MODEL OF OPTIMUM SIZE FOR METROPOLITAN POLICE STATIONS FOR EFFICIENCY IN CRIME PREVENTION AND SUPPRESSION[1]

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ABSTRACT

The main objective of this article is to present a model of optimum size for the police area of responsibility (AOR) by taking the factors facilitating crimes into consideration. These factors are physical, economic, social and population with radius size of service in the AOR. Realization of the capacity in patrolling and the distance to respond to a crime scene within the proper time is considered. According to the analysis, the factors facilitating crimes consist of the number of cases per area, development level, population density and types of land usage. The established model developed from an approach for determining the AOR size as to cover each group of police stations by substitution with the highest and lowest possible values of each factor into the model. This approach categorizes the crime threat into 3 levels: high, medium and low, and divides the usage of land into 8 main types: residential, commercial, industrial, mixed, public utility, public support, recreational and agricultural types. The findings are 1) high level of crime threat leads to smaller size of the AOR and 2) the AOR size varies, depending on the type of land usage: the AOR of land usage for commercial type is the smallest whilst the AOR of land usage for agricultural type is the largest.

Keywords : *policing optimum size / policing area of responsibility / police stations / Thailand*

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1. CRIME AND LOSS

Whenever crimes occur, victims face several potential losses: money, property and injuries, up to loss of life. These losses are only some of the personal losses which criminal victims directly experience. In fact, there are other losses—either personal (such as medical treatment expenses and lack of income during treatment or after death) or social losses (such as capital spent in the judicial system, losses of productivity to the social economy contributed by victims, secured investment and quality of life). It is obvious that crime rates are essential elements affecting business investment because there is more social development in safer zones. Furthermore, there are emotional losses which are incalculable. These losses consist of fear and mental anguish of victims and relatives.

Grave losses have continuously led to research and findings on crimes so as to establish countermeasures and to reduce losses to as minimal as possible. The research and findings have brought about several criminal theories. However, this study is significantly based upon the theories which are related to crime-contributing factors.

2. CRIME-CONTRIBUTING FACTORS

While discussing the factors contributing to crimes, the relevant theories of crimes should be reviewed. Starting from the theory of crime-controlled environment, Purachai Piamsomboon (2002: 25-51) stated that crimes are formed by two main factors: personal attitude and environment. An individual can possess one of several different attitudes, ranging from a pro-law attitude to an anti-law attitude. If an individual belongs to one of several different surroundings: ranging from a pro-law environment to an anti-law environment, they will behave differently in accordance with the environment. For extensive analysis on these 2 factors, other theories will be applied as follows:

2.1 Theories of personal law-violating attitude

There are several theories related to the causes contributing to a law-violating attitude. Starting from the Theory of Expropriative Crime, Cohen and Machalex (as referenced in Annop Choobumrung, 2004 : 61-62) explained that crime occurs when people try to exclude the catastrophes of life: poverty, famine or lack of solutions. If we consider this type of individual as one who fails to achieve the economic goals in society, the Strain Theory of Merton can be applied as well (as referenced in Pornchai Khantee et al, 2000 :89). This theory has the significant hypothesis that if persons are minimized by their economic opportunities, they tend to breach the law so as to improve their economic prospects.

The Strain Theory was developed into the Subculture Theory by Cohen, Cloward and Ohlin. Cohen (as referenced in Pornchai Khantee et al, 2000 :97-99) believes that social structure is a barrier which discriminates against low-class adolescents; therefore, they have the feeling that their status is deprived, leading to disappointment over their current status. This has led to a mass reaction and created a new culture that is opposed to the main social culture. Cloward and Ohlin (as referenced in Pornchai Khantee et al, 2000 :99-101) believe that law violations are, not only, caused by minimized legitimate solutions, but also, by the chance to develop capability in committing crimes.

The approach in which a person learns to be a criminal is shown by the Differential Association Theory of Sutherland (as referenced in William III and McShane, 1999 : 83). The theory is based on the interaction with other persons, such as parents, close friends, etc. The interaction will result in learning the values and techniques of crimes from these persons.

2.2 Theories of crime-facilitating environment

There are several theories related to the theory of crime-facilitating environment including theories titled Social Disorganization, Group Conflict, Concentric Circles, Deviant Neighborhoods, Routine Activities and Criminal Opportunity.

Developed by a sociologist of the University of Chicago, Social Disorganization theory underlines that the continuing social conditions of community leading to urbanization would weaken social mechanisms and cause mounting crime rates. The reason is that as more people come into a community less social interaction is initiated. In addition, the fact that new immigrants belong to different values, faiths, traditions and culture can bring about further conflicts (as referenced in Pornchai Khantee et al, 2000 :82-83).

The above-mentioned situation relates to the Group Conflict Theory of Sellin (as referenced in Regoli and Hewitt, 1996 : 251-252) that states crime is caused by norm conflicts. Norm conflicts can be categorized in reference to norms of crimes as quoted in criminal laws and norms of a group which reflect the values, expectations and daily behavior of a given group. The norms can be unique or different for each group. Consequently, once several groups emerge, conflicts among them may occur, or they may have conflicts with norms of crime. It can be assumed that crime rates increase in the area where there is a diversity of norms, and this implies increasing crime rate in cities, rather than in suburbs or in rural areas, because of increased diversity and density of immigrants.

The nature of the above-mentioned area is in accord with the "zone in transition" of the Concentric Circles Theory proposed by Park and Burgess (as referenced in Vito and Holmes, 1994 : 141-142; Pornchai Khantee et al, 2000 :78-79). This theory was applied to divide the city of Chicago by drawing semi-circle lines from the center of the city to 5 areas: central business district, zone in transition, workingmen's homes zone, residential zone and commuter zone. The fact that the zone in transition tends to be a crime-prone area is caused by the expansion of business and industry from the central business district. Consequently, the law governing city zoning must be amended in accordance with the changes. If the residents who can afford enough to live in other areas move out, this area will become deserted and so cheap that various types of immigrants: foreigners, uptown people or low-income people are attracted to move into the zone in transition. As a result, the relationships among residents and social mechanisms are gradually weakened until a chaotic situation occurs. The chaotic situation brings about crimes and the problem will persist even when the old residents have moved out and the new ones have replaced them. The reason is that there are still operating factors in the nature of the changed area namely, poverty, population density or overcrowding, mixed-use of land, immoral residents and police negligence. These factors are articulated by the Deviant Neighborhoods Theory developed by Stark (as referenced in Vito and Holmes, 1994 : 143-144). This theory states that the area environment (physical, economic, social conditions and population density) determines crime rates. Crime rates are usually high in the low-income residential areas; however, if the density, the overcrowding and the immorality of the residents within an area are lowered with full attention by police officers, it is likely that the crime rates will be lower than an area with the opposite situation.

According to the Routine Activities Theory of Cohen and Felson, the factor of police attention plays a significant role in reducing crime rates (as referenced in Regoli and Hewitt, 1996 : 126-127). This theory states that crime is caused by the following factors: 1) crime-inclined individuals and motivations 2) proper targets or victims 3) lack of crime prevention officers. Under this theory, the routine activities of individuals can bring about various types of crimes since it is easier for criminals to observe opportunities and then plan to commit crimes. Nevertheless, self-motivated criminals normally tend to commit crimes. Crime possibilities can become higher when the number of proper targets increases. Consequently, if more officers are put into critical areas, crime rates will be reduced.

The situation can be explained further by the Criminal Opportunity Theory proposed by Cook (as referenced in Regoli and Hewitt, 1996 : 127). The theory states that criminals tend to choose specific victims in order to gain higher remuneration while requiring less effort and a lower risk of prosecution.

Under the theories of crime-facilitating environment, it is evident that environment can influence the pro-crime attitude of individuals. A troubled environment is the predominate factor in individual attitude: it causes individuals to have an anti-social attitude, because environment is a significant factor in determining or establishing individual attitudes. By applying the concept of awareness spaces, the close relationship and link between criminal attitude and criminal environment becomes obvious. The concept stresses that criminals usually commit crimes in a familiar area or "awareness space". Awareness space is basically an area close to the area that forms the criminal attitude and lacks protectors.

Chainey and Ratcliffe (2005 : 97) stated that criminals basically have the same daily life as other people. While traveling for activities, they will form a cognitive map of places, routes and links between places and routes. Within the cognitive map, criminals feel familiar and comfortable with this particular area. This forms awareness spaces for criminals. In such areas, criminals will look for opportunities to commit crimes. However, awareness spaces will not always facilitate crime commission, especially if there are safety guards in such areas. For this situation, Brantingham and Brantingham (as referenced in Chainey and Ratcliffe, 2005 : 97) established a hypothesis that crimes always occur at the crime-facilitating areas within the awareness spaces.

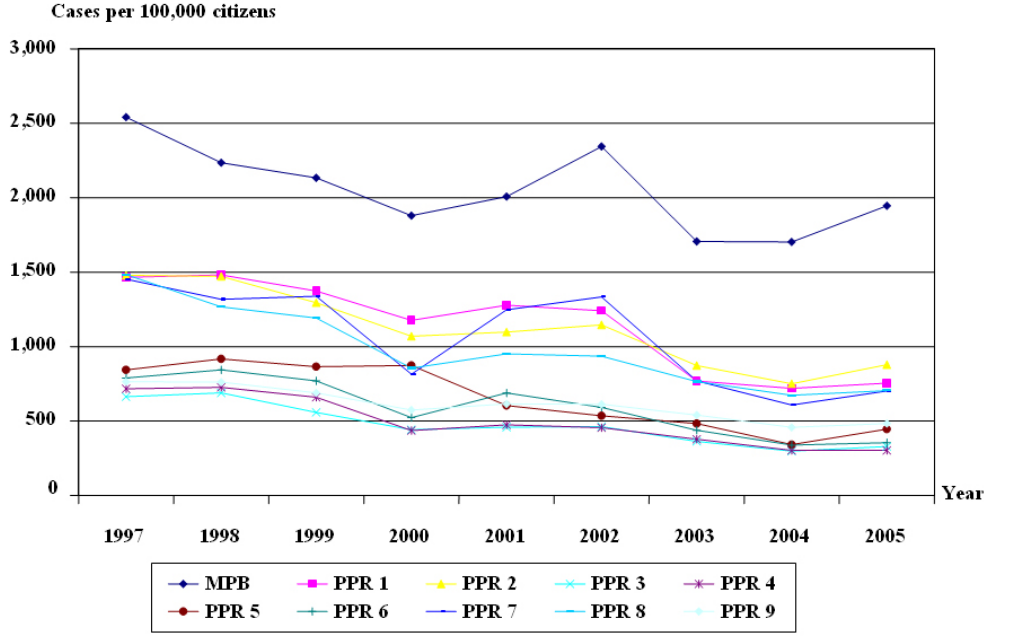
3. CRIME SITUATION IN THAILAND

For this topic, crime rates are applied to illustrate the overall phenomena of the crime situation in Thailand. At the beginning of the topic, the AOR of each police unit is presented to facilitate better understanding.

The Metropolitan Police Bureau (MPB) is responsible for maintaining peace and order in the Bangkok Metropolitan Area (BMA). It assigns the area of responsibility (AOR) to 9 divisions (Metropolitan Police Division or MPD 1-9). Each MPD administratively oversees 8 to 11 police stations which directly serve the public in its AOR. Currently, there are 88 police stations under the MPB. However, the AOR of each police station is not in accordance with the AOR of the administration of the Bangkok Metropolis.

In provinces, the responsibility for securing public peace and order is assigned to Provincial Police Regions (PPR) 1-9. Each PPR oversees a Provincial Police Region in its AOR and each Provincial Police Region oversees district and/or sub-district police stations which are the major entities of crime prevention and suppression that directly serve the public. The AOR of district and sub-district police stations is in accord with the local administrative areas.

As shown in Diagram 1, the data of crime reports in each police AOR reflects that crime tendency is obviously related to urbanization. In other words, Bangkok, the capital city of Thailand, the most developed, densest and most land employed city, has the highest crime rates in Thailand. During 1997-2005, MPB got the highest record of crimes reported as 1,703 – 2,541 cases per 100,000 citizens whereas another PPR had the second highest number of crimes reported for each different year. For example, in 1997, PPR 8 responsible for the upper region of the South had the second place in high crime reports. During 1998-2001, this occurred in PPR 1 responsible for Bangkok contiguous areas and the upper part of the Central region, and in 2002, it was PPR 7, responsible for Bangkok contiguous areas, lower part of the Central region, and the Western region. During 2003 -2005, it was PPR 2, which is responsible for the Eastern region. However, the number of crime reports in these PPR is much lower than that of MPB: 750 – 1,484 per 100,000 citizens.



This situation of crime occurrence is similar to other countries where the crime rates develop as per the size of the city. Glaeser and Sacerdote (as referenced in O'Sullivan, 2000 : 681) cited three reasons for high crime rates in big cities: 1) criminals gain higher remuneration from crimes 2) criminals have lower risks of arrest due to overcrowding and non-cooperative attitudes of the public 3) city overcrowding makes adolescents from troubled families tend to be criminals because of a lack of skills and lower morality.

Focusing on the 5 major zones[2] of BMA—inner city area, eastern urban fringe area, western urban fringe area, eastern suburb area and western suburb area—crime reports in the year 2003 reveal that the inner city area has the greatest number of reports on crimes against property and crimes against life and limb, 8,331 and 3,201 cases, respectively. Urban fringe areas and suburban areas had fewer cases reported; however, the eastern side of both areas had greater number of crimes than the western sides. Considering the number of cases reported in each area, it was found that the order of density of 2 types of crimes ranged from the highest to the lowest as previously ranged, except for the suburban areas, where it was found a higher number of crime reports per square kilometer at the western side than at the eastern side: 3.81 cases per sq.km. and 1.78 cases per sq.km. for crimes against property and 2.41 cases per sq.km. and 1.21 cases per sq.km. for crimes against life and limb.

As mentioned above concerning the crime situation in Bangkok, it can be assumed that the inner city area is the highest risk area for crimes while the second highest places are in urban fringe areas or in-between areas; the lowest risk areas are the suburbs. In analyzing the crime situation along with the general situation of an area, there was found correlations to the Social Disorganization Theory, the Group Conflict Theory, Concentric Circles Theory and the Deviant Neighborhoods Theory, as previously mentioned. In other words, the inner city area consists of police stations in areas where most land is mixed use have a medium to high level of development and a high population density. In urban fringe areas, overall, police stations in areas where most land usage is for recreation have medium levels of development and low population density. While considering the different aspect of areas, it was found that police stations in western urban fringe areas where most land usage is for residential purposes have medium to low levels of development, while the police stations in the eastern urban fringe areas have medium to high levels of development. For the police stations in suburb areas, overall, most land usage is agricultural type with low levels of development and low population density. However, in the western suburbs, some land is used for industrial purposes.

To analyze the crime situation based on crime scenes, the view from police officers and sentenced prisoners must be taken into account. The author has collected 449 samples from police officers from 88 police stations and 338 samples of sentenced prisoners committing crimes against property and crimes against life and limb. This is categorized as follows:

3.1 For crimes against property

Police officers define residential areas of middle-class citizens as prone to crimes against property. Under the Routine Activities Theory and the Crime Opportunity Theory, it can be inferred that criminals can easily observe the residents' activities and can penetrate these areas more easily than high-income residential areas possessing tighter security measures. While the low-income residential areas can be very easily penetrated, crime is less profitable. The

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[2] *BMA has been divided, in accordance with the research on the project of the city plan and information technology on land, as inner city, urban fringe (eastern and western) and suburb (eastern and western) areas. This was determined by various factors: 1) the past development of the city and city expansion 2) location and geographic attributes 3) number of population and density 4) land use and buildings 5)transportation network 6) distance from the center and 7) remaining free-space and agricultural area compared with the city area.*

commercial area also attracts criminals, but it is harder to penetrate because of tighter security measures and a high risk of being arrested. This is in accord with the information obtained from sentenced prisoners who stated that the nature of middle-class residential area facilitates crime and escape. Therefore, a middle-class residential area is prone to crimes against property. While discussing crime scenes, police officers observed that crimes against property always occur on sidewalks and shortcut routes because of greater opportunities to encounter victims being both an environment conducive to the commission of crimes and enabling escape from the crime scenes. According to the views of police officers, the most risky place is an isolated one because most crimes against property are usually committed in the kind of place where a lack of observation facilitates the crime.

3.2 For crimes against life and limb

Crimes against life and limb always occur in the low-income residential areas because this type of area facilitates the crime by allowing easy opportunities to encounter victims, commit the crime and escape. This situation is in accordance with several theories: the Social Disorganization Theory, the Group Conflict Theory, the Concentric Circles Theory, the Deviant Neighborhoods Theory and the Subculture Theory. This type of area is disorganized by the influx of immigrants and the diversity of the population that easily bring about conflicts. Moreover, the minors of low-income citizens tend to form gangs and fight with each other. They have a misguided belief that fighting between gangs is respectable within their group and among peers. The sidewalk and shortcut routes are the highest risk areas for crimes against life and limb, while a crowded, dense and dark area facilitates these types of crimes. In addition, the sentenced prisoners noted that the increased distances between police stations also facilitate crime commission in meeting victims, committing crimes and escaping the crime scene.

4. FACTORS AT POLICE-STATION LEVEL THAT FACILITATE CRIME

The following factors were evaluated to whether they facilitate crimes and how they might facilitate crimes: development level, number of population, land usage and the size of AOR. For development level, the score was taken from a number of social and economic activities in the AOR[3], such as banks and financial institutions, industrial plants, hotels, attractions, international organizations, cinemas, entertainment locations, gas stations, department stores, shopping malls, goldsmith shops, pawn shops and apartments. For number of population, the high, medium or low number of population was into account. For the land usage, the types of usage whether residential, commercial, industrial, mixed, public utility, public support, recreational or agricultural was considered by comparison with overall land usage in the BMA. For the size of the existing AOR, the police service areas were measured in square kilometers.

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[3] *As applied under the criteria of area development evaluation for the classification of police stations*

Taking an overall look at the above-mentioned factors, there are differences in each police station. For example in the year 2003, the Bangkhaen police station's AOR had the highest population of 187,179 citizens, while the Lamhin police station's AOR had the lowest population of 10, 073 citizens. The Kannayao police station had the largest AOR of 77.54 Sq.km. while the Chakawat police station had the smallest AOR of 0.64 Sq.km. The differences in these factors results in different crime rates for each police station. This issue will be analyzed by the type of crimes.

4.1 For crimes against property

The multiple regression analysis shown in Table 1 reflects the factors at police-station level as applied to the analysis concerning development level, number of population, land usage and the size of the AOR that results in the occurrence of crimes against property with statistical significance at a designated level of 0.05. These factors can explain the changes of crime occurrence against property up to 87%, by considering the multiple coefficient of determination (R2) which is equivalent to 0.870.

Under the multiple regression analysis, it can be interpreted that a police station oversees the high-level developed area with a large number of population, usage of land for commerce and a large AOR tends to have more crimes against property than other police stations with different attributes. This fact is indicated by the positive multiple regression coefficients and the large size of the multiple regression coefficients in the use of land for commerce.

Table 1. Factors contributing to crimes against property

Variables	Coefficients (b)	T	Sig.t.
Development level	0.925	5.072	0.000
Size of AOR	1.430	2.835	0.006
Overpopulation	93.007	3.527	0.001
Major land use			
Commercial	153.335	3.808	0.000
Industrial	82.253	2.572	0.012
Mixed	53.246	2.095	0.039
Public utility	90.629	2.438	0.017
Public support	86.958	2.467	0.016
Recreational	144.831	4.015	0.000
$R^2 = 0.870$ SEE = 95.122 F = 57.340 Sig. of F = 0.000 Durbin-Watson = 2.003			

The relevant theories can explain what results when an increased development level in an area attracts people to move in and to live independently in a city lifestyle. A conflict may occur due to the diversity of values, faiths, traditions and cultures. The crime situation will be worsened by overcrowding, conflicts in the independent-living area as mentioned by the Social Disorganization Theory, the Group Conflict Theory and the Deviant Neighborhoods Theory. For the usage of land, this can reflect the activities of the area and link to the nature of victims or targets. Moreover, the nature of land usage, such as the changing land usage, is mentioned in the Concentric Circles Theory as a crime-prone area. However, the changed land use that tends to become mixed usage of land is mentioned in the Deviant Neighborhoods Theory as a crime-facilitating factor by the nature of resident relocation. The size of the AOR will reflect the police capacity in serving the public. If the AOR is too large, police officers cannot respond to the public efficiently and lower efficiency facilitates crime commission as mentioned in the Routine Activities Theory. If the above-mentioned situation persists, the area will have crimes consistent with those mentioned in the Deviant Neighborhoods Theory.

4.2 For Crimes against life and limb

The multiple regression analysis shown in Table 2 reflects all the factors at police-station level as applied to the analysis concerning development level, number of population, land usage and size of AOR that results in occurrence of crimes against life and limb with a statistical significance at the designated level of 0.05. These factors can explain the changes of crime occurrence against life and limb up to 82.9%, by considering the multiple coefficient of determination (R2) which is equivalent to 0.829.

Under the multiple regression analysis, it can be interpreted that a police station that oversees the high-level developed area with a large population, usage of land for industrial purpose and a large-sized of AOR tends to have more crimes against life and limb than other police stations with different attributes. As explained in the analysis on factors facilitating crimes against property, the high-level development area attracts people to move in, especially in the industrial area. Conflicts may occur due to the diversity of people with different values, faiths, traditions and cultures. The conflicts may lead to fights, and finally, crimes against life and limb.

Table 2. Factors contributing to crimes against life and limb

Variables	Coefficients (b)	t	Sig.t.
Development level	0.462	8.329	0.000
Size of AOR	1.218	5.318	0.000
Overpopulation	40.048	3.409	0.001
Major land use			
Industrial	40.182	2.802	0.006
Public utility	39.115	2.433	0.017
Public support	33.544	2.192	0.031
$R^2 = 0.829$ SEE = 43.703 F = 64.570 Sig. of F = 0.000 Durbin-Watson = 1.994			

As in the analysis of crime-facilitating factors, it is significant that the quickest way to reduce crime rates is to determine the optimum size of the AOR.

5. MODEL OF OPTIMUM SIZE OF THE AOR

The relationship between the AOR size and efficiency in serving the public is the main issue that police officers and public are concerned. From the data obtained from 449 samples of police officers and 3,015 samples of Bangkok residents, it was found that 90% of the samples from both groups commented that the size of the AOR for police stations affects the efficiency in crime prevention and suppression. If a police station has the optimum size of the AOR, it will enable police officers to be efficient in preventing and suppressing crimes. Thus, this state of optimum size AOR will ensure public security.

In determining the optimum size of the AOR, police officers opine that the distance and estimate of time of arrival at each spot within the AOR must be prioritized. In other words, the capacity in securing the area for crime prevention, and capacity in responding to crime scenes for crime intervention and prosecution must be taken into account. The public focuses on the population density and number of cases which reflects that the public are concerned about the service capacity of police officers to ensure total public security.

The view on factors involved in the determination of the AOR size for a police station, from both police officers and Bangkok residents, along with area factors facilitating crime occurrence, was taken into consideration in the analysis for syntheses of a model of optimum AOR in response to the efficiency in crime prevention and suppression. As shown in Table 3, the factors with statistical significance at designated level 0.05 consists of number of cases per area size, development level, population density and primary usage of land. These factors can explain the changes of optimum service radius up to 80.9%, by considering the multiple coefficient of determination (R2) which is equivalent to 0.809.

Table 3: Factors contributing to the designated of police station radius

Variables	Coefficients (b)	t	Sig.t.
Number of cases per area	-0.009	-5.969	0.000
Development level	-0.004	-5.180	0.000
Population density	-2.18E-005	-2.131	0.036
Major land use			
Residential	-0.801	-3.903	0.000
Commercial	-0.932	-4.408	0.000
Industrial	-0.795	-4.298	0.000
Mixed	-0.898	-4.349	0.000
Public utility	-0.923	-4.413	0.000
Public support	-0.892	-4.168	0.000
Recreation	-0.820	-4.148	0.000
Intercept	3.673	29.004	0.000
$R^2 = 0.809$ SEE = 0.415 F = 31.711 Sig. of F = 0.000 Durbin-Watson = 1.873			

Source: from multiple regression analysis results

According to the analysis in Table 3, a model for determining the optimum size may be synthesized as follows:

R= 3.673 - 0.004G_level - 0.0000218P_den - 0.009Tc_area - 0.801R_lu - 0.932C_lu - 0.795I_lu - 0.898M_lu - 0.923Pu_lu - 0.892Ps_lu - 0.820Rl_lu

Whereas

R	=	Radius of police service area
G_level	=	Growth level or level of development of the area
P_den	=	Population density
Tc_area	=	Number of criminal cases per area
R_lu	=	Major land usage for residential type
C_lu	=	Major land usage for commercial type
I_lu	=	Major land usage for industrial type
M_lu	=	Major land usage for mixed type
Pu_lu	=	Major land usage for public utility type
Ps_lu	=	Major land usage for public support type
Rl_lu	=	Major land usage for recreational type

The model implies that a police station oversees the high-level developed area with high population density and large number of cases per area tends to be designated with a smaller service radius, compared within the group of police stations with the same major land usage. This fact is displayed in the negative multiple regression coefficients. In relation to the land usage, compared within the group of police stations which are prone to other types of crimes, it was found that a police station with major land usage for commerce tends to be designated with the smallest size service radius because the analysis result shows the most negative

multiple regression coefficient. Whereas a police station with major land usage for agricultural purpose tends to be designated with the largest service radius since there are no negative multiple regression coefficients moved out of balance, unlike other purposes for land usage.

6. APPROACH IN DETERMINING OPTIMUM SIZE OF POLICE STATIONS' AOR AND THE RELEVANCY

Since crimes enormously threaten public security and property, many counter-measures are being established. The incentive of counter-measures is for public safety and reducing the budget for crime suppression. There are several crime counter-measures based on the social and economic aspects of each country, for example, the U.S. focuses on crime prevention by using a patrol system, Japan focuses on public service by using police boxes, etc. Thailand applies a mixed model of crime prevention from various countries including a patrol system and a public service system. However, in reality, the limitation of budget and manpower is a very important issue that impacts on the efficiency of crime prevention.

The efficiency of crime prevention and suppression depends on many factors. One of key factors is the size of police stations' AOR. The determination of the AOR size is varied by specific character, which is composed by these factors: geography, economy, society and population, of each area. Therefore, each area has different factors contributing to crimes. When analyzing the crime-facilitating factors of each police station's AOR with the number of crime reports on crimes against property and crimes against life and limb, it can be classified the crime threats into 3 levels: high, medium and low. It is found that in some police stations, the level of crime threat is different from the neighboring: from low level to high level. This is caused by different crime-facilitating factors of each AOR. Observe the crime threat level of each police station as shown in Figure 1.

Replacing within the model of optimum size of the AOR the number of criminal cases per area, development level and population density, ranging from highest values to lowest values of crime threat (3 levels: high, medium and low) and the different type of land usage, establishes a method in determining optimum size of the AOR that is efficient in crime prevention and suppression by classifying crime-threat level and usage of land in such areas as shown in Table 4. The data concerning the service radius (r) was obtained from the calculation of the model's variables, then the data concerning the AOR size was calculated by using the circle space formula (πr^2).

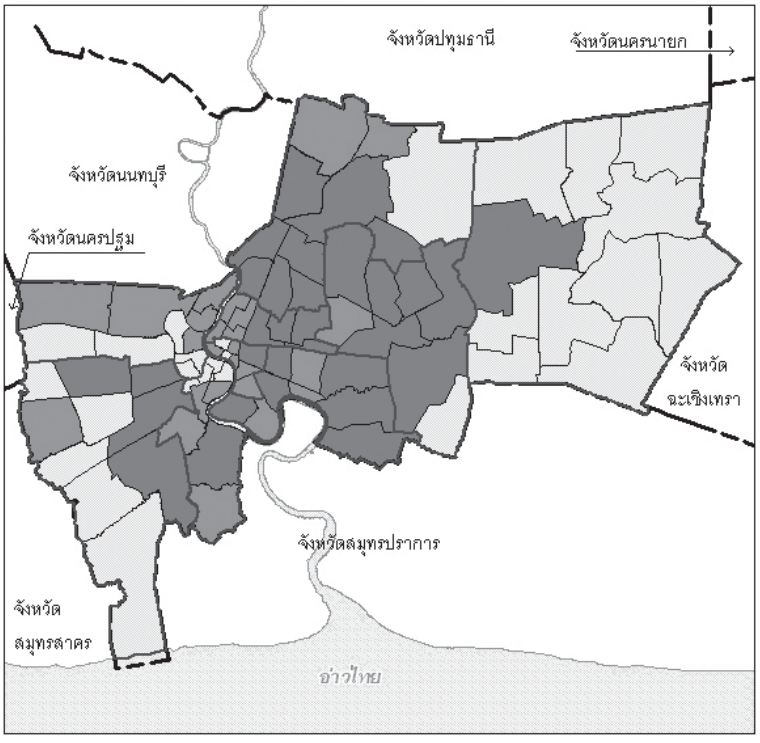

Figure 1: Source: Developed from the Bangkok Metropolitan Map of the Royal Thai Police with the result analyzed by the author using MapInfo, Version 8

Table 4. Sizes of the AOR

Type of land usage	Level of threat		
	High	Medium	Low
Residential			
Radius size	0.898 – 1.677	1.936 – 2.274	2.626 – 2.796
Area size	2.535 – 8.836	11.782 – 16.253	21.680 – 24.578
Commercial			
Radius size	0.767 – 1.546	1.805 – 2.143	2.495 – 2.665
Area size	1.850 – 7.509	10.242 – 14.434	19.571 – 22.329
Industrial			
Radius size	0.904 – 1.683	1.942 – 2.280	2.632 – 2.802
Area size	2.569 – 8.899	11.855 – 16.339	21.779 – 24.684
Mixed			
Radius size	0.801 – 1.580	1.839 – 2.177	2.529 – 2.699
Area size	2.017 – 7.843	10.631 – 14.896	20.108 – 22.902
Public utility			
Radius size	0.776 – 1.555	1.814 – 2.152	2.504 – 2.674
Area size	1.893 – 7.597	10.344 – 14.556	19.713 – 22.480
Public support			
Radius size	0.807 – 1.586	1.845 – 2.183	2.535 – 2.705
Area size	2.048 – 7.903	10.701 – 14.978	20.204 – 23.004
Recreational			
Radius size	0.879 – 1.658	1.917 – 2.255	2.607 – 2.777
Area size	2.429 – 8.637	11.552 – 15.983	21.367 – 24.245
Agricultural			
Radius size	1.699 – 2.478	2.737 – 3.075	3.427 – 3.597
Area size	9.074 – 19.295	23.547 – 29.719	36.920 – 40.674

Source: Calculated by equation of multiple regression analysis on factors contributing to the determination of radius size
Note: The measurement of radius size is in kilometer, area size is in Sq.km.

According to the determinant guidelines as shown in Table 4, the size of the AOR has an opposite relationship with the crime threat of the area. This means that the AOR with a high-level of crime threat will have a smaller sized AOR than the AOR with a low-level of crime threat. Similarly, when considering type of land usage, for example, the police station's AOR for an area with residential type of land usage with a high level of crime threat the AOR will be 2.535 – 8.836 Sq.km. If that area has a medium or low level of crime threat, the AOR will be 11.782 – 16.253 Sq.km. or 21.680 -24.578 Sq.km., respectively. When considering the level of crime threat, the AOR of land usage for commercial type is the smallest one. The size of AOR will increase based on the type of land usage accordingly for public utility, mixed, for public support, recreational, residential and industrial types. The largest AOR is the one for agricultural land usage. The difference in size of the AOR with commercial and agricultural land usage ranges from 1.850 -7.509 Sq.km. to 9.074 – 19.295 Sq.km., respectively.

Apart from the approach in determining optimum size of the AOR, there is another approach to develop efficiency in crime prevention and suppression, namely, optimum jurisdiction. Since Bangkok is the only province of which the police jurisdiction is different from local administration jurisdiction, this always confuses Bangkok citizens who are not familiar with the area and causes problems in reporting criminal cases. The ambiguous division of jurisdiction sometimes confuses police officers about their AOR, therefore the public outreach is intervened and the crime rates increase.

The information given by police officers and the public shows that the determination of police jurisdiction should depend on the nature of the community; the same community should be in the corresponding police jurisdiction. Furthermore, the views of police officers shows that the AOR border should be marked by physical features as roads, rivers or canals, while the public prioritizes the nature of local administration to mark the police jurisdiction. The idea of marking police jurisdiction based on local administration is argued against by police officers because of the oversize of local administration and its unclear jurisdiction.

7. ASSESSMENT ON THE OPTIMUM SIZE AND PRACTICABILITY OF AN APPROACH IN DETERMINING POLICE AOR

To ensure the compatibility of an approach to determine the AOR size, the assessment on the optimum size and practicability was implemented by finding the consensus with median and range between quartiles. The author applied purposive sampling for the assessment. The 252 samples consist of police officers with the position of Deputy Superintendent and Deputy Inspector, who are in charge of crime prevention and suppression, and patrol team leaders. The sampling excluded 4 police stations which have a waterway AOR: Bangpo, Bawornmongkol, Pakklongsan and Bangkorlam police stations. The author used questionnaires as a tool to collect data for consensus analysis. The questionnaires consisted of questions on the optimum and practicability of the approach with 5 rating scales.

The analysis on the overall median showed that the approach is optimum at the high level; half of the determinant guidelines on practicability were at the high level while the others were at the medium level. The determinant guidelines with medium level of practicability fell on the group of AOR with recreational, agricultural, public utility and public support types of land usage.

When assessing the optimum and practicability of the approach by evaluating service radius size of AOR with the same level of crime threat and same types of land usage, it showed the optimum at the high to highest level. The highest level of optimum was presented by the AOR of land usage for commercial type with a high level of crime threat and the AOR of mixed land usage with a medium level of threat and the AOR of industrial and public support land usage with a low level of threat. Regarding the practicability, it showed the medium to highest level of practicability. The medium level of practicability was presented by the AOR of land usage for residential type with medium level of threat, while the highest level was presented by AOR of land usage for commercial type with high level of crime threat and the AOR of land usage for industrial type with low level of threat.

Considering the above-mentioned medians together with quartile ranges it can be concluded that there is consensus within the overall sample group, and also within the specific sample group for the appropriateness of the determining guidelines obtained from the optimum size model. Thus, it is recommended that the model be applied.

8. CONCLUSION

This article presents the model of optimum size of police stations' AOR by considering the efficiency in crime prevention and suppression. The discussed issues are losses caused by crimes—economic loss (individual and social loss) and emotional loss.

After that, the discussed issues were factors contributing to crimes by referencing theories and the crime situation in Thailand. According to crime data, it was found that there is a relationship with Bangkok's urbanization. Bangkok has the highest ratio of crimes per 100,000 citizens. The inner-city area has the highest level of crime threat while the urban fringe areas and suburb areas have lower levels of threat than the inner city.

After the crime situation, it was discussed about the crime threat by area and environment facilitating crimes against property and crimes against life and limb. The area of middle-class residents, the sidewalks and shortcut routes that were isolated had the high level of threat of crimes against property. While the areas which has the high level of threat on crimes against life and limb were the low-income residential areas, sidewalks and shortcut routes that were crowded.

Apart from the factor facilitating crimes, there is an analysis on the factors contributing to crime threats in the AOR. It was found that the following factors were related to crime threats: development level, population density, land usage and the AOR size. The AOR size is regarded as the key factor in this study because it can be presented as an approach to control crimes. Under the consensus of public and police officers, the optimum size of AOR enables the efficiency of crime prevention and suppression.

Regarding the optimum size of the AOR, the author made an analysis and presented the model in determining service radius of the AOR. The factors brought into the analysis are number of cases per area, development level, population density and land use. The author eventually replaced the values of highest and lowest practicability into the model by classifying the threat level and types of land usage, in order to obtain the approach in determining the optimum size of the AOR.

REFERENCES

Annop Choobumrung. (2004). *Crimes and Solution.* Bangkok: Political Science and Public Administration Section, Faculty of Social Science, Kasetsart University. (Photocopy)

Bangkok Metropolitan Administration, Department of City Planning. (1999). *Bangkok General Plan.* (1st Amendment). Bangkok: Department of City Planning, Bangkok Metropolitan Administration.

Bangkok Metropolitan Administration, Department of Strategy and Valuation (2004). *Statistics of Bangkok Metropolitan: Year 2003.* Bangkok: Department of Strategy and Valuation, Bangkok Metropolitan Administration.

Chainey, S., and Ratcliffe, R. (2005). *GIS and Crime Mapping.* Chichester, West Sussex, England: John Wiley & Sons.

Department of Provincial Administration. (2004). *Compilation of Civil Registration: Year 2003.* Bangkok: Department of Internal Security Volunteer Press.

Department of Provincial Administration. *Thailand Population by Provinces.* [Online]. Source: http://www.thaienvimonitor.net. [2006, June 10]

O'Sullivan, A. (2000). *Urban economics.* Boston: McGraw – Hill.

Pornchai Khantee et al. (2000). *Theory and Research on Crime.* Bangkok: Booknet.

Prasert Boonnirun and Charoon Ngamsombat. (n.d.). *International Police System.* Bangkok: Sutrpaisarn Press.

Purachai Piamsomboon. (1983). *Japanese Police : The Views from the Past to Present.* Bangkok: Faculty of Public Administration, National Institute of Development Administration.

Purachai Piamsomboon. (2002). *Crime control by Environment: Theory and Measure Bangkok:* Bannakit Press 1991.

Regoli, R.M., and Hewitt, J.D. (1996). *Criminal Justice.* New Jersey: Prentice-Hall.

Royal Thai Police. Metropolitan Police Bureau. (2004). *Report on Crime Prevention and Suppression (5 categories) of Metropolitan Police Bureau: Year 2003.* Bangkok: Royal Thai Police.

Royal Thai Police. Metropolitan Police Bureau. (2006). *Statistics on Major Crimes of Metropolitan Police Bureau and Provincial Police Region 1-9.* Bangkok: Royal Thai Police.

Royal Thai Police. Personnel Bureau. (n.d.) *Criteria and Method to Classify Police Stations.* Bangkok: Royal Thai Police. (Photocopy)

Vito, G.F., and Holmes, R.M. (1994) Criminology: *Theory, research and policy.* Belmont, California: Wad & worth.

Walker, S. (1999). *The Police in America.* Boston: McGraw – Hill.

William III, F.P., and McShane, M.D. (1999) *Criminological Theory:* 3rd ed. New Jersey: Prentice-Hall.