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Form of Distribution of Traffic Accident and Environment Factors of Road Affecting of Traffic Accident in Dusit District, Only Area Responsible of Samsen Police Station

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***Abstract*—**This research aimed to study form of traffic distribution and environmental factors of road that affect traffic accidents in Dusit District, only areas responsible of Samsen Police Station. Data used in this analysis is the secondary data of traffic accident case from year 2011. Observed area units are 15 traffic lines that are under responsible of Samsen Police Station. Technique and method used are the Cartographic Method, the Correlation Analysis, and the Multiple Regression Analysis. The results of form of traffic accidents show that, the Samsen Road area had most traffic accidents (24.29%), second was Rachvithi Road (18.10%), third was Sukhothai Road (15.71%), fourth was Rachasrima Road (12.38%), and fifth was Amnuaysongkram Road (7.62%).

The result from Dusit District, only areas responsible of Samsen police station, has suggested that the scale of accidents have high positive correlation with statistic significant at level 0.05 and the frequency of travel (r=0.857). Traffic intersection point (r=0.763)and traffic control equipments (r=0.713) are relevant factors respectively. By using the Multiple Regression Analysis, travel frequency is the only one that has considerable influences on traffic accidents in Dusit district only Samsen Police Station area. Also, a factor in frequency of travel can explain the change in traffic accidents scale to 73.40 (R^2 = 0.734). By using the Multiple regression summation from analysis was $\hat{Y} = -7.977 + 0.044X6$.

***Keywords*—**Form of Traffic Distribution, Environmental Factors of road, Traffic Accidents, Dusit District.

I. Introduction

THAILAND has been developing into economically and politically country with better social conditions which causes city expansions resulted in the lack of land. Today, especially in Bangkok, many problems are unavoidable such as, traffic congestion, and road accidents. Bureau of Epidemiology Department of Disease Control, Ministry of Public Health reported final statistics from 2011 in collective data from 1 January 2011 to 31 December 2011, that seriously injured citizens who were admitted in emergency room in 33 hospitals under the supervision of National Injury Surveillance were total 80,962, averagely 9 injured people per hour, 4,535 people died, averagely 12 people daily. People who are 73% most likely to be dead are drivers, 21% passengers, and 5% pedestrian respectively [1].

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Traffic accident is a country's serious problem to be solved urgently, to plan for more serious situations in the future. It is necessary to understand form of distribution including risk factors, because if we know characteristics, causes, and location of accident correctly, we can easily prevent and reduce the severity.

Dusit District is an old area with long history and people. Dusit Palace, Equestrian statue, and palaces in the palace, which are SuanDusit, Vimanmek, Ampornsatan, Wang Sukhothai, Suan Jitralada, Suansunandha, Anuntasamakom, and also are places of parliament, school, university and ministry are also situated here. Because of that, these are among 1 to 10 busy, congested areas in Bangkok and an increase number in road accidents.

Such problems has affected the study of traffic accidents in the past that we searched for the cause and data to analyze only factors that related to human beings, especially location. Researchers have studied about the road environment that can has some effects to traffic accidents and the findings have led us to plan for safety in specific areas, communities, and people. We aim for the reduction in accidents. It also expands knowledge about traffic accidents in Bangkok.

II. Objectives of Study

1. Study distribution form of position of traffic accident in Dusit District, especially areas under the responsible of Samsen Police station**.**
2. Analyze environmental factors of road that affect traffic accidents in Dusit, District, only areas under the responsible of Samsen Police Station.

III. Methodology and Data Analysis

This study is a reconstructed data dividing to 2 steps as follow:

1. To study form of position distribution of traffic accidents in Dusit District, only responsible areas of Samsen Police Station, by studying from cases of accidents in 2011 and used the data to create a table into 3 parts: high, medium, and low to study the format of distribution of traffic accidents. The result will be revealed in the form of a table and a map using the Cartographic Method by ArcGIS program.

2. To study and analyze environmental factors of road that causes traffic accidents in Dusit District, only areas under the responsible of Samsen Police Station.

2.1 To study environmental factors of road that have effects on accidents in Dusit District, only responsible area of Samsen Police Station, by using statistic to calculate correlation of variances in positive, negative or non-correlation.

2.2 To analyze multiple regressive analysis to be use later in environmental factors that have effects on traffic accidents in Samsen Police Station area, by studying the amount of cases of accidents that are Dependent Variable. The remaining factors are Independent Variable which will be used to find environmental factors of road accidents as follow [2]:

Y = Scale of traffic accidents using example cases from 2011 in Dusit District, only areas under the responsible of Samsen Police Station in each road to be as criterion.

X_1 = Road physical factors using traffic width of each road as criterion in measurement.

X_2 = Factors in traffic distant using length of the road to be as criterion.

X_3 = Factors of traffic control equipment using traffic light of each road to be as criterion.

X_4 = Factors of traffic intersection using total amount of points and section of each road to be as criterion.

X_5 = Factors of lighting using lights that work perfectly to be as criterion.

X_6 = Factors of the frequency of travel of each household in the community that are situated about 10 meters of each road to be as criterion.

3. Statistic and quantity technique used in data analysis [3]

3.1 The Correlation Analysis Method is used to find coefficient, Pearson-Product Moment Correlation Coefficient as follow (1):

$$r = \frac{n(\sum XY)-(\sum X)(\sum Y)}{\sqrt{[N(\sum X^2)-(\sum X)^2]*[N(\sum Y^2)-(\sum Y)^2]}} \quad (1)$$

where:

r = correlation between variable XY
$\sum X$ = total result data from variable X
$\sum Y$ = total result data from variable Y
$\sum XY$ = data from X and Y
$\sum X^2$ = total data of both data from X
$\sum Y^2$ = total data of both data from Y
N = amount of data

3.2 The Analyze Multiple Regression Analysis by Stepwise method as follow (2):

$$Y = b_0 + b_1x_1 + b_2x_2 + \ldots b_nx_n + e \quad (2)$$

where:

Y =followed variables
b_0 = fix value
$b_1 - b_n$ = regression coefficient
e = inconsistent

IV. Areas Studied

This research was studied in Dusit District only areas under the responsible of Samsen Police Station for about 3.64 square meters, consisted of main road: 15lines in Spatial Framework in this following study

1. Samsen Road
2. Luklung Road
3. Pitsanuloke Road
4. Sriayudhya Road
5. Uthongnok Road
6. Ratchvithi Road
7. Sukhothai Road
8. Rachasima Road
9. Kao Road
10. Daokang Road
11. Ruamjit Road
12. Nakhonchaisri Road
13. Pichai Road
14. Amnuaysongkhram Road
15. Kiewkaika Road

V. Result and Analysis

1. To study format of position of traffic accidents in Dusit District only areas under the responsible of Samsen Police Station.

In this part of study we choose to examine format and position of traffic accidents from example cases in each road to indicate the size of location where accidents happened. The result of this case in each road suggested that in 2011 Samsen Road was the area that had 51 accidents or 54.29% of total accidents, Ratchvithi Road had 38 or 18.10% of total accidents, Sukhothai Road had 33 or 15.71% of total accident, Ratchasima Road had 26 or 12.38% of total accident, Amnuaysongkhram Road had 16 or 7.62% of total accident. Kao Road had only 1 or 0.48% of total traffic accident cases.

To analyze form of distribution of accidents in Dusit area, under the responsible of Samsen Police Station, the Cartographic Method is used to estimate traffic accidents cases in 2011 and divide all data into 3 levels to show location of accidents in each road that are high, medium, or low. The result is the road that has high rate of accidents is that that has accident occurred more than 31 cases which are: 3 main road; Samsen, Ratchvithi, and Sukhothai Road. The road that has medium rate of accidents hold between 16-30 cases are 2 roads; Ratchasima, and Amnuaysongkhram Road. The road that has the lowest rate of accidents hold between 1-15 cases are 10 roads: Nakhonchaisri, Pichai, Pitsamuloke, Lukung, Kiewkaika, Daokang, Sriayudhya, Uthongnok, Ruamjit, and Kao Road respectively as shown in Fig. 2.

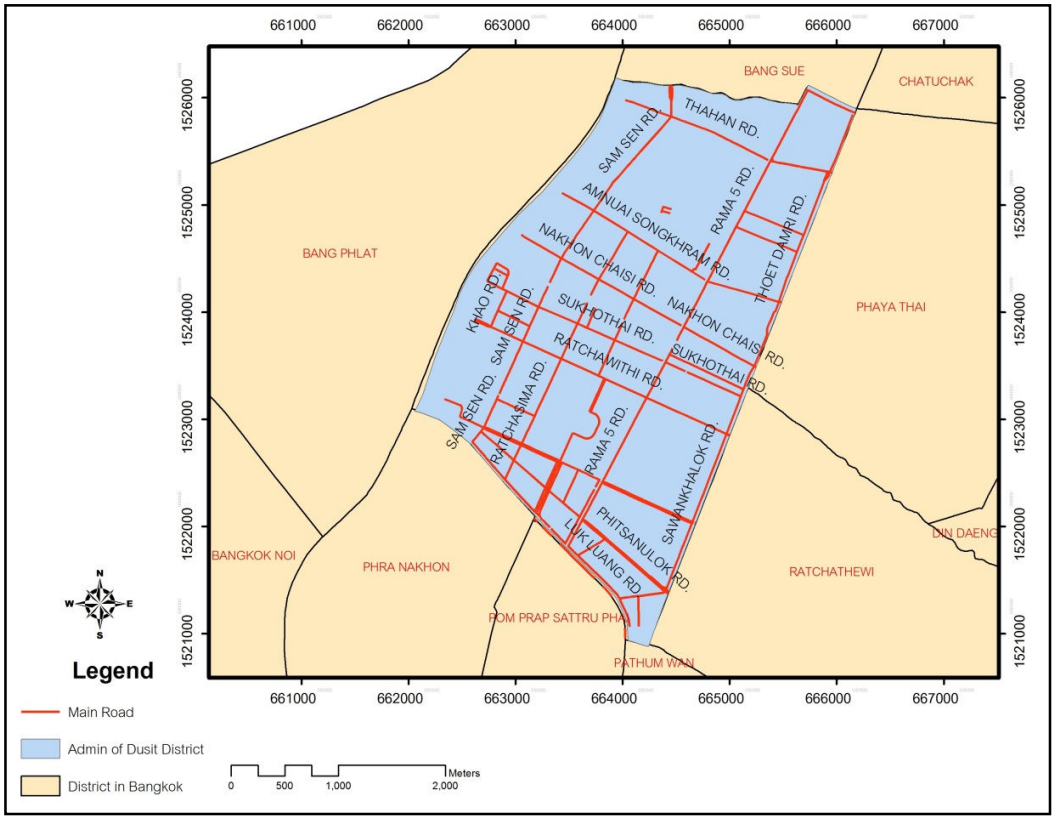

Fig. 1 Mapping of Spatial Framework in the study

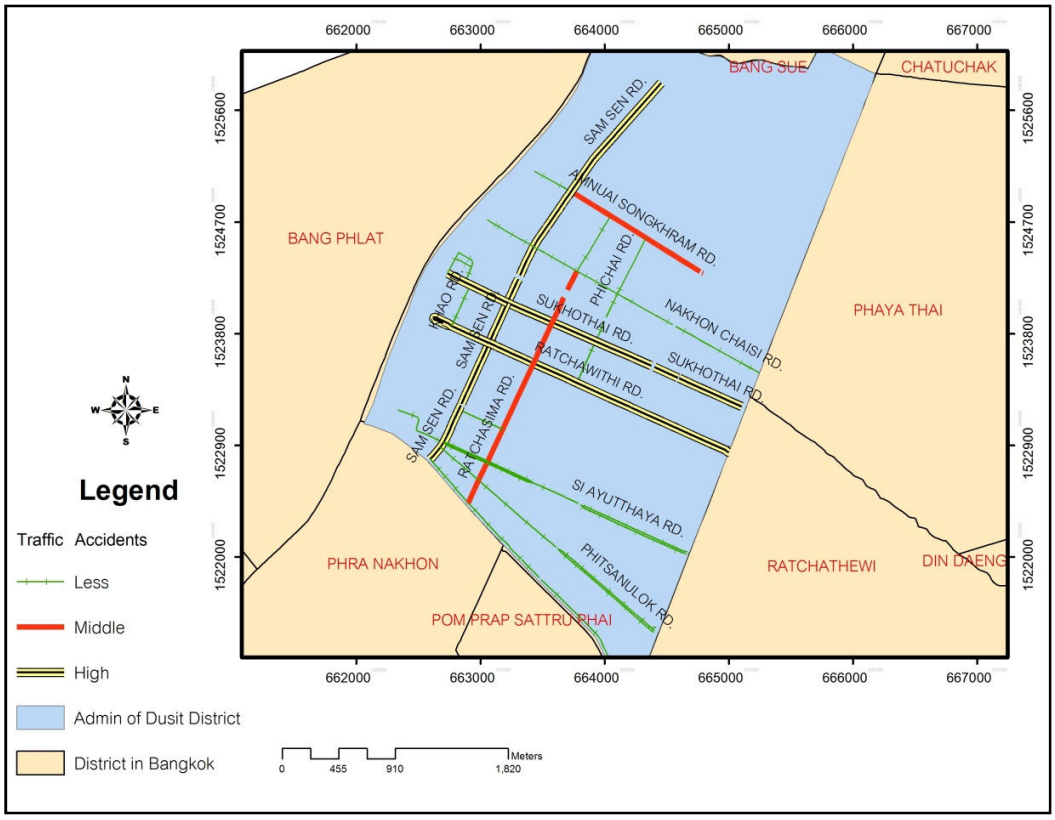

Fig. 2 Mapping of accident's pattern in Dusit area, under the responsible Samsen police station

2. To study and analyze environmental factors of road that causes traffic accidents in Dusit District only areas under the responsible of Samsen Police Station.

2.1 Analyze coefficient in Pearson's Product Moment Correlation Coefficient: r. Research team used all variables to analyze coefficient by correlation technique in Pearson using in statistical open source software.The results suggested that the scale of accidents is compatible to hypothesis; the scale of accidents as positive correlation with traffic frequency (r=0.857). It correlated in positive with traffic intersection factors (r=0.763). It has positive correlation with Traffic control equipment (r=0.713). It has positive correlation with traffic distant (r=0.656). It has positive correlation with lighting factors (r=0.652)and also has positive correlation with road physical factors (r=0.250) respectively as shown in Table I.

Therefore, we found that roads that have high result of traffic accidents are also those that have more traffic, which will cause high accidents in such areas because the frequency of travel used is substituted by households from the community around the location that situated 10 meters away of each road. Households from the community reflected variety of land utilization, the more the households, the more variety of land utilization. [4]Different usage of lands causes different forms of traffic and separate the need to own the piece of land from the need to travel hence will disturb the tempo of the traffic making it too slow or rapid. Oppositely, the road that has low rate of accidents is the road that has low frequency of use in said areas, as every factor are analyzed to find coefficient correlation.

TABLE I
COEFFICIENT IN PEARSON CORRELATIONS

	Y1	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*
Y1	1	0.250	0.656	0.713	0.763	0.652	0.857
Sig		0.369	0.008	0.003	0.001	0.008	0.000
N		15	15	15	15	15	15
X1		1	0.511	0.552	0.294	0.598	0.406
Sig			0.051	0.033	0.288	0.019	0.133
N			15	15	15	15	15
X2			1	0.626	0.840	0.796	0.660
Sig				0.012	0.000	0.000	0.002
N				15	15	15	15
X3				1	0.671	0.913	0.722
Sig					0.006	0.000	0.002
N					15	15	15
X4					1	0.795	0.709
Sig						0	0.003
N						15	15
X5						1	0.737
Sig							0.002
N							15
X6							1
Sig							
N							15

2.2 The Multiple Regression Analysis and the Stepwise Regression is used to select variables that are the factor of the frequency of travel. It is the only one that has regressive summation and has Coefficient of Multiple Correlation or R value equals to 0.857 or $R^2$is equal to 0.734 which means frequency of travel can explain the change or scale alteration of traffic accidents to 73.40% of total value of factors. The remaining 26.60% came from other factors that are not considered after the adjustment of R^2 to R^2_{adj} (Adjusted R Square)or equal to0.713. It was shown that after adjustment of R^2, the factor of frequency of travel has impact on the scale of accidents in high level as shown in Table II.

TABLE II
MODEL SUMMARY IN MULTIPLE REGRESSION

Model	*R*	*R^2*	*Adj R^2*	*Std.Eror*
1	0.857	0.734	0.713	8.46550

TABLE III
COEFFICIENT IN MULTIPLE REGRESSION

Model	*Unstandardized Coefficients*		*standardized Coefficients*	*t*	*Sig.*
	B	Std. Eror	Beta		
Constant	-7.977	4.274		-1.866	0.085
X6	0.044	0.007	0.857	5.984	0.000

Table III showed Multiple Regression Coefficient: B of summation, is) b_0 (= -7.977 coefficient of variables X6) b_1(=0.44); therefore, regression summation will be as follow (3):

$$\hat{Y} = -7.977 + 0.044X6 \quad (3)$$

VI. SUMMARY OF RESEARCH

From the analysis of position in traffic accidents by using the Cartographic Method and environmental factors of road that can cause traffic accidents in Dusit District, only areas under the responsible of Samsen Police Station, and by using the Pearson's Product Moment Correlation Coefficient, and the Multiple Regression Analysis, indicated that Samsen Road has the highest rate of accidents, followed by connecting road or intersect by Samsen Road, which are: Ratchvithi Road, Sukhothai Road, Nakhonrachasima Road, and Amnaysongkhram Road, etc. Environmental factors of road that can cause traffic accidents in Dusit District, only areas under the responsible of Samsen Police Station, and factors of the frequency of travel are only one factors affect on the scale of traffic accidents. After considering form of distribution and environmental factors of traffic accidents in Dusit District, only areas under the responsible of Samsen Police Station, it can be clearly seen that form of distribution and factors of traffic accidents are compatible and are suitable: Samsen Road has the highest households quantity in Dusit District, and variety usage of land cause more frequencies in the road, because the frequency of travel has different characteristics. The traffic that occurs variously, such as, on footpath, bicycle, cars, motor cycle, and also big trucks, disturbs the tempo of the traffic making it too slow or rapid hence increase the risk of accidents. Reference [5] indicated that main road should be more strict about nearby land permission to connect directly or

limit the amount of direct connection at least with main road and separate land usage from traffic that is incompatible in order to reduce dispute between traffic. Reference [6] shows the imitation of accidents, using the Poisson Regression to predict the accident amount on special highway and intersection of Italy, having areas length of 142 km. Various factors are studied, such as, speed limit, traffic amount, road width, traffic channels, speed reduction ratio, core city, public parking lots, land usage, and driver's expediency. The result shows that the factor that can cause the highest risk of accidents is traffic amount, speed limit in particular areas, and the amount of road respectively.

Accordingly, the results of this research are significantly reliable and can be used for reference and further study.

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