Trip Rates of Night Markets in Thailand

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Abstract

The night market is a popular space for people to find merchandise and foods for their needs; this is true especially for Thai communities. This study finds the trip rates of vehicles entering and exiting the selected ten night-markets in Thailand. Data is collected on a weekday, and weekends during 17:00-21:00, which are the rush hours. Total parking spaces of each night market are also counted. Regression analysis is conducted to obtain the correlation between the maximum number of vehicles entering and exiting the night markets and the area of the night markets. This study also finds the highest parking demands of the night markets and the relationship between the highest parking demand and night markets area. This work uses the data to calculate average trip rates. From this study, it is learned that the maximum needed number of parking spaces is on Sunday. Moreover, for a night market located in the city with high workplaces and populations, the trip rate is highest on a weekday. Whereas for night-markets located in a city with tourist attractions, the highest trip rate is on weekends.

Disciplinary: Civil Engineering (Transportation and Traffic Engineering).

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Cite This Article:

Chiangin, N., Raksuntorn, W., Witchayangkoon, B., Raksuntorn, N., and Chayanan, S. (2021). Trip Rates of Night Markets in Thailand. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies, 12*(4), 12A4G, 1-6. http://TUENGR.COM/V12/12A4G.pdf DOI: 10.14456/ITJEMAST.2021.70

1. Introduction

Night markets are a form of land development. The number of night markets has increased, scattered throughout Thailand. Night markets open from late afternoon to after midnight. Most of them offer a wide variety of merchandise, restaurants, and resting areas for people. These night markets cause traffic problems in the vicinity. For Traffic Impact Assessment (TIA), the main factor

is the amount of traffic generated from night market visitors. Other factors causing traffic problems include the size of the market area, parking spaces, and market location. Moreover, the amount of traffic generated by market visitors on each day of the week is different.

Office of Transport and Traffic Policy and Planning, Thailand's Ministry of Transport, found that the rate of market travel in Bangkok and its vicinity is 78.49 PCU/100 square meters of market area with a large travel proportion during peak hours. Also, markets with an area of more than 5000 square meters have high traffic impacts during rush hours.

The traffic impacts of land development have not been studied in the form of local and international markets. Thus, this research approach is important for traffic impacts in Thailand to represent traffic situations. Therefore, this research study has collected and analyzed detailed data from 10 night-markets in Thailand.

2. Literature Review

Chik and Shankar (1998) reported a study of the trip generation in Malaysia, focusing on four big shopping complexes having an area larger than 55,000 m². Based on pass-by and diverted trips to form math models, they discovered a relationship between traffic volume and the size of the shopping complex area.

In a study on types of supermarket trip generations in New Zealand, Steedman et al. (2016) found that the main factor of trip generations was the supermarket location and had an influence on road traffics. The weekdays' pass-by trips were 50% whereas the weekday primary trips 50%.

Pimcham et al. (2021) studied the trip generation of community malls in Thailand and found that the size of community malls did not affect the types of trips. However, the influential factors were the day of the week and the location of the community malls. Noticeably, the community malls situated on the major streets away from a community caused pass-by trips 98%.

Chairat et al. (2021) concentrated on a study of trips generated by five different night markets around Thailand, on weekdays and weekends The key results were 50% primary trips, 40% pass-by trips, and 10% diverted link trips. The proportion of trip types depended on the days of the week. The diverted link trips on Sunday rose double. The night market location is an important affecting factor. The night-market size area generated no effect on the proportions of trip types of primary trips and pass-by trips. However, The number of parking spaces affects the proportion of the primary trips and pass-by trips that the primary trips increase with the increased parking spaces while the pass-by trips are the contrary.

De Gruyter et al. (2021) studied site characteristics for multi-modal trip generation rates at 933 UK residential developments based on estimation of site characteristics relating to location and housing attributes, public transport service quality, parking, and travel plan measures. Regression of trip generation rates was made to understand the site characteristics to explore their association with multi-modal trip generation. The findings yielded that multi-modal trip generation rates are related to a variety of site characteristics at residential developments including locational and

housing attributes such as apartment developments and housing size, population density, car ownership, distance to local facilities, etc.

Molloy et al. (2021) studied the impacts of the lockdown and the relaxation of the Covid-19 first wave on travel behavior based on 1439 Swiss residents using online questionnaires. The trip characteristics observed of over 90% public transport decreases, while the cycling increased in mode share hugely.

3. Method

This study observes the number of all vehicle types entering and exiting ten night-markets. A video recorder is installed at each market. The recorded motion pictures are used to collect and analyze data on a workday and weekends, during 17:00-21:00.

3.1 Features of the Night Markets

This research studies ten night-markets in Thailand (Table 1). From the detail of night markets characteristics Table 1, it can be categorized according to location into three main groups including in cities with high workplaces and populations (Markets #1, #2, #4, #7, #9) in cities with tourist attractions (Markets #3 and #5) located far from the city and residential areas (Markets #6, #8, #10).

Table 1: Detail of the studied night markets

No	Night Market	Area (sq.m)	Parking (cars)	Location	Geocoordinates
#1	Liab Duan Night Market	45,900	790	Bangkok	13°50'50.58" N, 100°38'20.70" E
#2	Huamum Night Market	24,090	639	Bangkok	13°49'35.25"N, 100°37'35.91"E
#3	Teng Vintage Night Market	8.700	300	Nakhon Nayok	14°14'44.62" N, 101°15'6.28" E
#4	Black Market	17,640	350	Samut Prakan	13°35'6.69"N, 100°36'32.45"E
#5	Ninja Night Market	53,000	1,100	Chon Buri	13°25'7.27" N, 100°59'46.52" E
#6	Save One Night Market	68,000	3,200	Nakhon Ratchasima	14°57'26.52" N, 102° 2'43.14" E
#7	Tonson Night Market	21,000	420	Samut Sakhon	13°33'35.62" N, 100°16'21.10" E
#8	Awake Night Market	14,000	310	Pathum Thani	13°58'29.8"N, 100°30'46.3"E
#9	Plane Night Market	31,326	950	Samut Prakan	13°35'48.63"N, 100°44'42.94"E
#10	Kunawan Night Market	36,000	700	Nakhon Pathom	13°59'44.55"N, 99°59'47.27"E

4. Analysis and Results

4.1 Correlation between the Maximum Number of Vehicles Entering and Exiting the Night Markets and the Area of the Night Markets

From the statistical analysis using a linear correlation, it finds that the majority of the traffic entering and exiting the night markets is directly related to the size of the night market's area, indicating that the size of the night market's area is a direct factor for night market trip rate.

4.2 Average Trip Rate

On workdays, the average trip rate is 27.5 cars/hour/1000 square meters market area. On Saturday, the average maximum trip rate is 26.2 cars/hour/1000 square meters market area and on Sunday 31.1 cars/hour/1000 square meters market area.

Night markets that are located in cities with famous tourist attractions will have higher trip rates, followed by markets in the city with high workplaces and population. The lowest trip rates are markets far from the city and residential areas.
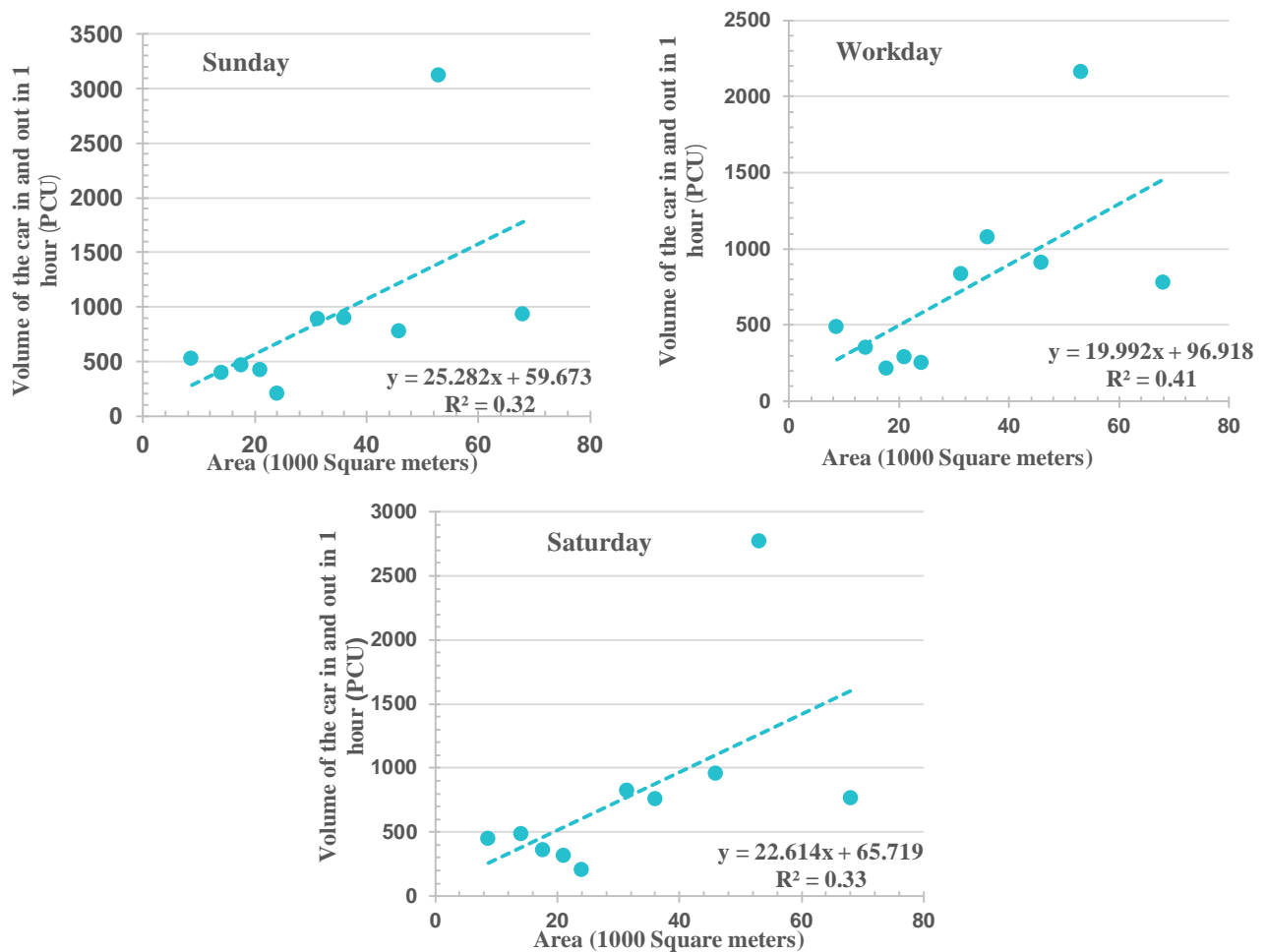
Sunday

Volume of the car in and out in 1 hour (PCU)

$y = 25.282x + 59.673$
$R^2 = 0.32$

Area (1000 Square meters)

Workday

Volume of the car in and out in 1 hour (PCU)

$y = 19.992x + 96.918$
$R^2 = 0.41$

Area (1000 Square meters)

Saturday

Volume of the car in and out in 1 hour (PCU)

$y = 22.614x + 65.719$
$R^2 = 0.33$

Area (1000 Square meters)

Figure 1: Correlation between the maximum number of vehicles entering and exiting the night markets and the area of the night markets for workday and weekend

Table 2: Average trip rate.

Market	Area	Workday		Saturday		Sunday	
		Volume of vehicles entering-exiting in 1 hour *	Volume of vehicles entering-exiting in 1 hour **	Volume of vehicles entering-exiting in 1 hour *	Volume of vehicles entering-exiting in 1 hour **	Volume of vehicles entering-exiting in 1 hour *	Volume of vehicles entering-exiting in 1 hour **
Liab Duan Night Market	45,900	21.61	19.76	20.85	20.85	18.47	17.06
Huamum Night Market	24,090	10.67	10.58	12.08	8.58	10.5	8.58
Teng Vintage Night Market	8,700	62.64	56.32	57.82	51.61	60.8	60.8
Black Market	17,640	15.76	12.13	27.49	20.24	35.37	26.76
Ninja Night Market	53,000	48.68	40.81	57.08	53.35	59.04	59.04
Save One Night Market	68,000	13.34	11.44	12.24	11.28	15.03	13.76
Tonson Night Market	21,000	20	13.67	20.9	15	21.86	20.38
Awake Night Market	14,000	25.21	25.32	27.43	34.5	29.29	28.57
Plane Night Market	31,326	27.61	26.66	26.75	26.37	32.11	28.38
Kunawan Night Market	36,000	29.92	29.92	30.78	20.97	28.83	25.11

*During the period with the maximum number of vehicles entering - exiting per area 1000 sq m, m^2
**During 16.00 - 18.00 with the maximum number of vehicles entering - exiting per area 1000 sq m, m^2

4.3 The Highest Night Market Parking Demand & the Relationship between the Highest Parking Demand and Night Market Area

According to the data, the highest average parking demand is on Sunday with 477.3 cars and the lowest on Saturday 415.6 cars.
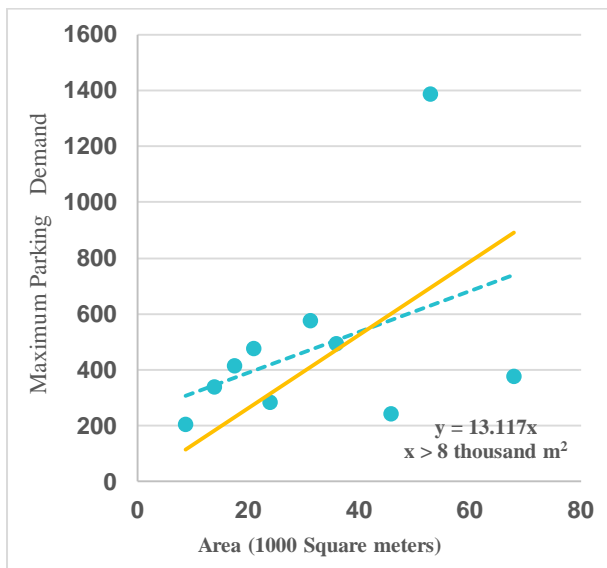
Figure 2: Correlation between the maximum parking demand and the area of the night markets

The chart shows:
- y-axis: Maximum Parking Demand (0 to 1600)
- x-axis: Area (1000 Square meters) (0 to 80)
- $y = 13.117x$
- $x > 8$ thousand m^2

Table 3: maximum parking demand

Night markets	Max Parking Demand workday	Max Parking Demand Saturday	Max Parking Demand Sunday	Parking spaces
Liab Duan Night Market	468	468	241	790
Huamum Night Market	274	275	283	639
Teng Vintage Night Market	188	181	202	300
Black Market	283	475	412	350
Ninja Night Market	1,490	839	1,384	1,100
Save One Night Market	411	307	373	3,200
Tonson Night Market	442	452	473	420
Awake Night Market	289	269	338	310
Plane Night Market	438	424	574	950
Kunawan Night Market	209	466	493	700
Maximum Parking Demand Average	449.2	415.6	477.3	

From statistical analysis using straight-line correlation, it was found that the size of the night market's area directly affected the demand for parking, with the average maximum parking demand rate 16.3 cars per 1000 square m areas.

5. Discussion

From the traffic observation of all ten night-markets in Thailand, high traffic volumes are on Saturday and Sunday. This study finds different trip rates for different groups of the night markets classified according to their locations, markets locating in cities with high workplaces and populations (Markets #1,#2,#4,#7,#9), in cities with tourist attractions (Markets #3 and #5), and at a location far from the city and residential areas (Markets #6, #8,#10).

From the observation of the traffic impact, it is found that the average maximum daily trip rate closes to the average peak trip rate. The average peak trip rate is 27.5 cars on weekdays, 26.2 on Saturday, and 31.1 on Sunday (per hour per 1000 square meters of night markets area).

It is noticed for the factors involving entrance and exit traffics that a larger size of the night markets has to provide more parking lots accordingly. The highest average parking demand on Sunday is 477 cars. The average rate of the highest parking demand is 16.3 cars per 1000 square meters of night markets area.

6. Conclusion

This study observes a number of vehicles entering and exiting of 10 night-markets on a weekday and weekends. This study finds that the night market's highest traffic is on Saturday and Sunday. The average maximum trip rates on weekdays, Saturdays, and Sundays are 27.5, 26.2, and 31.1 vehicles per hour per market area of $1000m^2$. From the observation, it is noticed that the vital factor affecting traffic volumes is the size of the night market as the bigger the size of the market, the more parking spaces are available to visitors. The maximum parking demand is on Sunday, with the average maximum demand at 16.3 vehicles per market area of $1000m^2$. This study reflects the traffic impacts of land development for night markets.

7. Availability of Data, and Material

Data can be made available by contacting the corresponding author.

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