rates Manual for the Emirate of Abu Dhabi (ADTGM)” based on international best practices and extensive research and surveys undertaken into development trends in the Emirate (ADTGM, 2012).

In addition to trip generation and parking generation rates, ADTGM presents data about public transportation, walking, and cycling trips. These multi-modal travel information is very useful in designing the facilities required for pedestrian, bicycles, and other transportation modes, as well as it is used in a description of the development in order to develop “Transportation Impact Studies (TIS)”.

Trip generation rates have been determined for each land use for three periods during the day; morning (AM), midday (MD), and evening period (PM), in order to keep in touch with international manuals. Data were collected in specific intervals during these periods, which coincide with travel characteristics of roads peak hours. These intervals are 06:00 - 09:00 AM, 12:00-14:00 PM, and 17:00-20:00 PM, respectively.

The processes followed in developing trip generation and parking rates is similar to the ITE methodology. this is an important reference in conducting this study since it describes the methodology that will be followed in such studies.

Al-Masaeid et al (1999) developed a statistical model for estimating vehicle parking demand for different land uses in Jordan that include hospitals, hotels, etc. The study defined a total of 208 sites of selected parking lots in several cities, such as Amman, Zarqa, and Irbid. The study found that the developed models had an exponential form for hospitals, office buildings, hotels, and apartment buildings, while it was linear for restaurants and shopping centers. Also, the study found that the parking demands for the

investigated land uses were lower than the typical values in the developed countries.

Al-Sahili (2010) conducted a Traffic Analysis and Simulation of Al-Ersal Center for the benefit of Arduna Real Estate Development Company. The study discussed specific land uses, which are the shopping and commercial, residential, office, and hotel. Five sites (land uses) were surveyed during the AM peak and PM peak periods of the work day.

The study also made a comparison between the trip generation rates for the surveyed land uses and the ITE rates. Table 2.2 illustrates the differences between local and ITE trip generation rates.

Table 2.2: Comparison between Local and ITE Trip Generation Rates

Land Use	Local Trip Rate		ITE Trip Rate	
	AM Peak	PM Peak	AM Peak	PM Peak
Shopping/Commercial Center	4.0	18.60	11.09	40.26
Hotel (Grand Park)	0.68	0.38	0.56	0.61
Hotel (Best Eastern)	0.31	0.12	0.56	0.61
Residential	0.30	0.13	0.34	0.38
Office Bldg.	6.97	4.70	16.79	16.04

(Source: Al-Sahili, 2010)

It is clear from the previous table that the local Palestinian trip generation rates for the local land uses are lower than the ITE Rates, which is logical since these rates are based on local socioeconomic conditions and traffic characteristics.

The researcher considered the independent variable that was different from which was adapted by ITE for the commercial land use, as the ITE estimates the rate of trips for commercial/shopping per "gross leasable area" while the local rate was based on the "gross floor area." Therefore, the ITE trip rates are typically higher than the local rates.

The research also considered a reduction in trips generated by specific land uses; these reductions are on Pass-By and Internal Trips.

Pass-by trips are applied for commercial land use, and were estimated based on the ITE Trip Generation Handbook to be approximately 35 percent. The researcher defined Internal Trips as "the number of trips from a land use to another land-use within the same multi-use development" or "the number of trips between a particular pair of internal land uses is limited to the smaller of the two values"; and these trips are a function of the size of "receiving" land use and the number of trips it attracts as well as the size of the "originating" land use and the number of trips it sends.

Tomeh et al (2010) developed a Traffic Impact Study of Al-Ersal Center in Al-Bireh city; the same development studied by Al-Sahili (2010). The study conducted analysis process for the existing conditions at the opening of the project and after operating the project. The Study provides a brief methodology about conducting traffic impact studies through conducting trip generation rates for similar developments within Ramallah and Al-Bireh cities in order to estimate the number of trips generated by the proposed development.

Awadallah and Al-Sahili (2008) conducted a Traffic Assessment for Rawabi City. This study assessed traffic conditions to be generated by the proposed development, which is the establishment of Rawabi City in the northern part of Ramallah and Al-Bireh cities. The city will consist of approximately 5000 dwelling units (apartments) and the associated facilities and services; mainly schools and commercial center. The objectives of this study was to determine traffic generation for a new town and estimation of traffic forecasts to determine appropriate level of access road and infrastructure provision to connect the new town to local highway network. In addition, the study intended to give the planner and designer of this development the preliminary information regarding traffic including data about traffic volume, expected road traffic operating conditions and capacities, and projected traffic volumes. Traffic assessment for Rawabi was conducted in a short duration and with very limited information concerning Rawabi land uses and their locations within the new development. Despite such facts, the study provides preliminary and important estimates of trip generation and basic traffic assessment for Rawabi.

This study was conducted on three land uses, which are residential, school, and commercial land uses. Two survey sites were selected for each of the main land uses stated above to estimate the local trip generation rates.

Trip generation surveys were conducted at each location during two different weekdays and for the same time periods. It should be noted that the survey was conducted during the month of Ramadan, thus the school start and end

times, as well as the shopping and residential trip patterns were considered for determining the survey periods. Table 2.3 presents a summary of trip generation rates produced by the study.

Table 2.3: Vehicular Trip Generation Rates for Rawabi City

Land Use	Approximate Development Size	Rate Unit	Trip Rate	
			AM	PM
Residential	5000 apartments	Per apartment	0.28	0.25
Commercial	15 thousand m^2	Per 100 m^2	0.5	2.60
Schools	6000 students	Per student	0.24	0.06

(Source: Awadallah and Al-Sahili, 2008)

2.5 Summary

Several methods used to establish trip generation models -rates or equations- are illustrated in this chapter, but the most popular one is the simple linear and logarithmic regression, which are used by ITE and several other studies. Several other studies used rates for trip generation such as ADTGM, San Diego Trip Generation Manual, ITE, etc.

The previous studies determined several independent variables to be correlated with the dependent variable such as number of persons, number of dwelling units, number of owned vehicles, GFA, number of employees. The best independent variables, which are suitable in the West Bank are selected and investigated in this thesis.

This chapter illustrates some of results of studies specially those conducted in the developed countries, and illustrates the methodology of conducting such researches.

Several studies and manuals concerning trip generation follows the ITE procedures and methodology. This thesis will be conducted with accordance of the ITE procedures and methodology in terms of the site selection, sample size, independent variables, estimating of pass-by trips, and procedures for estimating trip generation model. However, site specification or land use local specific characteristics are also taken into consideration.

Chapter Three

Methodology

3.1 Introduction

This section illustrates the detailed methodology adopted in this thesis. Generally, the methodology follows the recommended methodology by the ITE, which is illustrated in the Trip Generation Handbook (ITE, 2012), and it is also similar to the methodology followed by the Trip Generation and Parking Rates Manual for the Emirate of Abu Dhabi (ADTGM, 2012).

Figure 3.1 illustrates the methodology and procedures that is followed in this research.

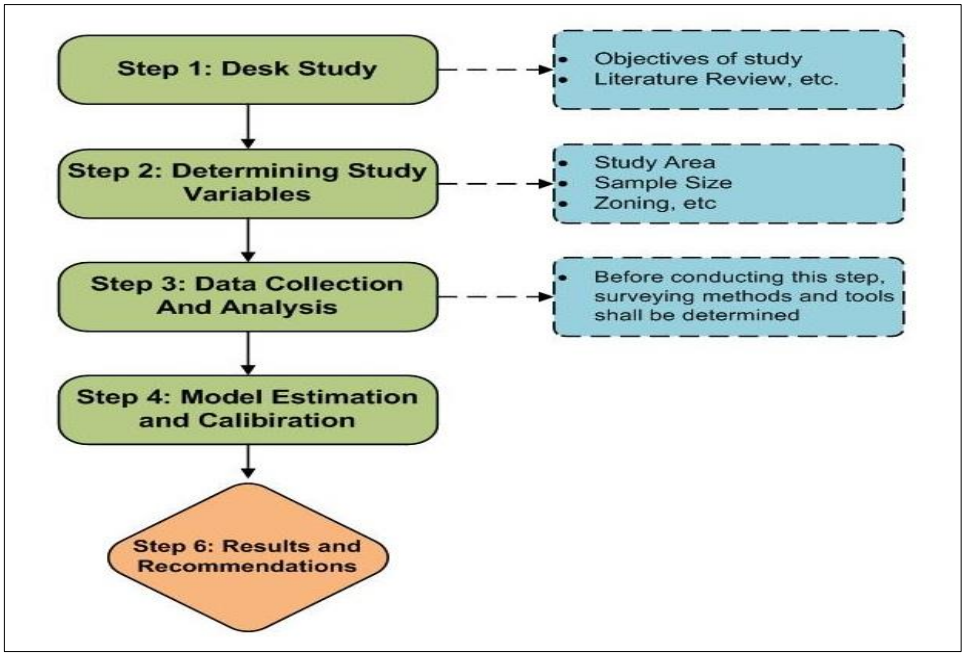


Figure 3.1: Methodology Flow Chart

As shown in Figure 3.1, the methodology will mainly consist of 5 consequential steps in order to achieve the objectives of this thesis.

3.2 Steps and Procedures to Conduct the Study

3.2.1 Step 1: Desk Study

This is the first and the most important step because in this step the specific objectives of this study is determined in addition to other items such as the importance of study, schedule, expected outputs, and literature review.

Moreover, in this step, the land uses to be studied are determined, which are residential, office, and retail land uses. Furthermore, land uses are divided into categories. These categories are selected so as to be consistent with the common style in the study area (West Bank). Figure 3.2 shows an example of this breakdown in the residential land use that was used in this thesis.

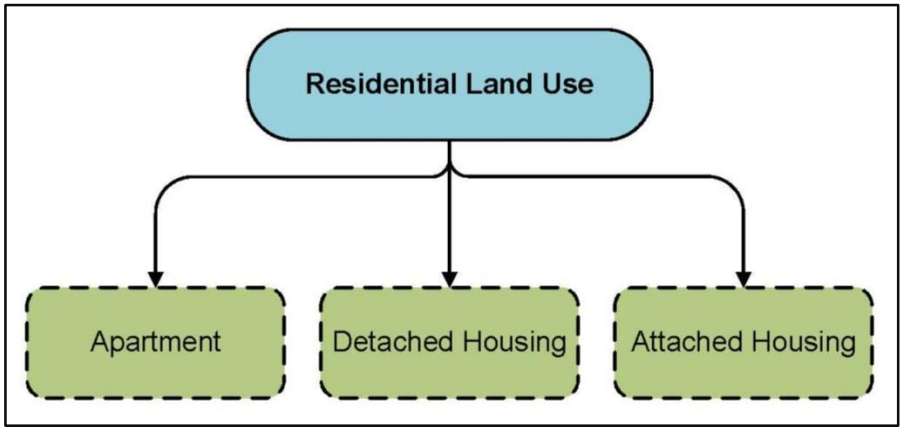


Figure 3.2: Breakdown of Residential Land Use

In addition, the office land uses were classified into three categories, which are government offices, private offices, and institutional offices. The categories of the retail land uses are Shopping Center/shopping centers, large supermarkets, and commercial strip.

3.2.2 Step 2: Determining Study Variables

In this step, the study area, sample size, and other variables are determined.

3.2.2.1 Study area

The primary task in this step is to identify the study area. The boundary of this area is the external cordon and should include the development area. The location of this boundary is very important, because the zoning system and the network will be defined clearly within it.

The study area in this research is the West Bank, and this study area was divided into main cities, based on the boundary of Palestinian National Population Census boundaries.

The West Bank consists of eleven governorates. These are Jenin, Tulkarm, Tubas, Nablus, Qalqilya, Salfeet, Ramallah and Al Bireh, Jericho, Bethlehem, and Hebron. The researcher distributes the samples among all governorates as much as possible in order to be representative to all the West Bank. Figure 3.3 shows the distribution of governorates in the West Bank map and cities where the survey was conducted. It should be noted that Jerusalem Governorate was not included in the study area due to political reasons.

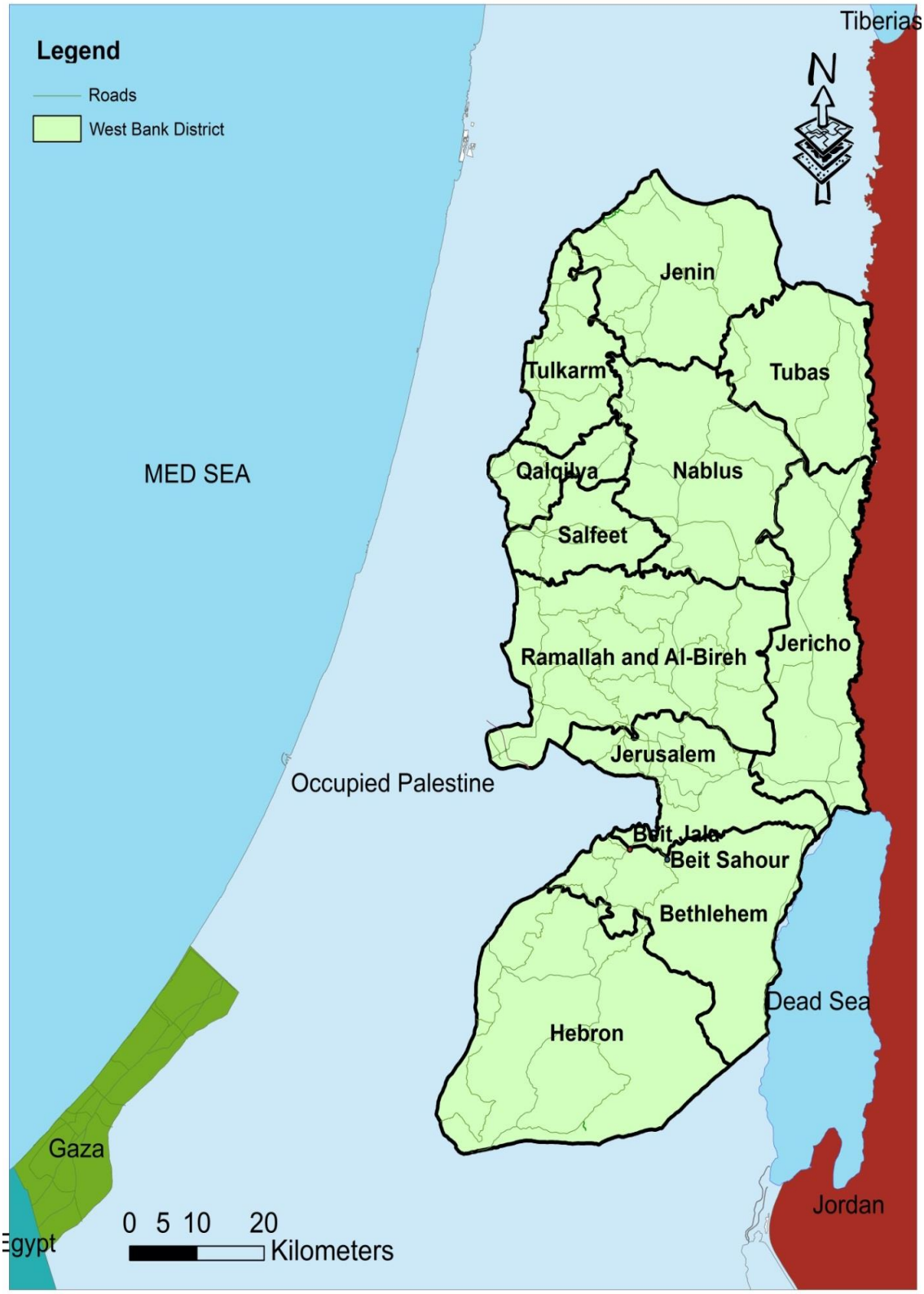


Figure 3.3: Governorates within the West Bank

3.2.2.2 Sample size

There is no simple statistical methodology that has been established for determining the number of sites that should be studied to obtain statistically significant trip generation results (ITE, 2012). However, ITE recommends that at least three (preferable five) sites should be surveyed, and the higher number of sites is suggested, based on the time and budgetary constraints.

The researcher attempted to collect at least one sample for every studied land use in each governorate; however, in some governorates and for specific land uses, there was no suitable sample to be surveyed. Nevertheless, at least 6 samples were surveyed through the West Bank for each land use.

3.2.2.3 Site Selection

After determining the number of sites to be surveyed, a critical issue should be identified, which is the site selection. ITE (2012) and Al-Masaeid et al (1999) suggested some criteria for identifying the sites within the study area, as presented in Chapter 2; Section 2.4.1. These criteria are adopted in this thesis.

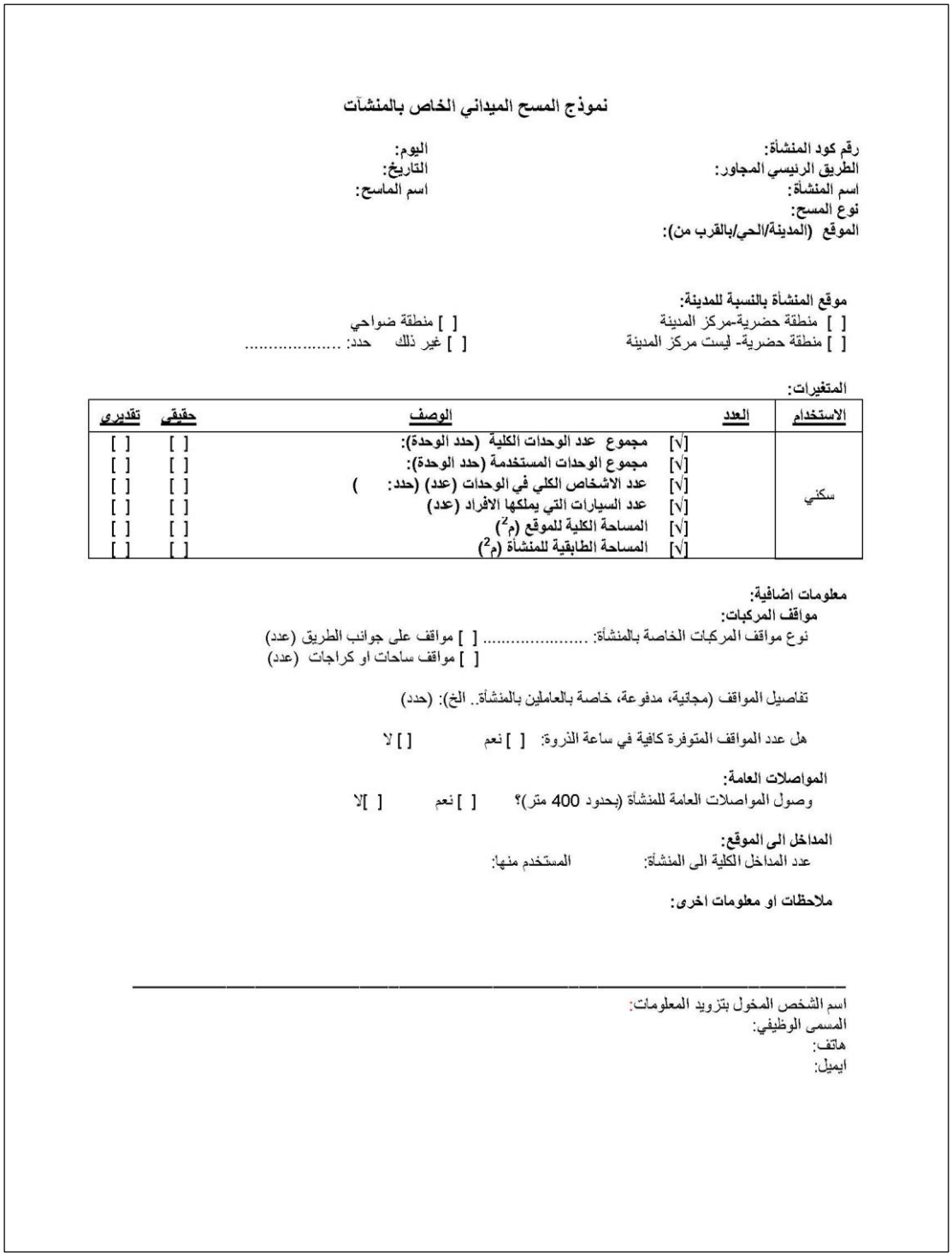
The researcher conducted reconnaissance visits to all governorates in the West Bank in order to capture appropriate samples for each land use. Furthermore, the researcher conducted several communications with ministries, municipalities, and public/private agencies to get the permission to conduct inventory visits to assist in determining the suitability of these sites with requirements indicated above.

Due to the common pattern in the West Bank, the full occupancy criterion was not satisfied in several land use categories. For example, the Physician's Housing-Rujeeb, which is considered as a sample under Attached Housing category, the total number of attached units is 52 units, while the occupied units are 36, thus the occupancy percentage is 69%. For this reason, the researcher considered the occupied units as an Independent Variable especially for residential land use. On the other hand, all other site selection criteria are taken into consideration and were satisfied.

3.2.3 Step 3: Data Collection

The collected data could be classified into two main categories; development information and traffic counting.

1. Development (Site) information: This type of data was collected by the researcher by visiting each site in the study area and meeting the responsible person for the development. During this visit, the researcher collected and filled the required data by special form for each land use. Figure 3.4 illustrates an example of residential land use data collection form. It should be noted that the form was prepared in Arabic to make it easier for the surveying team and users.



نموذج المسح الميداني الخاص بالمنشآت

رقم كود المنشأة: اليوم:
الطريق الرئيسي المجاور: التاريخ:
اسم المنشأة: اسم الماسح:
نوع المسح:
الموقع (المدينة/الحي/بالقرب من):

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة [ ] منطقة ضواحي
[ ] منطقة حضرية- ليست مركز المدينة [ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد	الوصف	حقيقي	تقديري
سكني	[√]	مجموع عدد الوحدات الكلية (حدد الوحدة):	[ ]	[ ]
	[√]	مجموع الوحدات المستخدمة (حدد الوحدة):	[ ]	[ ]
	[√]	عدد الاشخاص الكلي في الوحدات (عدد) (حدد:)	[ ]	[ ]
	[√]	عدد السيارات التي يملكها الافراد (عدد)	[ ]	[ ]
	[√]	المساحة الكلية للموقع ($م^2$)	[ ]	[ ]
	[√]	المساحة الطابقية للمنشأة ($م^2$)	[ ]	[ ]

معلومات اضافية:
مواقف المركبات:
نوع مواقف المركبات الخاصة بالمنشأة: ..... [ ] مواقف على جوانب الطريق (عدد)
[ ] مواقف ساحات او كراجات (عدد)

تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ): (حدد)

هل عدد المواقف المتوفرة كافية في ساعة الذروة: [ ] نعم [ ] لا

المواصلات العامة:
وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟ [ ] نعم [ ]لا

المداخل الى الموقع:
عدد المداخل الكلية الى المنشأة: المستخدم منها:

ملاحظات او معلومات اخرى:

اسم الشخص المخول بتزويد المعلومات:
المسمى الوظيفي:
هاتف:
ايميل:

Figure 3.4: Data Collection Form for Residential Land Use

The data includes general information about the development such as location, working hours, contact person, etc. Moreover, it includes

information about several variables needed in this research. For example, the variables that were collected include:

1. Site Area
2. Total number of units
3. Number of occupied units
4. Total number of persons
5. Number of owned vehicles
6. Gross floor area (if possible)

Additional data were collected regarding parking, public transportation accessibility, and the development entrances.

2. Traffic Counting:

   After collecting the data about the development, the site was explored to detect a suitable location for conducting traffic counting, taking into consideration that the counter can observe all entrances of the development and adjacent streets that lead to the development, as well as to decide if more than one counter is needed.

Manual traffic count was conducted for at least 2 hours for each peak period (AM and PM) for 15-minutes intervals. In addition, the researcher avoided making counts during special events, holidays, bad weather, or any other time when the conditions at the study site and its vicinity is not operating normally because it may affect the site's trip generation.

As shown in Figure 3.5, a special form for traffic counting was designed in Arabic to be easier for the surveying team; this from was designed to collect traffic counts for both entering and exiting traffic to/from the development. It was also designed to count the traffic based on vehicle classification.

Before conducting the traffic counting for all study sites, a pilot study with small scale zone and sample size was fully carried out by the researcher in order to test the logistics and information gathering process. This pilot study was applied on specific developments in Nablus City; these developments are Engineers Housing-Al Makhfeya (Detached Housing), and Physicians' Housing-Rujeeb (Attached Housing). Based on this pilot study, all forms were modified in such a way it became convenient to conduct the large scale study.

The time period selected for counting is the period in which the adjacent street traffic is at its maximum.

After getting the required permissions for conducting traffic counting, the researcher selected teams of senior students and junior engineers from all Palestinian cities, and those teams were instructed on how to use the traffic counting forms and to conduct the survey. The training was conducted in several cities, and the training includes onsite training to ensure that the team has a full understanding of what is to be done. Each member of the team was assigned times and locations for the survey component he/she is responsible for.

نموذج التعداد المروري للمركبات

رقم كود المنشأة: ....   اليوم: ....
اسم المنشأة: ....   التاريخ: ....
نوع المسح: ....   اسم الماسح: ....
الموقع: ....   حالة الطقس: ....
وقت المسح: من: .... الى: .... (صباحاً \ مساءً)

الوقت: من: .... إلى:			
الوصف	**عدد المركبات القادمة**	**عدد المركبات المغادرة**	**المجموع**
١. سيارة خصوصي او جيب Passenger Car			
٢. تاكسي عمومي Taxi			
٣. فان عمومي Taxi Van (7 sts)			
4. باص Bus			
٥. شاحنات خفيفة وثقيلة Trucks			

الوقت: من: .... إلى:			
الوصف	**عدد المركبات القادمة**	**عدد المركبات المغادرة**	**المجموع**
١. سيارة خصوصي او جيب Passenger Car			
٢. تاكسي عمومي Taxi			
٣. فان عمومي Taxi Van (7 sts)			
4. باص Bus			
٥. شاحنات خفيفة وثقيلة Trucks			

الوقت: من: .... إلى:			
الوصف	**عدد المركبات القادمة**	**عدد المركبات المغادرة**	**المجموع**
١. سيارة خصوصي او جيب Passenger Car			
٢. تاكسي عمومي Taxi			
٣. فان عمومي Taxi Van (7 sts)			
4. باص Bus			
٥. شاحنات خفيفة وثقيلة Trucks			

الوقت: من: .... إلى:			
الوصف	**عدد المركبات القادمة**	**عدد المركبات المغادرة**	**المجموع**
١. سيارة خصوصي او جيب Passenger Car			
٢. تاكسي عمومي Taxi			
٣. فان عمومي Taxi Van (7 sts)			
4. باص Bus			
٥. شاحنات خفيفة وثقيلة Trucks			

Figure 3.5: Traffic Counting Form

After finishing traffic counting, the teams delivered the forms to the researcher; the data was checked and transformed to an excel sheet in order to be analyzed.

3.2.4 Step 4: Estimation of Trip Generation Rates/Equations

The next step after collecting data is estimating trip generation rates/equations; it was done by developing the model equation for the parameters of interest after supplying observed values of both the dependent and independent variables.

The general mathematical relation between trip ends and the related independent variable is the regression analysis, which is adopted by ITE, ADTGM, and many other studies, and the regression analysis could be either linear or non-linear simple regression. The researcher attempted to develop an equation that defines the line of best fit of the data for each land use by using several regression forms.

Simple Linear Regression Model assumes that the observation of the dependent variable (Y: Number of Trip Ends) can be obtained from n observations of the independent variables (Xs), by the form $Y = \alpha + \beta Xs$ for the best fit equation. On the other hand Nonlinear Regression is a form of regression analysis in which observational data are modeled by a function, which is a nonlinear combination of the model parameters and depends on one or more independent variables. The data are fitted by a method of successive approximations. Nonlinear regression models may be presented in several shapes such as exponential, parabolic, log, etc.

An important measurement for goodness of fit is the Coefficient of Determination, also known as R^2. This coefficient is used to measure the total variation in the dependent variable that can be explained by the independent variables in the model. The value of R^2 lies between 0 and 1. Higher coefficient of determination explains better the variance in the dependent variable by the independent variable (good fit). For example if R^2 is given at 0.95; this means that the variation in the regression is 95% explained by the independent variable, which is a good regression. However, there is no standard value on how high R^2 value is "good" enough; it depends on the application (Dodeen, 2014).

A regression equation is preferred if R^2 is greater than 0.75, because it is an indicator of the desired level of correlation between trip ends and the independent variable. However; weighted average rates are preferred if the standard deviation is less than or equal 110% of the weighted average rate (ITE, 2012).

Some times; trip generation rates will be used, and as defined earlier, the generation rates is the number of weighted trip ends per unit of the independent variable. Simply it's a linear relationship between trip ends and the independent variable.

The general formula to calculate R^2 is:

$$R^2 = \frac{Regression\ Sum\ of\ Squares\ (RSS)}{Total\ Sum\ of\ Squares\ (TSS)}$$

In this research, R^2 will be calculated using Statistical Package for the Social Sciences (SPSS) software.

Since there is no exact value of R^2 to evaluate the good of fitness, and 0.75 is just a value recommended by ITE (2012), and since this is the first comprehensive study in the West Bank regarding trip generation and the sample size relatively small, the researcher suggests to consider a threshold value of 0.70 for R^2 to accept the regression equation.

The ANOVA test result are used to show the analysis of the total variance in the dependent variable. This variance is divided into two source; variance due to regression and variance due to the error (Dodeen, 2014).

3.2.4.1 Statistical Test of Variance

It is important to choose the best appropriate confidence level for the regression. The size of the confidence interval depends on the sample size and the standard deviation of the study groups. If the sample size is large, this leads to "more confidence" and a narrower confidence interval. If the confidence interval is wide, this may mean that the sample is small. If the dispersion is high, the conclusion is less certain and the confidence interval becomes wider. Finally, the size of the confidence interval is influenced by the selected level of confidence. In general, with a higher probability to cover the true value the confidence interval becomes wider (Lange, 2001).

In this research, a confidence level of 95% is used, and this value is obtained from the ANOVA table.

F-test is used to test the overall significance of the regression. The null hypothesis H_0 for testing the overall significance of the model is that the regression coefficient for independent variable are equal to zero. The

alternative hypothesis H_1 assumes that the coefficient is not equal to zero with 95% confidence level. **T-test** is used to test the significance of the individual regression coefficient (Dodeen, 2014)

3.2.4.2 Data Analysis Software

There are several statistical analysis software that can be used in estimating trip generation rates/equations. Excel and the Statistical Package for Social Science (SPSS) are examples of the software that could be used. SPSS software provides a descriptive statistics such as frequencies, mean, etc. SPSS software was used in this research to estimate trip generation rates/equations.

3.2.5 Step 5: Results and Recommendations

In this step the trip generation rates and equations was presented, in addition to the conclusions and recommendations that present the finding of the research.

Chapter Four

Field Survey and Data Collection

4.1 Introduction

This chapter illustrates and provides a detailed description of the data collected in developing the trip generation equation/rate for the targeted land uses studied in this thesis.

Generally, two types of data were collected in this thesis. The first type relates to the development itself, which is the independent variable such as the gross floor area, occupied area, number of employee, etc. The other type of data is the traffic counting related to the development (traffic from/to the development).

4.2 Site Selection

Based on the criteria mentioned in the methodology for site selection, the researcher nominates large number of sites for each land use in several cities to be filtered to select the suitable sites.

After visiting these sites and making sure that there are suitable for the study, the researcher started gathering information about each site. Figures 4.1, 4.2, 4.3 illustrate one sample of aerial photo for each land use; residential, office, and retail land use, and the counting locations.

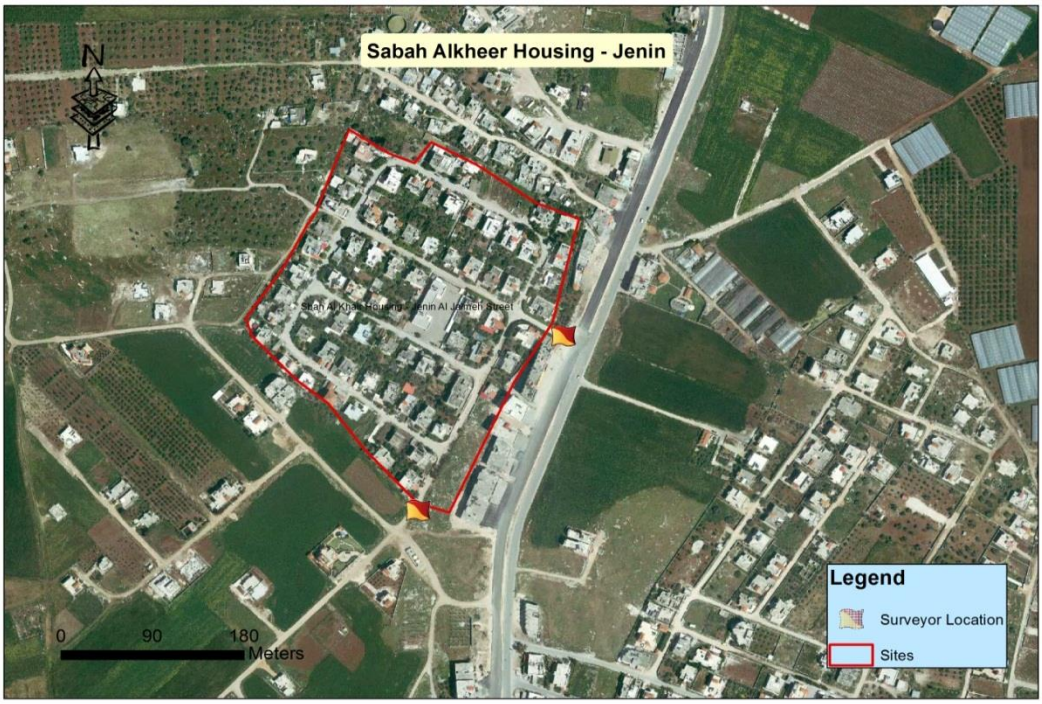


Figure 4.1: Aerial Photo for Sabah Alkheer Housing -Jenin

Figure 4.2: Aerial Photo for Ministry of State -Ramallah

Figure 4.3: Aerial Photo for Plaza Mall -Al Bireh

4.3 Data Collection Method

The researcher used several methods for data collection as indicated below:

1. Telephone Interview

   This was conducted with the responsible people of the development in several cases, especially for the residential land use; several telephone calls were made to collect information about the developments or to check the collected data from other sources.

2. Personal Interview

   This was used to collect the required data about the development. All developments were visited by the researcher. Furthermore, some of the information were sent by fax.

3. Field Exploration

   This was used to get special information, which is not provided by other methods or not available by the responsible person such as the data about parking spaces, illegal parking, etc. These data were collected in cooperation with responsible person during the exploration visit to the site.

4. Field Surveying

   This was made by the selected trained teams from all Palestinian cities who used special forms for manual traffic counting at the development entrances. As illustrated in the methodology, the manual traffic count was conducted for at least 2 hours for each peak period (AM and PM) for 15-minutes intervals. In addition, the researcher avoided making counts during special events, holidays, bad weather, or any other time when the conditions at the study site and its vicinity is not operating normally because it may affect the site trip generation.

4.4 Types of Collected Data

The collected data can be classified into two major categories;
Development's Information, and the Traffic Counting.

4.4.1 Development's Information

This type of data includes all required information about the developments, which is divided into three parts, the first is a general information that includes the name of the development, name of the adjacent streets, location of the development, name of the surveyor, and the date. The second part is

the independent variables. The third part is a miscellaneous information including the information about parking (type of parking, number of parking spaces, paid or free, and the sufficiency of parking), the availability of public transportation within 400m, and the number of entrances of the development. The researcher designed a special form for each land use to be used.

The independent variables were selected according to the recommendation of the ITE and through the researcher's assessment of the needed data. Several criteria were taken into consideration during the selection of these variables, which is:

a) The data for the independent variable should be readily available and accurate for the survey site and any potential proposed development.

b) The number of trips generated should be influenced in a logical way with the independent variable.

c) Variables should be provided directly for the survey site, not derived from other variables.

According to the mentioned criteria, the researcher selected the potential independent variables for each land use to be analyzed as shown in Table 4.1.

Table 4.1: Potential Independent Variables for Each Land Use

Land Use	Potential Independent Variables
Residential Land Use	1. Total number of units
	2. Total number of occupied units
	3. Total number of persons in the units
	4. Total number of owned vehicles
	5. Total area of the site
	6. Gross floor area (GFA) of the development
Office Land Use	1. Total number of the employees
	2. Gross floor area (GFA) of the development
	3. Occupied GFA of the development
	4. Total area of the site
	5. Total number of owned vehicles
Retail Land Use	1. Total number of the employees
	2. Gross floor area of the development
	3. Occupied GFA of the development
	4. Total area of the site
	5. Total number of owned vehicles

After collecting development data, the researcher reviewed these data and summarized the independent variables for each land use. Tables 4.2, 4.3, and 4.4 summarize the selected sites for each land use and all collected data. A sample of the full data for each development is attached in Appendix A.

Table 4.2: Summary Data of the Residential Land Use											
No.	**Class**	**City/Town**	**Development Name**	**Variables**							
				# of Units	**# of Occupied Units**	**# of Persons**	**# of Owned Veh.**	**Total Area (Site) m^2**	**# of Used Entrances**	**# of Parking**	**Availability of PT within 400 m**
1	**Apartment**	Nablus	An-Namsawi Housing	136	133	600	72	6,000	2	8	Yes
2			ANU Housing - Al Ma'jeen	77	61	382	39	4,500	1	36	Yes
3			An-Noor Building	32	26	134	10	1,250	1	12	Yes
4		Tulkarm	Palestinian Housing-Tulkarm	45	45	180	20	3,500	4	5	No
5			Al Jawhara Tower	35	29	126	19	1,920	2	12	No
6		Ramallah	Al Bazzar Housing-Al Tera	45	44	220	50		2	66	Yes
7			Bir Zeit University Housing - Al Ersal	30	30	120	28	1,100	1	36	Yes
8		Jenin	Palestinian Housing-Jenin	64	64	384	12	4,100	2	30	No
9			Engineer Adnan Housing	35	35	182	20	3,750	1	-	No
10		Hebron	Al Mohtaseb Building	23	18	87	11	500	1	-	Yes
11		Bethlehem	Yasso' Housing	24	24	220	24	600	1	20	Yes
12			Al Melad Housing	53	50	250	42	6,500	1	50	Yes

Table 4.2: Summary Data of the Residential Land Use											
No.	**Class**	**City/Town**	**Development Name**	**Variables**							
				# of Units	**# of Occupied Units**	**# of Persons**	**# of Owned Veh.**	**Total Area (Site) m^2**	**# of Used Entrances**	**# of Parking**	**Availability of PT within 400 m**
13		Jericho	Al Ajlouni Housing	40	25	120	4	3,000	1	8	No
14		Qalqilya	New Qalqilya Housing	72	58	315	26	3,100	1	16	No
15			Old Qalqilya Housing	16	14	70	13	900	1	8	No

Table 4.2 - Continued											
No.	**Class**	**City/Town**	**Development Name**	**Variables**							
				# of Units	**# of Occupied Units**	**# of Persons**	**# of Owned Veh.**	**Total Area (Site) m^2**	**# of Used Entrances**	**# of Parking**	**Availability of PT within 400 m**
1	**Detached Housing**	Nablus	Engineers Housing - Al Makhfeya	81	45	225	100	75,000	1	66	Yes
2			Tyba Housing	17	16	66	27	25,000	1	25	Yes
3			Teachers Housing - Rujeeb	235	214	1060	185	90,000	3	161	Yes
4		Tulkarm	Social Affairs Housing	54	45	142	45	43,000	2	35	Yes

Table 4.2: Summary Data of the Residential Land Use											
No.	**Class**	**City/Town**	**Development Name**	**Variables**							
				# of Units	**# of Occupied Units**	**# of Persons**	**# of Owned Veh.**	**Total Area (Site) m^2**	**# of Used Entrances**	**# of Parking**	**Availability of PT within 400 m**
5		Ramallah	Bir Zeit University Housing-Al Tera	52	52	182	97	31,000	3	87	Yes
6			Al Dawha Housing	51	36	187	48	40,000	1	51	No
7		Jenin	Engineers Housing - Al Jabriyat	27	22	132	22	20,700	3	22	Yes
8			Sabah Al Khair Housing	222	220	850	85	70,000	2	70	Yes
9		Hebron	Al Zaytona Housing	76	76	308	141	50,000	2	53	Yes
10		Beit Jala	Engineers Housing - Beit Jala	43	39	150	60	50,000	1	39	No
11		Beit Sahour	Engineers Housing - Beit Sahour	45	45	158	44	44,500	1	45	No
12		Jericho	Al Khedawi Housing	7	7	28	9	4,900	2	9	No
13		Qalqilya	Swaileh Villas	8	8	40	9	4,300	1	8	No

Table 4.2- Continued

No.	Class	City/Town	Development Name	Variables							
				# of Units	# of Occupied Units	# of Persons	# of Owned Veh.	Total Area (Site) m^2	# of Used Entrances	# of Parking	Availability of PT within 400 m
1	Attached Housing	Nablus	Physician Housing - Rujeeb	52	36	180	30	25,000	3	36	Yes
2			Engineers Housing - North Mountain	23	17	85	29	4,500	1	29	Yes
3		Tulkarm	Education Housing	31	23	80	11	8,200	2	26	No
4		Ramallah	An-Nejma Housing	48	23	115	28	18,300	1	23	Yes
5		Jenin	Physician Housing - Al Jabriyat	36	24	108	25	11,000	2	24	No
6		Qalqilya	Al At'ot Housing	14	13	59	10	5,600	1	17	No

Table 4.3: Summary Data of the Office Land Use

No	Class	City	Development Name	Variables							
				# of Employees	Total GFA (m^2)	Occupied GFA (m^2)	Total Area (Site) (m^2)	# of Owned Veh.	# of Used Entrances	# of Parking	Availability of PT within 400 m
1	Government	Nablus	Education Directorate	54	1,000	1,000	1,335	29	1	16	Yes
2			Ministry of Health	250	780	780	1500	105	2	4	Yes
3		Tulkarm	Education Directorate	123	1570	1440	1000	45	1	12	Yes
4			Tulkarm Governorate	43	1500	1500	1300	21	1	22	Yes
5			Local Government Directorate	21	256	256	950	10	1	7	Yes
6		Ramallah	Ministry of Transportation	140	3800	3800	940	55	1	15	Yes
7			Ministry of State	80	2000	2000	850	27	1	0	Yes
		Al-Bireh	Ministry of Agriculture	190	3950	3950	1220	35	1	0	Yes
9		Jenin	Education Directorate	110	1100	950	1800	40	1	15	Yes
10		Hebron	Hebron Governorate	63	2000	2000	1500	25	1	29	Yes
11			Health Directorate	50	800	800	3000	20	1	20	Yes
12			Public Works and Housing Directorate	30	400	400	5000	22	1	25	Yes
13		Bethlehem	Directorate of Awqaf and Religious Affairs	22	600	300	800	6	1	5	Yes
14			Education Directorate - Beit Jala	100	1200	1200	1600	29	1	36	Yes
15			Bethlehem Governorate	61	1500	1500	700	32	1	5	Yes
16		Jericho	Education Directorate	75	850	850	1250	12	1	5	No

Table 4.3: Summary Data of the Office Land Use											
No	Class	City	Development Name	Variables							
				# of Employees	Total GFA (m^2)	Occupied GFA (m^2)	Total Area (Site) (m^2)	# of Owned Veh.	# of Used Entrances	# of Parking	Availability of PT within 400 m
17		Salfeet	Salfeet Governorate	41	1823	1373	1520	15	1	31	Yes
18		Qalqilya	Qalqilya Governorate	43	1290	690	442	14	1	0	Yes
19		Tubas	Education Directorate	81	1200	1200	1500	26	1	24	Yes

Table 4.3 - Continued											
No	Class	City	Development Name	Variables							
				# of Employees	Total GFA (m^2)	Occupied GFA (m^2)	Total Area (Site) (m^2)	# of Owned Veh.	# of Used Entrances	# of Parking	Availability of PT within 400 m
1	Private	Nablus	Al Isra' Company	35	540	380	900	10	1	8	Yes
2			Jawwal Building (Offices)	45	1600	900	1200	15	1	15	Yes
3		Tulkarm	Badran Complex	23	1425	1425	450	15	1	0	Yes
4		Al-Bireh	Masrouji Building	120	3000	2400	2000	45	1	27	Yes
5		Ramallah	Ougarit Building	25	1250	1000	900	20	1	7	Yes
6		Jenin	As Sampodi Building	51	1400	1200	600	22	1	0	Yes
7		Bethlehem	Abda Building	40	1655	1158	650	21	1	8	Yes

Table 4.3 - Continued

No	Class	City	Development Name	Variables							
				# of Employees	Total GFA (m^2)	Occupied GFA (m^2)	Total Area (Site) (m^2)	# of Owned Veh.	# of Used Entrances	# of Parking	Availability of PT within 400 m
1	Institutional	Nablus	Telecommunication Company main office	390	7200	7200	2000	196	2	190	Yes
2		Bethlehem	Palestinian Insurance Company	12	250	250	540	8	1	0	Yes
3		Tulkarm	Telecommunication Company	43	900	700	1500	24	1	13	Yes
4		Ramallah	Al Watanya Company main Building	300	4067	3246	8000	150	1	120	Yes
5			Al Mashreq Insurance Company	99	3127	3127	941	55	1	16	Yes
6		Al-Bireh	Jawwal Company main Building	600	12500	12500	3620	277	1	220	Yes
7		Jenin	Telecommunication Company	25	1000	1000	1000	20	1	0	Yes

Table 4.4: Summary Data of the Retail Land Use										
No.	Class	City	Development Name	Variables						
				# of Employees	Total GFA (m^2)	Occupied GFA (m^2)	# of Owned Veh.	# of Used Entrances	# of Parking	Availability of PT within 400 m
1	Large Supermarkets	Nablus	Bravo Supermarket	15	650	650	2	1	44	Yes
2			Wahet Al Makhfeya	6	320	320	2	1	0	Yes
3		Tulkarm	Dallas Supermarket	4	420	420	2	1	7	Yes
4			Al Islameya Supermarket	12	490	490	5	1	0	Yes
5		Ramallah	Bravo Supermarket - Al Tera	15	1,200	1,200	2	1	10	Yes
6			Bravo Supermarket-Al Masyoun	12	1,000	1,000	1	1	5	Yes
7			Green Land Supermarket	5	300	300	1	1	0	Yes
8			Max Mar Supermarket	35	400	400	12	1	25	Yes
9		Hebron	Bravo Plaza- Hebron	12	1,000	1,000	1	1	13	Yes
10			Al Yazan Supermarket	5	170	170	2	1	3	Yes
11			Abu Mazin Supermarket	5	520	520	2	1	3	Yes
12		Bethlehem	Jamboo Supermarket	31	5,400	1,800	7	1	17	Yes
13			Al Sha'ab Supermarket	8	180	180	2	1	5	Yes
14			Al Moghrabi Supermarket	5	240	240	2	1	5	Yes
15			Khater Supermarket	5	200	200	3	1	7	Yes

Table 4.4: Summary Data of the Retail Land Use										
No.	**Class**	**City**	**Development Name**	**Variables**						
				# of Employees	**Total GFA (m^2)**	**Occupied GFA (m^2)**	**# of Owned Veh.**	**# of Used Entrances**	**# of Parking**	**Availability of PT within 400 m**
16		Jericho	Rami Rjoub Supermarket	2	130	130	1	1	0	No
17		Salfeet	Al Barakeh Store Supermarket	12	700	700	7	1	17	Yes
18		Qalqilya	Al Karmel Supermarket	14	700	700	2	1	3	Yes
19		Tubas	City Supermarket	3	110	110	2	1	0	Yes
20		Jenin	Al Waha Supermarket	6	400	400	2	1	0	Yes
21			Safe Side Supermarket	3	300	300	2	1	2	Yes
22			On the Run Supermarket	3	370	370	3	1	4	Yes

Table 4.4 - Continued

No.	Class	City	Development Name	Variables						
				# of Employees	Total GFA (m^2)	Occupied GFA (m^2)	# of Owned Veh.	# of Used Entrances	# of Parking	Availability of PT within 400 m
1	**Shopping Center**	Al-Bireh	Plaza Mall	37	3,000	3,000	20	2	50	Yes
1	**Commercial Strip**	Nablus	Bon Bon Strip	8	189	189	7	1	13	Yes
2			Eshtar Strip	7	220	220	4	1	0	Yes
3			Commercial Strip - Asera Street	12	279	279	9	1	0	Yes
4		Ramallah	Commercial Strip- Om Al Sharayt	20	950	950	7	1	0	Yes
			Commercial Strip - Al Ersal Street	8	210	210	7	1	0	Yes
6		Al-Bireh	Commercial Strip - Nablus Street	14	1,200	1,200	4	1	0	Yes
7		Tulkarm	Gov. Hospital Street strip	11	265	265	5	1	0	Yes
8			Rami Sport Strip	13	150	150	3	1	0	Yes
9		Jenin	Corner Café Strip	8	210	210	2	1	4	Yes
10		Qalqilya	Fihmi Al Ali Gas Station Strip	8	196	196	6	1	0	Yes
11		Hebron	Ras Al Jora	28	980	980	17	1	0	Yes
12			Beer Al Mahjar	16	490	490	8	1	0	Yes
13		Bethlehem	Commercial Strip - Al Quds Hebron Street	37	720	720	18	1	0	Yes
14			Al Karkafeh Strip	9	210	210	6	1	3	Yes

4.4.2 Traffic Counting:

As mentioned in the methodology, a special form for traffic counting was designed to collect traffic counts for both entering and exiting traffic to/from the development. It was also designed to count the traffic based on vehicle classification.

Traffic counting forms were checked and transformed to an excel sheet in order to be analyzed. Furthermore, in and out traffic were calculated for each development as shown in the following tables.

Tables 4.5, 4.6 and 4.7 show the traffic data for residential, office, and retail land use for AM and PM peak periods, respectively.

Table 4.5: A.M and PM Traffic Data for Residential Land Use

No.	Class	City/Town	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In	Out	PH	PHV (Veh/hr)	In	Out
						Veh/hr	Veh/hr			Veh/hr	Veh/hr
1	Apartment	Nablus	An-Namsawi Housing	7:00-8:00	107	47	60	3:00-4:00	67	36	31
2			ANU Housing - Al Ma'jeen	7:00-8:00	53	22	31	2:15-3:15	35	20	15
3			An-Noor Building	7:00-8:00	16	7	9	2:30-3:30	10	7	3
4		Tulkarm	Palestinian Housing-Tulkarm	7:00-8:00	41	20	21	2:00-3:00	25	12	13
5			Al Jawhara Tower	7:00-8:00	12	5	7	2:45-3:45	17	12	5
6		Ramallah	Al Bazzar Housing-Al Tera	8:00-9:00	41	25	16	3:45-4:45	31	18	13
7			Bir Zeit University Housing - Al Ersal	7:15-8:15	24	11	13	3:45-4:45	16	10	6
8		Jenin	Palestinian Housing-Jenin	7:00-8:00	40	18	22	2:00-3:00	37	25	12
9			Engineer Adnan Housing	7:00-8:00	40	15	25	2:00-3:00	24	15	9
10		Hebron	Al Mohtaseb Building	7:15-8:15	6	3	3	2:15-3:15	8	5	3

Table 4.5: A.M and PM Traffic Data for Residential Land Use

No.	Class	City/Town	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In	Out	PH	PHV (Veh/hr)	In	Out
						Veh/hr	Veh/hr			Veh/hr	Veh/hr
11		Bethlehem	Yasso' Housing	7:00-8:00	19	6	13	2:15-3:15	19	10	9
12			Al Melad Housing	7:00-8:00	43	18	25	2:00-3:00	27	17	10
13		Jericho	Al Ajlouni Housing	7:00-8:00	39	19	20	2:00-3:00	27	15	12
15		Qalqilya	Old Qalqilya Housing	7:00-8:00	46	20	26	4:00-5:00	46	29	17

Table 4.5 - Continued

No.	Class	City/Town	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In	Out	PH	PHV (Veh/hr)	In	Out
						Veh/hr	Veh/hr			Veh/hr	Veh/hr
1	Detached Housing	Nablus	Engineers Housing - Al Makhfeya	7:30-8:30	55	22	33	2:45-3:45	59	31	28
2			Tyba Housing	7:00-8:00	54	24	30	2:00-3:00	39	22	17
3			Teachers Housing - Rujeeb	7:00-8:00	299	123	176	2:15-3:15	208	111	97
4		Tulkarm	Social Affairs Housing	7:00-8:00	68	31	37	2:15-3:15	78	42	36
5		Ramallah	Bir Zeit University Housing-Al Tera	7:30-8:30	40	15	25	3:30-4:30	47	28	19
6			Al Dawha Housing	7:00-8:00	40	12	28	2:15-3:15	31	20	11
7		Jenin	Engineers Housing - Al Jabriyat	7:15-8:15	26	12	14	2:15-3:15	21	14	7
8			Sabah Al Khair Housing	7:15-8:15	168	72	96	2:00-3:00	101	66	35
9		Hebron	Al Zaytona Housing	7:30-8:30	130	58	72	2:00-3:00	106	59	47
10		Bethlehem	Engineers Housing - Beit Jala	7:00-8:00	52	21	31	2:15-3:15	32	19	13

Table 4.5 - Continued

No.	Class	City/Town	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In	Out	PH	PHV (Veh/hr)	In	Out
						Veh/hr	Veh/hr			Veh/hr	Veh/hr
11			Engineers Housing - Beit Sahour	7:00-8:00	42	18	24	2:45-3:45	18	10	8
12		Jericho	Al Khedawi Housing	7:00-8:00	49	22	27	2:00-3:00	35	20	15
13		Qalqilya	Swaileh Villas	7:00-8:00	31	10	21	2:00-3:00	22	12	10

Table 4.5 - Continued

No.	Class	City/Town	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In	Out	PH	PHV (Veh/hr)	In	Out
						Veh/hr	Veh/hr			Veh/hr	Veh/hr
1	Attached Housing	Nablus	Physician Housing - Rujeeb	7:00-8:00	49	19	30	2:00-3:00	25	17	8
2			Engineers Housing - North Mountain	7:15-8:15	17	7	10	3:00-4:00	16	11	5
3		Tulkarm	Education Housing	7:00-8:00	13	5	8	2:00-3:00	17	10	7
4		Ramallah	An-Nejma Housing	7:00 - 8:00	22	8	14	2:00 - 3:00	20	11	9
5		Jenin	Physician Housing - Al Jabriyat	7:00-8:00	37	16	21	2:45-3:45	24	17	7
6		Qalqilya	Al At'ot Housing	7:00-8:00	21	9	12	2:00-3:00	17	12	5

Table 4.6: A.M and PM Traffic Data for Office Land Use

No.	Class	City	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr	PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr
1	Government	Nablus	Education Directorate	7:15-8:15	84	45	39	1:45-	93	40	53
2			Ministry of Health	7:30-8:30	206	108	98	2:15-	124	54	70
3		Tulkarm	Education Directorate	7:15-8:15	80	43	37	12:30-	74	40	34
4			Tulkarm Governorate	7:45-8:45	39	23	16	3:00-	29	14	15
5			Local Government Directorate	7:30-8:30	22	14	8	2:15-	16	8	8
6		Ramallah	Ministry of Transportation	7:3-8:30	72	41	31	1:15-	64	35	29
7			Ministry of State	7:30-8:30	83	43	40	1:30-	57	25	32
		Al-Bireh	Ministry of Agriculture	7:30-8:30	103	54	49	1:15-	65	37	28
9		Jenin	Education Directorate	7:00-8:00	111	29	82	12:30-	73	35	38
10		Hebron	Hebron Governorate	8:00-9:00	58	28	30	1:15-	30	17	13
11			Health Directorate	7:45-8:45	113	59	54	12:00-	76	40	36
12			Public Works and Housing	7:30-8:30	20	12	8	1:30-	20	7	13
13		Bethlehem	Directorate of Awqaf and	7:30-8:30	17	9	8	2:30-	26	10	16
14			Education Directorate - Beit Jala	7:30-8:30	25	13	12	1:15-	20	8	12
15			Bethlehem Governorate	7:30-8:30	16	8	8	2:30-	19	6	13
16		Jericho	Education Directorate	7:15-8:15	63	32	31	12:30-	49	20	29
17		Salfeet	Salfeet Governorate	7:30-8:30	92	52	40	2:00-	80	35	45
18		Qalqilya	Qalqilya Governorate	7:45-8:45	26	16	10	2:00-	27	17	10
19		Tubas	Education Directorate	7:30-8:30	31	17	14	1:30-	32	15	17

able 4.6 – Continued

No.	Class	City	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr	PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr
1	Private	Nablus	Al Isra' Company	7:15-8:15	33	15	18	3:30-4:30	26	10	16
2			Jawwal Building (Offices)	7:45-8:45	20	12	8	3:15-4:15	33	14	19
3		Tulkarm	Badran Complex	9:00-10:00	40	21	19	2:30-3:30	22	12	10
4		Al-Bireh	Masrouji Building	7:45-8:45	53	27	26	3:45-4:45	36	14	22
5		Ramallah	Ougarit Building	7:45-8:45	23	14	9	3:45-4:45	29	12	17
6		Jenin	As Sampodi Building	7:15-8:15	45	26	19	3:30-4:30	40	15	25
7		Bethlehem	Abda Building	7:30-8:30	45	25	20	1:15-2:15	30	10	20
1	Institutional	Nablus	Telecommunication Company main office	7:30-8:30	140	80	60	3:45-4:45	114	50	64
2		Bethlehem	Palestinian Insurance Company	8:00-9:00	34	18	16	4:00-5:00	26	10	16
3		Tulkarm	Telecommunication Company	7:30-8:30	30	17	13	4:00-5:00	22	8	14
4		Al-Bireh	Jawwal Company main building	7:30-8:30	659	340	319	1:30-2:30	621	295	326
		Ramallah	Al Watanya Company main building	8:45-9:45	139	73	66	4:30-5:30	96	37	59
6			Al Mashreq Insurance Company	7:45-8:45	113	65	48	2:45-3:45	107	45	62
7		Jenin	Telecommunication Company	7:45-8:45	37	24	13	4:00-5:00	20	8	12

Table 4.7: A.M and PM Traffic Data for Retail Land Use

No.	Class	City	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr	PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr
1	Large Supermarkets	Nablus	Bravo Supermarket	9:00-10:00	22	12	10	1:15-2:15	56	27	29
2			Wahet Al Makhfeya	7:30-8:30	26	15	11	2:00-3:00	51	24	27
3		Tulkarm	Dallas Supermarket	7:15-8:15	32	18	14	1:45-245	38	21	17
4			Al Islameya Supermarket	8:00-9:00	26	12	14	2:00-3:00	30	15	15
5		Ramallah	Bravo Supermarket - Al Tera	7:30-8:30	48	25	23	1:30-2:30	165	80	85
6			Bravo Supermarket-Al Masyoun	8:00-9:00	55	30	25	1:45-2:45	145	72	73
7			Green Land Supermarket	7:30-8:30	42	25	17	2:00-3:00	125	65	60
8			Max Mar Supermarket	7:00-8:00	55	30	25	1:00-2:00	142	70	72
9		Hebron	Bravo Plaza- Hebron	8:45-9:45	45	22	23	1:45-2:45	111	50	61
10			Al Yazan Supermarket	8:45-9:45	53	27	26	1:00-2:00	44	24	20
11			Abu Mazin Supermarket	8:30-9:30	39	20	19	1:15-2:15	66	32	34
12		Bethlehem	Jamboo Supermarket	8:00-9:00	67	35	32	2:15-3:15	265	140	125
13			Al Sha'ab Supermarket	7:30-8:3	40	20	20	2:00-3:00	39	22	17
14			Al Moghrabi Supermarket	7:00-8:00	52	25	27	2:00-3:00	60	29	31
15			Khater Supermarket	9:00-10:00	29	16	13	2:30-3:30	28	15	13
16		Jericho	Rami Rjoub Supermarket	8:45-9:45	27	15	12	2:15-3:15	66	38	28
17		Salfeet	Al Barakeh Store Supermarket	8:45-9:45	57	29	28	1:00-2:00	49	25	24

Table 4.7 - Continued

No.	Class	City	Development Name	AM				PM			
				Peak Counted Traffic		In and Out Traffic		Peak Counted Traffic		In and Out Traffic	
				PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr	PH	PHV (Veh/hr)	In Veh/hr	Out Veh/hr
18	Large Supermarkets	Qalqilya	Al Karmel Supermarket	9:00-	43	26	17	2:00-	39	21	18
19		Tubas	City Supermarket	8:15-	20	13	7	2:00-	23	10	13
20		Jenin	Al Waha Supermarket	7:45-	35	19	16	2:15-	58	29	29
21			Safe Side Supermarket	7:30-	33	19	14	1:45-	36	20	16
22			On the Run Supermarket	8:45-	41	20	21	2:15-	57	28	29
1	**Malls**	Ramallah	Plaza Mall	7:45-	357	190	167	2:00-	446	228	218
1	Commercial Strip	Nablus	Bon Bon Strip	9:15-	12	8	4	1:15-	19	10	9
2			Eshtar Strip	9:30-	25	15	10	12:30-	36	20	16
3			Commercial Strip - Asera	9:00-	10	6	4	2:00-	29	15	14
4		Ramallah	Commercial Strip- Om Al	8:30-	66	35	31	3:00-	95	48	47
5			Commercial Strip - Nablus	8:00-	72	37	35	12:30-	66	33	33
6			Commercial Strip - Al	8:30-	19	10	9	2:30-	19	8	11
7		Tulkarm	Commercial Strip -	8:30-	32	20	12	1:30-	32	16	16
8			Rami Sport Strip	8:30-	20	12	8	1:30-	20	9	11
9		Jenin	Corner Café Strip	9:00-	15	9	6	2:00-	35	17	18
10		Qalqilya	Strip near Fihmi Al Ali	9:30-	32	20	12	2:30-	31	15	16
11		Hebron	Ras Al Jora	7:45-	67	37	30	1:30-	63	33	30
12			Beer Al Mahjar	8:30-	55	29	26	1:45-	53	29	24
13		Bethlehem	Commercial Strip -	9:00-	24	12	12	1:30-	27	15	12
14			Al Karkafeh Strip	8:00-	29	15	14	2:00-	43	22	21

Chapter Five

Data Analysis and Model Estimation

5.1 Introduction

Transport trip generation is the process of estimating hourly trips for an average weekday generated by developments. Transport generated trips include two types of trips: trip production and trip attraction. Figure. 5.1 illustrates the type of trips.

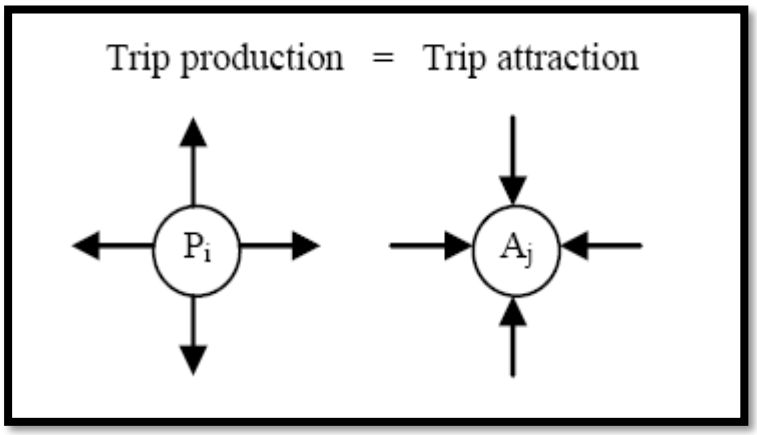


Figure 5.1: Types of Trips Generated

Trip production models estimate the number of trips generated by each development for any of the trip purposes and trip attraction models estimate the number of trips attracted to each location.

In this thesis, a model will be developed for trip generation including both of production and attraction trips (entering and exiting the development).

5.2 Descriptive Statistics of Data

This section shows the descriptive statistics for dependent and independent variables for residential land use, other land uses which are office and retail land uses are illustrated in the Appendix B. Table 5.1 summarizes the sample size for each land use.

Table 5.1 Size of Sample Survey for each Land Use

Land Use	Land Use Class	Sample Size
Residential	Apartment	15
	Attached Housing	6
	Detached Housing	13
Office	Government	19
	Private	7
	Institutional	7
Retail	Large Supermarket	22
	Shopping Center	1
	Commercial Strip	14

5.2.1 Descriptive Statistics for Residential Land Use

As mentioned in the previous chapter, residential land use was classified into three categories; apartment, attached housing, and detached housing.

Table 5.2 illustrates the descriptive statistics for traffic counting (dependent variable) for each category and for both AM and PM peak periods. While Table 5.3 shows the descriptive statistics for the independent variables.

Table 5.2 Descriptive Statistics for Traffic Counting for Residential Land Use

Residential Land Use Class	Traffic Counting Period	N	Minimum (Veh/hr)	Maximum (Veh/hr)	Mean (Veh/hr)	Std. Deviation (Veh/hr)
Apartment	AM	15	12	107	40	24
	PM	15	10	67	29	15
Attached Housing	AM	6	13	49	27	14
	PM	6	16	25	20	4
Detached Housing	AM	13	26	68	46	12
	PM	13	18	78	38	18

From the previous table, it is notified that the highest traffic was generated by the apartment class in the AM peak period, and the lowest traffic was generated by the attached housing during the PM period.

The minimum sample size is 6, which is found in the attached housing, that's due to the limitation of this type of housing in the West Bank. On the other hand, it is greater than 5 samples, which is recommended by the ITE.

Table 5.3 Descriptive Statistics for Independent Variables for Residential Land Use

Residential Land Use Class	Independent Variable	N	Minimum (Veh/hr)	Maximum (Veh/hr)	Mean (Veh/hr)	Std. Deviation (Veh/hr)
Apartment	No. of Units	15	16	136	49	31
	No. of Occ. Units	15	14	133	45	30
	No. of Persons	15	70	600	230	147
	No. of Owned Veh.	15	4	72	27	19
Attached Housing	No. of Units	6	14	52	34	15
	No. of Occ. Units	6	13	36	23	8
	No. of Persons	6	59	180	105	42
	No. of Owned Veh.	6	10	30	22	9
Detached Housing	No. of Units	13	7	235	56	63
	No. of Occ. Units	13	7	214	48	57
	No. of Persons	13	28	1060	215	287
	No. of Owned Veh.	13	9	185	59	52

5.3 Models of Estimating Trip Generation

There are several models that may be used to estimate Trip Generation Model, these includes Regression Model and Cross Classification Model. The most frequent method is the Regression Method.

The appropriate model of trip generation for each land use is developed through several steps:

1. Developing four models for every independent variable for each category of the land uses. These models are simple linear regression, logarithmic (Ln) model, exponential model, and power model.
2. Select the best regression model for each independent variable that has the best goodness of fit (R^2). This is because the determination coefficient (R^2) indicates how much of the variation in the dependent variable (Veh./hr) is explained by the independent variable in the regression, and taking into consideration that the model has a significance greater than 95%.
3. Select the best independent variable that clarified the dependent variable; i.e, selecting the best model with the best independent variable for each land use category.
4. Calculate the trip generation rate on the basis of a weighted average trip rate because of the variance found within each data set. Sites with a large variance from the mean would have over-influenced the average rate had they not been weighted (ITE, 2012).
5. Estimate the standard deviation of the weighted average trip generation rate to measure how widely dispersed the data around the average. The lower standard deviation, the better fit of data and the lower dispersion of data.

5.4 Trip Generation Model for Residential Land Use

The researcher uses SPSS software to analyze the relation between the dependent and every potential independent variable for each class of the

residential land use for the AM and PM peak periods for both traffic directions (entering and exiting the development).

5.4.1 Trip Generation Model for Apartment Land Use During AM Peak Period

This section illustrates a full description of how the model was developed for the apartment land use for the AM peak period; same steps were followed for each land use.

Step 1: Develop four models for each independent variable

Table 5.4 shows the ANOVA test results for the regression between traffic volume and the number of occupied units.

Table 5.4: ANOVA Results for Several Regression Models Between Traffic Volume and the Number of Occupied Units - Apartments

Model		Sum of Squares	df	Mean Square	F	Sig.	R^2
Linear	Regression	5957.247	1	5957.247	37.945	0.000	0.760
	Residual	1883.967	14	156.997			
	Total	7841.214	15				
Logarithmic	Regression	4444.562	1	4444.562	15.702	0.002	0.567
	Residual	3396.652	14	283.054			
	Total	7841.214	15				
Exponential	Regression	5180.445	1	5180.445	23.364	0.000	0.661
	Residual	2660.769	14	221.731			
	Total	7841.214	15				
Power	Regression	6013.822	1	6013.822	39.491	0.000	0.700
	Residual	1827.393	14	152.283			
	Total	7841.214	15				

The previous table shows that the best model that represents the number of trips generated by apartment based on the number of occupied units in the

AM peak period is the simple linear regression model since this model provides the highest R^2. Figure 5.2 illustrates the fit curve for this relationship.

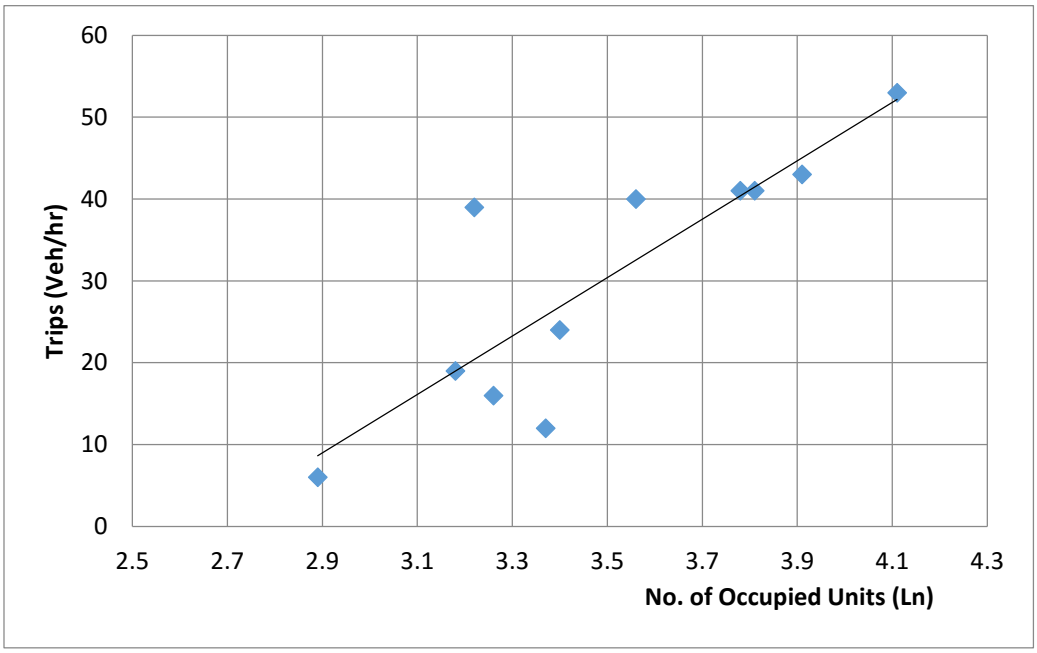


Figure 5.2: AM Trips vs. No. of Occupied Units (Apartment Land Use)

The same process was followed for the other potential independent variables.

Step 2: Select the best regression model for each independent variable

After developing the regression models for each potential independent variable, the best model was selected.

Logical aspect of the regression should be considered. For example; the regression coefficient should have the correct expected sign. That is to say, the independent variable is expected to have a positive effect on the dependent variable, so the regression should show a positive effect.

Table 5.5 shows the best regression model for each potential independent variable for the apartment land use during AM peak period.

Table 5.5: The Best Regression Model for Each Potential Independent Variable for the Apartment Land Use During AM Peak Period

Potential Independent Variable	Best Regression Model	Curve Equation	R^2	Sig.
Total Number of Units	Linear	$Y = 0.965x + 1.559$	0.370	0.016
Number of Occupied Units	Linear	$Y = 35.618 \ln x - 94.245$	0.728	0.001
Number of Persons	Power	$Y = 0.0002x^2 + 20.07$	0.799	0.000
Number of Owned Vehicles	Exponential	$Y = 4.019x10^{-30} x + 32.308$	0.661	0.000

By referring to the previous table, it is clear that all models show a positive effect of the independent variables on the dependent variable, which is logical. Furthermore, all models have a significance higher than 95%.

Step 3: Select the best independent variable that clarified the dependent variable

From Table 5.5, the best independent variable that clarified the dependent variable is number of persons and the number of occupied units.

Figure 5.3 illustrates the fit curve for the regression between traffic volume the number of persons for apartment land use during AM peak period.

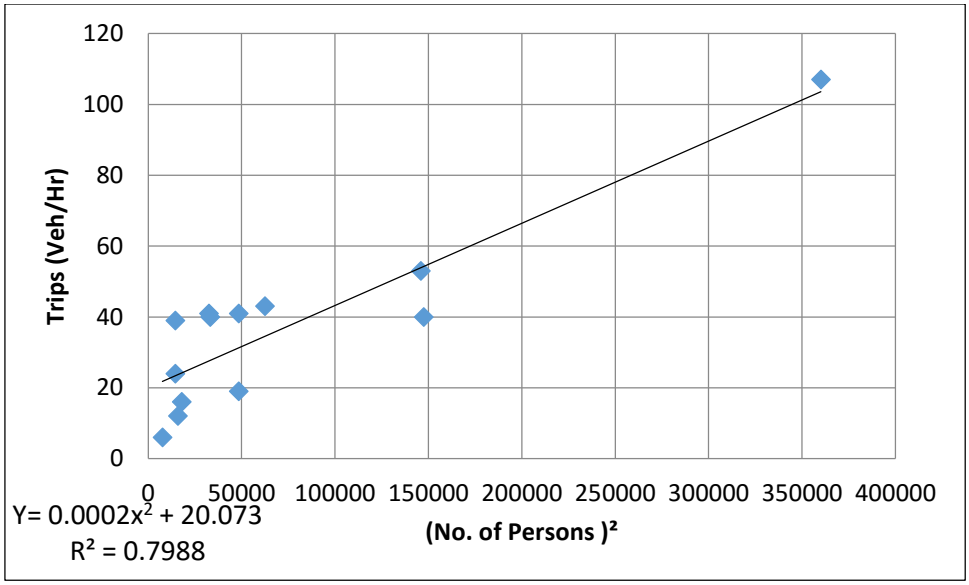


Figure 5.3: AM Trips vs. No of Persons (Apartment Land Use)

Step 4 and 5: Calculate the trip generation rate and the standard deviation

Trip generation rates is calculated on the basis of a weighted average trip rate. For the apartment land use, trip generation rate = 0.15 trip/(person)^2, whereas the standard deviation = 0.055.

The previous steps were applied for all classes of the residential land use for the AM and PM peak periods, and the results are shown in Table 5.6.

Detailed of statistical results for residential land use and its classes are shown in Appendix C.

Table 5.6: Results of the Analysis for the Residential Land Use for the AM and PM Peak Periods

Time Period	Land Use	Best Independent Variable	Best Model	TG Equation	TG Rate	Standard Deviation	R^2	Sig.	Directional Traffic (In%:Out%)
AM	Apartment	Persons	Power	$Y = 0.0002x^2 + 20.073$	0.15 trip/person	0.055	0.799	0.000	44.8 : 55.2
		Occupied Units	Logarithmic	$Y = 35.62 \ln x - 94.24$	0.76 trip/occ. unit	0.226	0.728	0.001	
	Detached Housing	Occupied Units	Power	$Y = 0.002x^2 + 39.527$	2.09 trip/occ. unit	1.930	0.904	0.000	41.0 : 59.0
		Persons	Simple Linear	$Y = 0.17 x + 27.97$	0.376 trip/person	0.238	0.755	0.000	
	Attached Housing	Persons	Power	$Y = 0.001x^2 + 12.408$	0.25 trip/person	0.082	0.747	0.026	40.2 : 59.8
PM	Apartment	Occupied Units	Simple Linear	$Y = 0.476x + 4.983$	0.57 trip/occ. unit	0.117	0.908	0.000	60.0 : 40.0
		Persons	Simple Linear	$Y = 0.096x + 4.117$	0.113 trip/person	0.024	0.865	0.000	
	Detached Housing	Occupied Units	Simple Linear	$Y = 0.752x + 17.353$	1.55 trip/occ. unit	1.239	0.856	0.000	58.1 : 41.9
		Persons	Simple Linear	$Y = 0.147x + 21.25$	0.367 trip/person	0.314	0.774	0.000	
	Attached Housing	Persons	Simple Linear	$Y = 0.0766x + 11.831$	0.187 trip/person	0.033	0.695	0.011	65.4 : 34.6

As shown in the previous table, the best independent variables that clarify trip generation for residential land use are the number of persons and the number of occupied units. An exception is for attached housing class where the best independent variable is the number of persons for both AM and PM peak periods, since R^2 of the regression between the traffic and based on the number of occupied units is less than 0.65, and also the regression is not statically significant at 95%.

Base on Table 5.6, and by referring to the regression between the trip ends and the best independent variable, one can notice that at least one independent variable achieved the value of R^2 of 0.75 or higher, which is the value recommended by ITE in order to use the equation. Therefore, it's recommended to use the equation for estimating trip generation for residential land use based on that independent variable.

The best fit curves and all related data and results of the regression for each class of residential land use. These forms are shown in Appendix C.

5.5 Trip Generation Model for Office Land Use

The Office land use is classified into three major categories; Government Offices, Private Offices, and Institutional Offices.

The researcher analyzed the relationship between the dependent variable (Trip Ends) and every potential independent variable for each class of the office land use for the AM and PM peak periods.

The same process was followed in developing trip generation models for residential land use and was also applied for all classes of the office land use for the AM and PM peak periods; the results are shown in Table 5.7.

As shown in Table 5.7, the best independent variables that clarify trip generation for office land use is the number of employee and the occupied gross floor area.

The researcher presented the best two independent variables that clarify trip generation. However, for private and government office class and for both peak periods, the value of R^2 is very low.

Base on Table 5.7, one can notice the value of R^2 of 0.75 or higher is achieved only for the institutional office class, but for the government and private office classes the values of R^2 is less than 0.7 for the AM and PM peak periods, which is the value recommended by the researcher as indicated in the methodology. Therefore, it's recommended to use the equation for estimating trip generation for institutional office classes and to use trip generation rate for government and private office class.

Best fit curves and all related data and results of the regression for each class of office land use are shown in Appendix D.

Table 5.7: Results of the Analysis for the Office Land Use for the AM and PM Peak Periods

Time Period	Land Use	Best Independent Variable	Best Model	TG Equation	TG Rate	Standard Deviation	R^2	Sig.	Directional Traffic (In%:Out%)
AM	Government	Employee	Linear	Y = 0.445x + 15.898	0.752 trip/employee	0.33	0.50	0.003	53.1 : 46.9
		Occupied Gross Floor Area	Power	$Y= 0.8038x^{0.5658}$	49.33 trip/1000m^2	25.03	0.45	0.006	
	Private	Occupied Gross Floor Area	Linear	Y = 0.0134x + 20.812	42.67 trip/1000m^2	25.61	0.46	0.037	54.8 : 45.2
		Employee	Linear	Y = 0.2219x + 26.252	0.93 trip/employee	0.44	0.36	0.004	
	Institutional	Employee	Exponential	$Y = 34.896e^{0.0046x}$	1.15 trip/employee	0.841	0.88	0.006	56.2 : 43.8
		Occupied Gross Floor Area	Exponential	$Y = 35.717e^{0.0002x}$	52.42 trip/1000m^2	38.22	0.84	0.012	
PM	Government	Occupied Gross Floor Area	Power	$Y = 1.9873x^{0.3993}$	35.13 trip/1000m^2	22.39	0.47	0.001	48.1 : 51.9
		Employee	Linear	Y = 0.3344x + 23.878	0.757 trip/employee	0.45	0.48	0.004	

	Private	Employee	Power	$Y = 11.177x^{0.2675}$	0.775 trip/employee	0.26	0.54	0.006	41.0 : 59.0
		Occupied Gross Floor Area	Linear	$Y = 0.0068x + 24.489$	33.07 trip/1000m^2	16.98	0.54	0.001	
	Institutional	Occupied Gross Floor Area	Exponential	$Y = 24.608e^{0.0007x}$	44.82 trip/1000m^2	30.55	0.88	0.046	41.5 : 58.5
		Employee	Exponential	$Y = 24.375e^{0.005x}$	0.887 trip/employee	0.648	0.85	0.020	

5.6 Trip Generation Model for Retail Land Use

The retail land use is classified into three major categories; Shopping Center, Large Supermarket, and the Commercial Strip.

The researcher tried to selected at least 3 samples for each class, but unfortunately for "Shopping Center" only one site was found, which is Plaza Mall in Al Bireh City. Therefore, for this class, trip generation rate will be used in this study.

The researcher analyzed the relationship between the dependent variable (Trip Ends) and every potential independent variable for each class of the retail land use for the AM and PM peak periods for both traffic directions.

The same process followed in developing trip generation model for residential land use was applied for all classes of the retail land use for the AM and PM peak periods, and the results are shown in Table 5.8.

As shown in Table 5.8, the best independent variable that clarifies trip generation for retail land use is the occupied gross floor area.

Base on Table 5.8, and by referring to the regression between the trip ends and the best independent variable, one can notice that the value of R^2 is higher than 0.70 for AM peak period for large supermarket and the commercial strip classes, whereas it is less than 0.70 for PM peak period for the same land use classes. Therefore, it's recommended to use the equation for estimating trip generation for AM peak period and using rates for PM

peak period. Trip generation rate is recommended for shopping center, because the regression is not valid for one sample.

Best fit curves and all related data and results of the regression for each class of retail land use are shown in Appendix E.

Table 5.8: Results of the Analysis for the Retail Land Use for the AM and PM Peak Periods

Time Period	Land Use	Best Independent Variable	Best Model	TG Equation	TG Rate	Standard Deviation	R^2	Sig.	Directional Traffic (In%:Out%)
AM	Shopping Center	Employee	-	-	9.65 trip/employee	-	-	-	51.1 : 48.9
		Occupied Gross Floor Area	-	-	119 trip/1000m^2				
	Large Supermarket	Occupied Gross Floor Area	Linear	Y = 0.023x + 27.046	114.11 trip/1000m^2	74.08	0.720	0.000	50.9 : 49.1
	Commercial Strip	Occupied Gross Floor Area	Linear	Y = 0.057x + 11.48	100.45 trip/1000m^2	37.85	0.718	0.000	50.6 - 49.4
PM	Shopping Center	Employee	-	-	12.05 trip/employee	-	-	-	53.2 : 46.8
		Occupied Gross Floor Area	-	-	148.67 trip/1000m^2				
	Large Supermarket	Occupied Gross Floor Area	Linear	Y = 0.1227x +19.85	197.5 trip/1000m^2	116.16	0.615	0.001	53.8 - 46.2
	Commercial Strip	Occupied Gross Floor Area	Linear	Y = 0.155x + 16.186	114.8 trip/1000m^2	46.99	0.649	0.000	57.0 : 43.0

5.7 Comparison between Local and ITE Trip Generation Rates

This section provides a brief comparison of the local trip generation rates for specific land uses with their counterparts from ITE (2012), as shown in Table 5.9. The comparison is provided for only five land uses since these are the ones that are common between the two documents in terms of their nature.

Table 5.9: Comparison between Local and ITE Trip Generation Rates

Land Use	Class	Best Independent Variable	Local Trip Rate		ITE Trip Rate *	
			AM	PM	AM	PM
Residential	Apartment	Persons / Occupied Units	0.15 trip/person	0.57 trip/occ. unit	0.28 trip/person	0.62 trip/ unit
	Detached Housing	Occupied Units	2.09 trip/occ. unit	1.55 trip/occ. unit	0.75 trip/ unit	1 trip/unit
Office	Government	Employee	0.752 trip/employee	0.757 trip/employee	1.02 trip/employee	1.91 trip/employee
Retail	Shopping Center	Occupied Gross Floor Area	119 trip/1000m^2	148.67 trip/1000m^2	10.33 trip/1000m^2	39.94 trip/1000m^2
	Large Supermarket	Occupied Gross Floor Area	114.11 trip/1000m^2	197.5 trip/1000m^2	36.6 trip/1000m^2	102.1 trip/1000m^2

(*) Source: Trip Generation Manual 9th Edition, ITE, 2012. Equivalent metric units are shown.

As shown in Table 5.9, it is clear that trip generation rates for apartment and government office class in ITE is higher than local trip generation rates due to the higher level socio-economic aspects in the USA compared with Palestine. On the other hand, the ITE trip generation rates for detached housing is lower than the study results. This may be due to the full occupancy assumption for the local rates, while the ITE assumes that the occupancy should be at least 0.85. Furthermore, the detached housing in Palestine is typically for higher income class with high vehicle ownership.

For retail land use, the ITE trip generation rates are lower than local trip generation rates. This could be explained by the larger GFA of the samples in the USA than their counterparts in Palestine. Therefore, this should be further verified by additional studies.

5.8 Trip Reduction Factors

There are two types of trips generated by a site; Pass-By Trips and Non-Pass-By trips. The second type includes primary trips and diverted link trips. Primary Trips could be defined as the trips made for a specific purpose of visiting the generator, and this trip typically goes from an origin to the generator and then returns to the origin. While diverted link trips are trips that are attracted from the traffic on the roadway within the vicinity of the generator, but require a diversion from that roadway to another roadway to gain access to the generator (ITE, 2012).

There are instances when the total number of trips generated by a site is different from the amount of new traffic added to the street system by the

generator. Certain land uses, such as the various types of commercial/retail uses, attract a portion of their trips from traffic passing on the way from an origin to an ultimate destination; these are "pass-by" trips. Since these are not new trips on the external road network, they should be deducted from the total trips generated by the site (Al-Sahili, 2008).

Pass-By trips are closely linked to the size of the development and the traffic on the adjacent street. The ITE suggests that the analysis of the pass-by trips should be as a percentage of trips generated by the development with unit of occupied development such as occupied GFA.

Based on the recommendation of ITE, pass-by trips were considered only for retail land use, since it is minimal for residential and office land uses.

The researcher considered only pass-by trips and neglected diverted linked trips that is due to the limitation of time and budget.

It was initially estimated that the pass-by trips would be in the range of 30-40%. Therefore, the researcher adopted, as much as possible, the recommended minimum sample size for pass-by surveys, which is located between 36-41 samples for 95% level of confidence and expected percent of pass-by between 30-40% with an approximate of 15% error in the mean (refer to Table 2.1).

The surveying team received a training on conducting the survey of pass-by trips by the researcher through randomly asking a sample of visitors if they are directly coming from the origin to the development and want to go back to the origin or not.

The researcher analyzed the raw data and estimated the percentage of pass-by trips for each site of the retail land use, and then correlated the percentage of pass-by trips for each class of retail land use with the best independent variable that clarified the trip generation, which is the occupied gross floor area.

Table 5.10 shows the related data of pass-by trips for each sample of the retail land use.

Figure 5.4 and 5.5 illustrate the regression between percentage of pass-by trips and the occupied gross floor area for large supermarket and commercial strip land uses, respectively. The third type of the retail land use "Shopping Center" has only one sample, so the pass-by percent will be considered as a rate.

As mentioned earlier, it is initially estimated that the pass-by trips would be in the range of 30-40%. Therefore, the minimum sample size is located between 36-41 samples. Referring to actual data for large supermarket class, the sample size ranges between 21and 95 samples, with an average of 46 samples, which is greater than the recommended by ITE. Pass-by for the same class is 61%. On the other hand, for 61% of pass-by trips, the minimum sample size should be between 41-36 samples. It is concluded that the average collected sample size is generally good; however, sample size needs to be increased for individual sites.

For commercial strip, the actual sample size ranges between 19 and 69 samples, with 34 samples as an average, and 57% average pass-by. This

percent of pass-by requires minimum sample size between 41and 43 samples. Therefore, the sample size should be increased in future studies.

Table 5.10: Pass-By Trips Data for Retail Land Use

No.	Class	City	Development Name	Pass-By Data		Occupied GFA (m^2)
				Sample Size	Pass-By (%)	
1	Large Supermarkets	Nablus	Bravo Supermarket	44	37	650
2			Wahet Al Makhfeya	95	57	320
3		Tulkarm	Dallas Supermarket	21	62	420
4			Al Islameya Supermarket	30	60	490
5		Ramallah	Green Land Supermarket	58	69	300
6			Max Mar Supermarket	86	61	400
7		Hebron	Bravo Plaza- Hebron	40	30	1,000
8		Bethlehem	Jamboo Supermarket	35	52	1,800
9			Al Sha'ab Supermarket	33	73	180
10			Al Moghrabi Supermarket	27	67	240
11			Khater Supermarket	30	80	200
12		Salfeet	Al Barakeh Stores Supermarket	27	56	700
13		Qalqilya	Al Karmel Supermarket	37	49	700
14		Tubas	City Supermarket	32	79	110
15		Jenin	Al Waha Supermarket	66	76	400
16			Safe Side Supermarket	55	75	300
17			On the Run Supermarket	39	48	370
Sub-Total				**755**		
Average				**46**	**61**	**505**
1	Shopping Center	Al-Bireh	Plaza Mall	12	42	3,000
1	Commercial Strip	Nablus	Bon Bon Strip	51	32	145
2			Eshtar Strip	56	52	198
3			Commercial Strip - Asera Street	64	68	200
4		Ramallah	Commercial Strip- Om Al Sharayt	55	73	820

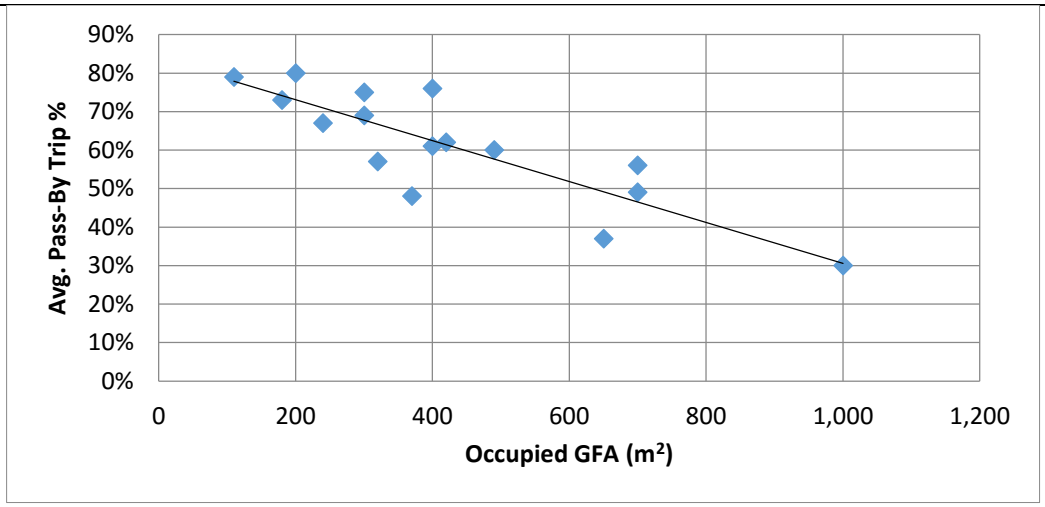
No.	Class	City	Development Name	Pass-By Data		Occupied GFA (m^2)
				Sample Size	Pass-By (%)	
5			Commercial Strip - Al Ersal Street	18	73	210
6		Al-Bireh	Commercial Strip - Nablus Street	36	73	1,112
7		Tulkarm	Commercial Strip - Hospital Street	35	58	220
8			Rami Sport Strip	23	44	150
9		Qalqilya	Strip near Fihmi Al ali Gas Station	15	54	196
10		Bethlehem	Commercial Strip - A-lQuds Hebron Street	19	48	720
11			Al Karkafeh Strip	25	68	210
Sub-Total				**397**		
Average				**34**	**57**	**598**

Average Pass-By Trip Percentage vs: Occupied Gross Floor Area (m^2)

During: Average of two normal week day peak period

Number of Studies: 17

Average Gross Floor Area: 505 m^2

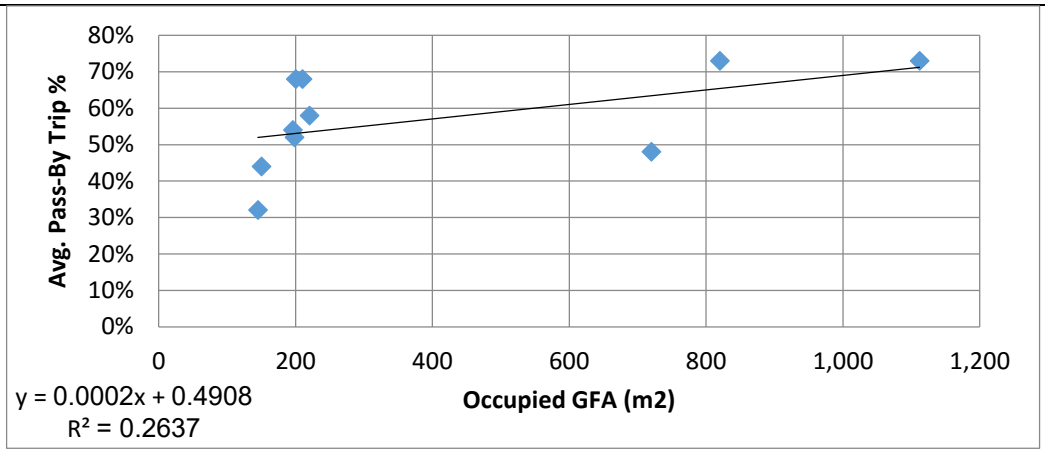


Fitted Curve Equation: Y = -0.0005x + 0.837

R^2 0.72

Figure 5.4: Regression of Pass-By Trips for Large Supermarket Land Use

Average Pass-By Trip Percentage vs:	Occupied Gross Floor Area (m^2)
During:	Average of two normal week day peak period
Number of Studies:	11
Average Gross Floor Area:	598 m^2



Fitted Curve Equation:	Y = 0.0002x + 0.4908
R^2	0.264

Figure 5.5: Regression of Pass-By Trips for Commercial Strip Land Use

From the previous figures, it's shown that there is an inverse proportional relationship between pass-by trips and the occupied GFA for large supermarket land use, which is logical in the West Bank, since when the store area is large, the supermarket has various types of goods, and families tends to go to these supermarkets to purchase all their needs from one store. On

the other hand, when the supermarket is small people go to purchase their daily needs while they are going to or from their jobs or other directions.

The weighted average of pass-by trips for large supermarket class is 21.5%; on the other hand, the regression equation has an R^2 of 0.72; therefore, it is recommended to be used. For commercial strip class, the coefficient of determination is low. Therefore, the pass-by weighted average is preferable, which is 22%.

Chapter Six

Conclusions and Recommendations

6.1 Conclusions

Trip generation is the first step of the four-step transportation planning process, which is mainly used for travel demand forecasting. This research investigates and presents models (trip generation rates and equations) for Residential, Office, and Retail land uses, which are considered major land uses in the West Bank.

This study, as well as other studies and researches, was conducted in accordance with the Institute of Transportation Engineers (ITE) procedures and methodology in terms of sample size, independent variables, site selection, and procedures for estimating trip generation model, taking into consideration the specific characteristics of the local land uses.

Special forms were designed to collect the required data about the developments and traffic counting. These forms were used by the researcher and well trained surveying teams from all Palestinian cities.

Based on data collected and analysis, the following conclusions can be drawn:

- Three major land uses were used in the thesis; each land use was classified into three primary classes.
- At least 6 samples were surveyed for each land use except the "Shopping Center" land use, only one site was found, which is Plaza Mall in Al Bireh City.

- The study recommended using the trip generation equation when R^2 is greater than 0.7, otherwise to use the trip generation rate.
- The best independent variables that estimate trip generation for residential land use are the number of persons and the number of occupied units, number of employee and the occupied gross floor area for office land use, and occupied gross floor area for retail land use
- Based on the recommendation of ITE, pass-by trips were considered only for retail land use. The average collected sample size is suitable for large supermarket class, otherwise, it should be larger for commercial strip class.
- There is an inverse proportional relationship between pass-by trips and the occupied GFA for large supermarket land use with R^2 equals to 0.72, which is considered logical in the West Bank. For commercial strip land use, the coefficient of determination is low. Therefore, the pass-by rate is preferable.
- Table 6.1 shows the recommended trip generation results for residential, office, and retail land uses during AM and PM peak periods.

Table 6.1: Recommended Trip Generation Results for Residential, Office, and Retail Land Uses During AM and PM Peak Periods

Time Period	Land Use	Class	Best Independent Variable	TG Equation	TG Rate	R^2	Range of x
AM	Residential	Apartment	Persons	$Y = 0.0002x^2 + 20.073$	0.15 trip/person	0.80	70-600
		Detached Housing	Occupied Units	$Y = 0.002x^2 + 39.527$	2.09 trip/occ. unit	0.90	7-214
		Attached Housing	Persons	$Y = 0.001x^2 + 12.408$	0.25 trip/person	0.75	59-180
	Office	Government	Employee	$Y = 0.445x + 15.898$	0.752 trip/employee	0.50	21-250
		Private	Occupied Gross Floor Area	$Y = 0.0134x + 20.812$	42.67 trip/1000m^2	0.46	380-2400
		Institutional	Employee	$Y = 34.896e^{0.0046x}$	1.15 trip/employee	0.88	12-600
	Retail	Shopping Center	Occupied Gross Floor Area	-	119 trip/1000m^2	-	-
		Large Supermarket	Occupied Gross Floor Area	$Y = 0.023x + 27.046$	114.11 trip/1000m^2	0.72	110-1800
		Commercial Strip	Occupied Gross Floor Area	$Y = 0.057x + 11.48$	100.45 trip/1000m2	0.72	150-1200
PM	Residential	Apartment	Occupied Units	$Y = 0.476x + 4.983$	0.57 trip/occ. unit	0.91	14-133
		Detached Housing	Occupied Units	$Y = 0.752x + 17.353$	1.55 trip/occ. unit	0.86	7-214
		Attached Housing	Persons	$Y = 0.0766x + 11.831$	0.187 trip/person	0.70	59-180
	Office	Government	Employee	$Y = 0.3344x + 23.878$	0.757 trip/employee	0.48	21-250
		Private	Occupied Gross Floor Area	$Y = 0.0068x + 24.489$	33.07 trip/1000m^2	0.54	380-2400
		Institutional	Occupied Gross Floor Area	$Y = 24.608e^{0.0007x}$	44.82 trip/1000m^2	0.88	250-12500
	Retail	Shopping Center	Occupied Gross Floor Area	-	148.67 trip/1000m^2	-	-
		Large Supermarket	Occupied Gross Floor Area	$Y = 0.1227x + 19.85$	197.5 trip/1000m^2	0.62	110-1800
		Commercial Strip	Occupied Gross Floor Area	$Y = 0.155x + 16.186$	114.8 trip/1000m^2	0.65	150-1200

6.2 Recommendations and Future Research

The following recommendations can be drawn from the results of this Study:

- It is recommended that ministries and municipalities use the results of this study to establish Transportation Impact Studies (TIS) at the policy level and incorporate it as a part of the building permit process.
- It is recommended to use trip generation equation for models with R^2 of 0.7 or greater, otherwise, use trip generation rate.
- Researchers are encouraged to collect additional data to increase the sample size in order to get more accurate regression results.
- Researchers are also encouraged to check model validation by collecting a new data and use it to validate the model.
- Establishing a cost sharing mechanism in Palestine where developers who participate in increasing the level of traffic and transportation problems would have to participate in the cost of mitigating their impacts.
- The study creates several future research opportunities such that the trip generation studies should be completed for the following aspects:
    - Trip generation models for the rest of land uses in Palestine including Gaza and Jerusalem.
    - Trip generation for land uses in the CBD areas and for rural areas.
    - Conducting trip generation for the weekends' peak period and for special events.

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Appendices

Appendix (A): Sample of a Full Data for each Development

Appendix (B): Descriptive Statistics for Office and Retail Land Use

Appendix (C): Regression Results for Residential Land Use

Appendix (C): Regression Results for Office Land Use

Appendix (C): Regression Results for Retail Land Use

Appendix (A)

Sample of a Full Data for each Development

نموذج المسح الميداني الخاص بالمنشآت السكنية

رقم كود المنشأة:
اليوم: الثلاثاء
الطريق الرئيسي المجاور: شارع سليمان النابلسي
التاريخ: 2014/4/1
اسم المنشأة: اسكان الاطباء - روجيب
اسم الماسح: الباحث
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس – المنطقة الشرقية – شارع سليمان النابلسي

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة
[ ] منطقة ضواحي
[√] منطقة حضرية- ليست مركز المدينة
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
سكني	52	[√]	**مجموع عدد الوحدات الكلية (حدد الوحدة:** فيلا متصلة)	[√]	[ ]
	36	[√]	**مجموع الوحدات المستخدمة (حدد الوحدة:** فيلا متصلة)	[√]	[ ]
	180	[√]	**عدد الاشخاص الكلي في الوحدات (عدد) (حدد:** شخص)	[ ]	[√]
	30	[√]	**عدد السيارات التي يملكها الافراد (عدد)**	[ ]	[√]
	25,000	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
	6,048	[√]	**المساحة الطابقية للمنشأة (م^2)**	[√]	

معلومات اضافية:

مواقف المركبات:
نوع مواقف المركبات الخاصة بالمنشأة: ..... [√] مواقف على جوانب الطريق (عدد)
[√] مواقف ساحات او كراجات (عدد) 36

تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ): (حدد) خاصة للسكان

هل عدد المواقف المتوفرة كافية في ساعة الذروة: [√] نعم [ ] لا

المواصلات العامة:
وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟ [√] نعم [ ]لا

المداخل الى الموقع:
عدد المداخل الكلية الى المنشأة: 3 المستخدم منها: 3

ملاحظات او معلومات اخرى:
الاسكان عبارة عن فلل متصلة كل اثنتين مع بعضهما البعض بواسطة جدار، مكون من 52 فيلا مساحة كل منها 168 م^2، 36 منها مسكونة.

نموذج المسح الميداني الخاص بالمنشآت السكنية

رقم كود المنشأة:
اليوم: الثلاثاء
الطريق الرئيسي المجاور: شارع عصيرة الشمالية
التاريخ: 2014/4/1
اسم المنشأة: اسكان المهندسين – الجبل الشمالي
اسم الماسح: الباحث
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس – الجبل الشمالي

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[ ] منطقة ضواحي
[√] منطقة حضرية- ليست مركز المدينة
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
سكني	23	[√]	**مجموع عدد الوحدات الكلية (حدد الوحدة:** فيلا متصلة)	[√]	[ ]
	17	[√]	**مجموع الوحدات المستخدمة (حدد الوحدة:** فيلا متصلة)	[√]	[ ]
	85	[√]	**عدد الاشخاص الكلي في الوحدات (عدد) (حدد:** شخص)	[ ]	[√]
	29	[√]	**عدد السيارات التي يملكها الافراد (عدد)**	[ ]	[√]
	4,500	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
	2,550	[√]	**المساحة الطابقية للمنشأة (م^2)**	[√]	

معلومات اضافية:

مواقف المركبات:

نوع مواقف المركبات الخاصة بالمنشأة: [√] مواقف على جوانب الطريق (عدد) او (م^2) 400 م^2
[ ] مواقف ساحات او كراجات (عدد) .....

تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ): (حدد) خاصة للسكان

هل عدد المواقف المتوفرة كافية في ساعة الذروة: [ ] نعم [√] لا

المواصلات العامة:

وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟ [√] نعم [ ] لا

المداخل الى الموقع:

عدد المداخل الكلية الى المنشأة: 1 المستخدم منها: 1

ملاحظات او معلومات اخرى:

اسكان المهندسين مكون من 23 فيلا متصلة، 17 منها مشغولة، مساحة كل فيلا بالمعدل 150 م^2.

نموذج المسح الميداني الخاص بالمنشآت السكنية

رقم كود المنشأة:
اليوم: الاثنين
الطريق الرئيسي المجاور: شارع علي بن ابي طالب
التاريخ: 2014/5/26
اسم المنشأة: اسكان المهندسين - المخفية
اسم الماسح: الباحث
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس – المخفية – حي العامرية

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة
[ ] منطقة ضواحي
[√] منطقة حضرية- ليست مركز المدينة
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
سكني	81	[√]	**مجموع عدد الوحدات الكلية (حدد الوحدة:** فيلا منفصلة)	[√]	[ ]
	45	[√]	**مجموع الوحدات المستخدمة (حدد الوحدة:** فيلا منفصلة)	[√]	[ ]
	225	[√]	**عدد الاشخاص الكلي في الوحدات (عدد) (حدد:** شخص)	[ ]	[√]
	100	[√]	**عدد السيارات التي يملكها الافراد (عدد)**	[ ]	[√]
	75,000	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
		[√]	**المساحة الطابقية للمنشأة (م^2)**	[√]	

معلومات اضافية:

مواقف المركبات:
نوع مواقف المركبات الخاصة بالمنشأة: ..... [√] مواقف على جوانب الطريق (عدد)
[√] مواقف ساحات او كراجات (عدد) 66

تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ): (حدد) خاص بالسكان

هل عدد المواقف المتوفرة كافية في ساعة الذروة: [√] نعم [ ]لا

المواصلات العامة:
وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟ [√] نعم [ ]لا

المداخل الى الموقع:
عدد المداخل الكلية الى المنشأة: 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت السكنية

رقم كود المنشأة:
الطريق الرئيسي المجاور: شارع العامرية الرئيسي
اسم المنشأة: جزء من حي طيبة
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس – العامرية – حي طيبة

اليوم: الاربعاء
التاريخ: 2014/5/21
اسم الماسح: الباحث

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
سكني	17	[√]	**مجموع عدد الوحدات الكلية (حدد الوحدة:** فيلا منفصلة**)**	[√]	[ ]
	16	[√]	**مجموع الوحدات المستخدمة (حدد الوحدة:** فيلا منفصلة**)**	[√]	[ ]
	66	[√]	**عدد الاشخاص الكلي في الوحدات (عدد) (حدد:** شخص**)**	[ ]	[√]
	27	[√]	**عدد السيارات التي يملكها الافراد (عدد)**	[ ]	[√]
	25,000	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
		[√]	**المساحة الطابقية للمنشأة (م^2)**	[√]	

معلومات اضافية:

مواقف المركبات:
نوع مواقف المركبات الخاصة بالمنشأة: ..... [√] مواقف على جوانب الطريق (عدد)
[√] مواقف ساحات او كراجات (عدد) 25

تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ): (حدد) خاص بالسكان

هل عدد المواقف المتوفرة كافية في ساعة الذروة: [√] نعم [ ]لا

المواصلات العامة:
وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟ [√] نعم [ ]لا

المداخل الى الموقع:
عدد المداخل الكلية الى المنشأة: 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:
جزء من حي طيبة تم حصره، تم الحصول على المعلومات عن طريق مقابلة الباحث لاحد سكان المنطقين القدامي

نموذج المسح الميداني الخاص بالمنشآت السكنية

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: الاسكان النمساوي
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس – الجبل الشمالي

اليوم: الاثنين
التاريخ: 2014/3/26
اسم الماسح: الباحث

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
سكني	136	[√]	**مجموع عدد الوحدات الكلية (حدد الوحدة:** شقة شكنية)	[√]	[ ]
	133	[√]	**مجموع الوحدات المستخدمة (حدد الوحدة:** شقة سكنية)	[√]	[ ]
	600	[√]	**عدد الاشخاص الكلي في الوحدات (عدد) (حدد:** شخص)	[ ]	[√]
	72	[√]	**عدد السيارات التي يملكها الافراد (عدد)**	[ ]	[√]
	6,000	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
	17,955	[√]	**المساحة الطابقية للمنشأة (م^2)**	[√]	

معلومات اضافية:

مواقف المركبات:
نوع مواقف المركبات الخاصة بالمنشأة: ..... [√] مواقف على جوانب الطريق (عدد)
[√] مواقف ساحات او كراجات (عدد) **8**

تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ): (حدد) خاص بالاسكان

هل عدد المواقف المتوفرة كافية في ساعة الذروة: [ ] نعم [√] لا

المواصلات العامة:
وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟ [√] نعم [ ]لا

المداخل الى الموقع:
عدد المداخل الكلية الى المنشأة: 2 المستخدم منها: 2

ملاحظات او معلومات اخرى:

الاسكان مكون من 4 عمارات سكنية، معدل مساحة كل شقة 135 م^2.

نموذج المسح الميداني الخاص بالمنشآت السكنية

رقم كود المنشأة:
اليوم: الثلاثاء
الطريق الرئيسي المجاور: شارع المعاجين الرئيسي
التاريخ: 2014/4/1
اسم المنشأة: اسكان موظفي جامعة النجاح الوطنية
اسم الماسح: الباحث
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس - المعاجين

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة
[ ] منطقة ضواحي
[√] منطقة حضرية- ليست مركز المدينة
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
سكني	77	[√]	**مجموع عدد الوحدات الكلية (حدد الوحدة:** شقة شكنية**)**	[√]	[ ]
	61	[√]	**مجموع الوحدات المستخدمة (حدد الوحدة:** شقة سكنية**)**	[√]	[ ]
	382	[√]	**عدد الاشخاص الكلي في الوحدات (عدد) (حدد:** شخص**)**	[ ]	[√]
	39	[√]	**عدد السيارات التي يملكها الافراد (عدد)**	[ ]	[√]
	4,500	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
	9,190	[√]	**المساحة الطابقية للمنشأة (م^2)**	[√]	

معلومات اضافية:

مواقف المركبات:
نوع مواقف المركبات الخاصة بالمنشأة: 500 م^2 [√] مواقف على جوانب الطريق (عدد) او (م^2)
..... [√] مواقف ساحات او كراجات (عدد)

تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ): (حدد) خاصة بالاسكان

هل عدد المواقف المتوفرة كافية في ساعة الذروة: [ ] نعم [√] لا

المواصلات العامة:
وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟ [√] نعم [ ] لا

المداخل الى الموقع:
عدد المداخل الكلية الى المنشأة: 2 المستخدم منها: 1

ملاحظات او معلومات اخرى:
الاسكان خاص لموظفي جامعة النجاح الوطنية، وهو مكون من 10 عمارات سكنية، تم حصر 4 منها بشكل جيد. وهي على ثلاثة انماط
العمارة رقم 1 تتكون من 30 شقة، مساحة كل شقة 138 م^2، العمارة رقم 2 تتكون من 26 شقة، مساحة كل شقة 138 م^2، العمارة رقم 3 تتكون من 14 شقة، مساحة كل شقة 180 م^2، العمارة رقم 4 تتكون من 7 شقق، مساحة كل شقة 200 م^2

نموذج المسح الميداني الخاص بالمنشآت المكتبية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: شركة الاتصالات الفلسطينية -بالتل
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس -رفيديا – شارع رفيديا الرئيسي

اليوم: الخميس
التاريخ: 2014/9/18
اسم الماسح: الباحث
ساعات العمل: 8 ساعات

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
مكاتب	390	[√]	**عدد الموظفين الكلي (عدد)**	[√]	[ ]
	7,200	[√]	**المساحة الطابقية الكلية للمنشأة (م^2)**	[√]	[ ]
	7,200	[√]	**المساحة الطابقية المشغولة للمنشأة(م^2)**	[√]	[ ]
	2,000	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
	196	[√]	**عدد المركبات التي يملكها الموظفون والمنشأة (عدد)**	[ ]	[√]
	7:30-9:30	[√]	**فترة الذروة الصباحية**	[ ]	[√]
	2:30-5:00	[√]	**فترة الذروة المسائية**	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد)
  190 [√] مواقف ساحات او كراجات (عدد)

- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):** المواقف في الكراج مخصصة لموظفي شركة الاتصالات اما المواقف على جوانب الطريق فهي للموظفين وغيرهم من عامة الناس

- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [√]نعم [ ] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** **2** **المستخدم منها:** **2**

ملاحظات او معلومات اخرى:

شركة الاتصالات الفلسطينية- بالتل، مكونة من عمارتين كل منهما مكونة من 6 طوابق، متجاوتين، ولها كراج مخصص لمركبات الموظفين يتسع لما يقارب 190 مركبة منظم باحدث التقنيات.

نموذج المسح الميداني الخاص بالمنشآت المكتبية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: شركة جوال
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): رام الله - البالوع

اليوم: الخميس
التاريخ: 2014/9/4
اسم الماسح: الباحث
ساعات العمل: 8 ساعات

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
مكاتب	600	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	12,500	[√]	المساحة الطابقية الكلية للمنشأة ($م^2$)	[√]	[ ]
	12,500	[√]	المساحة الطابقية المشغولة للمنشأة($م^2$)	[√]	[ ]
	3,620	[√]	المساحة الكلية للموقع ($م^2$)	[√]	[ ]
	277	[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	7:30-9:30	[√]	فترة الذروة الصباحية	[ ]	[√]
	2:30-5:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد) 220 [√] مواقف ساحات او كراجات (عدد)
- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):** المواقف في الكراج مخصصة لموظفي شركة الوطنية موبايل، اما المواقف على جوانب الطريق فهي للموظفين وغيرهم من عامة الناس.
- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [√]نعم [ ] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت المكتبية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: مديرية التربية والتعليم – طولكرم
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): طولكرم – قرب دوار شويكة

اليوم: الثلاثاء
التاريخ: 2014/8/12
اسم الماسح: الباحث
ساعات العمل: 8 ساعات

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
مكاتب	123	[√]	**عدد الموظفين الكلي (عدد)**	[√]	[ ]
	1,570	[√]	**المساحة الطابقية الكلية للمنشأة (م^2)**	[√]	[ ]
	1,440	[√]	**المساحة الطابقية المشغولة للمنشأة(م^2)**	[√]	[ ]
	1,000	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
	45	[√]	**عدد المركبات التي يملكها الموظفون والمنشأة (عدد)**	[ ]	[√]
	7:30-10:00	[√]	**فترة الذروة الصباحية**	[ ]	[√]
	12:30-3:00	[√]	**فترة الذروة المسائية**	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد) 12 [√] مواقف ساحات او كراجات (عدد)
- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):** المواقف في الكراج مخصصة لموظفي مديرية التربية والتعليم وزوارهم.
- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت المكتبية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور: شارع فيصل
اسم المنشأة: وزارة الصحة- نابلس
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس – عمان

اليوم: الاثنين
التاريخ: 2014/9/8
اسم الماسح: الباحث
ساعات العمل: 8 ساعات

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
مكاتب	250	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	780	[√]	المساحة الطابقية الكلية للمنشأة (م^2)	[√]	[ ]
	780	[√]	المساحة الطابقية المشغولة للمنشأة(م^2)	[√]	[ ]
	1,500	[√]	المساحة الكلية للموقع (م^2)	[√]	[ ]
	105	[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	7:30-10:00	[√]	فترة الذروة الصباحية	[ ]	[√]
	12:30-3:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد)
  [√] مواقف ساحات او كراجات (عدد)

- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):** المواقف في الكراج مخصصة لموظفي لسيارات مديرية الصحة اما الموظفون والزوار فيصطفون على جانب الطريق
- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** **2** **المستخدم منها:** **2**

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت المكتبية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: شركة الاسراء للبرمجة
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): نابلس –شارع فيضل

اليوم: الاثنين
التاريخ: 2014/8/11
اسم الماسح: الباحث
ساعات العمل: 8 ساعات

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
مكاتب	35	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	540	[√]	المساحة الطابقية الكلية للمنشأة ($م^2$)	[√]	[ ]
	380	[√]	المساحة الطابقية المشغولة للمنشأة($م^2$)	[√]	[ ]
	900	[√]	المساحة الكلية للموقع ($م^2$)	[√]	[ ]
	10	[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	7:30-9:30	[√]	فترة الذروة الصباحية	[ ]	[√]
	2:30-5:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد) 8 [√] مواقف ساحات او كراجات (عدد)
- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):** المواقف في الكراج مخصصة لموظفي شركة الاسراء اما المواقف على جوانب الطريق فهي للموظفين وغيرهم من عامة الناس
- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت المكتبية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: عمارة اوغريت
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): رام الله- شارع الارسال-
بالقرب من فندق بيست ايسترن

اليوم: الأحد
التاريخ: 2014/8/31
اسم الماسح: الباحث
ساعات العمل: 8 ساعات

موقع المنشأة بالنسبة للمدينة:
[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
	25	[√]	**عدد الموظفين الكلي (عدد)**	[√]	[ ]
	1,250	[√]	**المساحة الطابقية الكلية للمنشأة (م^2)**	[√]	[ ]
	1,000	[√]	**المساحة الطابقية المشغولة للمنشأة(م^2)**	[√]	[ ]
مكاتب	900	[√]	**المساحة الكلية للموقع (م^2)**	[√]	[ ]
	20	[√]	**عدد المركبات التي يملكها الموظفون والمنشأة (عدد)**	[ ]	[√]
	7:30-9:30	[√]	**فترة الذروة الصباحية**	[ ]	[√]
	1:00-3:00	[√]	**فترة الذروة المسائية**	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد) 7 [√] مواقف ساحات او كراجات (عدد)

- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):** المواقف في الكراج مخصصة لموظفي المكاتب الموجودة في العمارة، اما المواقف على جوانب الطريق فهي للموظفين وغيرهم من عامة الناس

- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت التجارية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
اليوم: الخميس
الطريق الرئيسي المجاور: شارع رفيديا الرئيسي - نابلس
التاريخ: 2014/9/25
اسم المنشأة: سوبر ماركت برافو - نابلس
اسم الماسح: الباحث
نوع المسح: يدوي
ساعات العمل: 15 ساعات
الموقع (المدينة/الحي/بالقرب من): نابلس - رفيديا

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[ ] منطقة ضواحي
[√] منطقة حضرية- ليست مركز المدينة
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
	15	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	650	[√]	المساحة الطابقية الكلية للمنشأة ($م^2$)	[√]	[ ]
	650	[√]	المساحة الطابقية المشغولة للمنشأة($م^2$)	[√]	[ ]
مكاتب	800	[√]	المساحة الكلية للموقع ($م^2$)	[√]	[ ]
		[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	2				
	3:00-12:00	[√]	فترة الذروة الصباحية	[ ]	[√]
	9:00-7:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد)
  [√] 44 مواقف ساحات او كراجات (عدد)
- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):** مواقف تستخدم من قبل الزبائن وغيرهم من عامة الناس
- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [√]نعم [ ] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت التجارية

معلومات عامة عن المنشأة:

رقم كود المنشأة: **اليوم:** الأحد
الطريق الرئيسي المجاور: **التاريخ:** 2014/8/31
اسم المنشأة: سوبر ماركت ماكس مار - رام الله **اسم الماسح:** الباحث
نوع المسح: يدوي **ساعات العمل:** 20 ساعات
الموقع (المدينة/الحي/بالقرب من): رام الله -الارسال- بالقرب من برج فلسطين

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة [ ] منطقة ضواحي
[√] منطقة حضرية- ليست مركز المدينة [ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
	35	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	400	[√]	المساحة الطابقية الكلية للمنشأة (م^2)	[√]	[ ]
	400	[√]	المساحة الطابقية المشغولة للمنشأة(م^2)	[√]	[ ]
مكاتب	550	[√]	المساحة الكلية للموقع (م^2)	[√]	[ ]
	12	[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	1:00-4:00	[√]	فترة الذروة الصباحية	[ ]	[√]
	8:00-10:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** 25 [√]مواقف على جوانب الطريق (عدد)
  [ ] مواقف ساحات او كراجات (عدد)
- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):**
- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** **1** **المستخدم منها:** **1**

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت التجارية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: سوبر ماركت جمبو - بيت لحم
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): بيت جالا- الشارع الرئيسي

اليوم: الأحد
التاريخ: 2014/8/31
اسم الماسح: الباحث
ساعات العمل: 20 ساعات

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
	31	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	5,400	[√]	المساحة الطابقية الكلية للمنشأة ($م^2$)	[√]	[ ]
	1,800	[√]	المساحة الطابقية المشغولة للمنشأة($م^2$)	[√]	[ ]
مكاتب	1,800	[√]	المساحة الكلية للموقع ($م^2$)	[√]	[ ]
		[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	7				
	1:00-4:00	[√]	فترة الذروة الصباحية	[ ]	[√]
	7:00-10:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

- ✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد) 7 [√]مواقف ساحات او كراجات (عدد)
- ✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):**
- ✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [√]نعم [ ] لا

المواصلات العامة:

- ✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

- ✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت التجارية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: بلازا مول
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): رام الله - البالوع

اليوم: الخميس
التاريخ: 2014/9/25
اسم الماسح: الباحث
ساعات العمل: 15 ساعات

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
	37	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	3,000	[√]	المساحة الطابقية الكلية للمنشأة ($م^2$)	[√]	[ ]
	3,000	[√]	المساحة الطابقية المشغولة للمنشأة($م^2$)	[√]	[ ]
مكاتب	1,950	[√]	المساحة الكلية للموقع ($م^2$)	[√]	[ ]
		[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	20				
	1:30-5:00	[√]	فترة الذروة الصباحية	[ ]	[√]
	5:30-10:30	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد)
50 [√]مواقف ساحات او كراجات (عدد)

✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):**

✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

✓ **عدد المداخل الكلية الى المنشأة:** 2 **المستخدم منها:** 2

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت التجارية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
اليوم: الاربعاء
الطريق الرئيسي المجاور: شارع رفيديا الرئيسي
التاريخ: 2014/9/17
اسم المنشأة: تجاري شريطي - رفيديا - بون بون
اسم الماسح: الباحث
نوع المسح: يدوي
ساعات العمل: 16 ساعات
الموقع (المدينة/الحي/بالقرب من): نابلس - رفيديا - شارع رفيديا الرئيسي

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[ ] منطقة ضواحي
[√] منطقة حضرية- ليست مركز المدينة
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
	8	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	189	[√]	المساحة الطابقية الكلية للمنشأة ($م^2$)	[√]	[ ]
	189	[√]	المساحة الطابقية المشغولة للمنشأة($م^2$)	[√]	[ ]
مكاتب	189	[√]	المساحة الكلية للموقع ($م^2$)	[√]	[ ]
		[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	7				
	1:00-3:00	[√]	فترة الذروة الصباحية	[ ]	[√]
	7:00-10:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد) 13 [√]مواقف ساحات او كراجات (عدد)

✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):**

✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

نموذج المسح الميداني الخاص بالمنشآت التجارية

معلومات عامة عن المنشأة:

رقم كود المنشأة:
الطريق الرئيسي المجاور:
اسم المنشأة: تجاري شريطي - ام الشرايط
نوع المسح: يدوي
الموقع (المدينة/الحي/بالقرب من): رام الله - ام الشرايط - قرب شرطة الضواحي

اليوم: الثلاثاء
التاريخ: 2014/8/12
اسم الماسح: الباحث
ساعات العمل: 14 ساعات

موقع المنشأة بالنسبة للمدينة:

[ ] منطقة حضرية-مركز المدينة
[√] منطقة حضرية- ليست مركز المدينة
[ ] منطقة ضواحي
[ ] غير ذلك حدد: .....

المتغيرات:

الاستخدام	العدد		الوصف	حقيقي	تقديري
مكاتب	20	[√]	عدد الموظفين الكلي (عدد)	[√]	[ ]
	950	[√]	المساحة الطابقية الكلية للمنشأة ($م^2$)	[√]	[ ]
	950	[√]	المساحة الطابقية المشغولة للمنشأة($م^2$)	[√]	[ ]
	950	[√]	المساحة الكلية للموقع ($م^2$)	[√]	[ ]
		[√]	عدد المركبات التي يملكها الموظفون والمنشأة (عدد)	[ ]	[√]
	7				
	1:00-3:00	[√]	فترة الذروة الصباحية	[ ]	[√]
	7:00-10:00	[√]	فترة الذروة المسائية	[ ]	[√]

معلومات اضافية:

مواقف المركبات:

✓ **نوع مواقف المركبات الخاصة بالمنشأة:** [√]مواقف على جوانب الطريق (عدد)
[ ]مواقف ساحات او كراجات (عدد)

✓ **تفاصيل المواقف (مجانية، مدفوعة، خاصة بالعاملين بالمنشأة.. الخ):**

✓ **هل عدد المواقف المتوفرة كافية في ساعة الذروة:** [ ]نعم [√] لا

المواصلات العامة:

✓ **وصول المواصلات العامة للمنشأة (بحدود 400 متر)؟** [√]نعم [ ]لا

المداخل الى الموقع:

✓ **عدد المداخل الكلية الى المنشأة:** 1 **المستخدم منها:** 1

ملاحظات او معلومات اخرى:

Appendix (B)

Descriptive Statistics for Office and Retail Land Use

Descriptive Statistics for Office Land Use

Office land use was classified into three main categories based on the common function of the offices in the West Banks. These categories are government, private, and institutional offices.

Table B1 illustrates the descriptive statistics for traffic counting (dependent variable) for each category and for both AM and PM peak periods. While Table B2 shows the descriptive statistics for the independent variables

Table B1 Descriptive Statistics for Traffic Counting in Office Land Use

Office Land Use Class	Traffic Counting Period	N	Minimum (Veh/hr)	Maximum (Veh/hr)	Mean (Veh/hr)	Std. Deviation (Veh/hr)
Government	AM	19	16	206	66	48
	PM	19	16	124	51	30
Private	AM	7	20	53	37	12
	PM	7	22	40	31	6
institutional	AM	7	30	659	165	224
	PM	7	20	621	144	215

Referring to the previous table, it is notified that the highest traffic was generated by the institutional class, but when referring to the origin data, it is clear that there is one sample that has a very high traffic compared to other samples, which is Jawwal Company main building. If this value is excluded from the sample, the range of institutional will be 110 and 94 for AM and PM peak periods with a mean of 82.17 and 64.17.

Table B2 Descriptive Statistics for Independent Variables in Office Land Use

Residential Land Use Class	Independent Variable	N	Minimum	Maximum	Mean	Std. Deviation
Government	No. of Employees	19	21	250	83	59
	Total GFA	19	256	3950	1454	986
	Occupied GFA	19	256	3950	1368	1014
	No. of Owned Veh.	19	6	105	30	22
Private	No. of Employees	7	23	120	48	33
	Total GFA	7	540	3000	1553	738
	Occupied GFA	7	380	2400	1209	618
	No. of Owned Veh.	7	10	45	21	11
Institutional	No. of Employees	7	12	600	210	226
	Total GFA	7	250	12500	4149	4393
	Occupied GFA	7	250	12500	4003	4430
	No. of Owned Veh.	7	8	277	104	105

Descriptive Statistics for Retail Land Use

Retail land use was classified into three main categories based on the common function of the retails in the West Banks. These categories are large supermarket, shopping center, and commercial strips.

Table B3 illustrates the descriptive statistics for traffic counting (dependent variable) for each category and for both AM and PM peak periods. While Table B4 shows the descriptive statistics for the independent variables

Table B3 Descriptive Statistics for Traffic Counting in Retail Land Use

Retail Land Use Class	Traffic Counting Period	N	Minimum (Veh/hr)	Maximum (Veh/hr)	Mean (Veh/hr)	Std. Deviation (Veh/hr)
large supermarket	AM	22	20	67	40	13
	PM	22	23	265	77	59
commercial strips	AM	14	10	72	34	22
	PM	14	19	95	41	22

Referring to the previous table, it is notified that the highest traffic was generated by the large supermarket class during PM peak period. Shopping center class has one sample, for this it is not listed in Table B3.

Table B4 Descriptive Statistics for Independent Variables in Office Land Use

Residential Land Use Class	Independent Variable	N	Minimum	Maximum	Mean	Std. Deviation
Large Supermarket	No. of Employees	22	2	35	10	9
	Total GFA	22	110	5400	691	1094
	Occupied GFA	22	110	1800	527	413
	No. of Owned Veh.	22	1	12	3	3
Commercial Strip	No. of Employees	14	7	37	14	9
	Total GFA	14	150	1200	448	359
	Occupied GFA	14	150	1200	448	359
	No. of Owned Veh.	14	2	18	8	5

Appendix (C)

Regression Results for Residential Land Use

Apartment Class - AM

Average Vehicle Trip Percentage vs: Total No. of Units

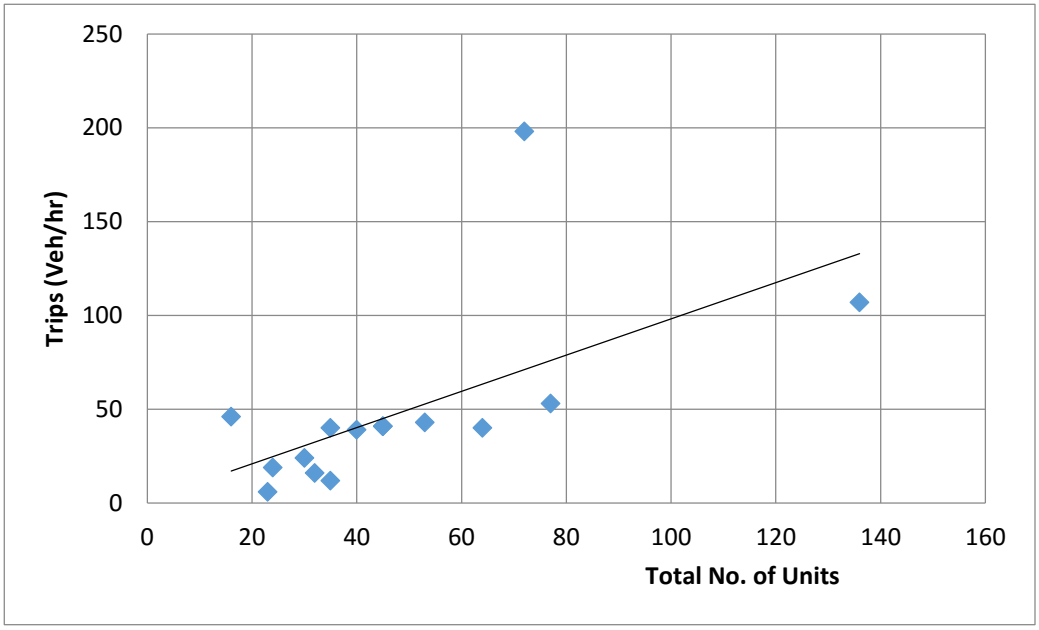
During: Average of two normal week day peak period

Number of Studies: 15

Average No. of Units: 48.47

Directional Distribution: 44.8 : 55.2

Data Plot



Fitted Curve Equation: Y = 0.965x +1.559

R^2: 0.370

Rate: 0.714 trip/unit

Standard Deviation: 0.25

Apartment Class - AM

Average Vehicle Trip Percentage vs: No. of Occupied Units

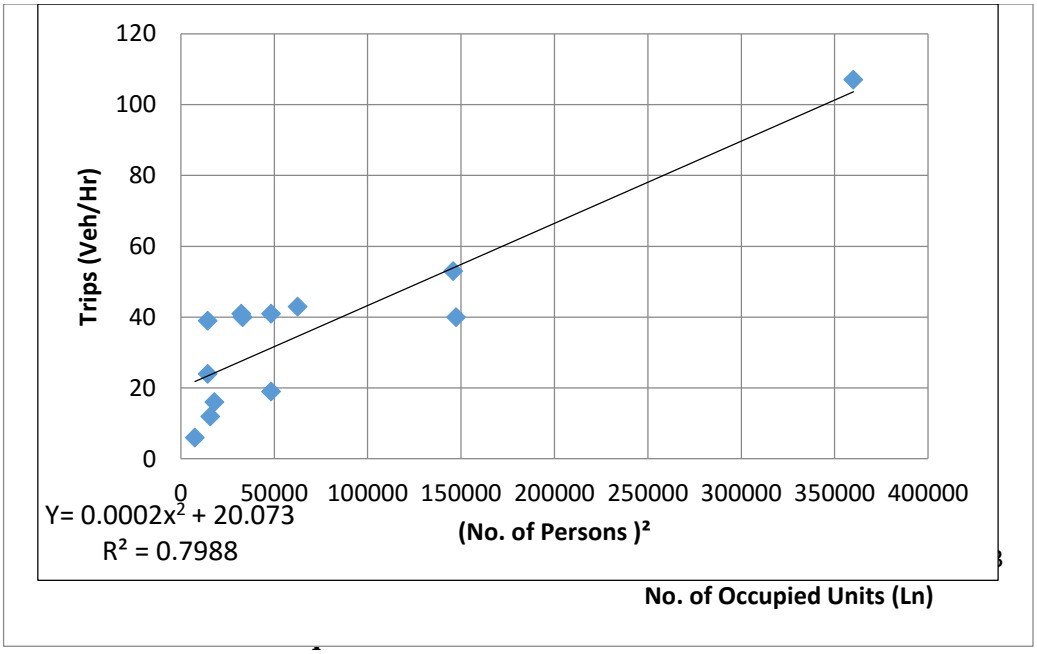
During: Average of two normal week day peak period

Number of Studies: 15

Average No. of Occupied Units : 24582

Directional Distribution: 44.8 : 55.2

Data Plot



Fitted Curve Equation: Y = 35.618 lnx -94.245

R^2: 0.728

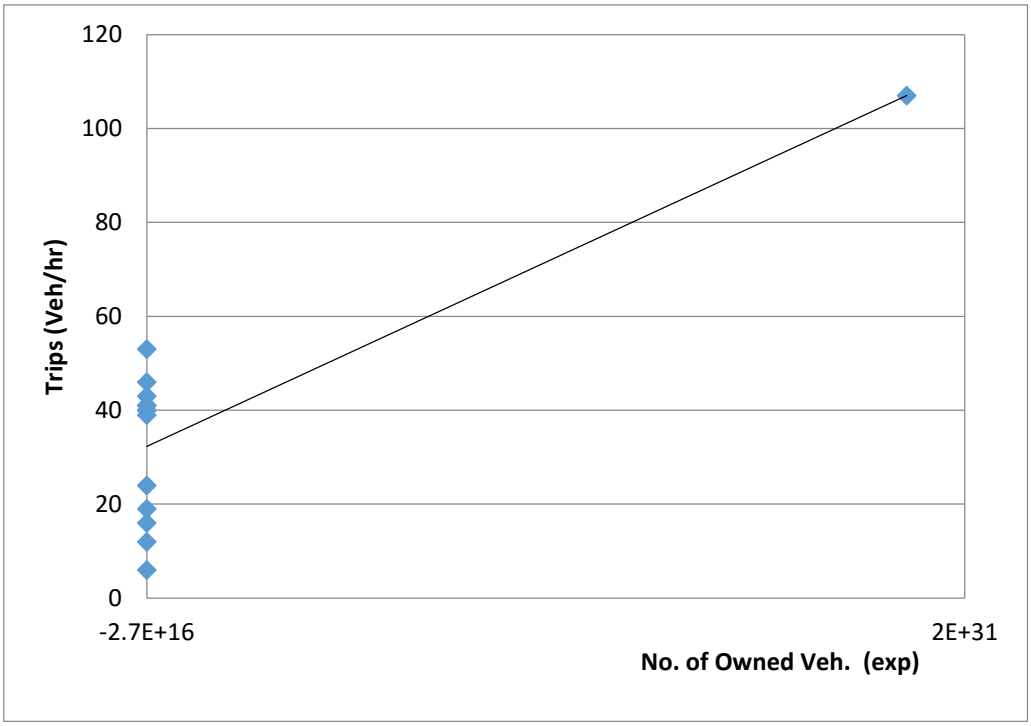
Standard Deviation: 0.758 trip/unit

Standard Deviation: 0.227

Apartment Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	15
Average No. of Owned Vehicles :	28.92
Directional Distribution:	44.8 : 55.2

Data Plot



Fitted Curve Equation: $Y = 4.019*10^{-30} + 32.308$

R^2: 0.661

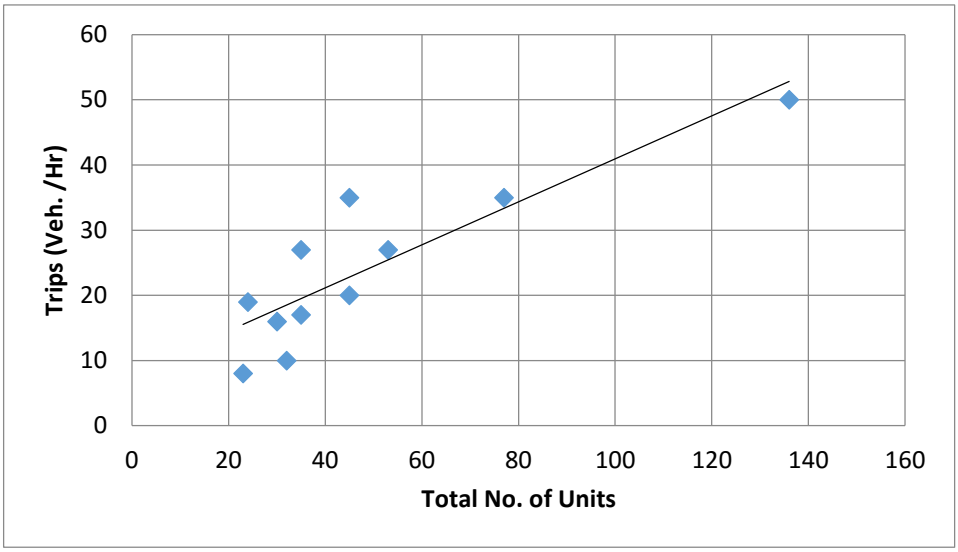
Rate: 1.37 trip/veh.

Standard Deviation: 0.799

Apartment Class - PM

Average Vehicle Trip Percentage vs:	Total No. of Units
During:	Average of two normal week day peak period
Number of Studies:	15
Average No. of Units:	48.47
Directional Distribution:	60 : 40

Data Plot

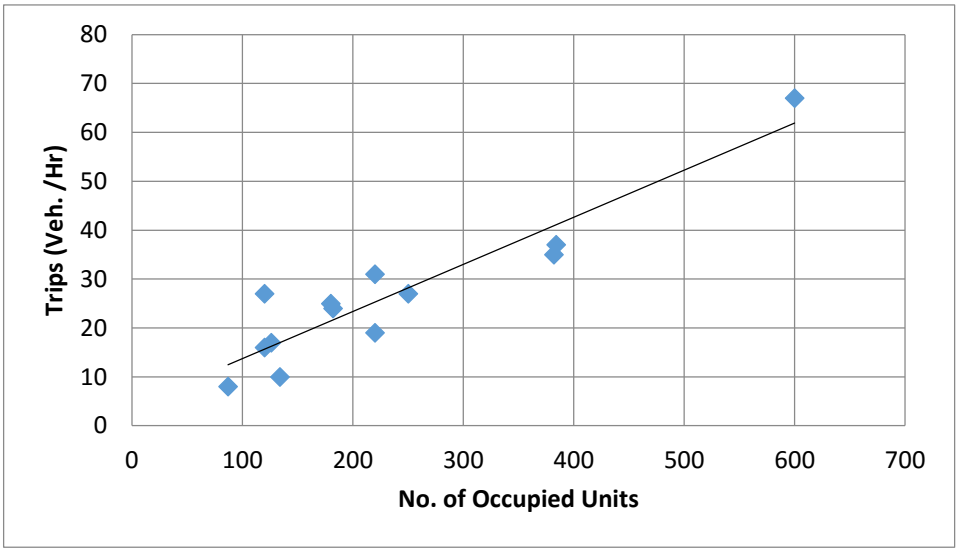


Fitted Curve Equation:	Y= 0.3296x + 7.9683
R^2:	0.757
Rate:	0.527 trip / unit
Standard Deviation:	0.176

Apartment Class - PM

Average Vehicle Trip Percentage vs:	No. of Occupied Units
During:	Average of two normal week day peak period
Number of Studies:	15
Average No. of Occupied Units :	46.58
Directional Distribution:	60 : 40

Data Plot

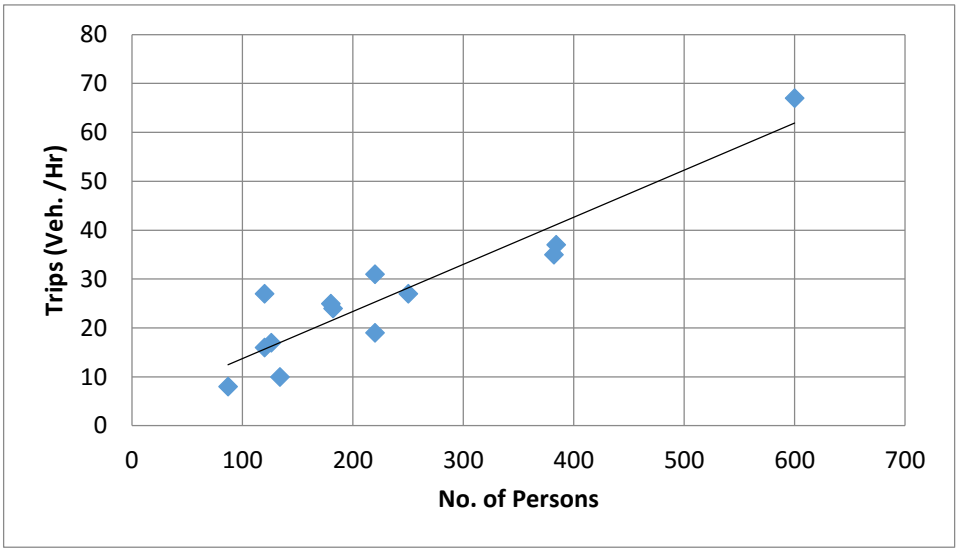


Fitted Curve Equation:	Y= 0.476x +4.983
R^2:	0.908
Rate:	0.57 trip / unit
Standard Deviation:	0.117

Apartment Class - PM

Average Vehicle Trip Percentage vs:	No. of Persons
During:	Average of two normal week day peak period
Number of Studies:	15
Average No. of Persons:	240.58
Directional Distribution:	60 : 40

Data Plot

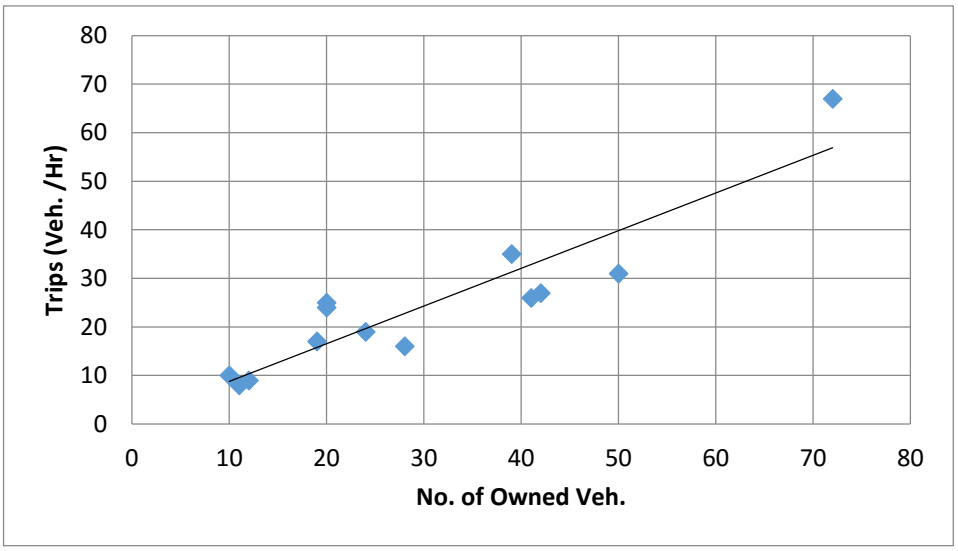


Fitted Curve Equation:	Y = 0.096x + 4.117
R^2:	0.865
Rate:	0.113 trip / person
Standard Deviation:	0.024

Apartment Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	15
Average No. of Owned Vehicles :	28.92
Directional Distribution:	60 : 40

Data Plot

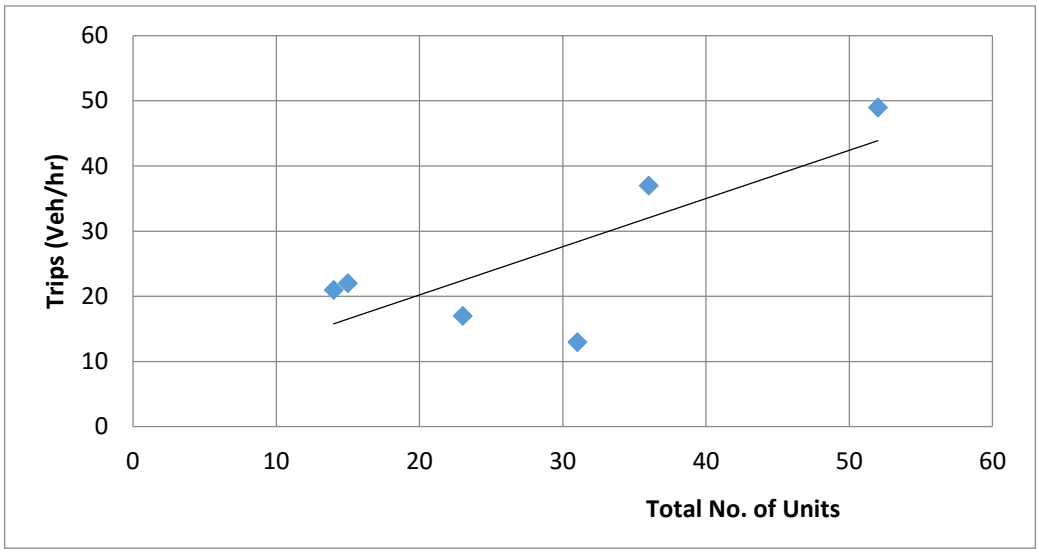


Fitted Curve Equation:	Y = 0.776x + 0.988
R^2:	0.835
Rate:	0.839 trip/veh
Standard Deviation:	0.216

Attached Housing Class - AM

Average Vehicle Trip Percentage vs:	Total No. of Units
During:	Average of two normal week day peak period
Number of Studies:	6
Average No. of Units:	34
Directional Distribution:	40.2 : 59.8

Data Plot



Fitted Curve Equation: Y = 0.7388x + 5.4443

R^2: 0.603

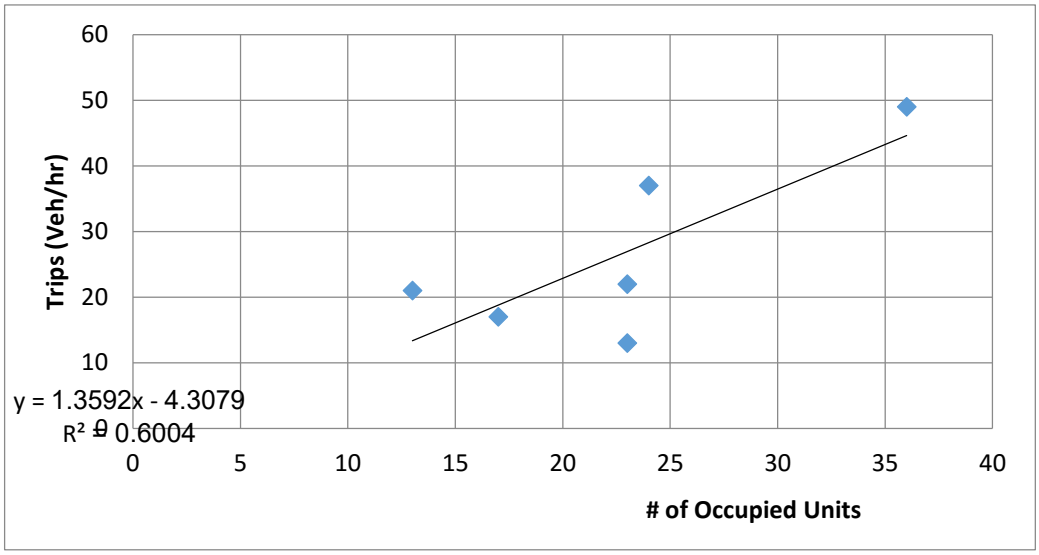
Rate: 0.926 trip/unit

Standard Deviation: 0.419

Attached Housing Class - AM

Average Vehicle Trip Percentage vs:	No. of Occupied Units
During:	Average of two normal week day peak period
Number of Studies:	6
Average No. of Occupied Units :	22.67
Directional Distribution:	40.2 : 59.8

Data Plot

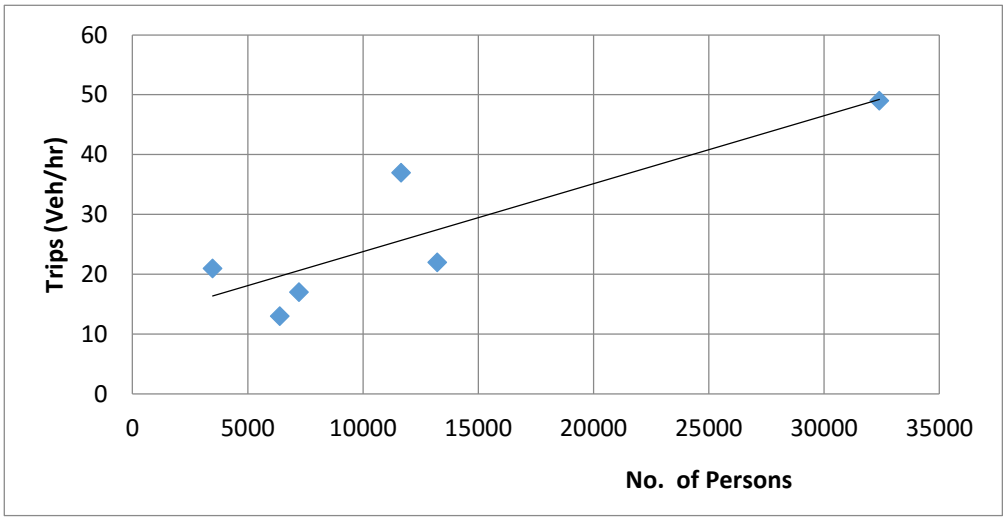


Fitted Curve Equation:	Y = 1.3592x - 4.3079
R^2:	0.600
Rate:	1.295 trip/occ. unit
Standard Deviation:	0.403

Attached Housing Class - AM

Average Vehicle Trip Percentage vs:	No. of Persons
During:	Average of two normal week day peak period
Number of Studies:	6
Average No. of Persons:	92.5
Directional Distribution:	40.2 : 59.8

Data Plot



Fitted Curve Equation: $Y = 0.001\ x^2 + 12.408$

R^2: 0.747

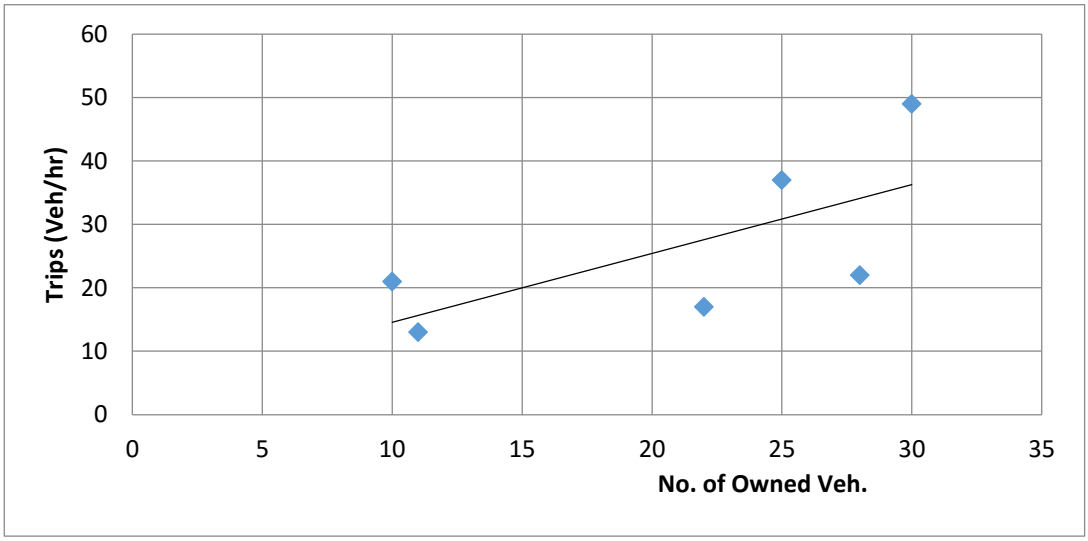
Rate: 0.25 trip / person

Standard Deviation: 0.082

Attached Housing Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	6
Average No. of Owned Vehicles :	22.16
Directional Distribution:	40.2 : 59.8

Data Plot



Fitted Curve Equation: Y = 1.0842x + 3.731

R^2: 0.461

Rate: 1.436 trip/veh

Standard Deviation: 0.517

Attached Housing Class - PM

Average Vehicle Trip Percentage vs: Total No. of Units

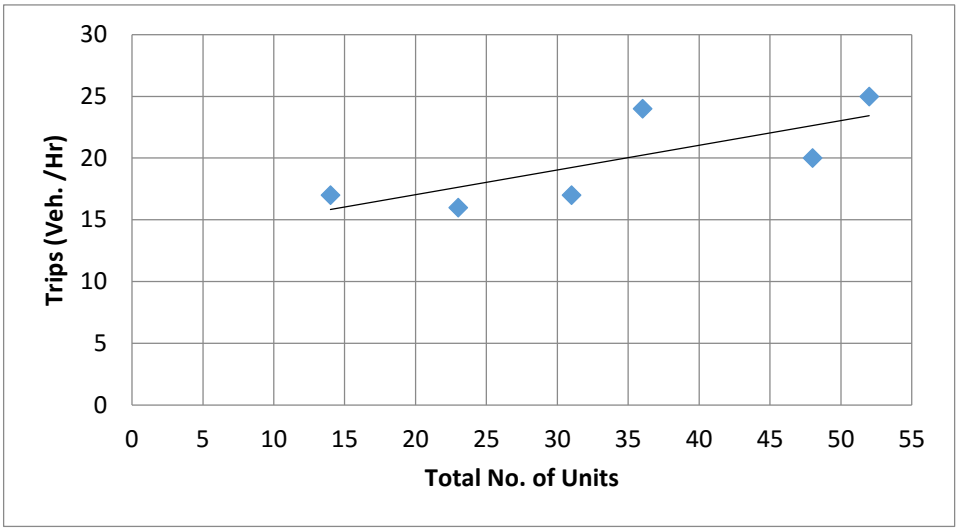
During: Average of two normal week day peak period

Number of Studies: 6

Average No. of Units: 34

Directional Distribution: 65.4 : 34.6

Data Plot



Fitted Curve Equation: Y = 0.2002x + 13.027

R^2: 0.564

Rate: 0.671 trip / unit

Standard Deviation: 0.287

Attached Housing Class - PM

Average Vehicle Trip Percentage vs: No. of Persons / No. of Occupied Units

During: Average of two normal week day peak period

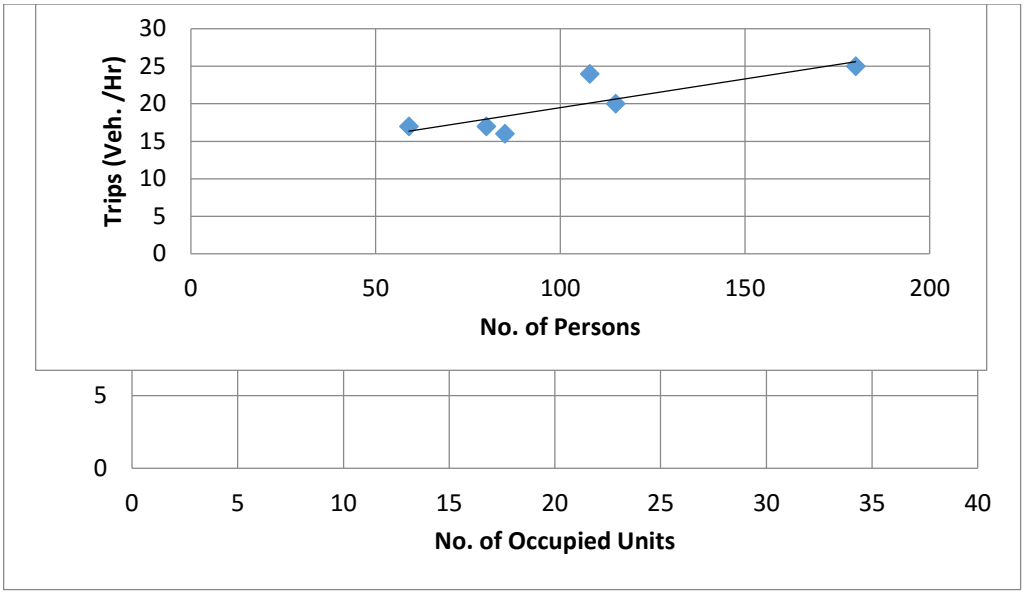
Number of Studies: 6

Average Number of Persons: 2.67

Average Number of Occupied Units: 2.67

Directional Distribution: 65.4 : 34.6

Data Plot



R^2: 0.695

Fitted Curve Equation: Y = 0.4017x + 10.727

Rate: 0.207 trip / person

R^2: 0.659

Standard Deviation: 0.056

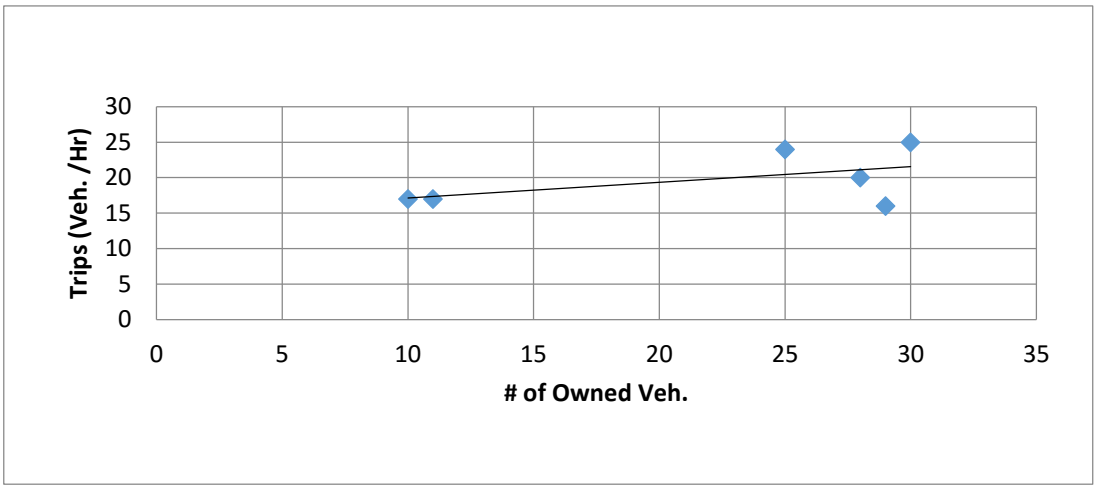
Rate: 0.848 trip/ occ. unit

Standard Deviation: 0.223

Attached Housing Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	6
Average No. of Owned Vehicles :	22.16
Directional Distribution:	65.4 : 34.6

Data Plot

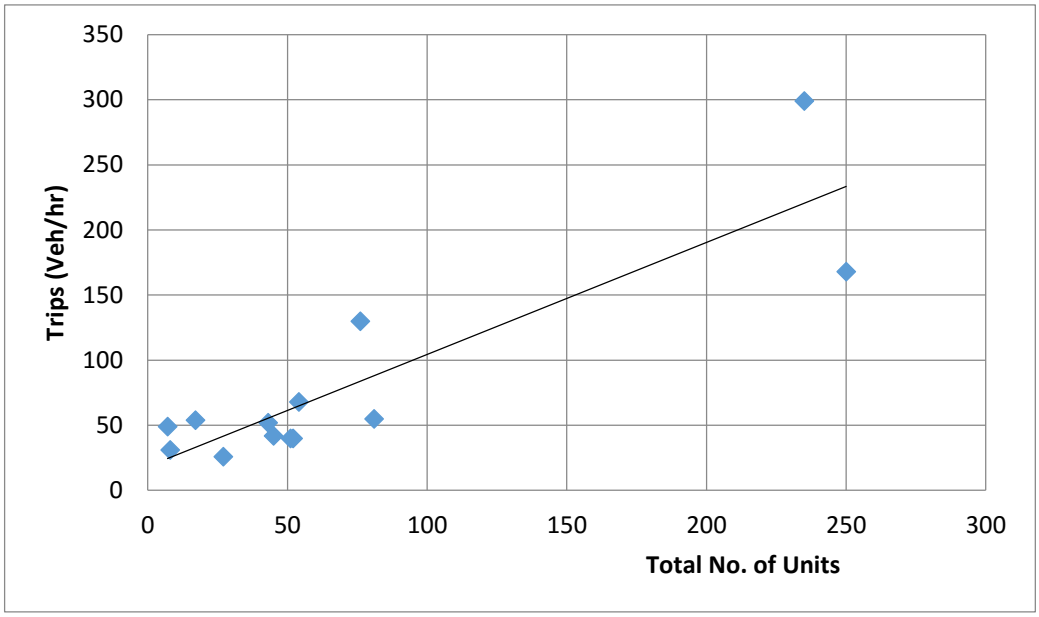


Fitted Curve Equation:	Y = 0.2203x + 14.949
R^2:	0.274
Rate:	0.921 trip / veh
Standard Deviation:	0.466

Detached Housing Class - AM

Average Vehicle Trip Percentage vs:	Total No. of Units
During:	Average of two normal week day peak period
Number of Studies:	13
Average No. of Units:	72.77
Directional Distribution:	41 :59

Data Plot

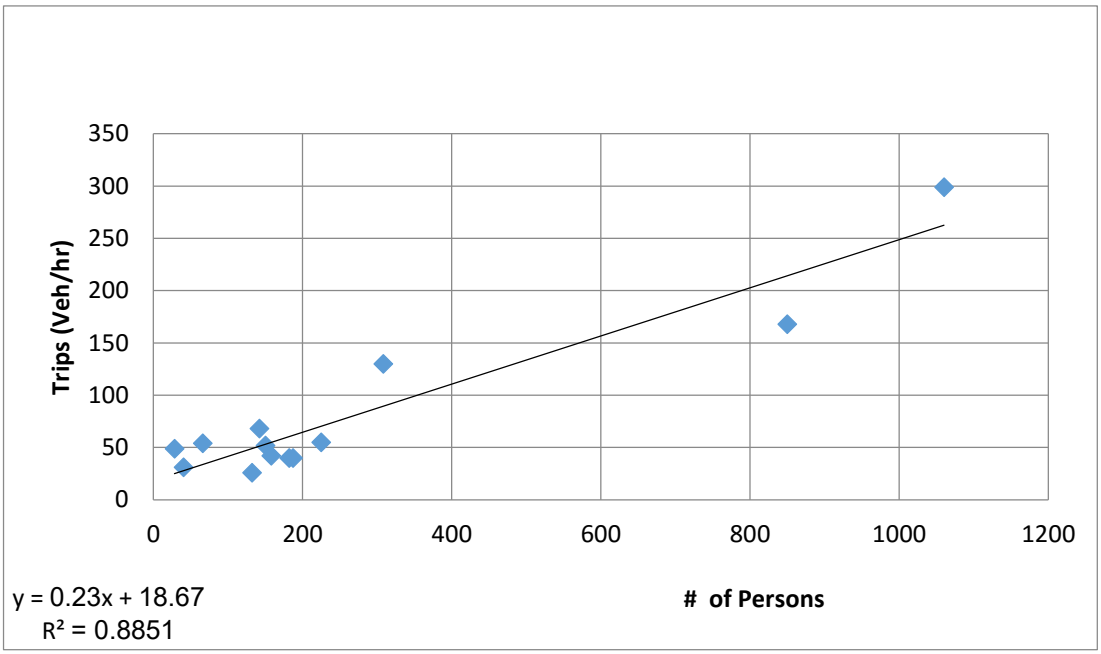


Fitted Curve Equation:	Y = 0.8601x + 18.491
R^2	0.772
Rate:	1.869 trip / unit
Standard Deviation:	1.829

Detached Housing Class - AM

Average Vehicle Trip Percentage vs:	No. of Persons
During:	Average of two normal week day peak period
Number of Studies:	13
Average No. of Persons:	271.38
Directional Distribution:	41 :59

Data Plot

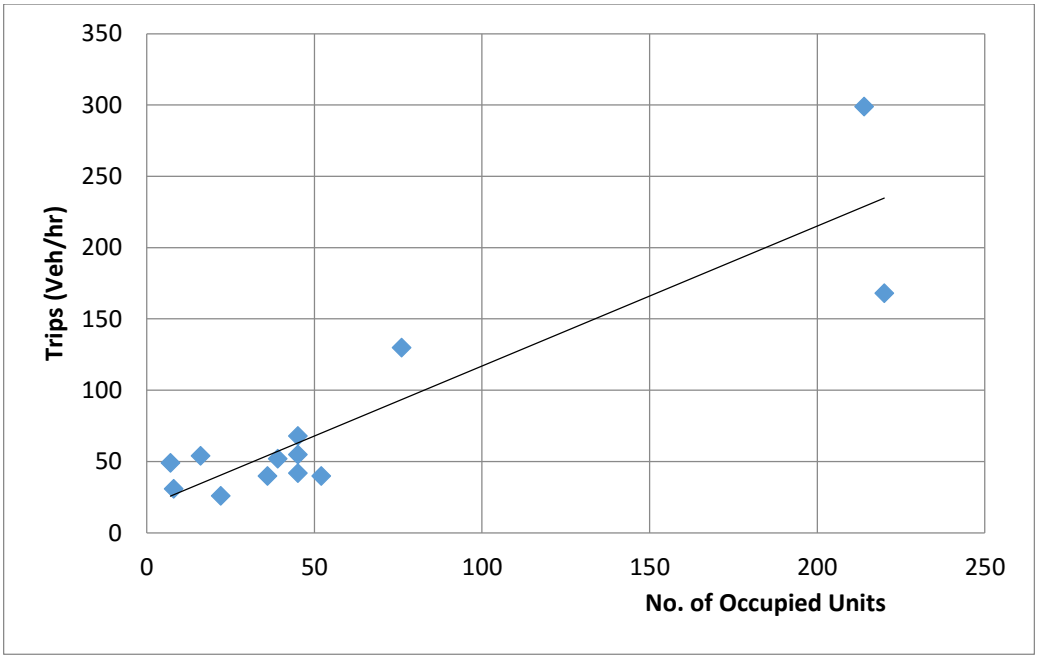


Fitted Curve Equation:	Y = 0.23x + 18.67
R^2:	0.885
Rate:	0.477 trip / person
Standard Deviation:	0.435

Detached Housing Class - AM

Average Vehicle Trip Percentage vs:	No. of Occupied Units
During:	Average of two normal week day peak period
Number of Studies:	13
Average No. of Occupied Units :	63.46
Directional Distribution:	41 :59

Data Plot

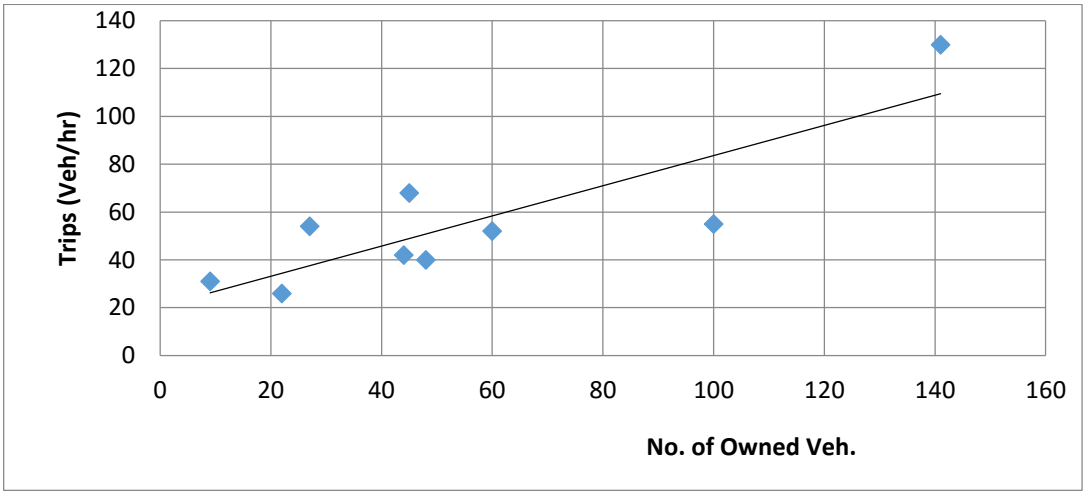


Fitted Curve Equation:	Y = 0.9812x + 18.807
R^2:	0.811
Rate:	2.014 trip / occ. unit
Standard Deviation:	1.774

Detached Housing Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	13
Average No. of Owned Vehicles :	55.11
Directional Distribution:	41 : 59

Data Plot



Fitted Curve Equation:	Y = 0.6306x + 20.583
R^2:	0.715
Rate:	1.363 trip / veh.
Standard Deviation:	0.890

Detached Housing Class - PM

Average Vehicle Trip Percentage vs: Total No. of Units

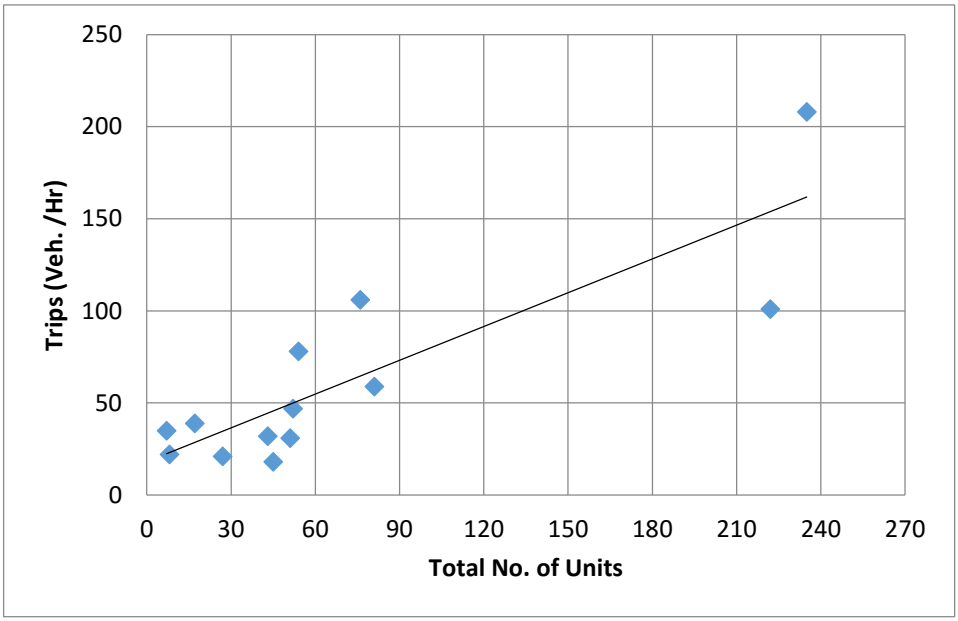
During: Average of two normal week day peak period

Number of Studies: 13

Average No. of Units: 72.77

Directional Distribution: 58.1 : 41.9

Data Plot



Fitted Curve Equation: Y = 0.612x + 18.092

R^2 0.727

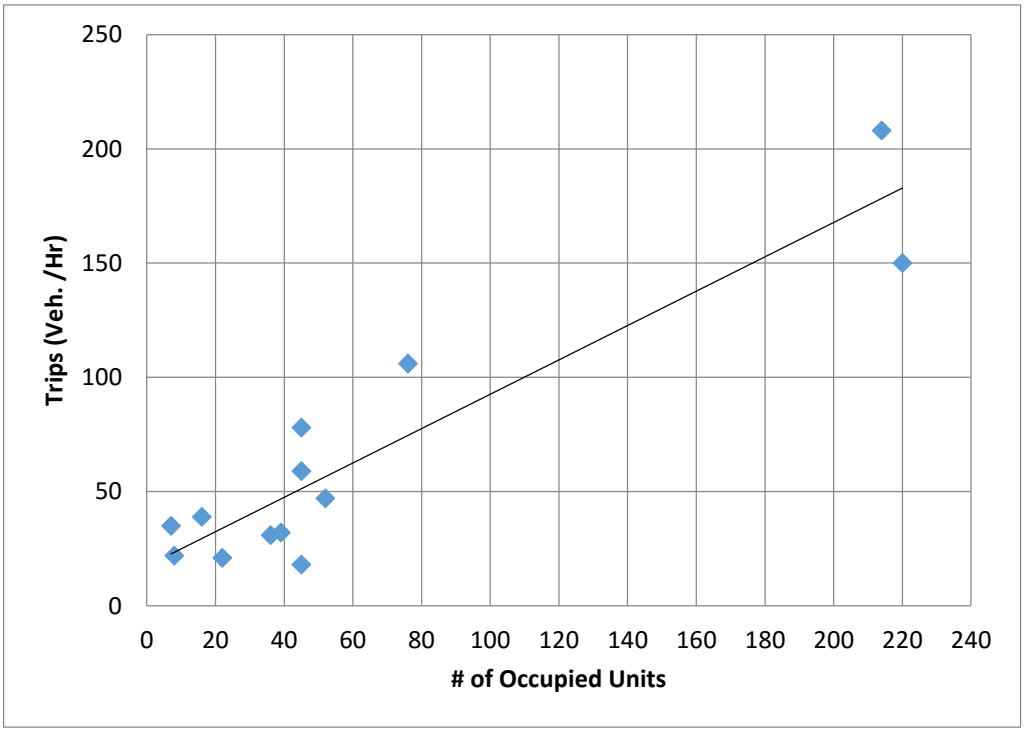
Rate: 1.414 trip / unit

Standard Deviation: 1.287

Detached Housing Class - PM

Average Vehicle Trip Percentage vs:	No. of Occupied Units
During:	Average of two normal week day peak period
Number of Studies:	13
Average No. of Occupied Units :	63.46
Directional Distribution:	58.1 : 41.9

Data Plot



Fitted Curve Equation: Y = 0.752x + 17.353

R^2: 0.856

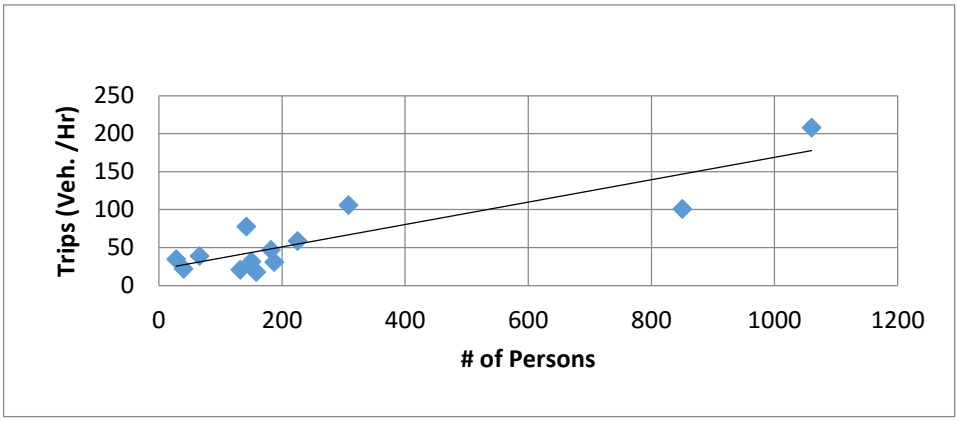
Rate: 1.55 trip/occ. unit

Standard Deviation: 1.239

Detached Housing Class - PM

Average Vehicle Trip Percentage vs:	No. of Persons
During:	Average of two normal week day peak period
Number of Studies:	13
Average No. of Persons:	271.38
Directional Distribution:	58.1 : 41.9

Data Plot

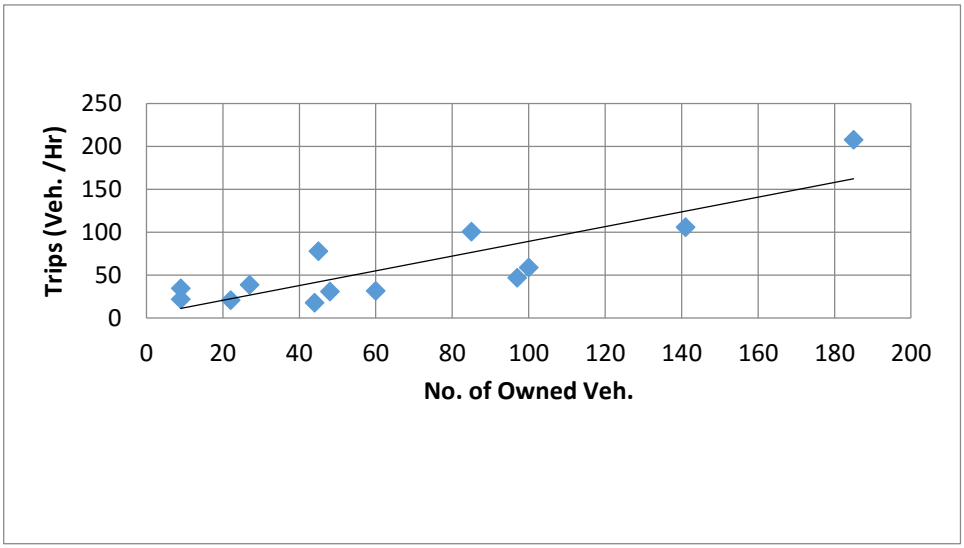


Fitted Curve Equation:	Y = 0.1476x + 21.252
R^2:	0.774
Rate:	0.367 trip / person
Standard Deviation:	0.314

Detached Housing Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	13
Average No. of Owned Vehicles :	55.11
Directional Distribution:	58.1 : 41.9

Data Plot



Fitted Curve Equation:	Y = 0.8584x + 3.7273
R^2:	0.735
Rate:	1.245 trip / veh.
Standard Deviation:	0.984

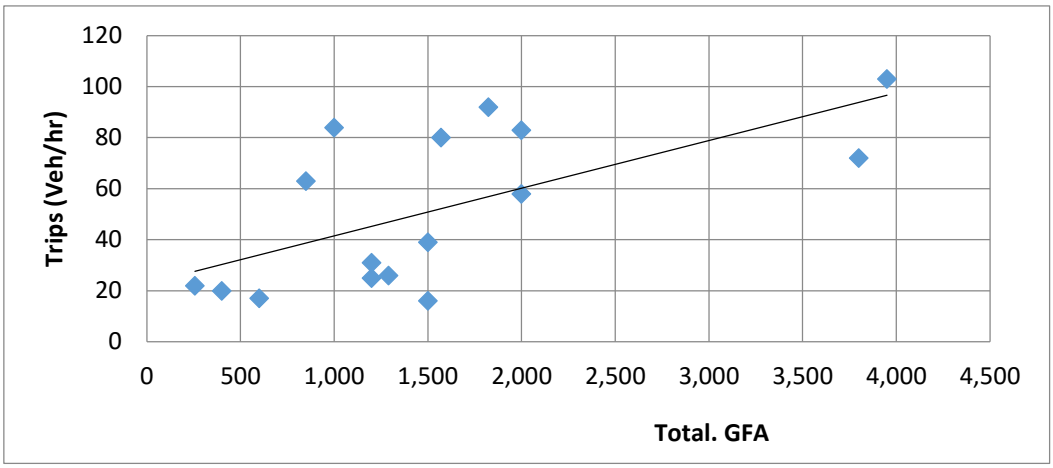
Appendix (D)

Regression Results for Office Land Use

Government Office Class - AM

Average Vehicle Trip Percentage vs:	GFA
During:	Average of two normal week day peak period
Number of Studies:	19
Average GFA :	1453.6
Directional Distribution:	53.1 :46.9

Data Plot

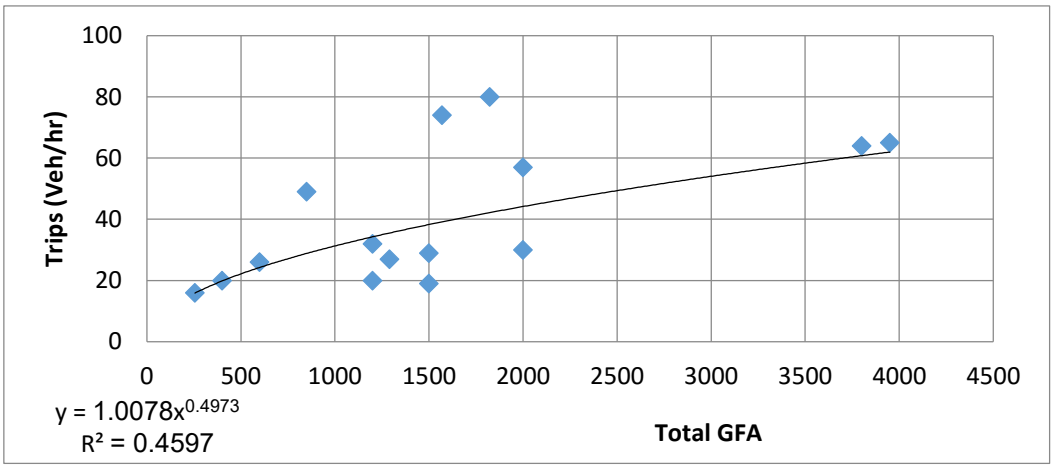


Fitted Curve Equation:	Y= 0.0187x + 22.78
R^2:	0.408
Rate:	40.18 trip / 1000 m^2
Standard Deviation:	23.74

Government Office Class - PM

Average Vehicle Trip Percentage vs:	GFA
During:	Average of two normal week day peak period
Number of Studies:	19
Average GFA :	1453.6
Directional Distribution:	48.1 : 51.9

Data Plot



Fitted Curve Equation: $Y = 1.0078x^{0.4973}$

R^2: 0.46

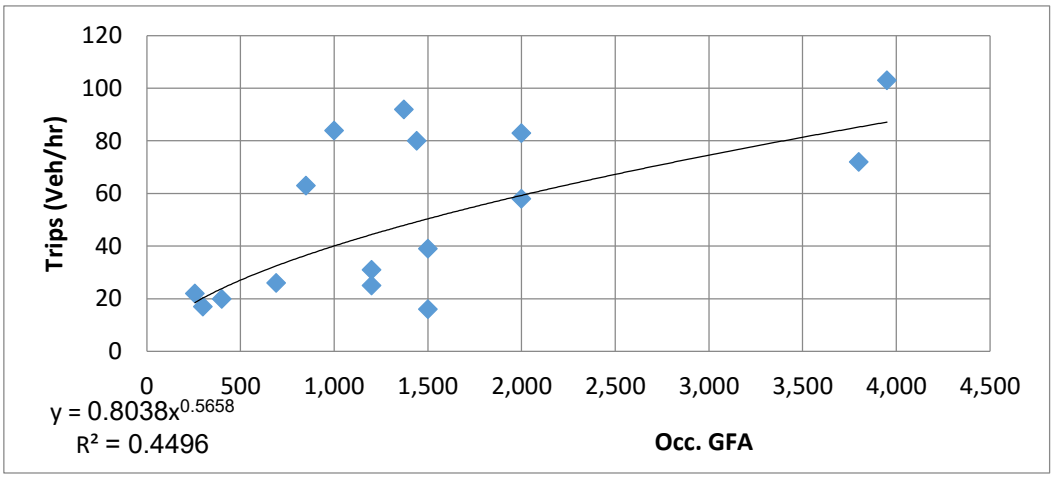
Rate: 31.84 trip / 1000 m^2

Standard Deviation: 17.12

Government Office Class - AM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	19
Average of Occupied GFA :	1367.84
Directional Distribution:	53.1 :46.9

Data Plot

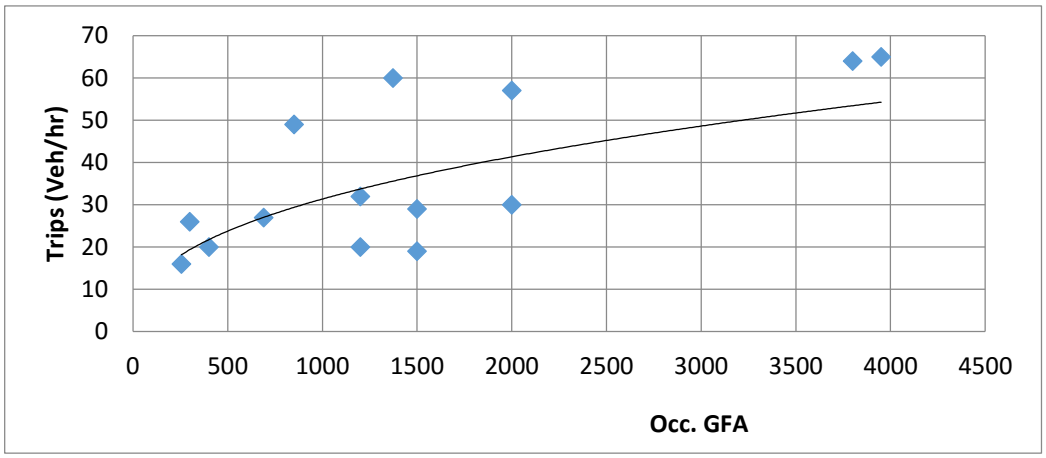


Fitted Curve Equation:	$0.8038x^{0.5658}$
R^2:	0.45
Rate:	49.33 trip / 1000 m^2
Standard Deviation:	25.03

Government Office Class - PM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	19
Average of Occupied GFA :	1367.84
Directional Distribution:	48.1 : 51.9

Data Plot



Fitted Curve Equation: $Y = 1.9873x^{0.3993}$

R^2: 0.47

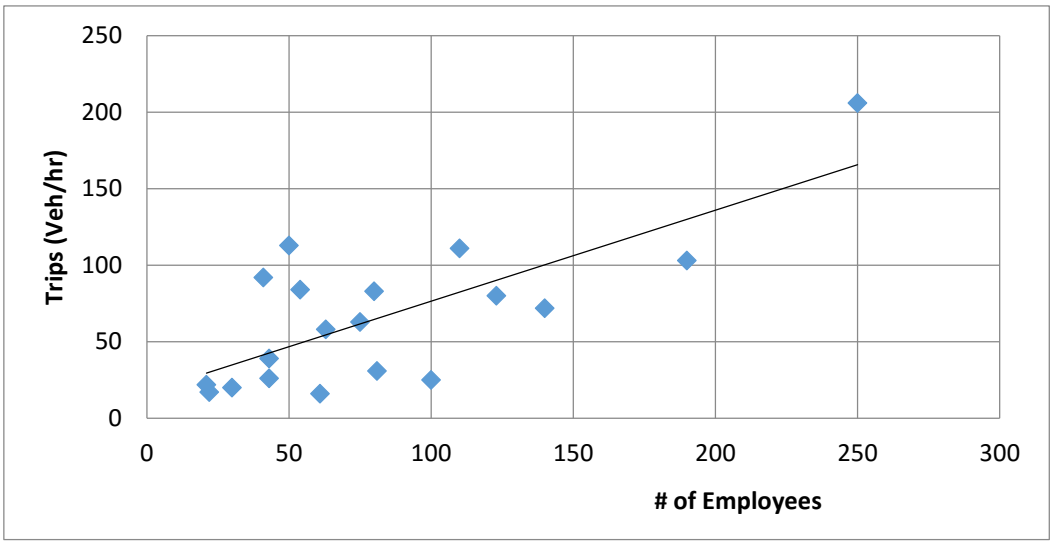
Rate: 35.13 trip / 1000 m^2

Standard Deviation: 22.39

Government Office Class - AM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	19
Average Number of Employees :	83
Directional Distribution:	53.1 :46.9

Data Plot



Fitted Curve Equation: Y = 0.5948x + 16.998

R^2: 0.55

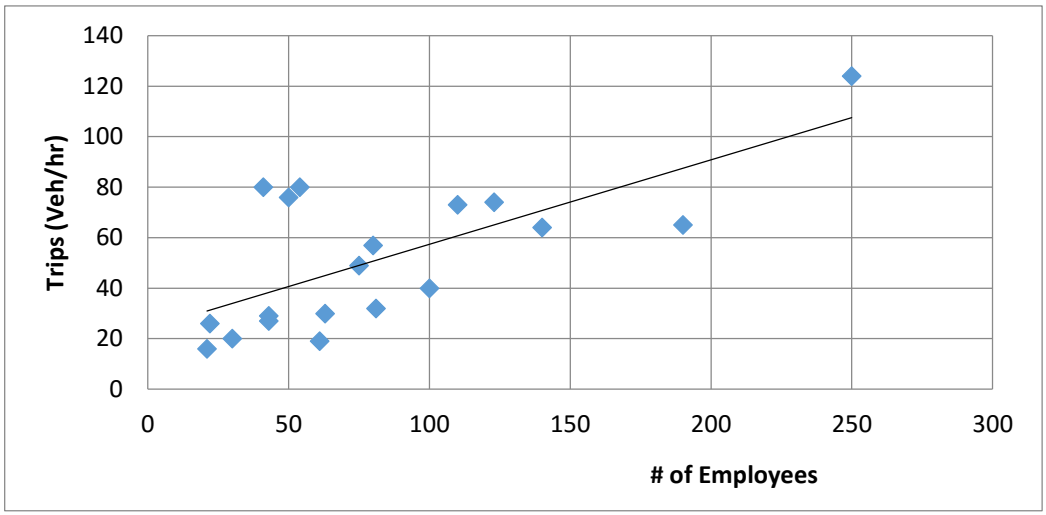
Rate: 0.936 trip / employee

Standard Deviation: 0.593

Government Office Class - PM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	19
Average number of Employees :	83
Directional Distribution:	48.1 : 51.9

Data Plot



Fitted Curve Equation: Y = 0.3344x + 23.878

R^2: 0.48

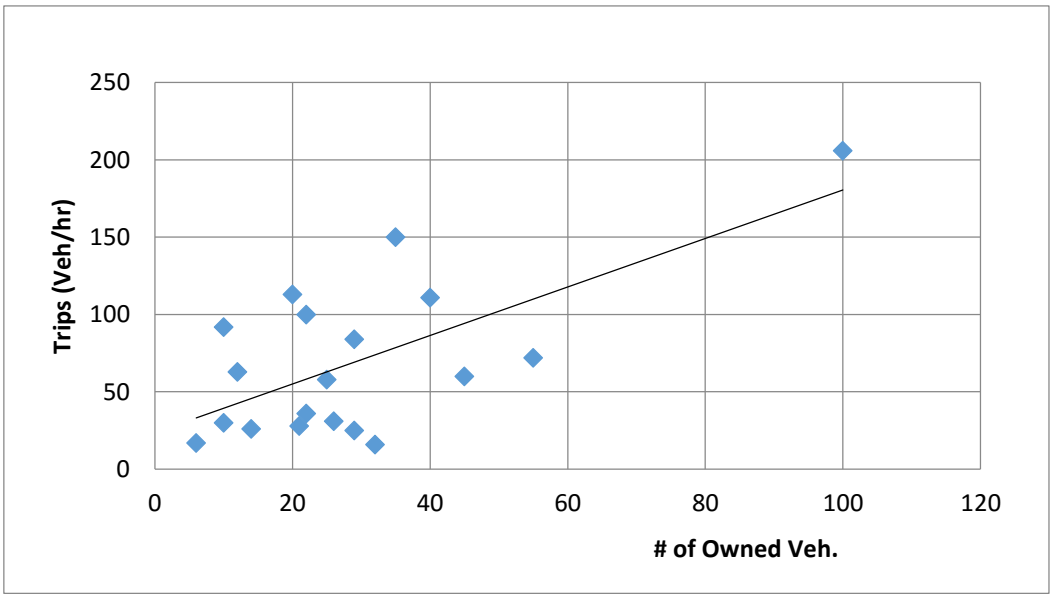
Rate: 0.757 trip / employee

Standard Deviation: 0.451

Government Office Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	19
Average No. of Owned Vehicles :	29.89
Directional Distribution:	53.1 :46.9

Data Plot

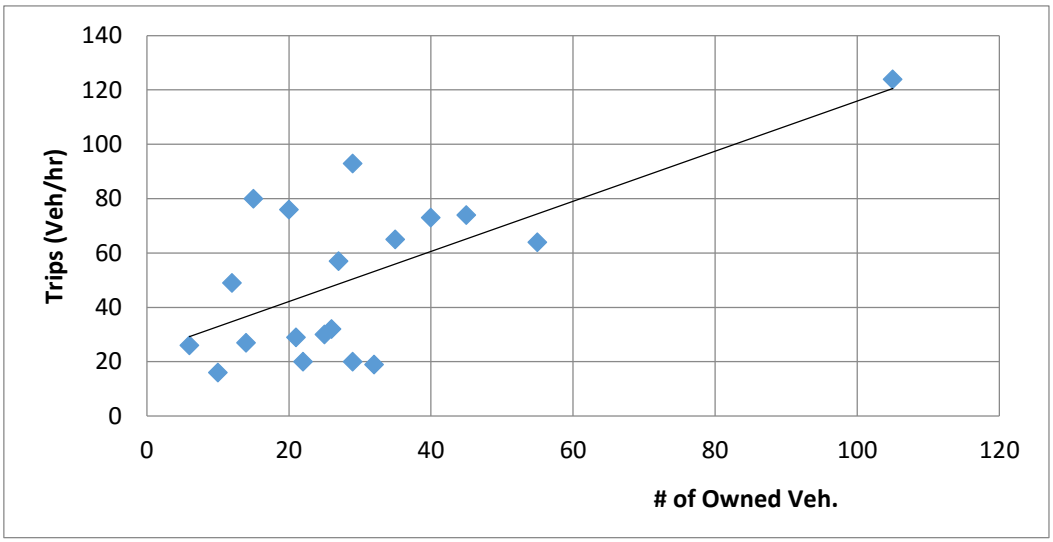


Fitted Curve Equation:	Y = 1.5664x + 23.778
R^2:	0.44
Rate:	2.886 trip / veh.
Standard Deviation:	2.127

Government Office Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	19
Average No. of Owned Vehicles:	29.89
Directional Distribution:	48.1 : 51.9

Data Plot

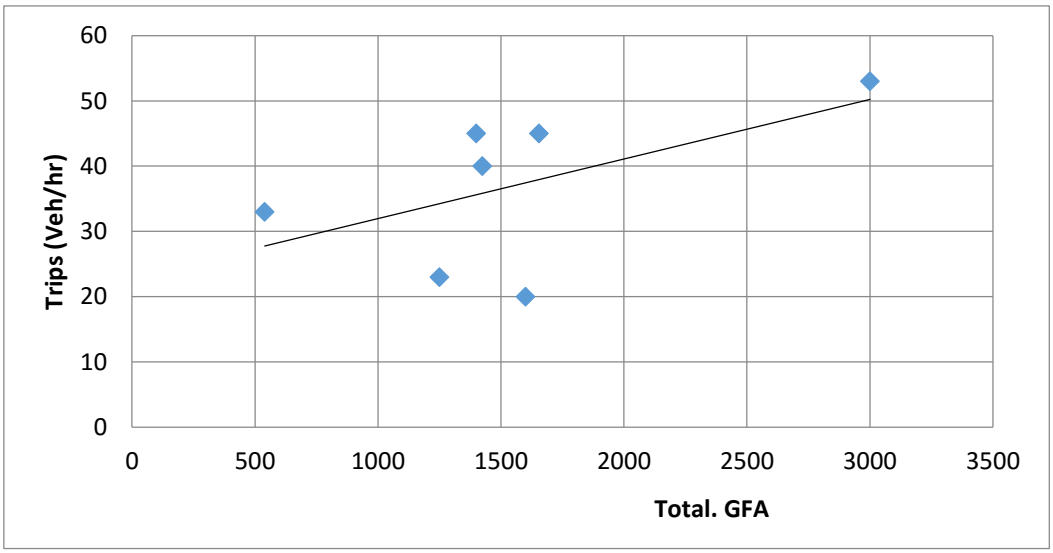


Fitted Curve Equation:	Y = 0.922x +23.7
R^2:	0.44
Rate:	2.11 trip / veh.
Standard Deviation:	1.37

Private Office Class - AM

Average Vehicle Trip Percentage vs:	GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average GFA :	1552.86
Directional Distribution:	54.8 : 45.2

Data Plot



Fitted Curve Equation:	Y = 0.0091x + 22.797
R^2:	0.305
Rate:	28.15 trip / 1000 m^2
Standard Deviation:	16.09

Private Office Class - PM

Average Vehicle Trip Percentage vs: GFA

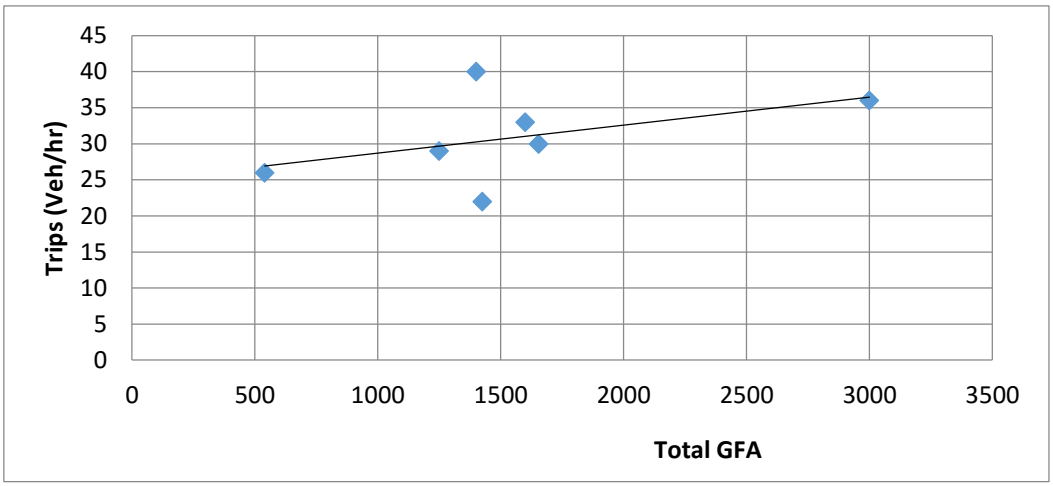
During: Average of two normal week day peak period

Number of Studies: 7

Average GFA : 1552.86

Directional Distribution: 41 : 59

Data Plot



Fitted Curve Equation: Y = 0.0039x + 24.828

R^2: 0.22

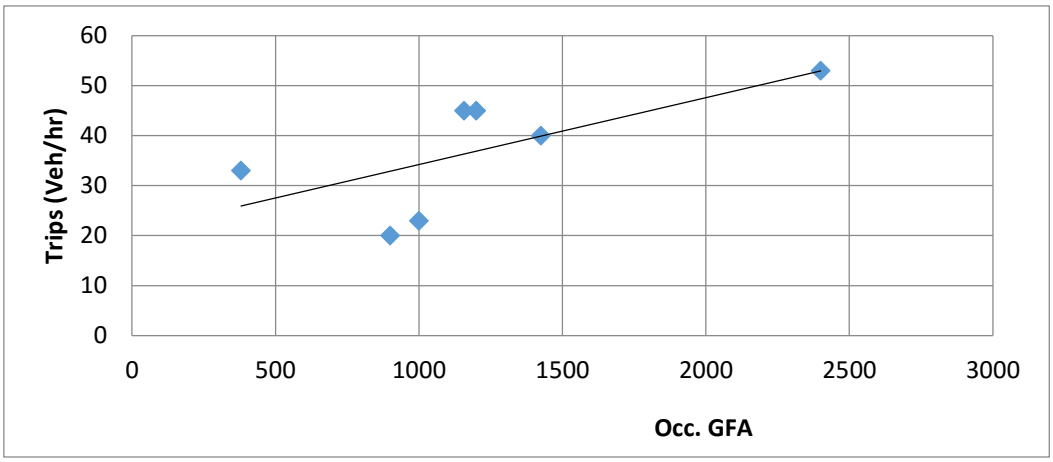
Rate: 23.73 trip / 1000 m^2

Standard Deviation: 12.02

Private Office Class - AM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average of Occupied GFA :	1209
Directional Distribution:	54.8 : 45.2

Data Plot

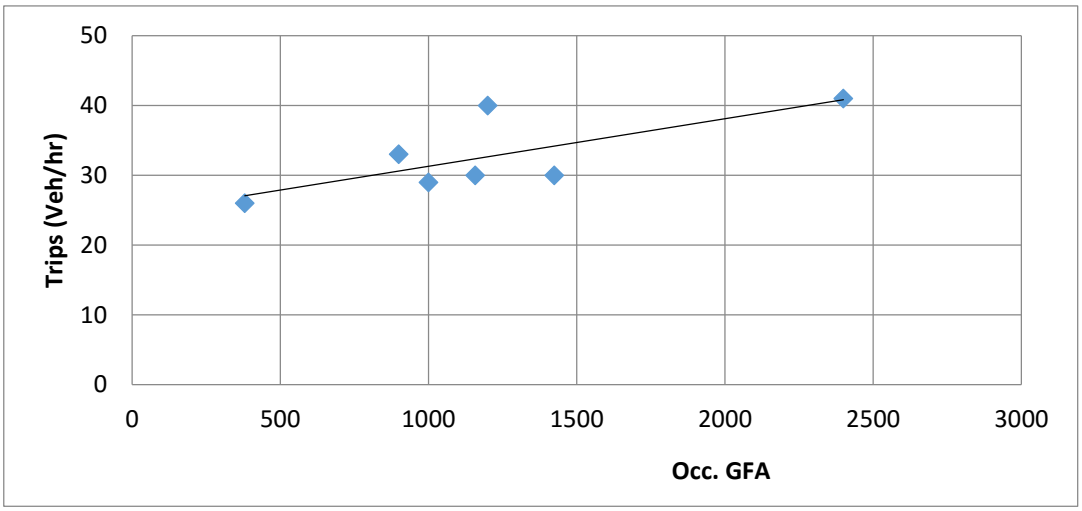


Fitted Curve Equation:	Y = 0.0134x + 20.812
R^2:	0.46
Rate:	42.67 trip / 1000 m^2
Standard Deviation:	25.61

Private Office Class - PM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average of Occupied GFA :	1209
Directional Distribution:	41 : 59

Data Plot

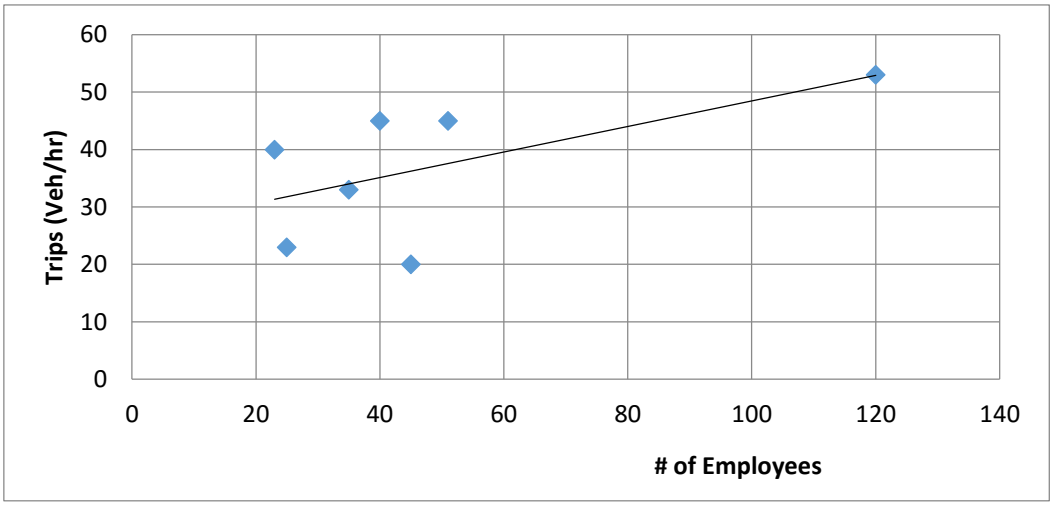


Fitted Curve Equation:	Y = 0.0068x + 24.489
R^2:	0.54
Rate:	33.07 trip / 1000 m_2
Standard Deviation:	16.98

Private Office Class - AM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	7
Average Number of Employees :	48.43
Directional Distribution:	54.8 : 45.2

Data Plot



Fitted Curve Equation: Y = 0.2219x + 26.252

R^2: 0.36

Rate: 0.93 trip / employee

Standard Deviation: 0.44

Private Office Class - PM

Average Vehicle Trip Percentage vs: No. of Employees

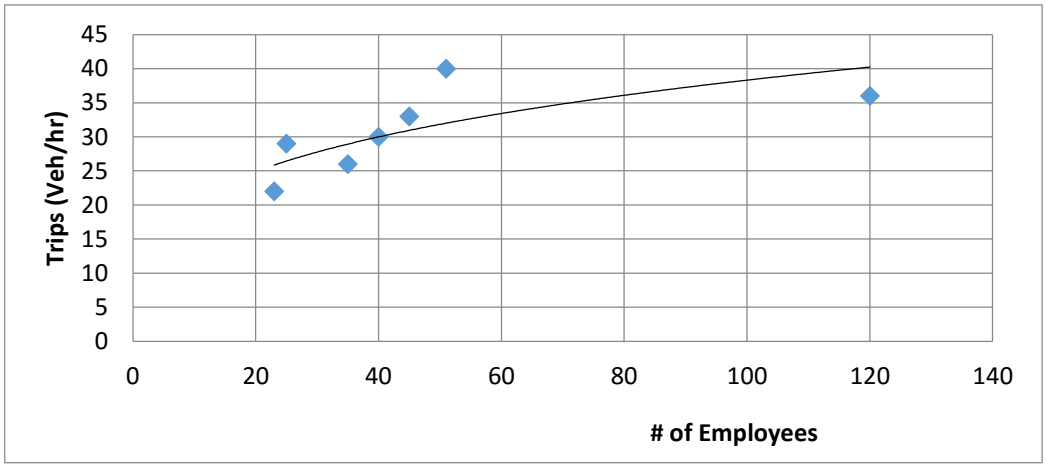
During: Average of two normal week day peak period

Number of Studies: 7

Average number of Employees : 48.43

Directional Distribution: 41 : 59

Data Plot



Fitted Curve Equation: $Y = 11.177x^{0.2675}$

R^2: 0.54

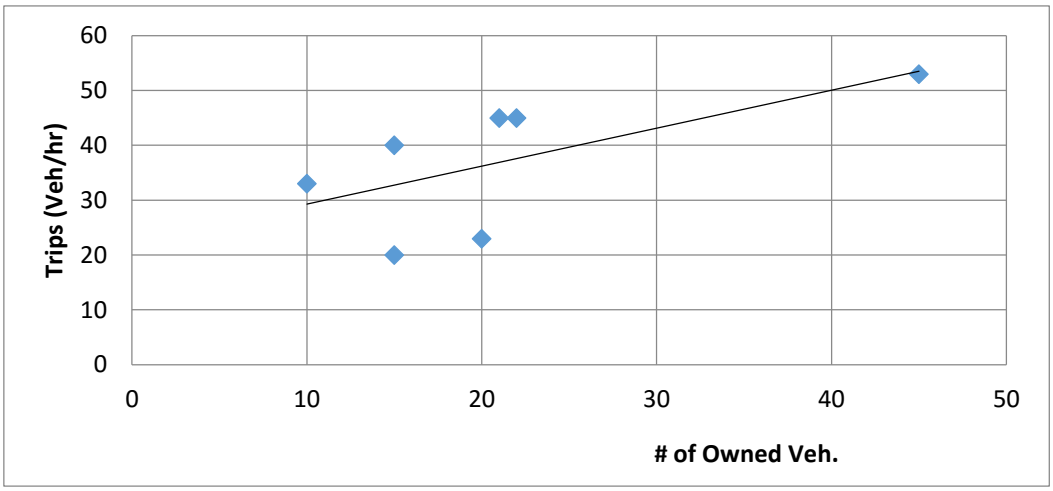
Rate: 0.775 trip / employee

Standard Deviation: 0.262

Private Office Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles :	21.14
Directional Distribution:	54.8 : 45.2

Data Plot

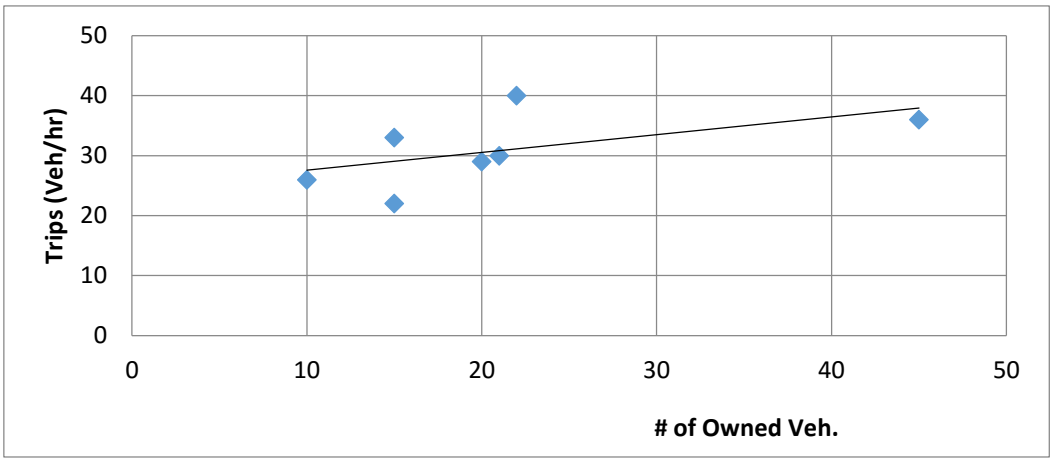


Fitted Curve Equation:	Y = 0.6927x + 22.354
R^2:	0.41
Rate:	1.97 trip / veh.
Standard Deviation:	0.82

Private Office Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles:	21.14
Directional Distribution:	41 : 59

Data Plot

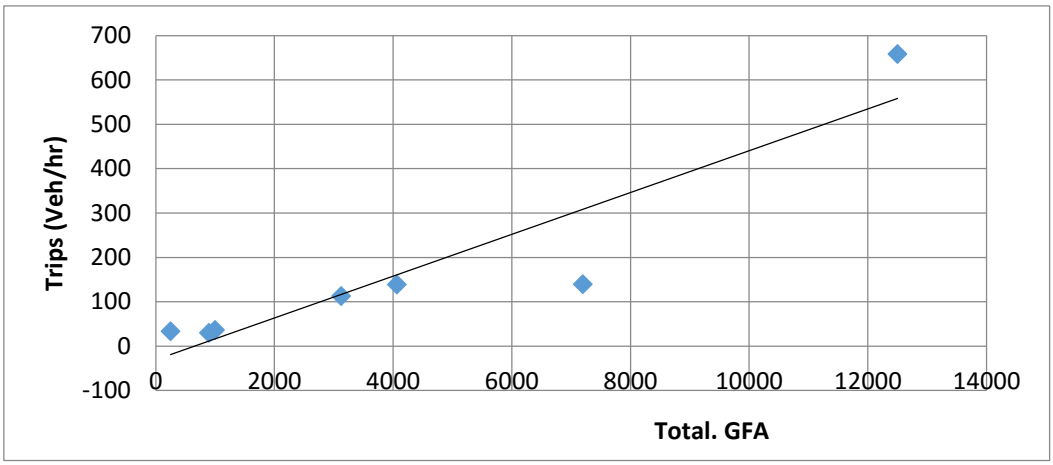


Fitted Curve Equation:	Y = 0.296x + 24.6
R^2:	0.31
Rate:	1.681 trip / veh.
Standard Deviation:	0.588

Institutional Office Class - AM

Average Vehicle Trip Percentage vs:	GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average GFA :	4149.14
Directional Distribution:	56.2 : 43.8

Data Plot

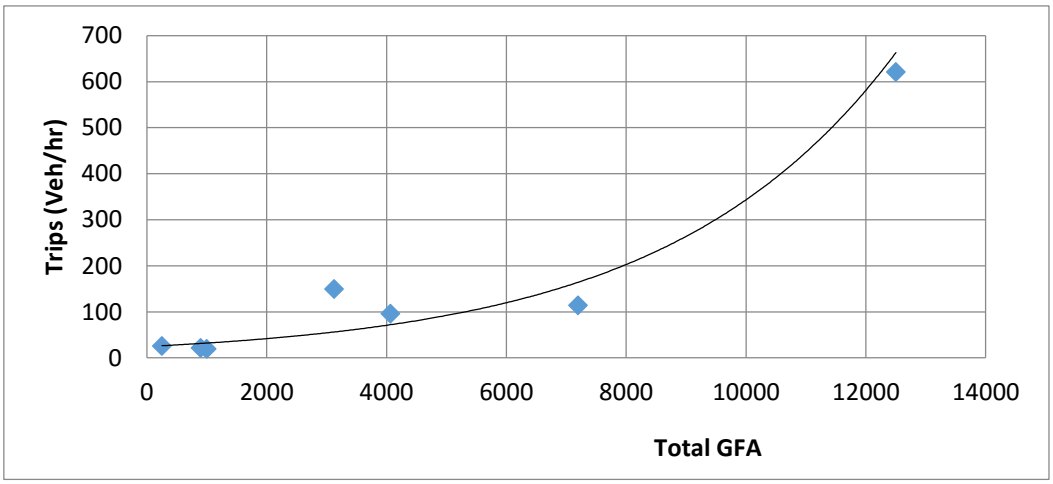


Fitted Curve Equation:	Y = 0.0471x - 30.994
R^2:	0.86
Rate:	49.83 trip / 1000 m^2
Standard Deviation:	39.21

Institutional Office Class - PM

Average Vehicle Trip Percentage vs:	GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average GFA :	4149.14
Directional Distribution:	41.5 : 58.5

Data Plot



Fitted Curve Equation: $Y = 24.677e^{0.0003x}$

R^2: 0.83

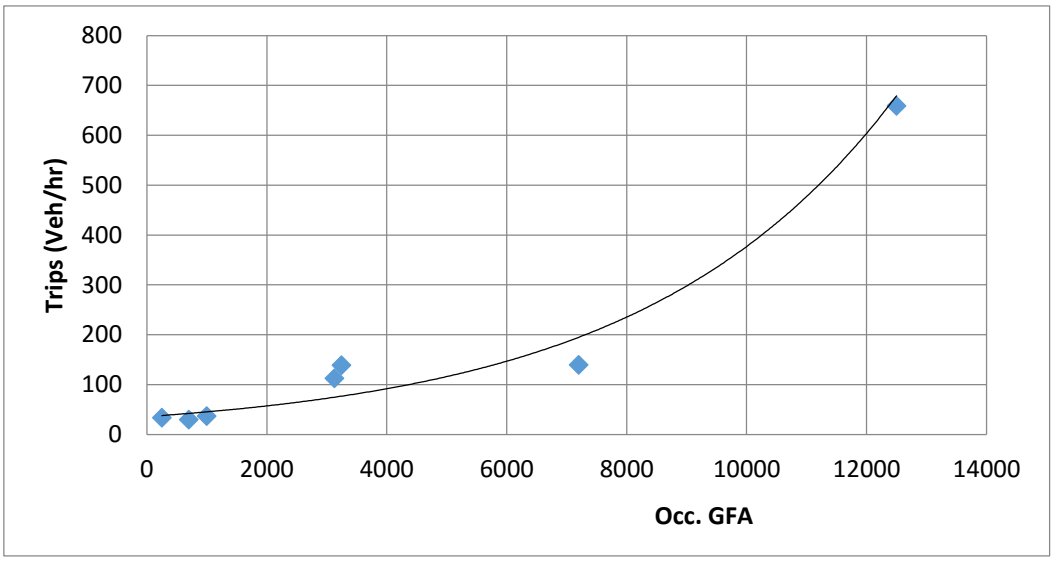
Rate: 40.79 trip / 1000 m^2

Standard Deviation: 30.94

Institutional Office Class - AM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average of Occupied GFA :	4003.29
Directional Distribution:	56.2 : 43.8

Data Plot



Fitted Curve Equation: $Y = 35.717e^{0.0002x}$

R^2: 0.89

Rate: 52.42 trip / 1000 m^2

Standard Deviation: 38.22

Institutional Office Class - PM

Average Vehicle Trip Percentage vs: Occupied GFA

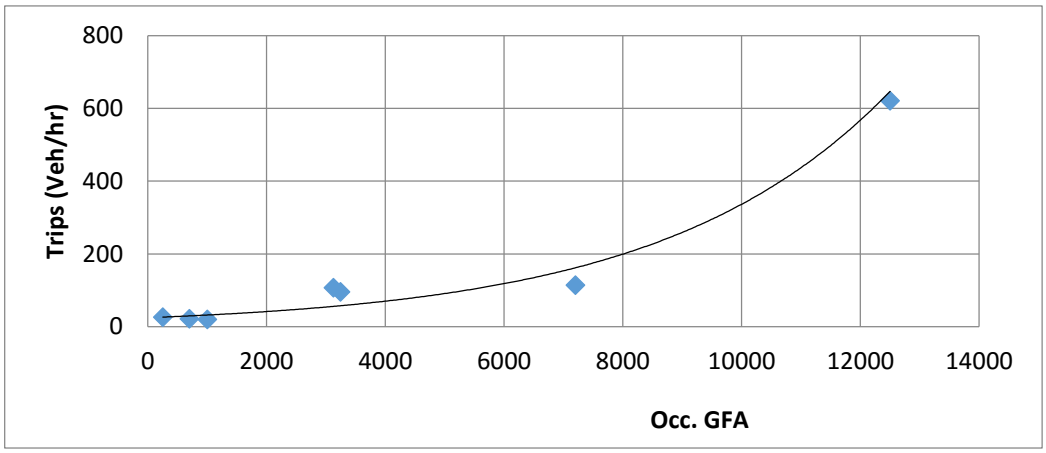
During: Average of two normal week day peak period

Number of Studies: 7

Average of Occupied GFA : 4003.29

Directional Distribution: 41.5 : 58.5

Data Plot



Fitted Curve Equation: $Y = 24.608e^{0.0003x}$

R^2: 0.88

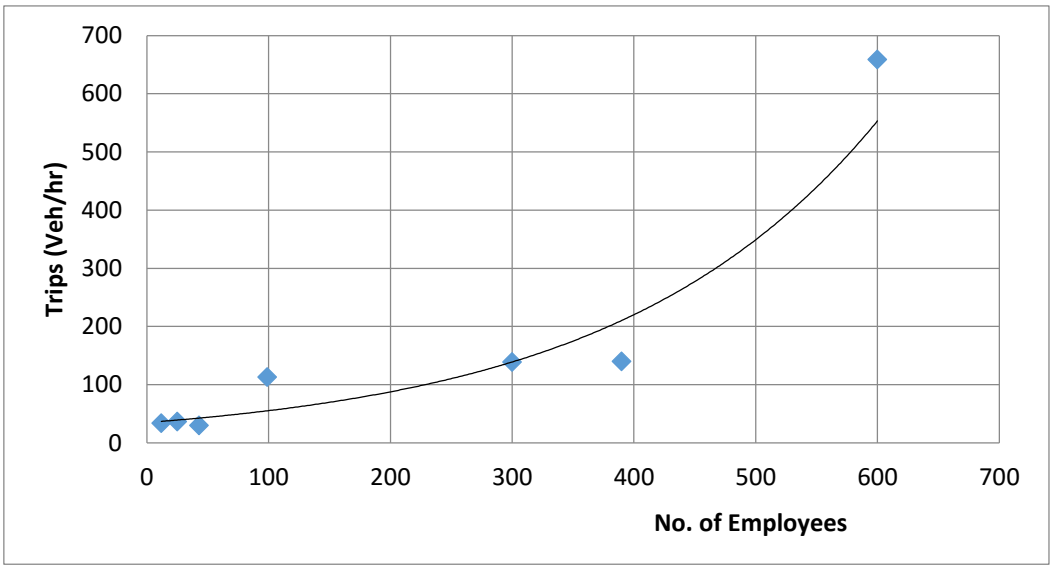
Rate: 44.82 trip / 1000 m^2

Standard Deviation: 30.55

Institutional Office Class - AM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	7
Average Number of Employees :	209.86
Directional Distribution:	56.2 : 43.8

Data Plot



Fitted Curve Equation: $y = 34.896e^{0.0046x}$

R^2: 0.88

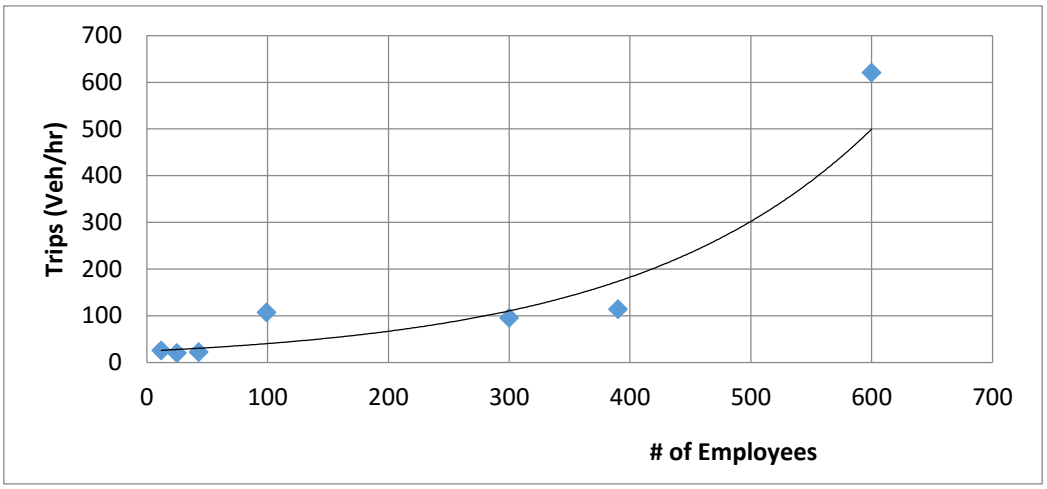
Rate: 1.15 trip / employee

Standard Deviation: 0.84

Institutional Office Class - PM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	7
Average number of Employees :	209.86
Directional Distribution:	41.5 : 58.5

Data Plot



Fitted Curve Equation: $Y = 24.375e^{0.005x}$

R^2: 0.85

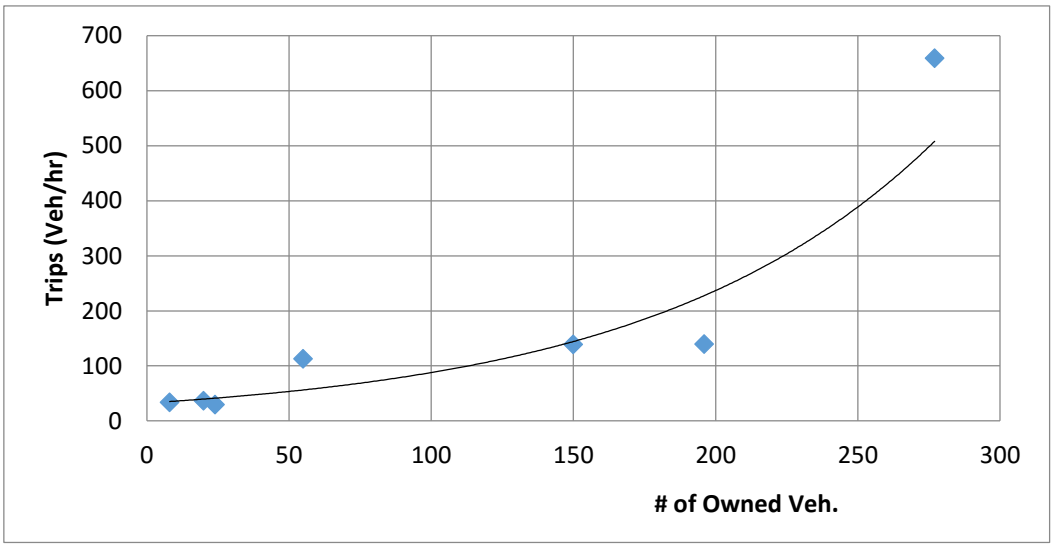
Rate: 0.887 trip / employee

Standard Deviation: 0.648

Institutional Office Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles :	104.29
Directional Distribution:	56.2 : 43.8

Data Plot



Fitted Curve Equation: $Y = 32.64e^{0.0099x}$

R^2: 0.87

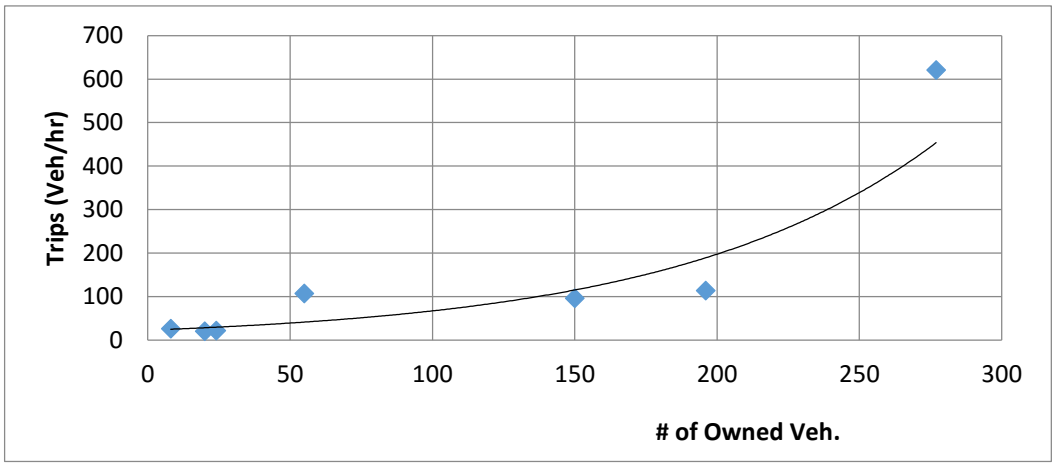
Rate: 1.92 trip / veh

Standard Deviation: 1.19

Institutional Office Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles:	104.29
Directional Distribution:	41.5 : 58.5

Data Plot



Fitted Curve Equation: $Y = 22.698e^{0.0108x}$

R^2: 0.83

Rate: 1.511 trip / veh

Standard Deviation: 0.998

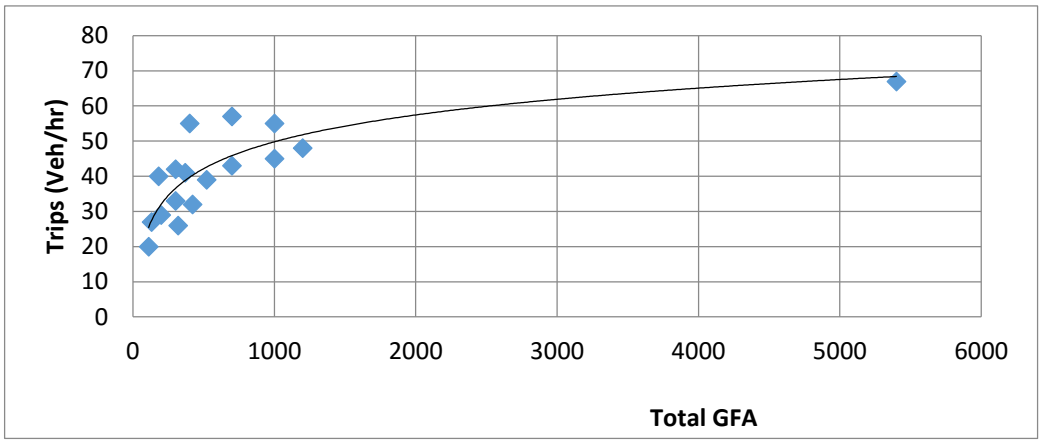
Appendix (E)

Regression Results for Retail Land Use

Large Supermarket Class - AM

Average Vehicle Trip Percentage vs:	GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average GFA :	690.91
Directional Distribution:	50.9 : 49.1

Data Plot



Fitted Curve Equation:	Y = 11.015ln(x) - 26.29
R^2:	0.6827
Rate:	104.86 trip/1000 m^2
Standard Deviation:	60.09

Large Supermarket Class - PM

Average Vehicle Trip Percentage vs: GFA

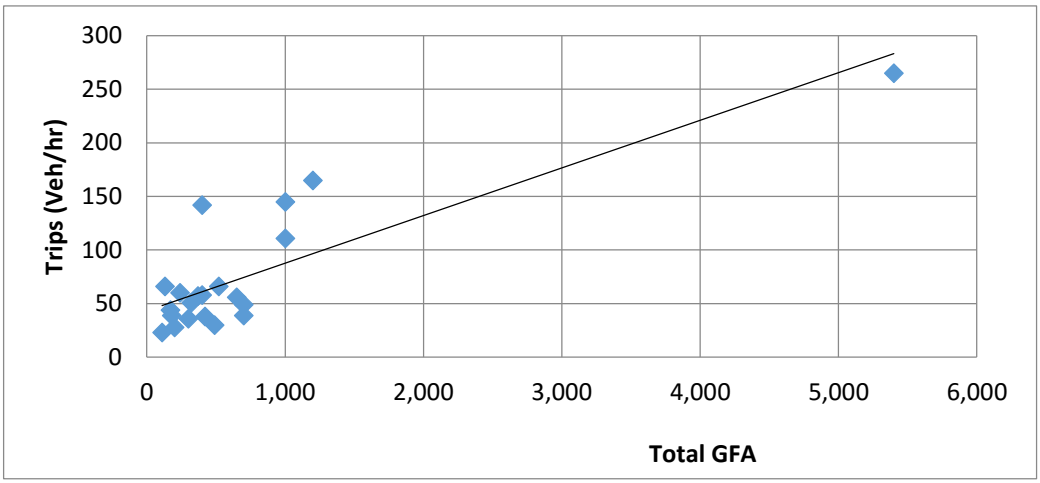
During: Average of two normal week day peak period

Number of Studies: 7

Average GFA : 690.91

Directional Distribution: 53.8 : 46.2

Data Plot



Fitted Curve Equation: Y = 0.0445 x + 43.127

R^2: 0.696

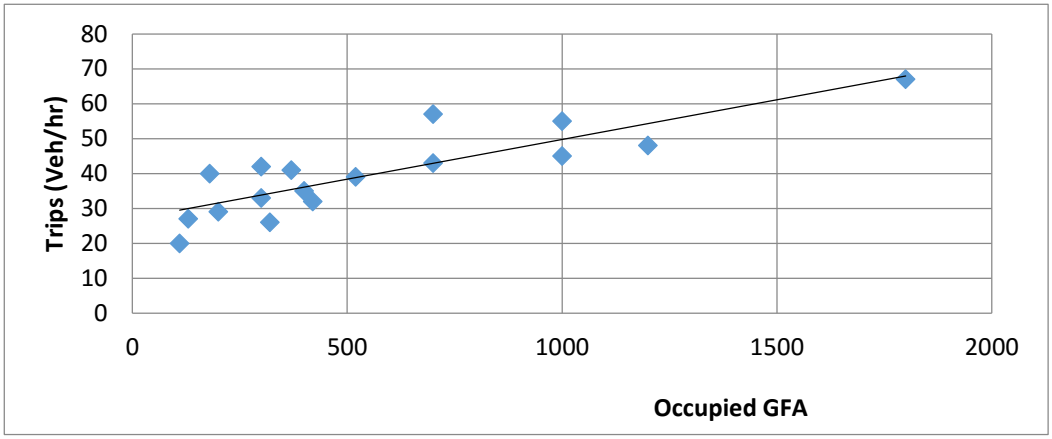
Rate: 164.23 trip/1000 m^2

Standard Deviation: 109.51

Large Supermarket Class - AM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average of Occupied GFA :	527.27
Directional Distribution:	50.9 : 49.1

Data Plot

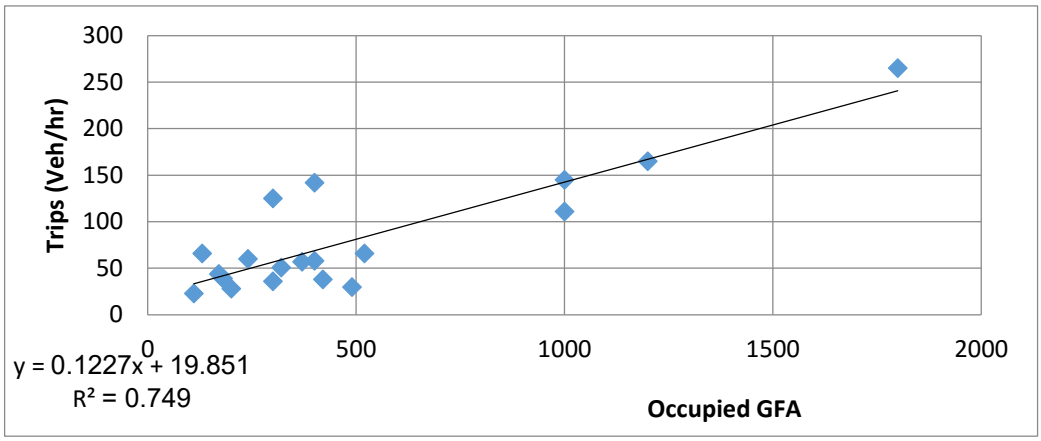


Fitted Curve Equation:	Y = 0.0227x + 27.046
R^2:	0.72
Rate:	103.38 trip/1000 m^2
Standard Deviation:	57.44

Large Supermarket Class - PM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average of Occupied GFA :	527.27
Directional Distribution:	53.8 : 46.2

Data Plot

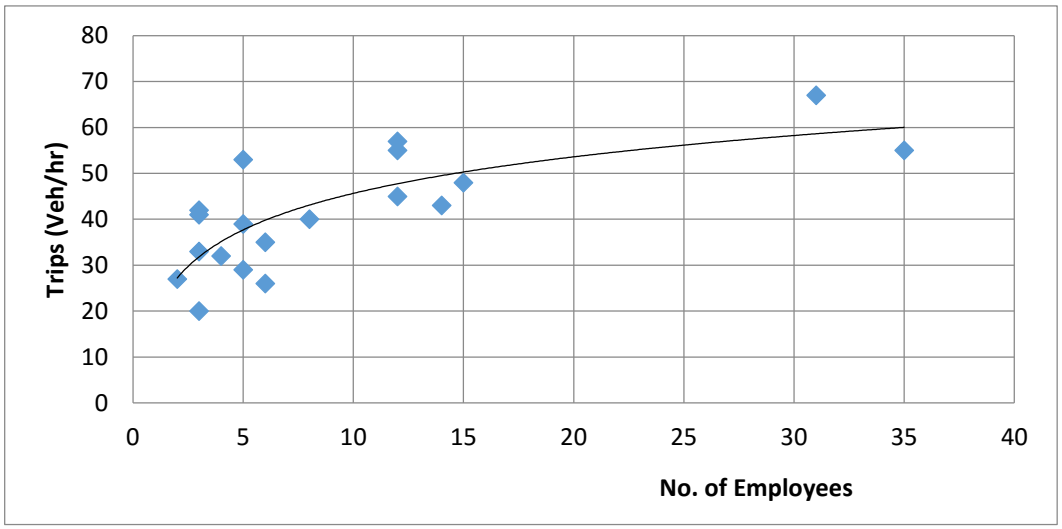


Fitted Curve Equation:	Y = 0.1227x + 19.851
R^2:	0.749
Rate:	197.46 trip/1000 m^2
Standard Deviation:	116.16

Large Supermarket Class - AM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	7
Average Number of Employees :	9.91
Directional Distribution:	50.9 : 49.1

Data Plot



Fitted Curve Equation: Y = 11.471ln(x) + 19.23

R^2: 0.574

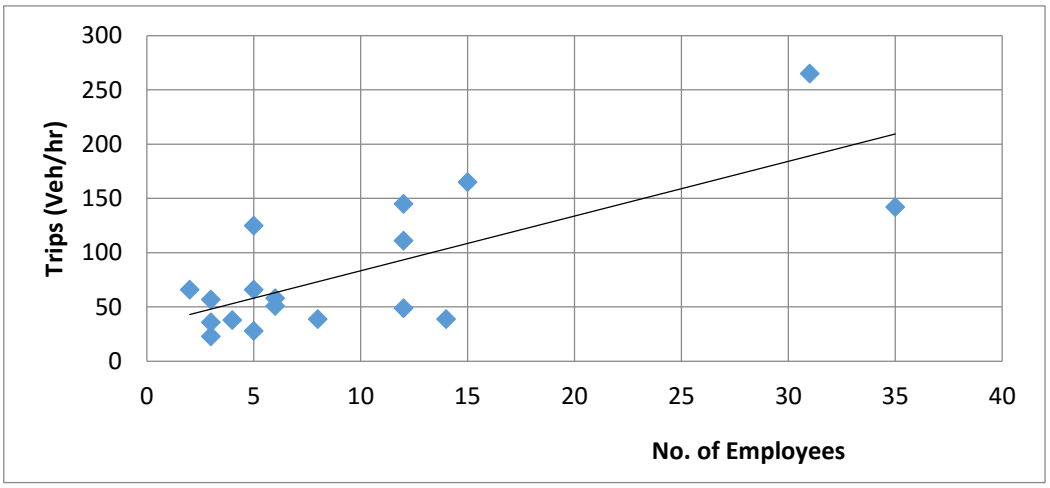
Rate: 6.084 trip/employee

Standard Deviation: 3.97

Large Supermarket Class - PM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	7
Average number of Employees :	9.91
Directional Distribution:	53.8 : 46.2

Data Plot

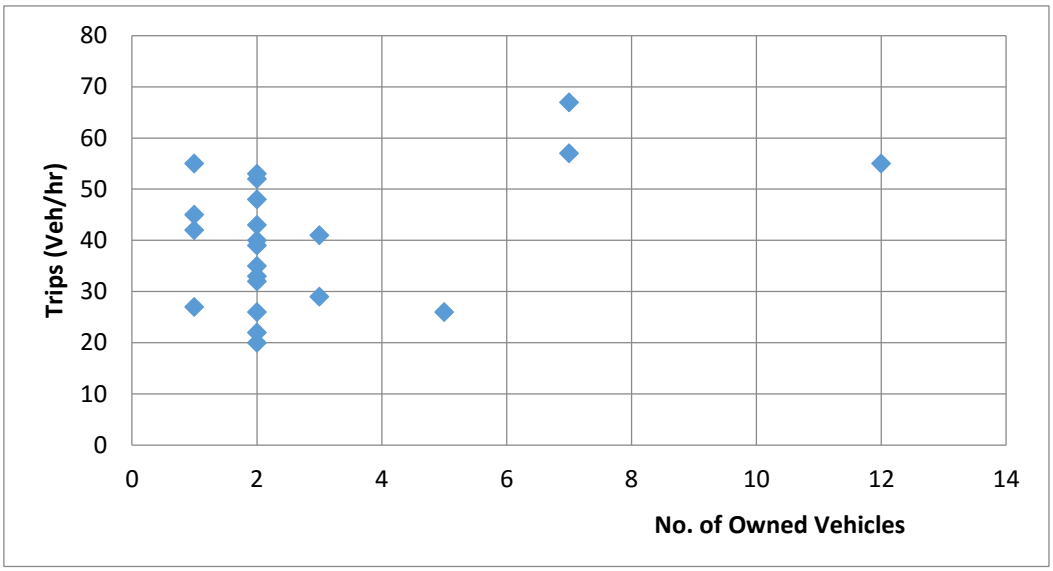


Fitted Curve Equation:	Y = 5.0412x + 32.808
R^2:	0.548
Rate:	11.1 trip / employee
Standard Deviation:	7.71

Large Supermarket Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles :	2.95
Directional Distribution:	50.9 : 49.1

Data Plot



Fitted Curve Equation: -

R^2: Less than 0.2

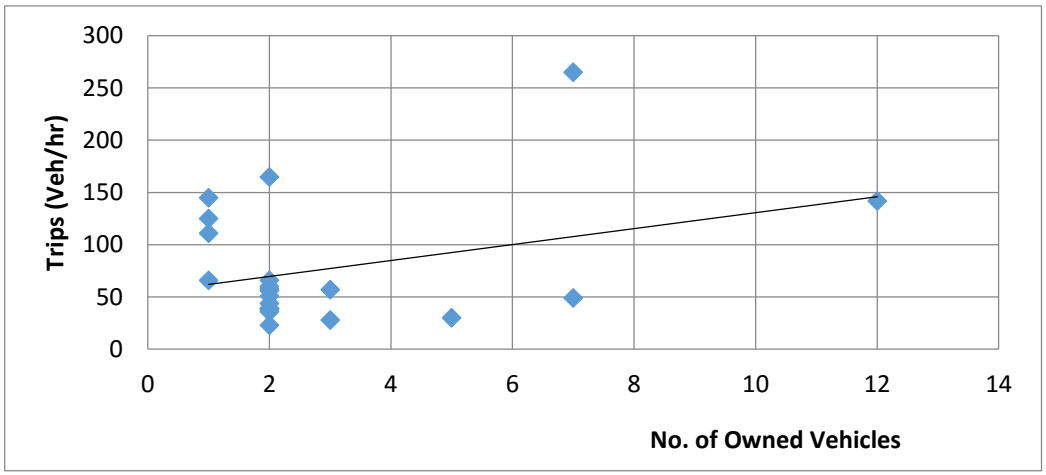
Rate: 20.06 trip / veh.

Standard Deviation: 13.09

Large Supermarket Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles:	2.95
Directional Distribution:	53.8 : 46.2

Data Plot



Fitted Curve Equation: -

R^2: Less than 0.2

Rate: 39.79 trip / veh.

Standard Deviation: 40.07

Commercial Strip Class - AM

Average Vehicle Trip Percentage vs: GFA

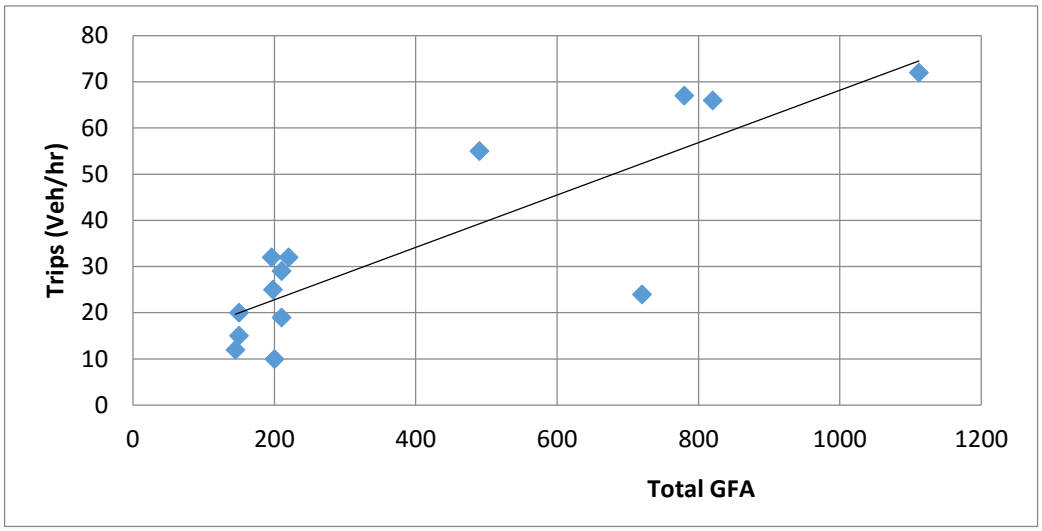
During: Average of two normal week day peak period

Number of Studies: 7

Average GFA : 447.8

Directional Distribution: 50.6 : 49.4

Data Plot



Fitted Curve Equation: Y = 0.0566x + 11.48

R^2: 0.718

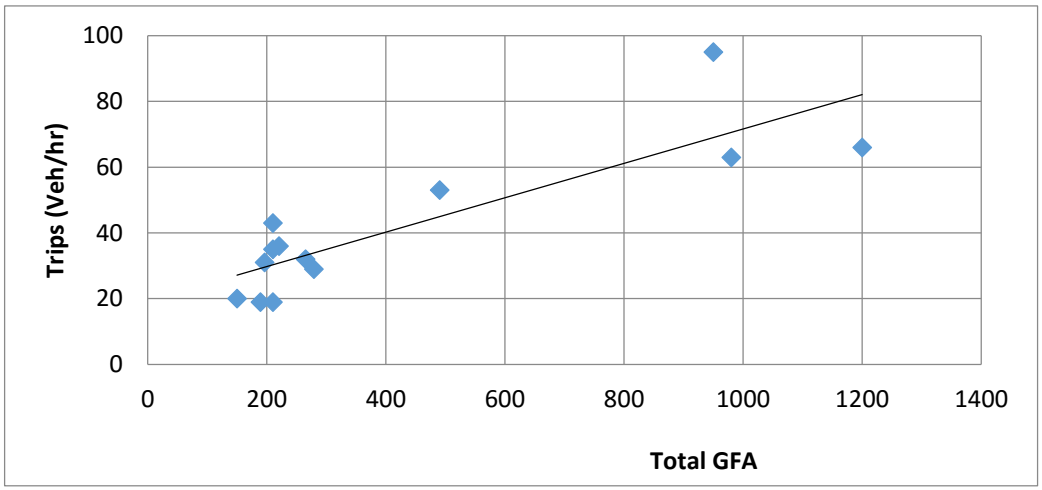
Rate: 100.45 trip/1000 m^2

Standard Deviation: 37.84

Commercial Strip Class - PM

Average Vehicle Trip Percentage vs:	GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average GFA :	447.8
Directional Distribution:	57 : 43

Data Plot



Fitted Curve Equation: Y = 0.0524x + 19.267

R^2: 0.73

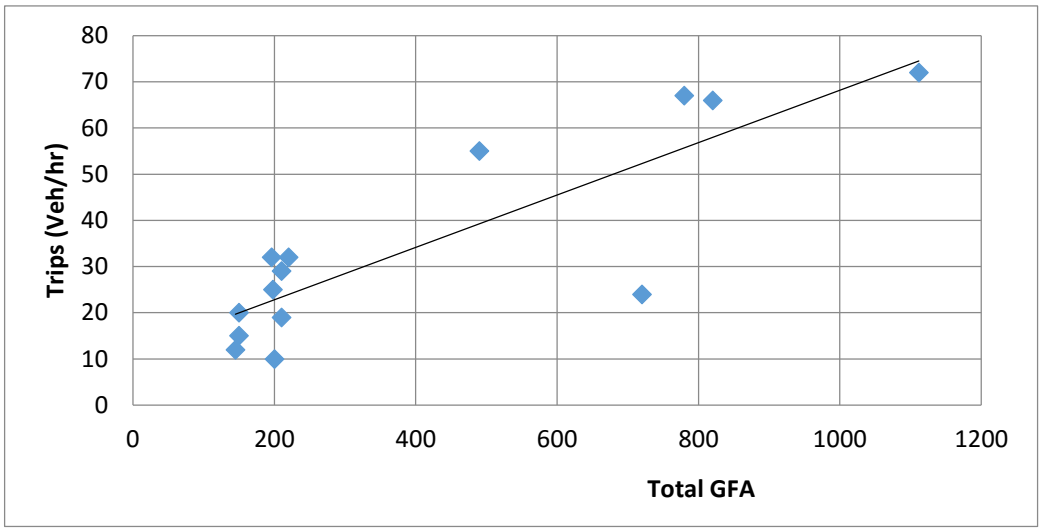
Rate: 120.75 trip/1000 m^2

Standard Deviation: 43.08

Commercial Strip Class - AM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average of Occupied GFA :	447.8
Directional Distribution:	50.6 : 49.4

Data Plot



Fitted Curve Equation: Y = 0.0566x + 11.48

R^2: 0.718

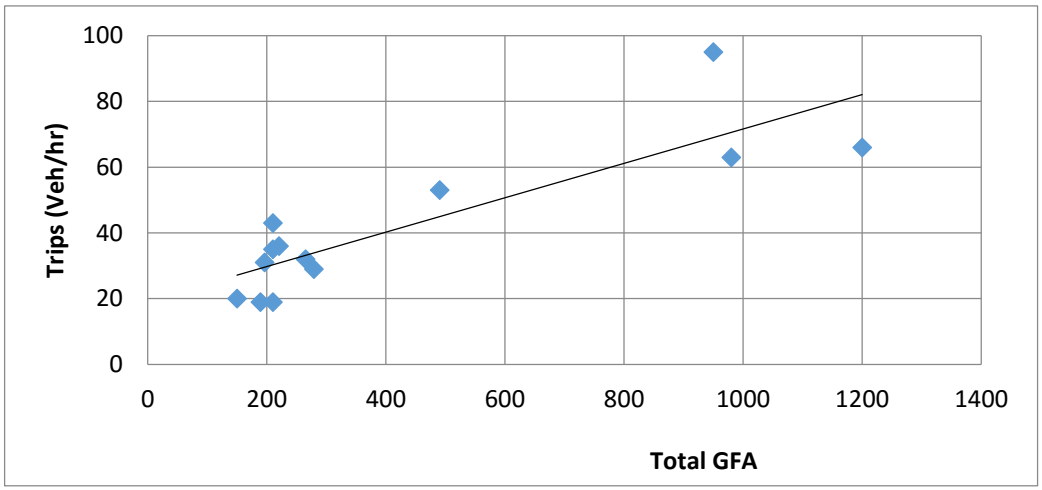
Rate: 100.45 trip/1000 m^2

Standard Deviation: 37.84

Commercial Strip Class - PM

Average Vehicle Trip Percentage vs:	Occupied GFA
During:	Average of two normal week day peak period
Number of Studies:	7
Average of Occupied GFA :	447.8
Directional Distribution:	57 : 43

Data Plot



Fitted Curve Equation: Y = 0.0524x + 19.267

R^2: 0.73

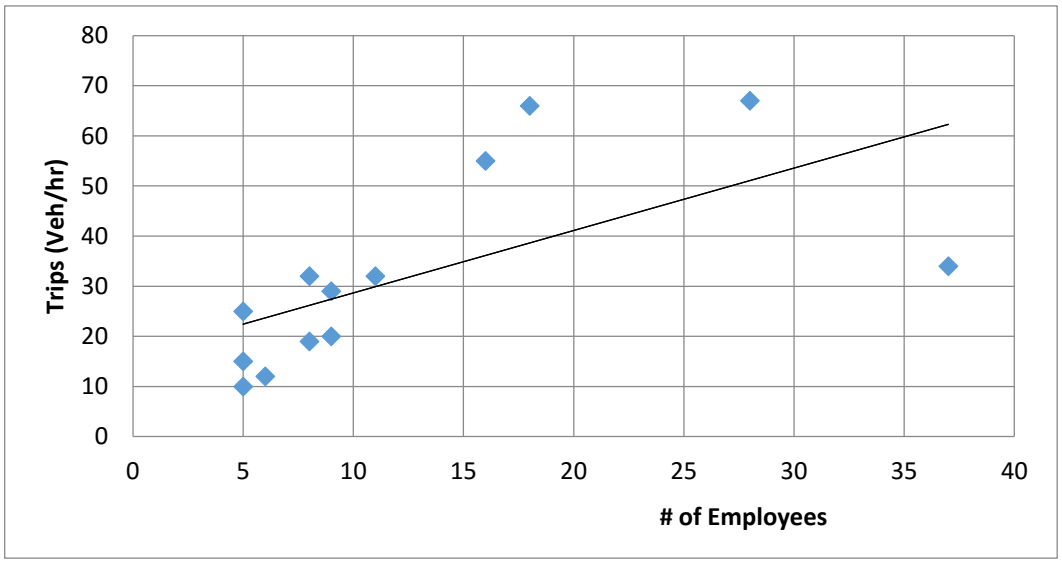
Rate: 120.75 trip/1000 m^2

Standard Deviation: 43.08

Commercial Strip Class - AM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	7
Average Number of Employees :	14.21
Directional Distribution:	50.6 : 49.4

Data Plot



Fitted Curve Equation: Y = 1.2449x + 16.2

R^2: 0.404

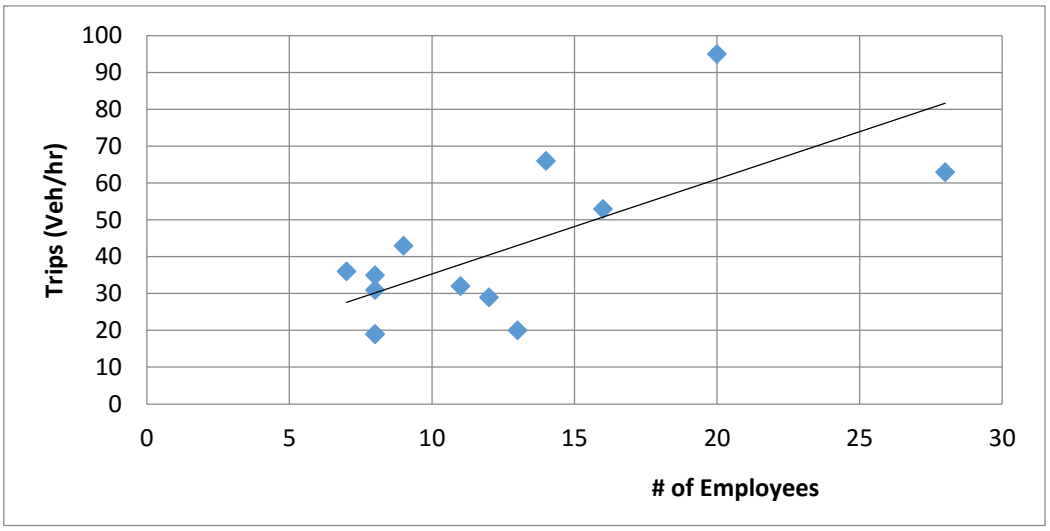
Rate: 2.85 trip/employee

Standard Deviation: 1.04

Commercial Strip Class - PM

Average Vehicle Trip Percentage vs:	No. of Employees
During:	Average of two normal week day peak period
Number of Studies:	7
Average number of Employees :	14.21
Directional Distribution:	57 : 43

Data Plot



Fitted Curve Equation: Y = 2.5737x + 9.5429

R^2: 0.486

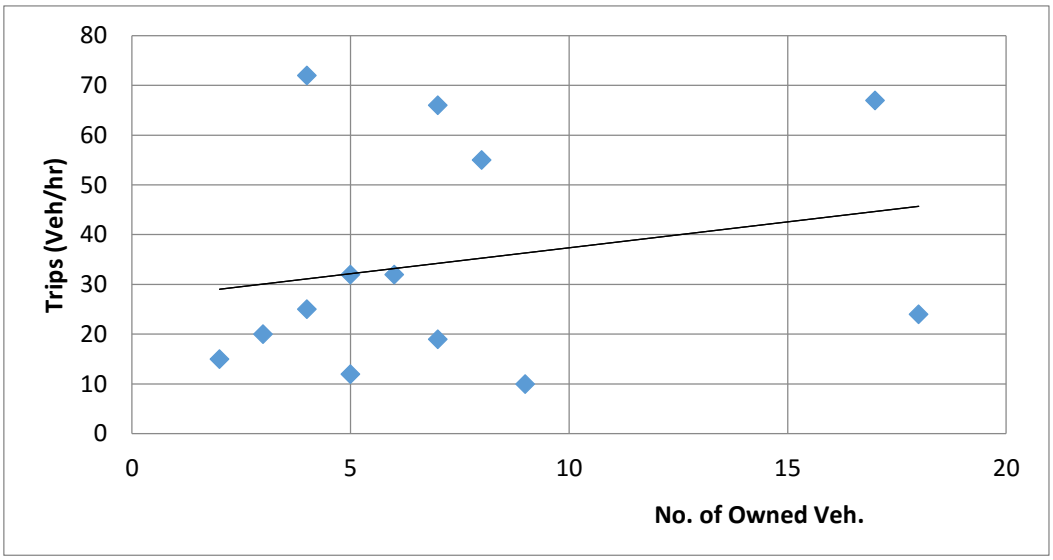
Rate: 3.45 trip / employee

Standard Deviation: 1.21

Commercial Strip Class - AM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles :	7.36
Directional Distribution:	50.6 : 49.4

Data Plot



Fitted Curve Equation: -

R^2: Less than 0.2

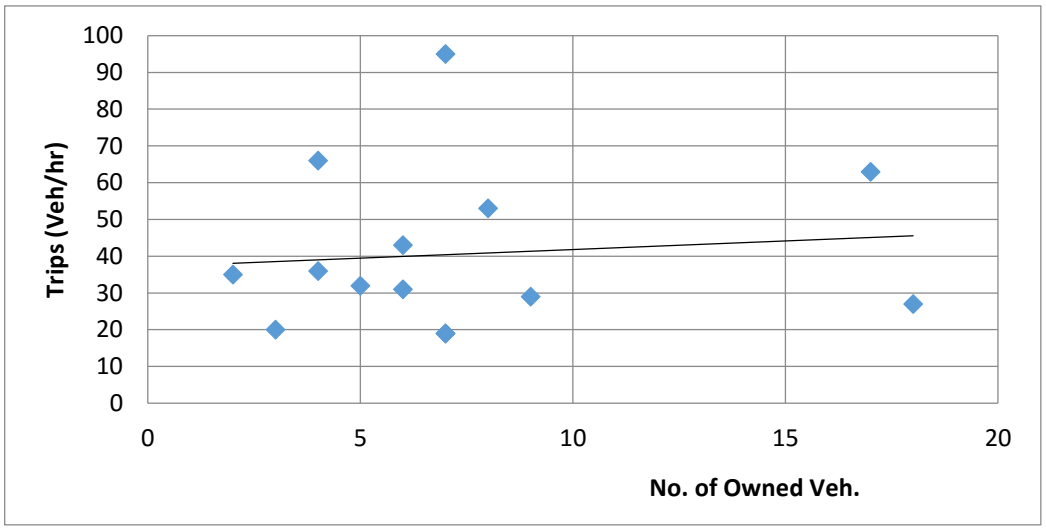
Rate: 5.91 trip / veh

Standard Deviation: 4.24

Commercial Strip Class - PM

Average Vehicle Trip Percentage vs:	No. of Owned Vehicles
During:	Average of two normal week day peak period
Number of Studies:	7
Average No. of Owned Vehicles:	7.36
Directional Distribution:	57 : 43

Data Plot



Fitted Curve Equation:	-
R^2:	Less than 0.2
Rate:	7.33 trip / veh
Standard Deviation:	5.34

جامعة النجاح الوطنية
كلية الدراسات العليا

نموذج تولد الرحلات لأنماط مختارة من استخدامات الأراضي في الضفة الغربية

إعداد
أحمد محمد محمود مصطفى

إشراف
د. خالد الساحلي

قدمت هذه الاطروحة استكمالا لمتطلبات الحصول على درجة الماجستير في هندسة الطرق والمواصلات بكلية الدراسات العليا، جامعة النجاح الوطنية في نابلس- فلسطين.
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نموذج تولد الرحلات لأنماط مختارة من استخدامات الأراضي في الضفة الغربية

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الملخص

إن تولد الرحلات هي المرحلة الأولى في عملية التخطيط الرباعي للمواصلات، والتي تستخدم بشكل أساسي في تنبؤ الطلب على النقل.

قدم هذا البحث نماذج (معدل أو معادلة) لتولد الرحلات لاستخدامات أراض مختارة في الضفة الغربية شملت الاستخدام السكني والاستخدام المكتبي والاستخدام التجاري، والتي تعتبر من أهم استخدامات الأراضي وأكثرها شيوعا في الضفة الغربية، وقد تم تقسيم كل من هذه الاستخدامات لثلاث أنواع رئيسية.

أجري هذا البحث، كما هو الحال في العديد من الدراسات المماثلة، بالاعتماد على المنهجية المتبعة في معهد مهندسي المواصلات (ITE)، من حيث حجم العينة والمتغيرات واختيار الموقع وطرق حساب نماذج تولد الرحلات، مع الأخذ بالاعتبار خصائص منطقة الدراسة.

قام الباحث بتصميم عدة نماذج استخدمت في جمع البيانات المتعلقة بالمواقع، كما استخدمت في عملية التعداد المروري في المواقع، حيث أن هذه النماذج استخدمت من قبل الباحث أو من قبل فرق جمع المعلومات المدربة في كافة مدن الضفة الغربية الرئيسية.

تم مسح عدد من العينات لكل نوع من استخدامات الأراضي، حيث كان أقلها ست عينات، وكان ذلك في نمط البناء السكني المتصل (Attached Housing) وذلك لقلة تلائم عينات هذا النمط من الاستخدام مع مواصفات العينة المطلوبة. من ناحية أخرى فقد تم مسح عينة واحدة فقط من مراكز التسوق (Shopping Centers) وهي بلازا مول في مدينة البيرة، ولذا فقد تم اعتماد معدل تولد الرحلات لهذا النمط من استخدام الأراضي.

بالاعتماد على تحليل البيانات الخاصة بالاستخدام السكني، فإن أفضل متغير يمكن تفسير تولد الرحلات من خلاله هو عدد الأشخاص وعدد الوحدات السكنية المشغولة. أما بالنسبة للاستخدام المكتبي فإن أفضل متغير هو عدد الموظفين والمساحة الطابقية المشغولة، أما بالنسبة للاستخدام التجاري فإن أفضل متغير هو المساحة الطابقية المشغولة.

بالرجوع إلى تحليل الرحلات العابرة (Pass-By Trips) والتي تم اعتمادها للاستخدام التجاري فقط، فقد كان واضحا أن هنالك علاقة عكسية بين Pass-By Trips وبين المساحة الطابقية المشغولة للمحلات التجارية، حيث أن معامل التحديد (R^2) كان 0.72، وهذه العلاقة منطقية في منطقة الدراسة.

أوصت الرسالة باستخدام المعادلات للنماذج التي كانت فيها قيمة معامل التحديد 0.7 أو أكثر، واستخدام المعدل للنماذج التي قلت فيها قيمة معامل التحديد عن ذلك. كذلك أوصت باعتماد المنهجية المتبعة في البحث للدارسات والأبحاث المستقبلية المماثلة. من ناحية أخرى شجعت الرسالة الباحثين العمل على جمع المزيد من العينات لزيادة حجم العينة لزيادة دقة النتائج.