EXPLORING CRIME IN A SPATIAL AND TEMPORAL CONTEXT: SUITABLE RESPONSE STRATEGIES FOR URBAN PLANNING AND POLICING BY THE CASE OF ETLİK POLICE STATION ZONE

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ABSTRACT

EXPLORING CRIME IN A SPATIAL AND TEMPORAL CONTEXT :
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This study explores incidents in a *spatial* and *temporal* context to achieve suitable strategies for urban planning and policing in crime prevention/reduction. For this purpose, "*space*" and "*time*" related incidents are analyzed through "*new crime ecology*" theories within the designed "loose-coupled" GIS-based system at "mezo"-"micro" ecological levels in a case area within Ankara Metropolis, in 2000. Its main argument is that incidents display differences in the *spatial* and/or *temporal* distribution among *planned*, *squatter*, and *in-transition* settlements. In exploring distribution of incidents at *global* and *local scales*, it also searches the validity and *critical* adaptability of the *new theories* developed/practiced in North American and European countries.

In line with *new theories*, incidents at *global scale* displayed clustering in *space* and *time*. Generally, incidents in aggregate, concentrated mostly in *planned*; less in *in-transition*; least in *squatter* areas; and particularly during spring-summer months. However, incidents against people and against property predominated respectively in *squatter* and *planned* areas, and between 18:00-00:00, and 00:00-08:00. As for *local scale*, incidents in aggregate, displayed *spatial interaction* (*clustering*), but no *space-time interaction*. *Spatial* distribution in *time* suggested that incidents persistently occur mainly in *planned* areas.

Incidents against property displayed highest level of *spatial*, and also *temporal clustering* at *global scale*; and particularly *spatial clustering* (particularly for commercial burglaries/thefts) and *space-time clustering* (for residential burglaries) at *local scale*. Complementarily, relatively homogenous *global scale spatial* distribution of incidents against people is accompanied by their non *local scale spatial clustering* or *space-time clustering*, whereby *space-time dispersion* was observed for simple batteries.

Keywords: Loose-coupled GIS-based system, crime pattern analysis, new (place-based) crime ecological theories, 'planning/designing out crime', community policing.

ÖZ

SUÇUN MEKAN VE ZAMANDA İNCELENMESİ :
ETLİK KARAKOL BÖLGESİ ÖRNEĞİYLE
KENT PLANLAMA VE POLİSLİĞİ İÇİN UYGUN KARŞI STRATEJİLER

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Bu çalışmada, suçun önlenmesi/azaltılmasında kent planlama ve polisliği için uygun stratejiler bulunması amacıyla, olaylar *mekanda* ve *zamanda* incelenmektedir. Bu doğrultuda, "*mekan*" ve "*zaman*" ile ilgili olaylar, *yeni suç ekolojisi kuramları* kullanılarak, tasarlanan gevşek-birleşimli CBS-tabanlı sistemde "mezo"-"mikro" ekolojik düzeylerde Ankara Büyükşehri içindeki bir çalışma alanında 2000 yılı için çözümlenmektedir. Çalışmanın temel savı, olayların *mekandaki* ve/veya *zamandaki* dağılımının *planlı*, *gecekondu* ve *dönüşen* yerleşimlerde farklılık göstermesidir. Çalışmada olayların dağılımı *genel* ve *yerel ölçekte* incelenirken Kuzey Amerika ve Avrupa Ülkeleri'nde geliştirilen/uygulanan *yeni kuramların* geçerliliği ve *eleştirel* bakışla uyarlanabilirliği de araştırılmaktadır.

Yeni kuramlarla uyumlu olarak, *genel ölçekte* olaylar*, mekanda* ve *zamanda* kümelenme göstermiştir. Olaylar birlikte değerlendirildiklerinde, genel olarak; en çok *planlı, daha az dönüşüm*, en az da *gecekondu* alanları ile özellikle bahar-yaz aylarında yoğunlaştıkları görülmüştür. Şahsa karşı ve mala karşı olaylar ise, sırasıyla; *gecekondu* ve *planlı* alanlarda ve 18:00-00:00 ile 00:00-08:00 arasında etkili olmuştur. *Yerel ölçekte*, olaylar birlikte ele alındığında, *mekansal etkileşim* (*kümelenme*) göstermiş, ancak *mekan-zaman etkileşimi* göstermemişlerdir. *Zaman* içindeki *mekansal* dağılım, olayların genellikle *planlı* alanlarda tekrarlandığına işaret etmiştir.

Mala karşı olaylar, *genel ölçekte*, *mekanda* ve ayrıca *zamanda* en yüksek düzeyde kümelenirken, *yerel ölçekte* özellikle *mekansal kümelenme* (özellikle işyerinden hırsızlıklarda) ve *mekan-zaman kümelenmesi* (evden hırsızlıklarda) göstermiştir. Bunu tamamlayan şekilde, *genel ölçekte* göreceli olarak homojen *mekansal* dağılım gösteren şahsa karşı olaylar, *yerel ölçekte mekansal kümelenme* veya *mekan-zaman kümelenmesi* göstermemiş ve bununla birlikte darp olaylarında *mekan-zaman ayrışması* gözlemlenmiştir.

Anahtar Kelimeler: Gevşek-birleşimli CBS-tabanlı sistem, suç dağılımı analizi, yeni (yer-tabanlı) suç ekolojisi kuramları, “suçun planlamayla/tasarımla giderilmesi”, toplum polisliği.

In loving memory of my mother

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AB: Aggravated battery

AMA: Ankara Metropolitan Area

ANOVA: Analysis of variance

AT: Auto theft

ATM: Automated Teller Machine

AWSW: Ankara Water and Sewage Works

BEMTAP: *Bursa Emniyet Müdürlüğü Teknolojik Adaptasyon Projesi*
(Bursa Police Department Technological Adaptation Project)

BUTKID: *Bursa Trafik Kazalarını İnceleme ve Değerlendirme Projesi*
(Bursa Traffic Accidents Inspection and Evaluation Project)

CADMC: Computer Aided Dispatching and Management Center

CBD: Central Business District

CBS: Coğrafi Bilgi Sistemi

CB/T: Commercial burglary/Theft

CCTV: Closed Circuit Television

CFS: Calls For Police Service

CGT: Criminal Geographic Targeting

CoV: Coefficient of Variation

CPTED: Crime Prevention Through Environmental Design

CSR: Complete Spatial Randomness

CTR: Complete Temporal Randomness

df: Degrees of freedom

EPS: Etlik Police Station

EPSZ: Etlik Police Station Zone

FBI: Federal Bureau of Investigation

DV: Domestic violence

GIS: Geographic Information System

GPRS: General Packet Radio Service

GPS: Global Positioning System

iape: Incidents against people

iapp: Incidents against people and property

iapr: Incidents against property

ICS: Index of Cluster Size

ID: Index of Dispersion

LQC: Location Quotient of Crime

MI: Mantel Index

MOBESE: *Mobil Elektronik Sistem Entegrasyonu* (Mobile Electronic System Integration)

NGO: Non-governmental organization

NND: Nearest Neighbour Distance

NNI: Nearest Neighbour Index

PC: Personal computer

R: Study area

RB: Residential burglary

RDBMS: Relational Database Management System

SB: Simple battery

SCP: Situational Crime Prevention

SDD: Standard Distance Deviation

SDA: Spatial Data Analysis

SIS: State Institute of Statistics

SPSS: Statistical Package for the Social Sciences

STAC: Spatial and Temporal Analysis of Crime

TCC: Turkish Criminal Code

TFA: Theft from auto

TFP / R: Theft from person / Robbery

VMR: Variance-Mean Ratio

CHAPTER 1

INTRODUCTION

Background. The cities, which were once perceived as places for positive aspects of social life (Healey et al, 1995 in Yuen, 2004:2), started to turn into dangerous, insecure, and feared places. This change has taken place particularly since the industrial revolution, with an increasing pace during the last decades (Yuen, 2004:2). Today, in urban areas which are continuously reshaped by mainly social and physical impacts of globalization, the level of insecurity and fear of crime bring threats not only for their livability, but also for their "stability and social climate…sustainable and economic development, the quality of life and human rights" (HABITAT, 2006). Particularly, over the last two decades for many of the cities with 100 000 or more inhabitants, the increase in crime became an important problem (Vanderschueren, 2000:2).

In its occurrence, crime embodies a variety of aspects in terms of social, economic, cultural, behavioral, spatial, and temporal differences. Among these differences, high variance and unequal distribution of crime in *space* and *time* became one of the oldest questions in social sciences (Glaeser et al, 1996:507). The field of science, which tries to explain the distribution of criminal acts in "*space*" and "*time*", is called "ecology of crime" (Crews, 2001:143). Theories of "ecology of crime" compose only one section within a much greater and complex scheme of theoretical framework in approaching crime.

The theoretical context in crime ecology literature, which explores the reasons for the unequal or non-random distribution of crimes/incidents in *space* and *time*, can be summarized as follows: According to *traditional ecological theories* (*Moral Statisticians, Chicago School, Social Disorganization*), social conditions affect the human behaviour in a way that people become criminals. It should be stated that '*traditional crime ecology theories*' are also called as '*offender theories*'. As for *early new ecological theories* (*Defensible Space, Crime Prevention Through Environmental Design-CPTED-, Space Syntax*), some spatial/structural/built layouts or conditions give rise to occurrences of criminal events. Finally, in a wider context *late new ecological theories (Routine Activities, Situational Crime Prevention-SCP-, Rational Choice, Crime Pattern)* state that *spatio-*

temporal conditions affect the distribution of criminal events such that some targets (in terms of *space* and *time*) become more attractive than others. In literature, there is not a particular separation of '*early new*' and '*late new crime ecology theories*' and they are considered as one group called as '*new crime ecology theories*'. At the same time, they take names like "*Place-based Crime Theories*", "*Crime Place Theories*" where *'place'* refer to both a specific *space* and *time* (Brantingham and Brantingham, 1981a:8), "*Event Theories*", "*Opportunity Theories*" or "*Environmental Criminology Theories*". In this study, although such categorization (*early new* and *late new*) is utilized for ease of explanation of theoretical and empirical approaches in Chapter 2, in the rest of the study, the *early* and *late new ecological theories* are taken together in one group, namely as *new ecological theories.*

Both *traditional* and *new ecological theories* are parts of structural/sociological/ epidemiological perspectives to crime (factors of distribution of crime) and are not parts of processual/social psychological/etiological (specific causes of criminal acts) perspectives (Jensen, 2001b; Crews, 2001). From risk management[1] aspect while the *traditional theories* address the problem from the 'hazard'[2] side, the *new theories* address it from the 'vulnerability'[3] side (EIRD, 2006) in urban environments.

Crime, which is mainly seen as an urban phenomenon, is related to spatial and social impacts of urbanization and urban development processes that shape the cities themselves. The level of crime and also the fear of crime[4] are indicators of quality of life and are directly related to livability and sustainability of the urban environment to the extent that people could make their choices freely both in *space* and *time*, for all their activities like dwelling, working, education, shopping, and entertaining. Since late 1970s-early 1980s, the cities of both developed and developing countries experienced a dramatic spatial and social restructuring characterized by globalization and increasing levels of criminal activities.

During this period, some of the western countries, particularly the US and Britain from where the theories of *new crime ecology* emerged, have already started to integrate these theories into their urban planning and design practices for the purposes of crime prevention and reduction (Oc and Tiesdell, 1997:51). These initiatives involve either single or multiple *place-based* tactics/strategies implemented in either a reactive way (after criminal incidents have happened and for its reduction) or in a proactive way (before criminal incidents happen and for its prevention) (Schneider and Kitchen, 2002:137).

Mainly in these two countries, the reduction of *opportunity* for crime through *environmental* design (e.g., through *Defensible Space* principles) by far did not compose the main features of most of the house construction activities (Schneider and Kitchen, 2002:274). In addition, in these countries, all these *opportunity* reduction urban planning and design activities are supported by not only development of related laws and codes, and by the support of different institutions other than planning, but also by some divisions established in the security institutions like Architectural Liaison Officers throughout British Police Forces, and recent urban policing (security) programs like Community Oriented Policing Service by an Office established in the US Attorney General. Although all these developments concerning the *environmental criminology* are recent and need further evidence for their longer-term consequences, it should be accepted that some of these '*place-based* crime initiatives' became successful in the short-term. The integration of these principles into local level planning system has been initiated only recently (Schneider and Kitchen,2002:122,280-281).

Every country has its own peculiar urbanization and urban development processes and corresponding crime/incident patterns. Concordantly, there are great differences and even contrasts in both spatial and socio-cultural structures of the cities in the western and developing countries (see Chapter 3). In parallel to this, it is important, as Schneider and Kitchen (2002:261) point out, to take into consideration the differences in spatial and socio-cultural contexts in which *place-based crime prevention* principles and practices were developed and experienced for their success in adopting elsewhere. However, it is also an accepted reality that the impacts of globalization and changing social, economic, and political systems have begun to produce similar segregated and fragmented urban spaces and societies throughout the world without distinguishing between developed and developing countries starting from their innermost central business districts (CBD) extending towards the gated communities in their suburbs.

Scope and Arguments. As explained in detail in Chapter 2, most of the reviewed studies in Turkey deal with crime distribution problem by means of *traditional approaches*. Consequently, they provide policies on urbanization, social welfare, migration, legal and regulative framework (Kaplan, 1980; Uğur, 1986; Şener, 1994; Sayın, 1998; Erkut et al, 2001; Ergun et al, 2003). Among these a recent study utilizes GIS technology for analytical purposes (Alpdemir, 2006). There are also fewer number of existing studies that either adopt *new ecological approaches* (Gül, 2002; Düzgün and Erdoğan, 2003; Akpınar, 2005) or integrate them with *traditional* theories (Ünlü et al, 2000). Majority of these studies concentrate on the usefulness and effectiveness of GIS-based systems (including Alpdemir (2006)) and spatial data analysis tools (Gül, 2002; Düzgün and Erdoğan, 2003; Akpınar, 2005).

The current study, contributes with the exploration of criminal activities in a *spatial* and *temporal* context, to achieve suitable strategies for urban planning and policing (*kent planlama ve polisliği*) in crime prevention and reduction. For this purpose, the selected *place* (in terms of *space* and *time*) related incidents (Brantingham and Brantingham, 1981a; Brantingham and Brantingham, 1981b) are explored by utilizing "*new crime ecology*" perspective in a case area within Ankara Metropolis, which is the developed part of Etlik Police Station Zone in the year 2000.

This study is the first scientific research within the context of "The Protocol of Research Cooperation between General Directorate of Security and the Middle East Technical University" (August 26, 2003), which aims to develop a study-base for common researches between the two institutions for crime prevention including crime analytic and strategic studies.

It is basically structured on the main argument that incidents display differences in the *spatial* and/or *temporal* distribution among three different settlement types, i.e., *planned*, *early stage gecekondu* (*squatter*), and *in-transition.* In exploring these differences, the *opportunities* that specific urban *places* (in terms of *space* and *time*) provide for occurrences of incidents are emphasized with reference to *new crime ecology* theories[5]. In this respect, the study deals with the exploration of validity and *critical* adaptability of "*new crime ecological theories*" developed and practiced in the western (North American and European) countries in the current city structure of Turkey, from urban planning and policing perspectives in developing suitable response strategies for prevention and reduction of crime.

The first settlement type composed of areas where developed as *planned* settlements either since their establishment or areas transformed into a *planned* settlements in their early stages of development. Second development pattern are found in the peripheral areas characterized by *early stage gecekondu* housing (Işık and Pınarcıoğlu, 2002:115-119,161). Third development pattern, is the second type of areas that are being transformed into first type of settlements by Improvement Plans, i.e., *in-transition* settlements during the study period.

One of the basic properties of the analytical framework for crime ecology involves differentiation of *spatial* and *temporal* levels of aggregation, which are "macro", "mezo", and "micro"[6] (Brantingham and Brantingham, 1998:264; Quimet, 2000). While "macro" level analytical studies are relevant for regional or small scale (macro)[7] planning in Turkey (mostly at 1/25 000 and rarely at 1/50 000 and 1/100 000 scales), they are relevant to urban policing activities coordinated at the national level by mainly the General Directorate of Security affiliated to the Ministry of Interior Affairs.

The current study contributes at mainly "mezo" and to a certain extend at "micro" *spatial* and *temporal* levels[8]. In this respect, on the one hand, *spatial* levels are ranging from neighbourhoods within the study area, i.e., developed parts of Etlik Police Station Zone (EPSZ), to smaller sub-regions in these neighbourhoods. On the other hand, *temporal* levels range from months, weeks, days to three daily time intervals within the study period (the year 2000).

In line with this, the current study involves medium-large scale (mezo-micro)[9] planning in Turkey (mostly at 1/5000 and 1/1000 scales and in specific circumstances at larger scales like 1/500). Similarly, they are relevant to corresponding level of urban policing activities at mainly local Police Authority or Police Station level. Nevertheless, such a focus in this study does not necessarily prevent to draw implications at "macro" levels concerning the general social and spatial structure of cities and their planning and concerning to higher level of Police Authority responsibilities.

Therefore, the current study addresses first, the possibilities of how *new crime ecological theories* and their practical implications could be integrated into medium-large scale urban planning of that locality in a narrow context, and medium-large scale urban planning system in a wider context. Second, it contributes with *environmental* measures that could be taken by police authorities at various spatial scales, such as: local Police Station in a narrow context; other police authorities responsible in similar inner metropolitan areas and/or responsible at higher level metropolitan regions (District level, Province level, etc.).

In this respect, this study can also be seen at least as an effort for raising awareness for the possibility of reduction of *opportunities* for crime occurrences through *place-based crime prevention* principles to be carried out by both planning (Sümengen, 2005) and policing (Dağ, 2002) authorities, which currently lack. However, it should be emphasized that *environmental* strategies cannot and, in fact, are not the only means to prevent and reduce crime (Mathéy, 2005:22). As stated, other aspects such as social, economic, cultural, and behavioural dimensions also have substantial impacts in occurrences of criminal activities.

In other words, being confined to its *spatial* and *temporal* aspects, this study is focusing on the necessary measures to be taken in “planning/designing out crime” (Schneider and Kitchen, 2002:280) and *environmental* measures that could be utilized particularly by the local Police Authority and generally by the others who have responsibility in similar inner metropolitan areas. In setting up these measures, the interdisciplinarity of planning and policing and the importance of community participation are emphasized and are illustrated through concrete proposals.

The reflections of and interpretations for the underlying socio-economic conditions and thus, the implications related to *traditional ecological theories* are based on not only quantitative, but also qualitative explanations obtained from literature and the field study due to the data limitations[10]. On the contrary, it should be noted that particular physical (spatial) conditions in an urban environment has its corresponding socio-economic conditions. That is, because of the high relationship and inseparability of the physical and social characteristics of a settlement, it is highly probable that the quantitative results found by processing of the former characteristics would be most of the time similar to the results found by processing of the latter characteristics.

Among these neighbourhood characteristics the followings can be listed. For socio-economic environmental structures: degree of privacy; heterogeneity or homogeneity of the community; isolation; neighbour relations; sense of community; foreigner toleration; feeling stranger; life styles; education; income; and household size. For physical environmental structures: amount of social facilities; land use heterogeneity or homogeneity; architectural styles; horizontal and vertical building layouts; predictability of road structures; housing security measures; and population density (see Chapter 3).

The study explores the distribution of three *place* (in terms of *space* and *time*) related incidents, which are against people, property and people and property (Brantingham and Brantingham, 1981a; Brantingham and Brantingham, 1981b). It involves quantitative and statistical techniques (Chapter 5) that are performed on the variables in the databases, which is developed as part of loose-coupled (Sui, 1998:653) GIS-based system designed by this study (Chapter 4). The GIS-based analyses, by which the distribution of criminal incidents in *space* and/or *time* is assessed, are practical means to locate the clusters of incidents and to define the *environmental* characteristics that underlie these clusters. In the continuing sections, the results of the previous step are evaluated with reference to *new crime ecological theories* for urban planning and policing (Chapter 6).

Another basic contribution of this study is the development of the "Event Notebook Program" (Software). It is used for incident data management (entry, correction, etc.) in the loose-coupled GIS-based system, which is also developed in this study. The above stated software designed by the author, after minor changes, can be conveniently utilized in the police stations nationwide, which are equipped with "Event Notebook"s (see Chapter 4).

In this study, comparative and systematic distributional analyses of incidents as a whole, in terms of three types of incidents, and their respective commitment types at 'mezo'-'micro' ecological scales in the three different development patterns are carried out[11]. In order to achieve this, analyses are performed in two main groups. The first group consists of *spatial* analysis of incidents, and the second one consists of *temporal* and *spatio-temporal* analysis of incidents[12] form both general and localized perspectives[13] (see Chapter 5).

In the first main section of the case study; i.e., *spatial* analyses, both *general spatial distribution* and *spatial interaction* of incidents are explored for both the three incident types together, and for each of the three types of incidents and their respective commitment types. Likewise, in the second main section; i.e., *temporal* and *spatio-temporal* analyses *general temporal distribution*, *general spatial distribution in time*, and *space-time interaction* of incidents are explored for the same incident groupings. In exploration for *general spatial distribution in time*, the *space* and *time* variables are treated separately. However, in exploration for *space-time interaction*, these two variables are treated simultaneously (see Figure 1.1) Furthermore, in both above stated two main sections, the relationship between incident distribution and clustering (in terms of *space* and/or *time*) and the urban *spatial*, *temporal* and social structure are searched (Chapter 5).

Structure. This thesis, in addition to the first chapter of Introduction, consists of six chapters. In the second chapter, studies of crime in urban *places* are investigated in theoretical and empirical contexts. As mentioned, in *crime ecology* a '*place'* defines a certain *space* and *time* (Brantingham and Brantingham, 1981a:8). The former sections of the second

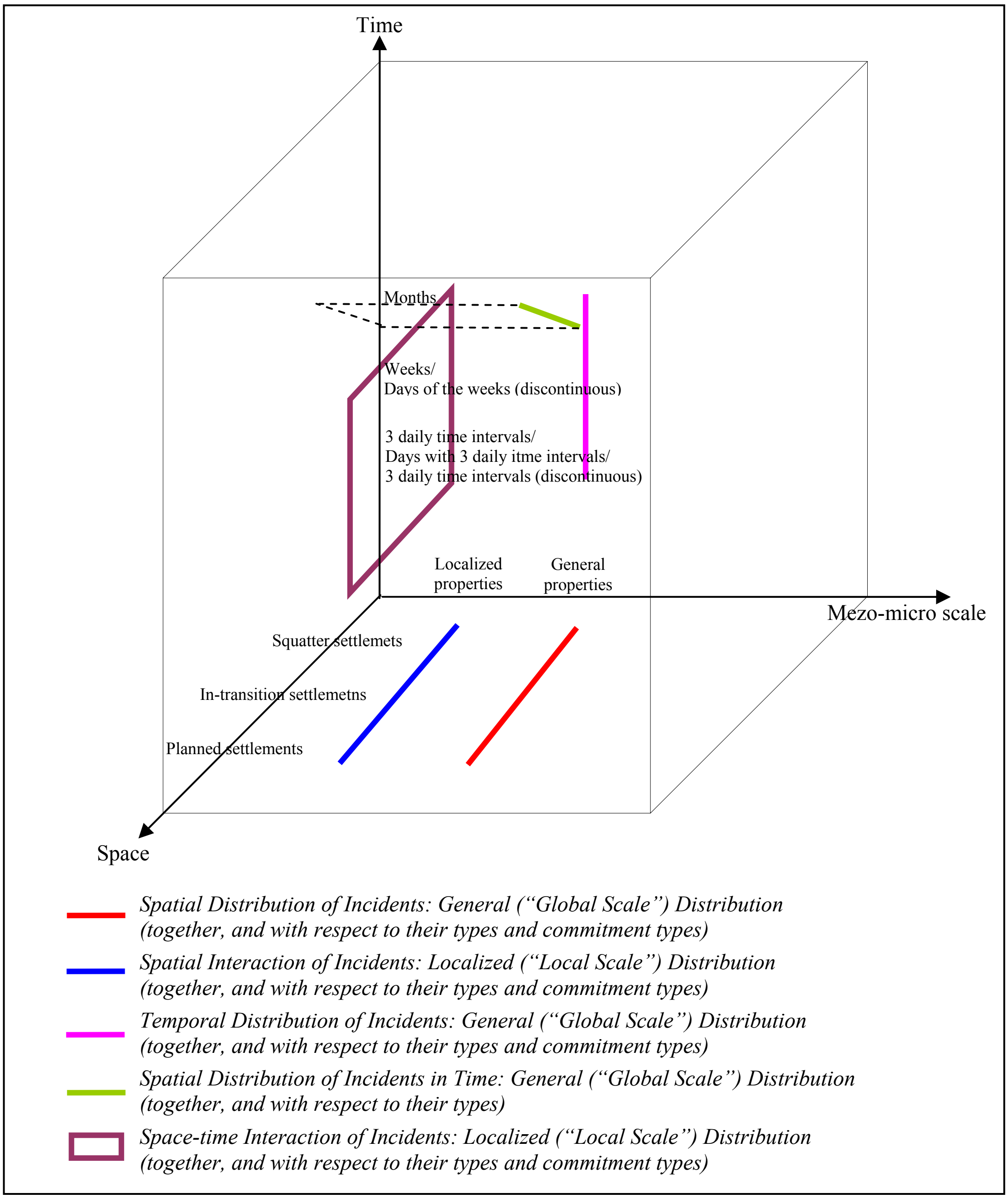


Figure 1.1 Three dimensional representation (*space, time*, and *scale*) of the distribution of incidents

chapter bring clarifications on the definitions -including legal aspects- and concepts related to crime phenomenon and the theoretical perspectives for its exploration with a focus on *ecology of crime theories.* Furthermore, the relationship between the urbanization and urban development processes and emergent *crime ecological theories* and practices in the western (several European and North American) countries are summarized from a historical point of view. The latter sections examine crime in urban *place* theoretical and empirical contexts. This chapter concludes with a discussion on the general framework of the current study.

In the third chapter, first, urbanization and urban development processes of Turkey are explained in a historical framework from a comparative aspect that includes the similarities/differences with other countries, and with a particular emphasis on crime phenomenon. Second, these explanations are extended to Turkey's second largest metropolis, that is, they are elaborated for Capital city of Ankara, within which the study area was selected. The remaining sections of this chapter presents detailed explanations related to the case study area; and its neighbourhood characteristics with respect to the three different development patterns.

Chapter four concentrates on the methodology concerning the development of the loose-coupled GIS-based system. The latter sections, first, give detailed explanation about the attribute (tabular) data to be utilized in the case study, the way the database is designed to be utilized by the Police Authority, and the resultant variable set to be used in the analyses. Secondly, the spatial data to be used in the study and the spatial database construction within the loose-coupled system are explained.

In the following chapter, which is chapter five, the analyses and findings of the case study are presented. For each of the sub-sections in the structuring of the *spatial*, and *temporal* and *spatio-temporal* analyses for both three incident types together and for the three incident types, and their respective commitment types, and the relationship of the incident distribution and clustering with the urban structure are explored by the descriptive, and statistical analyses.

Chapter six provides the implications of each of the sub-section of the previous chapter and the "urban planning and policing" activities with reference to the *new ecology theories* presented in the second chapter, and to the framework that is set in the third chapter.

In the seventh and last chapter, which is conclusions and recommendations, a general evaluation is made and final remarks on the thesis study are discussed and recommendations for further researches are presented.

[1] Risk Management is "the process of dealing with or controlling" (OALD, 1995:712) risk, which is "the possibility of meeting danger or of suffering harm or loss" (OALD, 1995:1015).

[2] Hazard is "a thing that can be dangerous or cause damage, a danger or risk" (OALD, 1995:549).

[3] Vulnerability is susceptibility to "be hurt, harmed or attacked easily" (OALD, 1995:1334).

[4] Schneider and Kitchen (2002:270,284-285) conclude "about the relationship between crime and the fear of crime…that…it is more helpful to think of them as two separate but linked issues than it is to think of them as being two sides of the same coin…requiring separate but related policy attention…it very likely that initiatives…which implicitly assume that by dealing with the one issue they are automatically dealing with the other, are increasing very considerably the probability that they will not succeed. Similarly, initiatives which fail to set clear objectives which recognise this distinction…are also likely to struggle…[P]arallel and mutually reinforcing initiatives, with clear and distinctive sets of objectives, are most likely to succeed in these terms, especially where major efforts have been made both to win community support for and then to enrol community partnership in those initiatives.".

[5] Among the reviewed studies it is observed that two researchers distinguished between the *two types* of development areas; which are *squatter* and *planned* (Uğur (1986) calls *planned* settlements as "central city area" and Kaplan (1980) calls *planned* settlements as "settled part of the city"), and that they approached the problem from *traditional ecology* aspect.

[6] For detailed explanations about these *spatial* and *temporal* levels, see Chapter2.

[7] As scale gets "smaller", the area that is covered gets "larger" or the level of resolution becomes "macro".

[8] It is observed that the reviewed studies were carried out at 'mezo' *spatial* and *temporal* levels (Kaplan, 1980; Uğur, 1986; Şener, 1994; Sayın, 1998; Ünlü et al, 2000; Erkut et al, 2001; Gül, 2002; Ergun et al, 2003; Düzgün and Erdoğan, 2003; Akpınar, 2005; Alpdemir, 2006). Moreover, one study (Akpınar, 2005) carried out certain additional 'micro' level spatial analyses (such as around subway stops).

[9] As scale gets "larger", the area that is covered gets "smaller" or the level of resolution becomes "micro".

[10] For this study, in the beginning, the *traditional ecological theories* were intended to be utilized throughout the analyses beside the *new ecological theories* and thus, the distribution of *offenders* -and *incidents*- would have been explored in terms of the *social conditions* affecting the human behaviour to become offenders. In addition, by utilizing two theories concurrently it was intended to find answers for interaction of *incidents* and *offenders* and the relation between them and their social and physical areas with a perception of them both as points and flows in space. However, exploring answers to all these questions would have expanded the scope of the study not only in terms of detailed socio-economic data but also detailed data on offenders.

[11] It is observed that the reviewed *traditional ecology* studies (Kaplan, 1980; Uğur, 1986; Şener, 1994; Sayın, 1998; Erkut et al, 2001; Ergun et al, 2003; Alpdemir, 2006), and studies which adopt or integrate *new ecology* (Gül, 2002; Akpınar, 2005) are in terms of descriptive. Two of the latter studies utilize testing and spatial data analysis (Ünlü et al, 2000; Düzgün and Erdoğan, 2003).

[12] In drawing some urban planning and policing implications, a limited level of offender based analyses were carried out. These involve residential locations and ages of offenders with respect to the most frequent commitment types for incidents against people and against property.

[13] In literature, *general* properties have different labels such as *global scale, large scale,* or *first order* properties of *space*. These properties measure the variation in the mean value of the point pattern (Bailey and Gatrell, 1996:32). They provide with ideas about the general distribution and "are global because they represent the dominant pattern of distribution-where it is centered, how far it spreads out, and whether there is any orientation or direction to its dispersion." (Levine and Associates, 2004:5.1). These properties may also be explored for incident distribution in *time*.

Similar to *general* properties, *localized* properties have different labels like *local scale, small scale,* or *second order* properties of *space*. These properties measure the correlation or the *spatial dependence* (*interaction*) in the point pattern (Bailey and Gatrell, 1996:32; Gatrell et al, 1996:264). They "refer to sub-regional patterns or 'neighborhood' patterns within the overall distribution." (Levine and Associates, 2004:5.1). When *localized* properties of point distribution are explored for *space* they refer to *spatial interaction;* and when they are explored for both *space* and *time* simultaneously, they refer to *space-time interaction* of the point distribution.

CHAPTER 2

THEORETICAL AND EMPIRICAL STUDIES OF CRIME IN URBAN PLACES

In this chapter, crime is investigated in the urban *place* theoretical and empirical context. It is once more worthwhile to state that in *crime ecological theory* a '*place'* defines a certain *space* and *time* (Brantingham and Brantingham, 1981a:8). The former sections of this chapter bring clarifications on the definitions -including legal aspects- and concepts related to crime phenomenon and the theoretical perspectives for its exploration. Here, from a historical point of view, a specific emphasis is made on *ecology of crime theories* in urban *place* context of western (several European and North American) countries, where these theories are developed and practiced.

In the following sections, empirical studies are reviewed and discussed. First, they are grouped with respect to one or more *crime ecological theories* that they utilize. Then, examples of other empirical studies on *ecology of crime* are presented. In the first place, these include two comparative studies, where *traditional* vs. *new ecological theories* and resident vs. non-resident offenders are compared. Secondly, it refers to the remaining *ecological* studies that could not be classified under any of the previously set categories. Afterwards, in this chapter, the current level of practices in Turkey is discussed. First, the projects that are carried out by the police authorities mainly in collaboration with universities are explained and then, a discussion is made on the reviewed *crime ecology* studies. Finally, this chapter concludes with a discussion on the general framework of the current study.

2.1 Definitions and Concepts Related to Crime

Crime is a socio-spatial phenomenon (Farooq, 1999:1), analysis of which requires underlying theory, assumptions and/or methodological requirements (CMN, 2002:12). Although there have been many controversial arguments on the crime and related concepts (Aday, 2001), dictionary meaning of crime is known as "an act punishable by law, as being forbidden by statute or injurious to the public welfare" (OED, 1987:20). Moreover, "deviance" or "deviant behaviour", which sometimes overlaps with crime, is generally accepted in social sciences as referring to "forms of behavior and other characteristics of people that are reacted to by members of a social system as worthy of social condemnation"

(Jensen, 2001a:88). However, it is distinct from the concept of crime because it "encompasses forms of behavior that violate standards for appropriate conduct…but which may not be defined as criminal, such as mental illness, excessive alcohol use, suicide" (Jensen, 2001a:88).

There are many forms of crime with diverse ways of commitments. On the other hand, it is generally known with its two main types, namely *crimes against property,* which are also called as property crimes like burglary and auto thefts and *crimes against person*, which are also called as violent crimes like homicide, rape and assault. Despite the fact that "delinquency" is a more complex term than "crime", which comprise a variety of behaviors not prohibited to adults but to juveniles, it is generally defined as "criminal acts committed by persons designated as "juvenile" because they are below a specific age, usually 18." (Glaser, 1970:42). Different studies refer to committers of these crimes as juvenile offenders, juvenile delinquents or simply delinquents and commitment of these crimes as juvenile crimes, juvenile delinquencies or simply delinquencies (Quimet, 2000; Boba, 2001:17; Shaw and McKay, 1942 in Anselin et al, 2000).

"Predatory" or "serious" crimes are defined as criminal acts having a clearly identifiable victim, such as in the case of murder, rape, assault, burglary, robbery, forgery, etc. In a complementary way, "non-predatory" or "non-serious" crimes are the ones that have no clear victims such as disorderly conduct, public drunkenness (Glaser, 1970:42). In liberal societies, while "white-collar crimes" represent criminal acts which are common in the business activity and committed generally by high socio-economic status people (Crews, 2001:145) like misrepresentation in selling, falsification of tax accounts, collusion in biding, etc. (Glaser, 1970:43), "street crimes" represent generally predatory crimes committed by people of low-economic status (Wu, 2001:10). "Predatory", "serious" and "street crimes" in western crime literature, have a common naming in Turkish criminal literature, which is *"asayiş",* and which literally means "public order"[1].

It is evident that every society has its own crime classification or categorization system, with respect to differing types of offences, their negative extents in disturbing or endangering the continuation of society or public order and/or resultant punishment levels. For example, while the US makes use of definitions and classifications made by Federal Bureau of Investigation (FBI) Uniform Crime Reports (Glaeser et al, 1996:545), Germany use the definitions given in the German Penal Code (Buettner and Spengler, 2003:20). In this respect, Turkish Judicial System related to “Criminal Courts” (SIS, 2002:58) differentiates between three types of crimes. The first two of these consists of crimes classified under the Turkish Criminal Code (TCC)[2], namely the “felonies”[3] and “misdemeanors”[4], and the third one is the crimes against “Special Codes”.

A differentiation between the concepts of “crime” and “incidents” is also made in that not all the “incidents” are “crimes”. For instance, in the US, not all 911 Calls For Police Service (CFS) are in fact crimes (Boba, 2001:38) and FBI’s Uniform Crime Reports consists of crimes that are known to police (Farooq, 1999:52). Similarly, in Turkey, not all the 155 Police Emergency Calls are in fact crimes, and Event Notebooks maintained in Police Stations consists of incidents known to police (Dağ, 2002). In Turkish Judicial System an incident needs to take three steps to be “decided upon” as a crime:

1. It must be reported to Police
2. Police must report it to Chief Public Prosecutor
3. Chief Public Prosecutor must report it to one of the Criminal Courts (SIS, 2002)

2.2 Theoretical Approaches to Crime

There is a substantial variation in measures, methods, samples and data, settings and controls characterizing tens of theories of either considering the concept of crime in an etiological (i.e., specific causes of criminal acts) or in an epidemiological (i.e., factors of distribution of crime) context (Jensen, 2001b; Crews, 2001). “Structural” or “sociological” theories (Clinard and Meier, 1998 in Crews, 2001:143) are interested in explaining the epidemiology of crime and they emphasize that it is related to certain social structural conditions of a society while “processual” or “social psychological” theories are concerned with etiology of crime and explain the process through which individuals come to commit such acts (Crews, 2001:143). Theoretical framework related to crime exploration can be summarized as in Figure 2.1.

The hierarchical structure given in Figure 2.1 is better to be seen as a trial categorization for expressional simplicity in understanding the wide variety of crime related perspectives. For example, in literature, there are no such explicit groupings as *early new* and *late new* crime ecological approaches, and they are referred as one group under *new* ecological approaches. Moreover, the structure given in Figure 2.1 does not intend to prevent theories’ horizontal relationship and their different combination or integrated use (Dunham and Wilson, 2001:189).

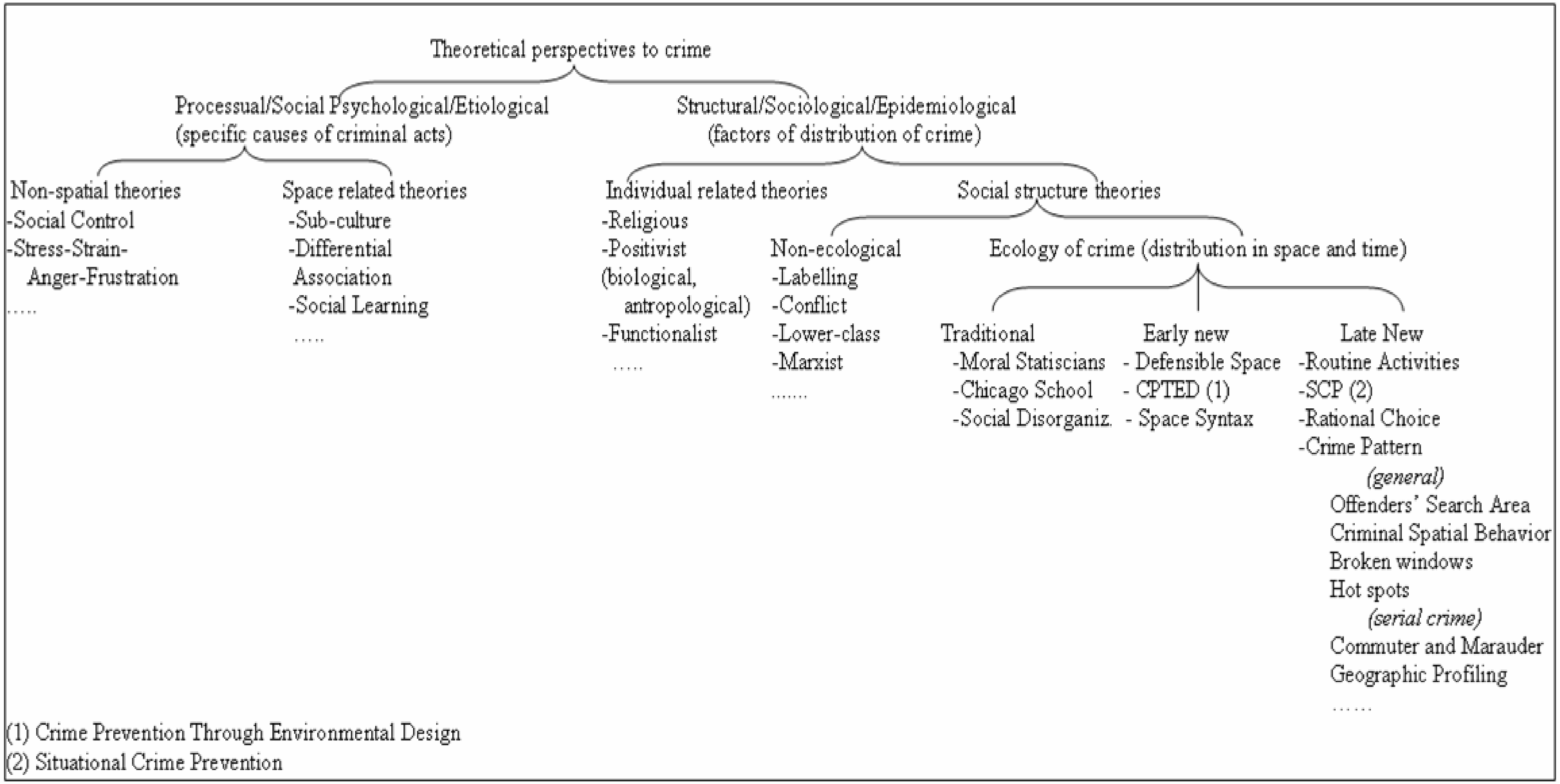


Figure 2.1 Theoretical framework for crime exploration

Source: Prepared by combining information from Whitt, 2001; Jensen, 2001; Crews, 2001; Sutherland, 1940 in Wu, 2001; Henslin, 1999 in Crews, 2001, Oc and Tiesdell, 1997, Schneider and Kitchen, 2002; Ratcliffe, 2001; Alston, 1994; Stangeland, 2003

Since this study primarily utilizes *new crime ecology theories* (i.e., both *early* and *late*), the following sections elaborate on *ecology of crime* in urban *place* context of the western countries. It needs to be reminded that only in this chapter; *new crime ecology* is discussed in terms of *early* and *late* theories.

2.2.1 Development of "Ecology of Crime" Social Structure Theories within Different Spatial and Social Contexts

The high variance and unequal distribution of criminal acts in space and time have long been recognized by the social scientists (Glaeser et al, 1996:507). The field of science that search for understanding of the distribution of criminal acts in *space* and *time* is called "ecology of crime" (Crews, 2001:143). According to ecological perspective, as Miethe (2001:203) states

> humans are similar to plants and other animals in that behavioral patterns occur in an ecological niche or context that establishes relationships, dependencies, and structures on the natural habitat. ….ecological perspective on crime attempts to identify those social and physical characteristics of geographical areas that enable and constrain the expression of criminal motivations.

In *crime ecology*, both *space* and *time* have different levels of aggregation: "macro", "mezo", and "micro" (Brantingham and Brantingham, 1998:264; Quimet, 2000). *Crime ecology* studies generally utilize one of these levels of resolution and rarely the two levels at once. These levels are listed as in the following:

- "Macro" levels range from inter-cities, inter-regions to national and international for *space* and from decades to centuries for *time*;
- "Mezo" level includes intra-city areas and neighborhoods within a particular city for *space* and range from a group of years, one year, months, and days for *time*; and
- "Micro" level range from individual addresses and street blocks for *space* and from hours, minutes to seconds for *time* (Herbert, 1982 in Wu, 2001:1; Leitner, 1999:71; Wu, 2001:98; Nelson et al, 1996:413,418-419; Henry and Bryan, 2000:3,7-14).

From a chronological perspective, the *crime ecology* (Figure 2.1) researches cover: First*, traditional crime ecology,* which consists of studies by: *Moral Statisticians; Chicago School; and Social Disorganization* theorists. Second, *early new ecology of crime,* which consists of studies by: *Defensible Space; Crime Prevention Through Environmental Design (CPTED); and Space Syntax* theorists. Third, *late new ecology of crime,* which consists of studies by: *Routine Activities; Situational Crime Prevention (SCP); Rational Choice;* and *Crime Pattern* theorists.

On one hand, *traditional ecology* or *offender theories* concentrate on *criminals/offenders* and the social conditions that affected their behaviour to become *criminals/offenders* by asking questions "*why do people commit crime?*". On the other hand, *new ecology* or *event/ opportunity/place-based crime/crime place/environmental criminology theories* (including both *early* and *late new ecology*) focus on *events* and the *environmental* (*spatio-temporal*) conditions that some targets provide more *opportunities* and become more attractive for crime occurrences, by asking questions "*why do crimes occur in specific settings?*".

Accordingly, whereas the former theories suggest *offender-based programs* and inform policy makers on what could be done to reduce crimes in socially disorganized communities, the latter theories provide *event-prevention strategies* and inform responsible authorities on the *ecological means* in cities for *event* occurrences and neighbourhoods that require *place-based prevention strategies* to be adopted and require greater patrolling and monitoring in addition to adoption of new security methods like community or problem oriented policing (Clark, 2001; Clarke, 1989; Clarke, 1992 in Wu, 2001; in Harries, 1999; and in Eck, 1998; Clarke and Weisburd, 1990 in Wu, 2001; Eck and Weisburd, 1995 in Eck, 1998; Miethe, 2001; Goldstein, 1990 in Eck, 1998; Henry and Bryan, 2000; Weisburd, 2002) (Table 2.1).

According to The Brantinghams (1981a:7-8), *new ecological theories* (without distinguishing between *early* and *late*) with a focal point for *place*, defined as a discrete location in *space* and *time*, searches on the fourth dimension of crime like other ecological theories. These dimensions, all of which are required for an event to be a crime, are law, the offender, the target (victim), and the *place* in terms of *space* and *time*.

Table 2.1 Two main approaches to crime ecology

Traditional Ecological Theories	**(Early and Late) New Ecological Theories**
Offender Theories	Event Theories/ Opportunity Theories / Place-based Crime Theories / Crime Place Theories / Environmental Criminology Theories
Emphasis is on how people come to be criminal offenders, or on "why people commit crime"	Emphasis is on explaining why some targets are attracting and others not, or on "why crime occurs in specific settings"
Suggest *offender-based prevention programs* like enlightening policy makers for what could be done to reduce crimes in socially disorganized communities, yet to date did not provide with making such predictions	Can provide *event-prevention strategies* by informing the law enforcement about ecological means in cities and neighbourhoods which require greater patrol and monitoring or *situational crime prevention strategies* and such new so called policing methods being adopted in the US local governments as *community policing* or *problem-oriented policing*

Source: Prepared by combining information from (Clark, 2001), (Clarke, 1989), (Clarke, 1992 in Wu, 2001, in Harries, 1999 and in Eck, 1998), (Clarke and Weisburd, 1990 in Wu, 2001), (Eck and Weisburd, 1995 in Eck, 1998), (Miethe, 2001), (Goldstein, 1990 in Eck, 1998), (Henry and Bryan, 2000), (Weisburd, 2002)

All *ecological theories* were all developed in the industrialized countries particularly by the researchers from Europe, Britain, and North America. *Ecological theories of crime* could be better comprehended when they are examined in the spatial and social contexts that they emerged. In other words, these theories which were developed mainly in European and American countries are intimately related to urbanization and urban development processes that took place in these western countries.

Late 18th-late 19th century industrial city is associated with rise of early traditional ecologists, whom known as *Moral Statisticians* (e.g., Guerry, 1833; Quetelet, 1831). Similarly, early 20th century modern city gave rise to traditional ecology dominated by studies of *Chicago School* (Park et al, 1925) and *Social Disorganization Theorists* (Shaw and McKay, 1942). The social and spatial restructuring of these western cities distinguished by being modern(ist) after the 2nd World War in the mid 1940s until early 1970s is accompanied by start of a new trend of (*early new*) *crime ecological* thinking by *CPTED* (Jeffrey, 1971), *Defensible Space* (Newman, 1972), and *Space Syntax Theorists* (Hillier, 1977; Hillier et al, 1983). This trend has been -is still being- improved further within the context of spatial and social restructuring of today's global(izing) cities since late 1970s and of the (late) new ecological approaches founded by *Routine Activities* (Cohen and Felson, 1979), *SCP* (Clarke, 1980; Clarke, 1992; Clarke, 1997), *Rational Choice* (Cornish and Clarke, 1986), and *Crime Pattern Theorists* (Brantingham and Brantingham, 1981a; Brantingham and Brantingham, 1981b; Brantingham and Brantingham, 1984; Wilson and Kelling, 1982; Sherman et al, 1989; Canter and Larkin, 1993; Rossmo, 1995). Particularly, the last area is the one that theory development continues at present (Table 2.2).

Table 2.2 Spatial and social contexts and corresponding theories of crime ecology

Urbanization and Urban Development Processes in the west (European and North American) and Related Spatial and Social Contexts	**Crime Ecology Theories**
Late 18th - Late 19th century Industrial City	Early Traditional Ecologists: Moral Statisticians
Early 20th century Modern City	Chicago School and Social Disorganization Theorists of Traditional Ecology
Mid 1940s - Early 1970s Modern(ist) City	Early New Ecology by Defensible Space, CPTED (1), and Space Syntax Theorists
Late 1970s - Present Global(izing) City	Late New Ecology by Routine Activities, SCP (2), Rational Choice, and Crime Pattern Theorists

(1) Crime Prevention Through Environmental Design
(2) Situational Crime Prevention

2.2.2 Traditional Ecology of Crime (*Moral Statisticians, Chicago School,* and *Social Disorganization*)

The main argument and the common point in the *traditional ecological approaches* to crime can be stated such that human behavior is determined by mainly social factors (Park et al, 1928 in Veenendaal and Houweling, 2000:3; Schneider and Kitchen, 2002:108) and the differences in the *spatio-temporal* distribution of crime can be explained by the differences in basically social conditions of the residential population (Whitt, 2001:231). They have the following main assumptions:

- Grouped data results can be attributed to individuals[5] (Clark, 2001:371);
- Crimes are product of local residents;
- Determinants of crimes are constant in space; and
- Data are statistically independent (Anstey, 1998:v).

Accordingly, all these studies aim at verifying this main argument, which makes particular emphasis on how people come to be criminal offenders or "*why do people commit crime?*" (Eck and Weisburd, 1995 in Eck, 1998:403). This explains why *traditional ecological approaches* are also called as "*offender" theories.*

In order to achieve this goal, *traditional theories* utilize similar simple analytical methodologies. These methods include visual inspections and simple statistical tests made after performing cartographic techniques such as simple overlying of spatial distribution of crimes/delinquencies or offenders/delinquents with maps of spatially defined areas, which are supposed to have different social and environmental conditions of the residential population (Whitt, 2001:231). These spatial definitions can be grouped with reference to their formation types. They can be either:

- *Administrative* like boundaries of cities, towns, neighbourhoods, local community areas (Quetelet, 1831 and Guerry, 1833 in Whitt, 2001:231);
- *Statistical* like census tracts (Shaw and McKay, 1942 in Quimet, 2000);
- *Conceptual* like neighbourhoods of the Chicago City Model (Park et al, 1925 in Clark, 2001:370); or
- *Regular* like boundaries of one-square mile areas constructed for Chicago City (Shaw and McKay, 1942 in Quimet, 2000).

In the initial years of *traditional ecology*, the early social ecologists, that is, *Moral Statisticians* (Quetelet, 1831 and Guerry, 1833 in Whitt, 2001:231; Glyde, 1856 in Wu, 2001:2) generally utilized “macro” level (Brantingham and Brantingham, 1998:264) spatial unit of analysis such as international, inter-regions, inter-cities, or rural areas in their mostly descriptive studies. The other *traditional ecology* founders, i.e., *Chicago School, and Social Disorganization* theorists subsequently made use of different types of “mezo” level (intra-urban) spatial units. They present a diverse range not only with respect to their formation types mentioned above, but also with respect to their sizes (e.g., neighbourhoods, census tracts, fixed size regular lattices set on the urban area).

Majority of the *traditional ecology* studies utilize dependent or independent variables that are computed as rates. Accordingly, sometimes the dependent variable turns out to be a measure of criminal events or delinquencies committed per a number of residents in a spatially defined area (Quetelet, 1831 in Whitt, 2001:231; Herbert, 1982 in Wu, 2001:1; Quimet, 2000). Similarly, sometimes it represents delinquent rates computed by a ratio of number of youth in each area referred to Juvenile Court for a given year per number of youths living in each area (Shaw and McKay, 1942 in Quimet, 2000). Dependent variables may also be subdivided into different groups as in the studies of early social ecologists. A common division followed in these studies is grouping of criminal events into its two major types, namely known as *violent crimes* (*crimes against person*) and *property crimes* (*crimes against property*).

Such a differentiation is observed not only in *traditional ecology* founding studies, but also in many of the current *crime ecology* studies and there are several reasons for it. First, it is stated that they have different aspects (Erkut et al, 2001:31) both in the extent of crime spillovers (Buettner and Spengler, 2003:7), and in spatial behavior of offenders (Portnov and Rattner, 2003:13). That is, there are differences in motivation of offenders for committing each type of crime (Buettner and Spengler, 2003:7). For example, generally property crimes are committed by offenders living outside of the crime commitment locality (Portnov and Rattner, 2003:13). Hesseling found out that the determinants of the spatial distribution of violent crime or offender are different from the determinants of non-violent crime or offenders (1992 in Quimet, 2000). Similar to Portnov and Rattner’s (2003:13) findings, Hesseling concludes that “violent crimes in neighbourhoods are more often the result of the residence of offenders in these neighbourhoods, while the variation in property crimes is more often the result of differences in opportunity structure” (1992:10 in Quimet, 2000).

In accordance with these spatial concerns in the choice of crime types, in general, crime ecological researches make use of one or more types of property or violent crimes, which were considered to be most likely to be related to *place* context (Brantingham and Brantingham, 1981a; Brantingham and Brantingham, 1981b). For instance, burglaries are chosen due to their potential to be committed in both residential or commercial and affluent or impoverished neighbourhoods (Schumacher and Leitner, 1999:3).

In *traditional ecology* studies, dependent variable data mainly come from crime statistical data either obtained from population censuses, police or judicial organizations. Similar to dependent variables, independent variables utilized in these studies are mainly rates computed in the spatially defined area where the occurrences or distribution of dependent variables are explored. Most of the time, only a small amount of information is found for the offenders (Anselin et al, 2000:217). However, since these theories assume that the offenders come from the resident population (Anstey, 1998:v) and that the criminal events in an area are mainly the result of differentiated social conditions of resident population (Park et al, 1928 in Veenendaal and Houweling, 2000:3), these characteristics are seen as the main determinants of criminal events.

The independent variables of traditional studies can be grouped into three main categories:

- Offender related like age, sex, etc. (Anselin et al, 2000:217);
- Resident population socio-economic conditions including age structure, household type-as indicator of residential stability, education level, rates of social truants, infant mortality, tuberculosis, mental disorder, unemployment, residential mobility or migration poverty, ethnic minorities or heterogeneity, etc.; and
- Resident population environmental conditions including housing/building quality, physical deterioration, rent levels, etc. (Shaw and McKay, 1942 in Wu, 2001:14-16).

Previous and current empirical *traditional ecology* studies, which have gained acceleration with the quantitative revolution in geography after the 1950s and with the advances in computerized mapping and spatial data analysis tools particularly starting in the 1990s, make use of similar social and physical correlates of crime. Below, some example indicators of *social disorganization* and low level of social control are listed (as compiled by Miethe, 2001:204-205).

- High density of boarding houses and tenements;
- Transitory businesses;
- Dilapidated buildings;
- Multiunit dwellings;
- High vacancy rates;
- Extreme poverty;
- High crowding;
- Signs of incivilities in the neighbourhood (e.g., garbage, litter on streets,…);
- High rates of foreign-born or non-English speakers;
- Low income and educational attainment;
- High residential mobility;
- High rates of single-parent families; and
- High concentration of persons between 15 and 25 years old.

Similarly, another listing, which have been done by the President's Commission on the Causes and Prevention of Violence in 1969 is given as (Miethe, 2001:204):

- Low income;
- Physical deterioration;
- Dependency;
- Racial and ethnic concentrations;
- Broken homes;
- Working mothers;
- Low levels of education and vocational skills;
- High unemployment;
- High proportions of single males;
- Overcrowded and substandard housing;
- High rates of tuberculosis and infant mortality;
- Low rates of home ownership or single family dwellings;
- Mixed land use; and
- High population density.

Although they are not as specific as these lists, the crimogenic (i.e., crime generating and attracting (Schneider and Kitchen, 2002:96)) factors defined by the General Directorate of Security of Turkish Ministry of Interior Affairs (GDS, 2000) are listed below.

- Migration due to socio-economic reasons to the metropolises in the west (from the east and south-east);
- Rapid urbanization and rapidly increasing squatter areas;
- Inadequate urbanization and residential policies;
- Low educational and cultural levels of the population;
- Decrease of control of families and society on individuals;
- Differentiation in income levels;
- Insufficient level of cultural activities; and
- Insufficient sports and recreational activities, and opportunities.

The main findings of *moral statisticians* in France in the 1830s, Quetelet and Guerry, who carried out "macro" level studies suggested that rates of crime are unevenly distributed among the urban and rural areas of the country (i.e., violent crimes were high in the southern rural area contrary to high property crimes and "suicide" in the more industrialized and wealthier northern areas) and also that crime rates for each type of crime in each jurisdiction were stable over decades (Whitt, 2001:231; Herbert, 1982 in Wu, 2001:1). Similarly, early English geographers of the mid-1800s (like Glyde 1856, in Wu, 2001:2), found that different levels and mixtures of crime rates vary substantially both in different locations and in different aggregation levels (cities, counties, etc.).

On the other hand, the findings at "mezo" level consisted of results of studies carried out by *Chicago School* in the mid 1920s (Park et al, 1925 in Clark, 2001:370; Whitt, 2001:232). They founded the first "theoretical" basis for social geography or human ecology of cities (Jones, 1970:138) and the corresponding *Chicago School Theory of Crime.* The model for the Chicago City was composed of five concentric zones (Clark, 2001:370) each of which had distinctive characteristics (Figure 2.2).

According to *Chicago School* cities evolve with ecological processes of invasion, dominance and succession such that "growth of any city is tied to the pressure from the center of the city to expand outward. For example, Zone II, or the zone of transition, will eventually be subject to the invasion by business and industrial expansion from the central business district, or Zone I" (Clark, 2001:370). After the movement of central business district activities into this zone, previously which retained some of the most desirable housing, becomes an undesirable place to live. Already old houses deteriorate and their rents decrease. Poor who are basically unskilled workers start to live in the area characterized by warehouses, pawn

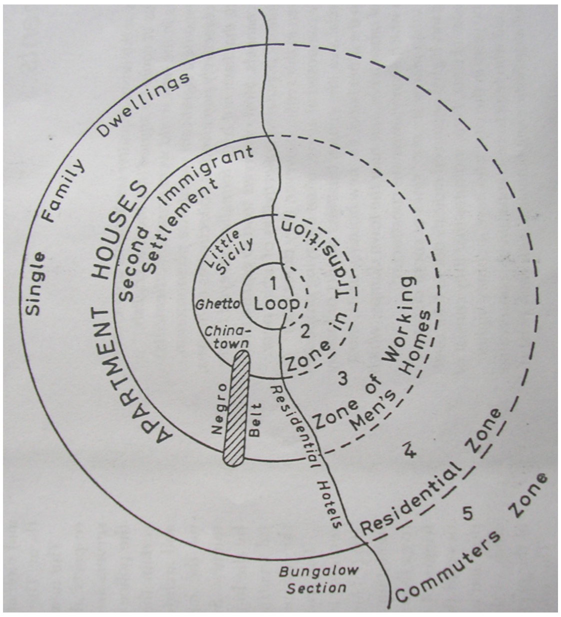


Figure 2.2 Chicago City Model (Diagram of City Ecology)
Source: Jones, 1970:138

shops and slums, which develop due to competing market forces of high land and low building values (Park et al, 1925 in Wu, 2001:14 and in Miethe, 2001:204). Accordingly, they found that crime and vice emerge (Park et al, 1925 in Wu, 2001:14).and are endemic in Zone II (Park, 1969 in Schwab, 1992:6), and in the groups that live in this zone.

By making use of Chicago City Model, Shaw and McKay (1942 in McNulty, 2001:375), the founders of *Social Disorganization Theory* concluded that delinquent rates widely vary among the different neighbourhoods of the city and they decrease with increasing distances from the CBD. Moreover, they found that delinquent rates are the highest in the areas of high social disorganization around the CBD (Zone II) characterized by low rents, physical deterioration and declining population area, which suffer from high poverty, residential mobility and ethnic heterogeneity together with other social ills such as high infant mortality rate. Another major finding is that the high rates of delinquents are persistent or stable over time in neighbourhoods where high delinquent rates are observed (Shaw and McKay, 1942 in Wu, 2001:14-16; Shaw and McKay, 1942 in Quimet, 2000).

2.2.3 Early New Ecology of Crime (*Defensible Space, Crime Prevention Through Environmental Design, and Space Syntax*)

Early new ecological approaches emerged as the result of criticisms initiated for *traditional crime ecology* or *offender* theories in the early 1970s. They have brought counter arguments based on the limitations of *traditional ecology*. In line with this, they placed an emphasis on the physical characteristics of the criminal acts and they lead to a start for shift of emphasis from the *offenders* towards the *events,* and to the *place-based* conditions or *opportunities* for criminal acts before the full rise of *late new crime ecological theories*[6]. However, since each of the three approaches are distinct from each other, their arguments, methodologies and findings are discussed one by one as in the following.

One of the major impacts in the modern(ist) cities era are the public housing programmes. These programmes which started with the aim of meeting the housing needs of lower income people and revitalize the inner city areas of the metropolises in parallel to slum clearance during the 1930s in the US, and in the mid 1950s in Britain, and in general in the post-2nd World War period in other western countries. While in the US they were constructed in the inner city slum clearance areas with high-rise design principles during the period of modernism between 1950s and 1970s[7], the location of British public housing projects included both inner city slum clearance areas and peripheral locations of expanded and new settlements outside of the conurbations (Schneider and Kitchen, 2002:125-126). Therefore, the latter form of public housing projects implemented in Britain and also in other countries, aimed at decentralization or suburbanization of lower income classes to have healthier living conditions than slums (Knox, 1987 in Osmay and Duruöz, 1995:68).

Two high-rise design stage[8] public housing projects in the Cities of St Louis and New York failed after their construction and became a place that feed criminal acts, which is a problematic with almost all such housing units even in the peripheral areas (Brantingham and Brantingham, 1981a:25). The two public housing projects became laboratories for Newman, the founder of *Defensible Space* theory (Schneider and Kitchen, 2002:128-129).

After studying at "micro" level consisting of high-rise and large buildings of public housing projects in these two cities (Newman, 1971 in Schneider and Kitchen, 2002:128; Newman, 1972:53) Newman, found the following three criteria, which increase the crime rate in any large residential building (Oc and Tiesdell, 1997:53).

- Anonymity and alienation, a case in which highly dense vertical buildings cause its residents not to know their neighbours and hence, they no longer feel themselves as part of a community (Newman, 1973 in Oc and Tiesdell, 1997:53)
- Lack of surveillance in the semi-public interiors of the buildings like in the lobbies, halls, elevators, and fire stairs (Newman, 1972:79); and
- Availability of escape routes in the buildings (Newman, 1972:34).

Following these findings, in his *Defensible Space Theory*, Newman (1972) argued that "the modification of specific features of urban architecture would reduce crime." (Brantingham and Brantingham, 1981a:18) and proposed four physical principles in construction of a space that defends itself. He argued that this defense would be possible by reversing the conditions of physical/built features of a place, which decrease the social control capacities (Newman, 1972). These principles are (1) Territoriality, (2) Natural surveillance, (3) Image, and (4) Milieu (Environmental setting) and they are described as in the following.

1. The capacity of the physical environment to create perceived zones of territorial influence: mechanisms for the subdivision and articulation of areas of the residential environment intended to reinforce inhabitants in their ability to assume territorial attitudes and prerogatives….
2. The capacity of physical design to provide surveillance opportunities for residents and their agents: mechanisms for improving the capacity of residents to causally and continually survey the nonprivate areas of their living environment, indoor and out….
3. The capacity of design to influence the perception of a project's uniqueness, isolation, and stigma: mechanisms which neutralize the symbolic stigma of the form of housing projects, reducing the image of isolation, and the apparent vulnerability of inhabitants….
4. The influence of geographical juxtaposition with "safe zones" on the security of adjacent areas: mechanisms of juxtaposition-the effect of location of a residential environment within a particular urban setting or adjacent to a "safe" or "unsafe" activity area. (Newman, 1972:50).

Crime Prevention Through Environmental Design (CPTED) was developed during the same period with Newman's *Defensible Space Theory* (Brantingham and Brantingham, 1981a:18; Schneider and Kitchen, 2002:100). *CPTED,* which was founded by Jeffrey (1971 in Schneider and Kitchen, 2002:100), is accepted today as one of the two "most well developed opportunity reduction approaches to crime prevention." (Oc and Tiesdell, 1997:51). The other approach, i.e., *Situational Crime Prevention (SCP)*; was developed as a group of principles for urban design with an argument that states "the modification of specific features of urban design would reduce crime." (Brantingham and Brantingham, 1981a:18). The basic idea behind it, is the prevention of crime on the basis of relationship between humans and their environment (Jeffrey, 1971 and Jeffrey, 1977 in Schneider and Kitchen, 2002:100).

Today, *CPTED* approach is implemented as urban design/planning programs that target at development of safer and defensible spaces in particularly Britain and to a lower degree in North American countries (Schneider and Kitchen, 2002:103). Many of *CPTED* strategies including "natural access control", "natural surveillance"[9], and "territorial reinforcement" are also common with those of *Defensible Space* approach (Oc and Tiesdell, 1997:97). A detailed comparison of these strategies is given in Table 2.3.

Table 2.3 Connections between Defensible Space principles and CPTED strategies

Defensible Space Principles	**CPTED Strategies**
Territoriality Boundary definition	Border definitions of controlled space
Territoriality Boundary definition Access control	Clearly marked transitional zones
Surveillance Access control	Attention directed to gathering areas
Image and milieu: activity generation	Place safe activities in unsafe areas
Image and milieu: activity generation	Place unsafe activities in safe locations
Boundary definition Access control	Reduce use conflicts with natural barriers
(None)	Better scheduling of space
Surveillance	Increase perception of natural surveillance in spaces by design
(None)	Overcome distance and isolation by communication

Source: Schneider and Kitchen (2002:102) (Originally adapted from Newman (1973) and Crowe (1997))

In so far as the territory context is concerned, the *CPTED* approach focuses much on the relation between land use and activity locations and territoriality (Schneider and Kitchen, 2002:101), and less on its biological importance (Oc and Tiesdell, 1997:57). *CPTED* argues that physical design "'can create or extend a sphere of influence so that users of a property develop a sense of proprietorship over it'" (Peel CPTED Committee, 1994:3 in Oc and Tiesdell, 1997:57).

The basic difference of *CPTED* approach from *Defensible Space* is that it extends beyond the residential or public housing context into broader urban land use categories (Schneider and Kitchen, 2002:101; Oc and Tiesdell, 1997:55). "Maintenance" principle is another important emphasis in this approach, particularly after the elaboration of *Broken Windows Theory*[10] of Wilson and Kelling (1982 in Schneider and Kitchen, 2002:93,101). Moreover, unlike *Defensible Space, CPTED* approach includes two non-spatial strategies: scheduling and communication (Table 2.3).

The basic criticisms of *CPTED* approach are as the following:

- largely unsupported by empirical evidence;
- too focused on design solutions, and distanced from social and management explanations;
- difficult to apply to many urban situations;
- unresponsive to concerns about fear of crime;
- too dependent on 'outside' experts, consultants who provide simplistic solutions; and
- neglect of the need for community residents to 'own' crime solutions, causing resentment and programme failures (Schneider and Kitchen, 2002:103).

Hillier's (1977) *Space Syntax*, is similar to Newman's (1972) *Defensible Space* in stating that it is possible to reduce or prevent crime and increase the defensibility of a space by its physical characteristics. However, Hillier and Newman differ in their main hypothesis in approaching this question. While Newman (1972) argue that physical design directly influences crime rates, Hillier suggests that spatial configuration in the first place is related to patterns of social interaction and by that means it may affect crime rates (1973 in Fanek, 1997:29).

In criticizing Newman's theory, Hillier looks from another point of view. First of all, unlike the previous research on society-space relation, the foundation of *Space Syntax Theory* does not rely on the "assumption that knowledge must first be created in the academic disciplines before being used in the applied ones." (Hillier and Hanson, 1984:x). Instead, the architecture is used as the basis in development of their theory, which aims at investigating the society-space relation. While constructing the descriptive theory of how spatial patterns carry social information and content, first a conceptual model is build, then by "a new definition of spatial order as restrictions on a random process, a method of analysis of spatial pattern with emphasis on the relation between local morphological relations and global patterns" is introduced (Hillier and Hanson, 1984:x-xi). Afterwards, these are applied at "mezo" level on the example settlements in England and France, and at "micro" level on some urban design projects (Hillier et al, 1983:52,60). *Space Syntax* is developed in a descriptive and quantitative approach, which aims

- to find the irreducible objects and relations, or 'elementary structures' of the system of interest-in this case, human spatial organisation in all its variability;
- to represent these elementary structures in some kind of notation or ideography,...
- to show how elementary structures are related to each other to make a coherent system; and
- to show how they may be combined together to form more complex structures. (Hillier and Hanson, 1984:52).

To investigate the main proposition that there is not “a relation between settlement forms and social forces, but that there is a relation between the *generators* of settlement forms and social forces” (Hillier and Hanson, 1984:82-83) this theory makes use of syntactic descriptions of “axial” or “convex” spaces on their “distribution/non-distribution” and “symmetry/asymmetry”. Some other variables of this approach include “depth”, “distance”, “global integration”, “local integration with R=3”[11], “regular/deformed grids”, “control”, “connectivity”, “intelligibility”, etc. (Fanek, 1997:35-51).

In developing the *Space Syntax Theory*, Hillier et al (1983:52) criticized not only Newman’s approach to ‘territoriality’ and ‘surveillance’, but also his approach to the related concepts of ‘strangers’ and ‘segregation’. Territoriality, is criticized for its basic views that the organization of space by human beings at both individual and all levels of human grouping emerge from “universal, biologically determined impulse in individuals to claim and defend a clearly marked ‘territory’, from which others will be -or at least selectively- excluded.” (Hillier and Hanson, 1984:6). According to *Space Syntax Theory*, the universality argument of *Defensible Space* loses its capacity to explain the important differences in physical configuration (Hillier and Hanson, 1984:6).

Hillier (1988 in Oc and Tiesdell, 1997:57) principally criticizes *Defensible Space* for its viewpoint on the concepts of ‘surveillance’, ‘strangers’ and ‘segregation’. In this viewpoint defensible enclaves are supported by excluding all strangers without differentiating between Jacobs’s “‘predatory strangers’ and the ‘many, many peaceable well-meaning strangers’” (1961:45 in Oc and Tiesdell, 1997:57). According to *Space Syntax Theory* while ‘passing strangers’ control the space, the strangers are controlled by the inhabitants. Thus, is argued that ‘defensible space’, which is “based on exclusion of strangers and only on surveillance of spaces by inhabitants can never work” (Hillier and Hanson, 1984:140). In line with this argument, while Newman (1973 in Oc and Tiesdell, 1997:158) is on behalf of merits of ‘enclosure’ or ‘segregation’ as a way of insulation of richer neighbourhoods from poorer ones[12], Hillier argues on the merits of ‘integration’ of residential developments into their immediate surroundings with a positive means of ‘de-ghetto-ising’ (1988 in Oc and Tiesdell, 1997:158).

2.2.4 Late New Ecology of Crime (*Routine Activities, Situational Crime Prevention, Rational Choice, and Crime Pattern*)

These challenges of today's global(izing) western cities since late 1970s made explicit that the resolutions of the previous era were not adequate. Concurrently, they have been largely criticised. Similar to this, the previous ecological theories were seen inadequate in resolution of crime problem. Therefore, there emerged an increasing need for an emphasis on *place* resulting in development of *late new ecological theories* to pursue crime distribution and prevention from a *place-based* view after many critics of the previous theories (Figure 2.1).

These criticisms had already started in development of *early new theories.* For example, Jeffrey (1977 in Schneider and Kitchen, 2002:100), founder of CPTED, made a general criticism against two of the earlier theories and argued that Chicago School, Shaw and McKay (founders of Social Disorganization Theory) and Sutherland (founder of Sub-culture Theory) disregarded the physical environment as a factor that affects criminal behaviour and only focused on social environment or on individuals (Figure 2.1). General criticisms towards the *traditional crime ecological theories*, which were made on the basis of their main assumptions, can be listed as below:

- Ecological fallacy problem, which refers to attribution of results of the grouped data to individuals (Clark, 2001:371);
- Ignorance of non residential offenders and assuming crimes are product of local residents;
- Determinants of crimes are considered to be constant in space; and
- Treatment of the data as they are statistically independent (Anstey, 1998:v).

Similarly, although *Defensible Space Theory* pays attention to opportunistic view for crime events in terms of site designs and provides with a possible explanation for some patterns concerning the space around high-rise buildings, further criticisms are made on this theory (Wu, 2001:36). First, similar to 'strangers paradox' for which, Newman (1972) took its negative side by defining 'defensible space' as the one that excludes all the strangers, Newman's theory is criticized for not considering the other sides of some additional paradoxes such that there is:

- Inadequate consideration of offenders' role, i.e., *Defensible Space Theory* is subject to what Harries (1999) calls as *density paradox,* meaning that while busy/high population places/densities increase the risk of offenders' being seen, they also increase the number of potential offenders, and present more opportunities for crime in terms of targets (Wu, 2001:37);

- *Lighting paradox* in 'surveillance', which requires sufficient illumination to be applied, i.e., lighting not only enables the offender to be seen, but also allow him/her to see potential targets (Schneider and Kitchen, 2002:96); and
- Inadequate consideration crime types, i.e., this theory is subject to what could be called *defended space* and *street activity paradoxes.* While a well defended space may decrease the likelihood of attacks, robberies or vandalism, it increases possibility for another crime type that is committed regarding that space as secure (Wu, 2001:37). Similarly, while street activities can mask certain types of crimes, it can encourage other types (Mayhew, 1981 in Schneider and Kitchen, 2002:95).

Further main critics of *Defensible Space* are counted as:

- Ineffectiveness of surveillance as a prevention mechanism due to public ignorance of crimes (Mayhew, 1981 in Schneider and Kitchen, 2002:94);
- Being too narrow (Mawby, 1977b in Wu, 2001:36) and thus lacking interest to be applied on a wide scale (Repetto, 1976 in Wu, 2001:37);
- Cost, safety, and privacy problems in modification of existing structures (Mayhew, 1981 in Schneider and Kitchen, 2002:95);
- No consideration of differences in offender rates between the projects (Mawby, 1977b in Wu, 2001:37);
- Some ineffectiveness of the concepts of "image" and "territoriality" (Phelan, 1977b in Wu, 2001:38), which is elaborated by development of *Space Syntax Theory* (Hillier et al, 1983); and
- Ethical concerns on the support of *Defensible Space* for enclaveness and segregation (Schneider and Kitchen, 2002:99).

Despite the fact that *Social Disorganization* remained as a major explanation (Miethe, 2001:204) for particularly offender rates (Quimet, 2000), all these criticisms, which first started with the emergence of *early new ecological theories*, introduced the beginning of a new era for *ecology of crime*. Subsequent to the critics of previous approaches and mostly of the *traditional* ones, the *late new crime ecological* approaches (Figure 2.1), which have been developed since the late 1970s (Wu, 2001:30), further shifted the emphasis from study of criminals, offenders or delinquents to the study of criminal events, crime environment or opportunities for crime occurrences (Eck and Weisburd, 1995 in Eck, 1998:403; Clarke, 1989:3; Brantingham et al, 1997 in Schneider and Kitchen, 2002:101). In other words, starting with *early* and continuing with *late new*, the *traditional ecological* view of the primacy of sociological determinism is rejected by asking the basic questions in terms of "where" instead of "who" (Brantingham and Brantingham, 1981a:18-21).

As stated, *early* and *late new ecology theories* are also called as *crime place theories* or *place-based crime theories*. These names cover one word for the two most important concepts in all these theories in understanding the distribution of crime occurrences, that is, '*place*', which refers to a specific '*space*' and '*time*' (Brantingham and Brantingham, 1981a:8). The main argument and the common point in all these approaches is that certain types of criminal events do not occur or distributed randomly in *space* and *time*, but they show distinct patterns (Ekblom, 1988 and Hirschfield et al, 1995 in Nelson et al, 1996:411). That is, there are *spatio-temporal* factors, which determine the occurrence and distribution of such criminal events. With regards to unequal distribution of crime, they very much resemble the *traditional (offender) theories* but with a change of emphasis from "*offenders*" towards the "*criminal events*" and "*crime environments*". This is why these theories are also called *"event" theories* and *"environmental criminology" theories*, respectively. Patterns are built by linking *spatial* and *temporal "events"*, and not by linking of social and cultural contexts where *offenders* live (Schneider and Kitchen, 2002:108). An example is given as

> a robbery committed by a minority youth one block from his home in the ghetto and a burglary committed by a middle-class white youth one block from home in the suburbs might be treated as unrelated by the sociological imagination, but as identical (one block from home, at noon) by the geographical imagination. (Brantingham and Brantingham, 1981a:21).

Consequently, *late new ecological approaches*, together with *early new* ones, aim at verification of this main assumption, which makes particular emphasis on why some targets *spatio-temporally* are more attractive or provide more *opportunities* for criminal behaviour to take place. Finally, this explains still another naming of these approaches, which is "*opportunity*".

Late new ecological approaches (Figure 2.1) cover studies on foundations of *Routine Activity Theory* by Cohen and Felson in the late-1970s (Cohen and Felson, 1979); *Situational Crime Prevention (SCP)* by Clarke in early 1980s (Clarke, 1980 in Weisburd, 2002:198) - subsequently improved in the early and mid 1990s (Clarke, 1992 in Oc and Tiesdell, 1997:58; Clarke, 1997 in Schneider and Kitchen, 2002:104)-; *Rational Choice Theory* by Cornish and Clarke in the mid-1980s (Fritz, 2001:141; Henry and Bryan, 2000:3); and *Crime Pattern Theories* (Brantingham and Brantingham, 1984 in Harries, 1999), which have begun with foundation of *Offenders' Search Areas Theory* (Brantingham and Brantingham, 1981b:29) and *Criminal Spatial Behavior Theory* (Brantingham and Brantingham, 1984 in Harries, 1999) by The Brantinghams during the early and mid-1980s. These two starting theories were developed by means of combining the *Rational Choice* and *Routine Activity* approaches (Wu, 2001:32).

Another related theory is called *Broken Windows* developed by Wilson and Kelling (1982 in Schneider and Kitchen, 2002:93) in the early-1980s. This theory afterwards became a supportive argument for *Hotspots* concept (Anselin et al, 2000:225), which became a further contribution to still developing field of *Crime Pattern Theories*. *Hotspot* concept was developed by Sherman, Gartin and Buerger (1989 in Miethe, 2001:205) in the late-1980s. Relatively recent contributions to the development of *Crime Pattern Theories* include models for serial criminal acts in the early and mid-1990s. These can be counted as *Commuter and Marauder Model* by Canter and Larkin (1993 in Ratcliffe, 2001:9; Stangeland, 2003:3); and *Geographic Profiling Model* by Rossmo (1995).

For their explorative means, *late new ecological* studies usually utilize the "mezo" spatial level. In addition, they reach a common conclusion that the *spatio-temporal* distribution of crime is not random and it has a distinct pattern and this occurs in a manner that can be explained (Wu, 2001). That is, its likelihood is influenced by the differentiating *spatio-temporal* characteristics of the urban area.

Routine Activity Theory describes when, where and how criminal events occur (Robinson, 2001:335), and as an analytical method it utilizes the opportunities provided by the *Routine Activities* of the victims and possible absence of controllers (Wu, 2001:33). The concept of "geography of fear" in late new ecological approaches looks from the *Routine Activity* perspective, and it stresses the important relationship between the offender perspective and physical characteristics of place in identifying the comparable fear hot-spots (Nasar and Fisher, 1993 and Fisher and Nasar, 1995 in Nelson et al, 1996:411). *Routine Activities* provide key population and individual needs in a repeating and usual way and are independent of biological or cultural differences. They include activities that provide work, food, shelter, entertainment, learning, child rearing and the like (Cohen and Felson, 1979:593). According to this theory, crime occurs in the routine activity areas of targets when three conditions take place simultaneously. These conditions are listed as in the following.

- a likely/motivated offender;
- a suitable/desirable target; and
- the absence of a guardian/crime suppressor capable of preventing the criminal act (e.g., friends, parents, teachers, place managers) (Cohen and Felson, 1979:589).

Harries (1999) argues that the last condition is subject to *density paradox*. He also states that geographical context of this theory and *Situational Crime Prevention (SCP)* approach, which is described below, ask

> how each element is distributed in geographic space. Where are the likely offenders? (What is the geography of the youthful male population?) Where are the suitable targets? (What is the geography of convenience stores, malls, automated teller machines, poorly illuminated pedestrian areas?) Where are the guardians? (What is the potential for surveillance, both formal and informal, of targets or areas that may contain targets? Where are the public or quasi-public spaces that lack surveillance and are ripe for graffiti and other incivilities?)

Situational Crime Prevention (SCP) was founded by Clarke in 1980 (Clarke, 1980 in Weisburd, 2002:198), and was subsequently developed in 1992 (Clarke, 1992 in Oc and Tiesdell, 1997:58) and in 1997 (Clarke, 1997 in Schneider and Kitchen, 2002:104). The continuous development of *SCP* by Clarke is not only influenced by *early new theories* of *Crime Prevention Through Environmental Design (CPTED)* and *Defensible Space*, but also by late new crime ecology theories of *Routine Activity* and *Rational Choice* (Schneider and Kitchen, 2002:104).

SCP was developed with the basic concept of *opportunity* structure of crime situation, and as stated previously, after *CPTED*, it is the second "most well developed opportunity reduction approach…to crime prevention." (Oc and Tiesdell, 1997:51). It is considered as a 'tactical' approach, which is place and crime specific, and functioning "at a micro scale, which is useful for analyses of particular cases (e.g. the burglary of a specific residence in a specific neigbourhood), but difficult when one wishes to make statements at mezo (middle) or macro levels." (Schneider and Kitchen, 2002:104). However, it provides generalizations in that it is possible to reduce opportunities for offending by 'increasing efforts', 'increasing risks', 'reducing rewards' in crime (Oc and Tiesdell, 1997:59) and by 'removing excuses' for crime (Schneider and Kitchen, 2002:104-105).The original version of *SCP* in 1980 include eight opportunity reduction principles ranging from "Target hardening" to "Environmental management" (Oc and Tiesdell, 1997:58).

Afterwards, in 1992, as it was developed into twelve 'opportunity reducing techniques', it is categorized under three main groups of 'increasing efforts', 'increasing risks' and 'reducing rewards' of offenders (Oc and Tiesdell, 1997:58). With 1997 version, currently, this approach includes totally sixteen such techniques with one more additional category of 'removing excuses' (Schneider and Kitchen, 2002:104)[13].

Similar to achievement of *Crime Prevention Through Environmental Design (CPTED)* approach in including few numbers of non-spatial principles in prevention of crime, the basic difference of *Situational Crime Prevention (SCP)* is that in addition to 'spatial' applications, it includes 'non-spatial' principles. Particularly, as Schneider and Kitchen (2002:104) state Clarke's rationale behind the addition of the fourth category ('removing excuses')

> was that situational crime prevention should be restricted to classical 'street' crime but is also applicable to crimes more typically associated with higher status perpetrators and with others whose actions might normally escape the same level of scrutiny and sanction as violent or 'predatory' offenders. This category is therefore intended to include many classical white collar crimes, as well as an assortment of tax, traffic and minor theft incidents that have been previously overlooked. Further, these crimes are generally not covered by 'environmental' designations in that they may not be linked to specific places.

Basically, the criticisms of *SCP* are based on the concept of 'displacement'. In this view, the deterrence of well-motivated offenders from committing crime is unlikely because the criminal act shifts from intervention areas for crime prevention or changes in terms of territory, space (location), time, tactic, function (method), target, and offence type (Repetto, 1976 in Weisburd, 2002:199; Oc and Tiesdell, 1997:58,71-72). On the other hand, challenges also exist against displacement on behalf of *SCP*. These challenges are found in studies that show criminal *opportunities* do not spread randomly in urban areas and crime is concentrated (Brantingham and Brantingham, 1981b; Sherman et al, 1989, Weisburd et al, 1992, and Weisburd and Green, 1994 in Weisburd, 2002:200) and "criminal opportunities are differentially distributed" (Weisburd, 2002:200) in space and time.

"Further challenge to displacement…is found in…studies that suggest a positive though unanticipated consequence of situational prevention. In these cases investigators found improvement in areas close to but not targeted by crime-prevention efforts" Weisburd (2002:201-202). While Clarke and Weisburd (1994 in Weisburd, 2002:202) define this concept as 'diffusion', Weisburd (2002) continues with other researchers using different names to explain it. Among these 'free rider' effect (Miethe, 1991 in Weisburd, 2002:202), 'the bonus' effect (Sherman, 1990 in Weisburd, 2002:202), the 'halo' effect (Scherdin, 1986 in Weisburd, 2002:202), and the 'multiplier' effect (Chaiken et al, 1974 in Weisburd, 2002:202) are counted.

In particular, from the analytical point of view, in *Rational Choice Theory*, offenders are seen as rational decision makers who aim to maximize their benefits (potential rewards) and minimize their costs (expended effort) and risks in choosing their targets. Thus, they take into account *space* and *time* in achieving their goals (committing criminal acts). Therefore, environmental factors affect the choices made by offenders and they commit crimes with decisions taken not in *absolute* and *value* rationality but in *bounded* and *instrumental* rationality (Cornish and Clarke, 1986 in Schneider and Kitchen, 2002:106). In other words, the distribution of criminal acts in space and time can be explained (Cornish and Clarke, 1986 in Fritz, 2001:141) by an imperfect neo-classical utilitarian human conduct (economic man) (Oc and Tiesdell, 1997, 44-45), and it is seen as a function of the opportunity and rewards offered by the environment (situation) in which it takes place and not as a function of defects in the offender's values, beliefs or socialization (Schneider and Kitchen, 2002:106).

Crime Pattern Theories try to find the interactions of offenders with their social and physical environments that influence their target choices and hence, the distribution of the criminal events in *space* and *time* and among other targets (Brantingham and Brantingham, 1993 in Wu, 2001:32). In order to achieve this, they make use of an analytical approach that combines *Routine Activity* and *Rational Choice* perspectives and make use of concepts like 'awareness space', 'activity space', and 'search areas' of offenders[14] (Schneider and Kitchen, 2002:108). Accordingly, the overlap of *late new ecology* with Environmental Psychology is concerned with the motivations for criminal activity (Nelson et al, 1996:411) and criminal behavioural patterns, particularly about target selection practices of offenders and they have the basic theories of *Offenders' Search Areas* (Brantingham and Brantingham, 1981b:29) and *Criminal Spatial Behavior* (Brantingham and Brantingham, 1984 in Harries, 1999) which emerged as the first two *Crime Pattern Theories.*

These two theories suggest that the crime is likely to occur on the intersection points and paths within the *awareness space* of the offender and around his/her *activity spaces* (e.g., home, work, entertainment, etc.), which in turn, contain his/her *search areas* for suitable targets and victims with low risk. These points and paths, at the same time, are far enough from their residences, where they are recognized and at risk to be caught (Brantingham and Brantingham, 1981b:30-47)[15].

Broken Windows Theory (Wilson and Kelling, 1982 in Schneider and Kitchen, 2002:117) aim to validate the argument that "even small levels of environmental (and behavioural) disorder matter and, if left unattended, send out cues that 'nobody cares', hence encouraging further, possibly more serious disorder and crime". According to this theory, the urban areas, which are exposed to incivilities like "uncollected trash, broken windows, graffiti, disorderly conduct, and other seemingly minor transgressions" (Wilson and Kelling, 1982 in Schneider and Kitchen, 2002:117), influence the community negatively as well as might have significant cumulative effect.

The fourth *Crime Pattern* approach, which is *Hotspots*, is based on generation of small areas of criminal event concentrations within identifiable boundaries. The purpose of this approach is to explore the conditions or potential values of space and time for some clustering in the spatio-temporal distribution of crimes (Anselin et al, 2000:221-222). It verifies its assumption by suggesting that crime in the city is highly concentrated in relatively few small areas (Anselin et al, 2000:221).

The *Crime Pattern Theories* or models developed for serial criminal events during the mid 1990s, particularly aim at defining the relationship between the offence (and related locations) and offender residences, where the latter is searched by means of the information on the former. In other words, in a way, they can be considered as reversal of the *Crime Pattern* studies that are based on determination of crime sites out of the areas where the offenders live (Mason, 1996). For this purpose, Canter and Larkin developed a model, which includes *Commuter Hypothesis* and *Marauder Hypothesis* (1993 in Ratcliffe, 2001:9 and in Stangeland, 2003:3).

In these hypotheses, home area of a -serial- offender is termed as 'home range' and areas of offences is termed as 'criminal range' (Ratcliffe, 2001:9). According to the first hypothesis, an offender is a "commuter" type, and travels to and commits crime in a distinct area away from his home, and his/her two ranges, i.e., 'home' and 'criminal' ranges, do not overlap or have little overlap. On the contrary, with reference to the second one, offender is a "marauder" type and his/her home base becomes central to offence patterns, and offender's home and criminal ranges almost completely overlap (Canter and Larkin, 1993 in Ratcliffe, 2001:9). Moreover, this model suggests that a circle drawn with a radius of the two offences farthest apart is very likely to encompass the home base of the offender (Stangeland, 2003:3). These range and circle analyses base the reason for another naming of this model: "Circle and Range Tests" (Canter and Larkin, 1993 in Alston, 1994:iii).

In *Geographic Profiling Method*[16] the aim is to determine the likely residence of a serial offender based on their spatial and hunting behavior (Grescoe, 1996 in Henry and Bryan, 2000:5; Rossmo, 1995). With this method, it is possible to produce "a map of the most probable location of the criminal's centre of activity, which in most cases is the offender's residence." (ECRI, 2004).

Similar to increase of interest in crime ecological studies following the quantitative revolution in geography after the 1950s (Wu, 2001:22), a new wave of interest for these studies have emerged recently (Weisburd and McEven, 1998:1). This increase of interest has been closely related with the advent of widely accessible and increased use of computerized mapping, desktop Geographic Information Systems (GIS) and spatial data analysis (SDA) techniques since the early 1980s and especially during the 1990s (Boba, 2001:17). The present research area concerning *late new ecological theories*, which started about three decades ago, continues to develop particularly within the field of *Crime Pattern Analysis* methodology that emerged in parallel to *Crime Pattern Theories.* This analysis being a practical extension of the respective theories use advances in crime mapping and spatial data analysis tools through computer technology (Anselin et al, 2000:218). In Figure 2.3, both former and recently developing theories are summarized from a chronological perspective.

2.3 Empirical Studies on Ecology of Crime

The aim of this section is to examine crime in urban *place* empirical context. For this purpose first, the reviewed empirical studies are grouped with respect to one or more crime ecological theories that they utilize. It is observed that these researches utilize ecological theories either in an integrated way, simultaneously or independently from each other. Secondly, other empirical studies on crime ecology are discussed, which include both comparative studies (in terms of theories and offender types), and other researches that could not be classified under any of the above mentioned categories. Thirdly, the current level of practices in Turkey concerning the *ecology of crime* is discussed in terms of both the projects that are carried out by the police authorities and sometimes in collaboration with the universities, and the researches on the *crime ecology.*

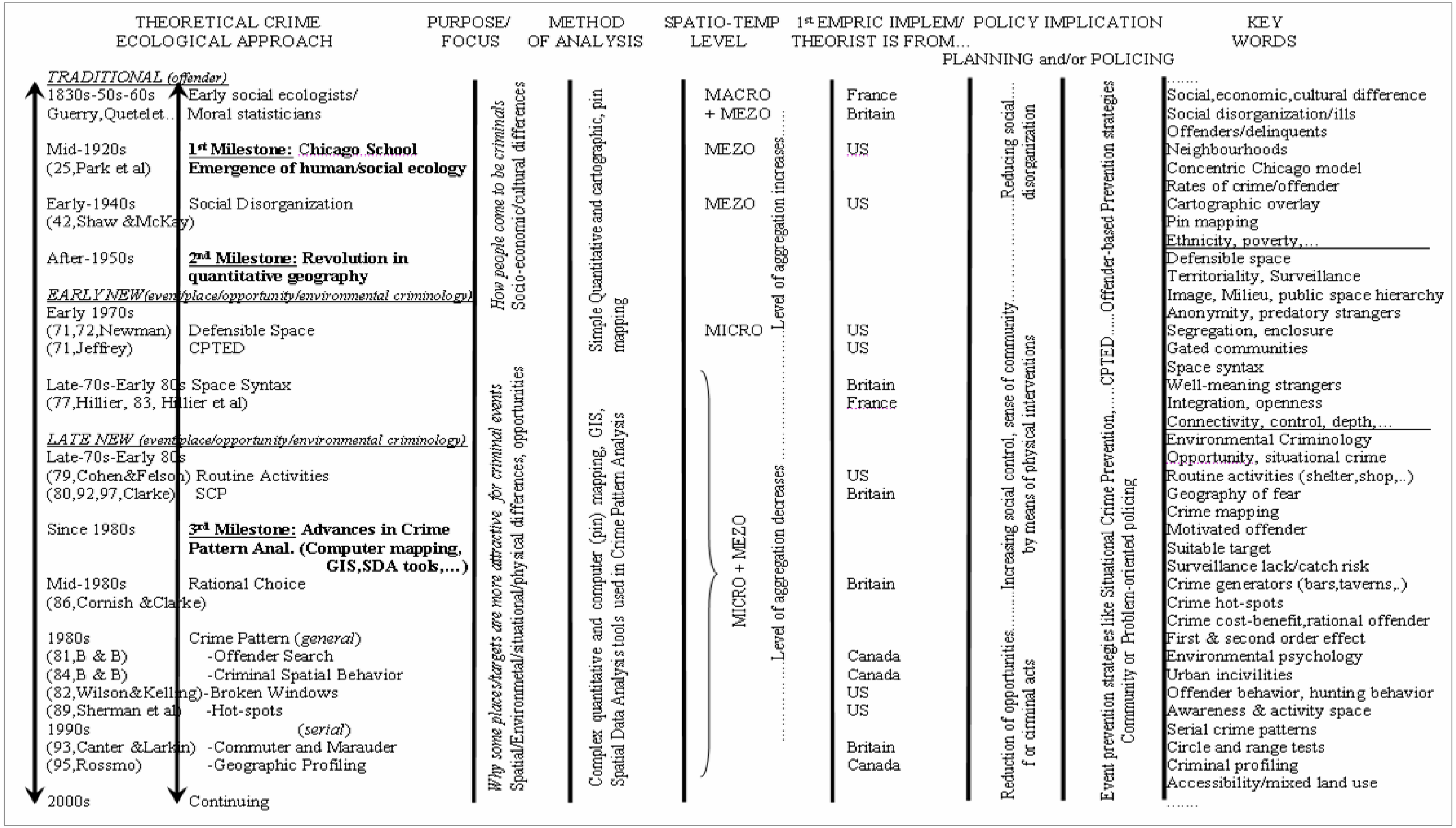


Figure 2.3 Crime ecological theories and their basics from a chronological perspective

Note: The arrows are used for representing the chronological continuity before and after; Source: Prepared form the literature reviewed

2.3.1 Example Studies with respect to One or More Crime Ecology Theories

In this section, totally a sample of 27 studies is examined. The grouping of studies with respect to the ecology of crime approaches is found as in the list below:

1. *Late new ecology:9*
2. *Late new ecology and traditional ecology:7*
3. *Traditional ecology:5*
4. *Early new ecology and traditional ecology:4; and*
5. *Early new ecology:2*

In the first group, while researches pursue the main line of argument of the *late new ecology* in general, particularly they focus on one of the following:

- Relationship between *spatio-temporal* patterns of incidents and their physical environments (Nelson et al, 1996; Henry and Bryan, 2000; Wu, 2001);
- Impacts of selected urban land-uses on the distribution of incidents (Sweet, 1996; Kinney, 1999);
- Patterns of various crime types (Young, 1992; Leitner, 1999);
- Spatial patterns of *serial crimes* committed in cities (Pelkey, 1990; Alston, 1994).

Similarly, in the second group, while researches is guided by the main argument of both *late new ecology* and *traditional ecology* in general, they have particular concern for one of the following:

- Relationship between spatial patterns of incidents and their physical and socio-economic environments (Anstey, 1998; Davison and Smith, 2002; Li and Rainwater, 2002);
- Impacts of urban renewal/redevelopment/ revitalization on patterns of various incidents (displacement) (Schumacher and Leitner, 1999; Suresh, 2000);
- Effects of spatial inequality of various socio-economic variables in the spatio-temporal patterns of various crimes (Phillips, 1998; Portnov and Rattner, 2003).

Thirdly, all the studies in the third group (Pruitt, 1995; Sacerdote, 1997; Park, 2000; Erkut et al, 2001; Ergun et al, 2003) have a common aim to investigate the relationship between distribution of crime and socio-spatial, economic, and/or demographic structures in the urban and/or rural areas.

The fourth group of studies (Fanek, 1997; Farooq, 1999; Dumanovsky, 1999; Ünlü et al, 2000). commonly focus on the relationship between distribution of crime and both the social and spatial structure in which they take place. Majority of these studies make particular emphasis on peculiar effects of organization or configuration of social and spatial entities especially in residential urban areas on the distribution of crimes.

Finally, the studies in the fifth group (Clontz, 1995; Howard, 1999) aim at investigating and testing the assumptions and/or achievements of the *CPTED* strategy in reduction of various property crimes in particularly residential urban areas.

All the studies in the first and second groups utilize a wide variety of quantitative methods, which extensively make use of computer technologies like GIS and a variety of statistical and/or spatial data analysis softwares. Like in the two previous studies groups third group of studies utilize quantitative methods. However, since they are based on *traditional ecological* approaches, and not on *late new ecological* ones including *Crime Pattern Theories* and corresponding analytical approaches, the researchers in this group rely much less on GIS and similar technologies. Similar to previous groups, the fourth group studies make use of quantitative methods, and adopt related computer technologies. The main difference is reflected in the techniques of data collection that came as a requirement of *early new ecological* approaches. In this respect, these studies generally rely on detailed field studies and questionnaires. This is needed for effective assessment of these theories' extensive emphasis on physical/structural characteristics and environmental quality, and social interactions within neighborhoods including anonymity and sense of community. In terms of analytical methods, the same as in the previous studies, while the researchers in the fifth group use quantitative methods, one study additionally makes use of qualitative methods (Clontz, 1995).

In all the reviewed researches, a variety of dependent (i.e., crime or incident) data are selected on *place-based* concerns and independent data coming from diverse institutions are utilized. As for *spatial* and *temporal* unit of analysis, all these studies utilize one or more ecological levels, i.e., "micro", "mezo", "macro".

Further empirical research is required particularly in the *new ecology of crime*. As Schneider and Kitchen (2002:116) argue that while past empirical research in small scale urban areas revealed some results on the relations between criminal behaviour, physical design and place management, there is still a lack of empirical evidence and case studies which would support the relatively general statements about relationships between crime and environmental factors. They come to a conclusion that there is a need for an "increased emphasis on empirical study along with carefully documented case studies…toward a general theory of place-based crime prevention planning and,…a better understanding of the linkage between crime and place at all levels of analysis." (Schneider and Kitchen, 2002:116).

2.3.2 Examples of Other Empirical Studies on Crime Ecology

In this section examples of other empirical studies on crime ecology are discussed. As stated, firstly, these include two *comparative* studies, where *traditional* vs. *new ecological theories* (Quimet, 2000) and *resident* vs. *non-resident offenders* (Buettner and Spengler, 2003) are compared. Secondly, remaining ecological studies that could not be classified under any of the previously set groupings are discussed.

In the first study, so as to assess the importance of the choice of aggregation level, Quimet (2000) compares two competing ecological approaches (*Social Disorganization Theory* and *Opportunity Theory*) with regard to two dependent variables (juvenile offender rate and juvenile crime rate) (see Section 2.1), respectively for two distinct aggregation levels (smaller Census Tracts and larger neighborhoods obtained from aggregation of Census Tracts) in Montreal City of Canada. The independent variables are poverty, residential mobility, and ethnic heterogeneity for the *Social Disorganization Theory* and the numbers of subway stations, shopping malls, and bars for the *Opportunity Theory.*

Similar to most of the empirical studies mentioned above, Quimet (2000) utilizes quantitative methods and Crime Pattern Analyses (e.g., computer mapping tools for geocoding). In addition to more specific results for violent and non-violent crimes, Quimet's (2000) most important findings are listed below:

- The choice of aggregation level influences variable types, magnitude and significance of the coefficients in the researches, and this choice is partially related to the number of persons or incidents available to compute;
- Both the "juvenile offender rate" and "juvenile crime rate" tend to vary strongly in space. That is, most of the delinquents commit their crime close to their area of residence;
- Theoretically juvenile offender rate should be used to understand the social conditions influencing individual reason for delinquency, and juvenile crime rate

should be used to study environmental factors increasing the likelihood of crime in an area; and

- Census Tract level is best to examine opportunity variables and neighborhood level is best to examine social disorganization variables on crime.

In the second comparative research, Buettner and Spengler (2003) revisit the local determinants of crime using a spatial model that distinguishes between resident and non-resident offenders from an economic theory of crime aspect. They also utilize quantitative methods and computer technology.

Independent variables include locational and residential population characteristics. The variables of locational characteristics are related to features of the administrative units such as monthly rent, shops, and daily commuters, which are almost all municipalities in the Baden-Wuerttemberg State of Germany. The variables of residential population are related to characteristics of individuals in aggregate such as income, unemployment, and divorce indicating both supply (potential offenders) and demand (potential victims) of crime.

Besides more specific results for either main two types of crime (i.e., violent and property crimes), Buettner and Spengler (2003) compares the results of an estimator (General Method of Moment estimator) that they found with those of a standard regression model. Following this comparison, they arrive at the major conclusion of the importance of offender type (resident and non-resident) differentiation in presence of criminal mobility.

As for other studies, although they have some background idea on some *ecological theories*, they are not related to their empirical applications. Moreover, they have a diverse variety in terms of their selected research topics. Therefore, the studies, which could not be classified under any of the above mentioned groups, are categorized as follows:

- Studies on tests of crime prevention measures (e.g., Grant, 2002; Cole, 2002)
- Offender/criminal behavioral studies (e.g., Anderson, 2001)
- Development of mapping and/or spatial data analysis tools/softwares for Crime Pattern Analysis of
    - Spatial Association, Spatial Autocorrelation, Neighborhoods/Aerial patterns (e.g., development of SpaNEx Software (Veenendaal and Houweling, 2000));
    - Point patterns (e.g., development of a new method for *Kernel Estimation* bandwidth choice in ArcView Spatial Analyst Software (Williamson et al,

1999); development of CrimeStat Software (Levine and Associates, 1999); and development of GRASP Software (Dalton, 2003));

- · Clustering, segregation, similarity, etc. indexes (e.g., Lee and Culhane,1998)

- Studies on implementation of computer mapping and Spatial Data Analysis tools (e.g., Canter, 1998; Gehl, 2000; Kennedy, 2002)
- Studies on choices for measurements of crime and/or its correlates (Brantingham and Brantingham, 1998)

2.4 The Case in Turkey

This section elaborates on the current level of practices in Turkey concerning the studies on the *ecology of crime*, which are discussed in two parts. First, the projects that are carried out by the police authorities and sometimes in collaboration with the universities are explained. The adoption of *Crime Pattern Analytical* tools and technologies with an implicit reference to *late new crime ecological theories* and particularly to *Crime Pattern Theories* are considered within the framework of advances in widely accessible computer mapping, related technologies and spatial data analytical tools. Second, a discussion is made on the reviewed *crime ecological* studies realized in Turkey are discussed in terms of their analytical approach. Although some of these empirical studies were mentioned earlier (Erkut et al, 2001; Ergun et al, 2003; Ünlü et al, 2000), here, they are reconsidered within a more general framework. This section concludes with several final remarks on the differences between this dissertation and the current empirical studies in Turkey.

2.4.1 Projects Carried out by the Police Authorities mainly in Collaboration with Universities

The first crime related practical use of GIS in Turkey starts with BEMTAP (Bursa Emniyet Müdürlüğü Teknolojik Adaptasyon Projesi -Bursa Police Department Technological Adaptation Project) Project of Bursa Police Department. This project is based on the Protocol between Bursa Police Department and Bursa Metropolitan Municipality signed in 1997. This project later became a part of another Protocol signed between Bursa Police Department and Istanbul University. A second project of Bursa Police Department is called BUTKID (Bursa Trafik Kazalarını İnceleme ve Değerlendirme Projesi-Bursa Traffic Accidents Inspection and Evaluation Project) Project started in 1999, and later it became one of the sixteen projects covered in the Protocol signed between Bursa Police Department and Uludağ University (Aksoy, 2004).

Respectively, these projects aim to prevent criminal activities and traffic accidents by establishing effective police information systems in connection with the urban information system, which have been successfully (Aksoy, 2002) operating in the Bursa Metropolitan Municipality since 1994 (Işık and Koşak, 2002). The two Protocols signed between Bursa Police Department and these two Universities aim at achieving scientific results on the effects of psychological, sociological, economic and other factors on the distribution of urban crime and traffic accidents and how to prevent them in Bursa (BEM, 2003b). The Protocol signed with Uludağ University is "The Protocol of Cooperation In Scientific Research and Education" and signed on April 4, 2002, and the other Protocol signed with the Istanbul University is "The Protocol of Scientific Cooperation" on March 14, 2001 (Aksoy, 2002:10).

BEMTAP Project is part of a wider project called Technological Projects for Security Organization with a context of an integrated software system "developed for Police Departments that enable them to archive information, to create digital maps, to trace and direct police cars, to query about individuals, and allow on-site queries about the event by means of databank access through car PCs and analog/digital radio" (ALFABİM, 2003:3). The system, which is operated by Computer Center Section of Bursa Police Department, includes components like 'Computer Aided Dispatching and Management Center' (CADMC), police teams with car PCs and GPS equipment, and Bursa Police Department crime database. CADMC answers 155 Police Emergency Calls[17] and maps each call in GIS and dispatches the most suitably located (some of which are determined by means of their mapping via Global Positioning System-GPS) police teams by online PC connection or radios to the crime scene. When the police team arrives and deals with the event they inform the CADMC about the process. The supervisor controls and closes the event via the 'Scene Closer Program'. In addition to routine communication related works among the components of the system, the 'Communication Server' in CADMC organizes local queries (Bursa Police Department Database), national queries (nation-wide Police Departments' Database) and queries of police teams with car PCs (Aksoy, 2002:1-6).

The studies related to crime mapping and analyses in BEMTAP Project are performed within the system's component of Bursa Police Department Database. These studies cover the production of urban crime maps and their integration with the urban, crime and offender data sets maintained in databases and/or GIS (BEM, 2003a). With these maps it is possible to make analyses related to patterns and intensity distribution of the events, and with reference to distribution tendency of events it becomes possible to take relevant measures (BEM, 2003b).

BUTKID Project covers the establishment of up-to-date Traffic Accidents Reports database by development of a web-based software called “NET” (Aksoy, 2004). This database is planned to include information on accident coordinates by use of GPS technology and other tabular data including accident summary, type, data and time, road and weather conditions, road surface and other environmental structures, damage type, driver’s identity, driver’s address and phone number, vehicle information, accident photographs and the reporting team (Işık and Koşak, 2002).

With these data at hand and with its integration with the urban information system of City of Bursa, it is expected that spatial, tabular and statistical analyses would not only be possible for the Security Department (Işık and Koşak, 2002) to take strategic measures against accidents like locating traffic control teams in risky areas, but also to start initiatives for related policy and programs by the responsible authorities (Işık and Koşak, 2002) such as Bursa Metropolitan Municipality and General Directorate of Highways.

Currently, with the pioneering effects of studies achieved by Computer Center Section of Bursa Police Department, there are a few more Police Departments which adopt/perform similar technologies/studies. Like Bursa, Ankara, Diyarbakır (ALFABİM, 2003) and Konya (Düzgün and Erdoğan, 2003) use such technologies in their “province” level Police Department. As for “district” level Police Departments, Çorlu District Police Department is an example. At the “central” level, General Directorate of Security, there are two sections, which actively use such technologies. These are Intelligence Department, and Directorate of Traffic Research Center (ALFABİM, 2003).

The crime analysis studies in Ankara Police Department, have been continuing since the end of 2001 (Yön, 2003:12) within Computer Center and Research-Development Office under the Public Order Section (AEM, 2003). The project, which started with crime mapping, has the aim of increasing the analytical capability of police staff in Ankara City. The information from 46 Police Stations on property and violent crimes are being geocoded and utilized with their tabular data together with the Ankara urban information system data in GIS environment. With this study, first, by visualization of how, when and where the criminal events occur, the ‘tactical crime analysis’ (Boba, 2001) capabilities are tried to be improved. Within the context of ‘tactical crime analysis’ studies, Computer Center and Research-Development Office under the Public Order Section prepares daily, weekly, monthly, crime maps, then, reports and distributes them to other Sections and Police Stations. Second, with this project, in the long term, by ‘strategic crime analysis’, which requires studies of socio-demographic, and spatial data (Boba, 2001), besides crime prevention, effectiveness and ease in management decisions including resource distribution and personnel requirements are expected (Yön, 2003:12).

According to a research on the use of crime mapping technologies conducted in Ankara Police Department, most of the managerial level police officers find this technology as a supportive tool for a better visual understanding of the crime problem. It is also seen that they use this tool to develop crime prevention strategies and to take decisions about organizational management. In addition to these, few of them state that “crime maps helped them to identify problem points or areas which they weren’t aware before.” (Yön, 2003:12).

The system, which is known as MOBESE (Mobil Elektronik Sistem Entegrasyonu - Mobile Electronic System Integration), has been developed in the Intelligence Department of General Directorate of Security. This system as a pilot study is in implementation since the beginning of 2003 in Diyarbakır Police Department.

MOBESE is defined as a “communication infrastructure designed for police cars that make use of GPRS technology and composed of software and hardware units in a Geographic Information System and Management Information System (GIS/MIS) integration.” (Taç, 2003). The system is started to be tested on 65 police cars in Diyarbakır and brought about a 50% decrease in crime rates. In the next stage, MOBESE system has also been implemented in İstanbul, and is currently in use.

The success of the system is a result of immediate polis enclosure of all the possible escape routes of offender(s) in the city by means of central visualization and monitoring of all the police cars on a digital map simultaneously. In the system, besides the operation center, the digital map visulization of incidents and locations of police cars is also supported for the equipped police cars. In this way, it becomes possible for all intervening actors to see crime incidents and each other’s location to take measures accordingly (Aktepe, 2004). With the system, which enables the coordination and control of police teams, it is possible to access the identity and criminal record(s) of the offender(s) from where the event occurred. This is achieved by the system's integration with instruments like camera that allow wireless communication between the operation center and the police teams (Yıldıral ve Nebi, 2003). Currently, only the photographs are sent to the operation center from the crime scene (Aktepe, 2004).

A project called Traffic Information System, which is similar to BUTKID Project adopted in Bursa Police Department and MOBESE in Diyarbakır Police Department, has been conducted by another section of General Directorate of Security since the mid 2003. This section is Directorate of Traffic Research Centre.

The purpose of this system is to achieve "continuous information connection between the highway traffic control teams and the center, compilation of better-quality accident statistics, and real-time mobile query on driver, vehicle and traffic fines by means of tablet PCs" (BTİNSAN, 2003).

First, the system is planned to be used in a 4200 km highway section and on 230 police cars, and with its tablet PC and General Packet Radio Service (GPRS) technology it would be possible from anywhere in Turkey:

- to make on-site registry queries to find the stolen and lost vehicles;
- to make queries on driver license penalty scores and to give penalty scores, and to seize on drivers' license;
- rapid conclusion of personal inquiries;
- scientific findings of 'black spots' by means of the accident place and better-quality statistics with their coordinate mapping;
- real-time central follow up police team locations on digital maps;
- urgent and standard written massaging in communication between the center and police teams, and among police teams themselves (BTİNSAN, 2003).

The relation of this study to current police authority practices is discussed at the end of the chapter.

2.4.2 Existing Studies on Ecology of Crime

Most of the existing studies in Turkey mainly approach the problem of crime and criminality from the *traditional ecology* aspect (Kaplan, 1980; Uğur, 1986; Şener, 1994; Sayın, 1998; Erkut et al, 2001; Ergun et al, 2003; Alpdemir, 2006). One of these studies, which is relatively recent, utilizes GIS technology for analytical purposes (Alpdemir, 2006).

The main emphasis in these studies is on the increase of crime and criminality because of negative social, economic, cultural, psychological, and environmental impacts of rapid urbanization process or urbanization with no equivalent level of industrialization in big metropolises. The main reason for criminality is seen under the loss of primary (face-to-face) relations and domination of secondary (not face-to-face) relations and decreasing social control in urban areas (Kaplan, 1980; Uğur, 1986; Sayın, 1998; Erkut et al, 2001; Ergun et al, 2003; Alpdemir, 2006).

These studies try to describe the above mentioned negative impacts in terms of how they contribute to the increase in criminality and how people come to be offenders. In line with this, they compare offender profiles in terms of their socio-economic and demographic characteristics like employment/unemployment, literacy, and/or the place where they migrated from (Kaplan, 1980; Uğur, 1986; Şener, 1994; Sayın, 1998). Alternatively, some others use socio-economic characteristics of the areas where criminal activities took place (Erkut et al, 2001; Ergun et al, 2003; Alpdemir, 2006).

So as to indicate the negative impacts of rapid urbanization on criminal activities and criminality, these researchers base their arguments either on

- *squatter* settlements (Kaplan, 1980; Uğur, 1986; Şener, 1994); or
- social, demographic and spatial impacts brought by *squatter* settlements (Ergun et al, 2003); or
- social, demographic and spatial impacts brought by rapid urbanization (Sayın, 1998; Erkut et al, 2001).

For this purpose, on one hand, some make a comparison between two police station zones in terms of either

- 'public order' (*asayiş*) incidents and offenders between *squatter* (Altındağ) and *planned* (Bahçelievler) settlements in Ankara in 1985 (Uğur, 1986); or

- ‘public order’ (*asayiş*) and ideological incidents and offenders between *squatter* (Mamak) and *planned* (Çankaya) settlements in Ankara in 1978 (Kaplan, 1980).

On the other hand, some only take *squatter* areas settlements in a district (Konak in İzmir) in early 1990s (Şener, 1994).

In general, all these studies (Kaplan, 1980; Uğur, 1986; Şener, 1994) maintain that the *squatter* settlements are not high criminal activity areas, but they state that these settlements are driving forces for increasing criminality in big cities. In the comparative studies the main finding is the qualitative and quantitative differences in incidents and their offenders in *squatter* and *planned* settlements (Kaplan, 1980; Uğur, 1986).

The remaining *traditional ecology* studies, which are distinguished from the others for their method of differentiating between the settlements, reach similar findings. Therefore, some of these make exploration of

- robbery incidents in districts of İstanbul during 1993-1997 (Sayın, 1998); or
- ‘public order’ (*asayiş*) incidents in all six police station zones of Eskişehir during 1999-2004 without differentiating between settlement types.

Contrary to these, some others make a comparison between

- all incidents except for terrorism in districts of İstanbul for the period of 1994-98 and in 1997 by differentiating them with respect to their ratio of *planned* and *squatter* residential areas (Ergun et al, 2003); or
- some selected property and violent incidents in districts of İstanbul for the years 1993 and 1997 by differentiating them according to their levels of population increase as regard to İstanbul’s annual average population increase rate (Erkut et al, 2001).

Therefore, these above stated *traditional ecology* studies (Kaplan, 1980; Uğur, 1986; Şener, 1994; Sayın, 1998; Erkut et al, 2001; Ergun et al, 2003; Alpdemir, 2006) were carried out at ‘mezo’ *spatial* (such as police station zones and districts) and *temporal* (such as for one-year, two year, or a few years period) levels. They describe incidents or offenders and conclude with policy proposals for crime prevention/reduction based on urbanization, social welfare, migration, legal and regulative framework concerning to security (policing) and judicial systems as it is typical in other *traditional ecology* studies.

Conclusions for police authorities involve a need for a structural change in their organization and functioning (e.g., towards more modern and dynamic) and capacity building in terms of their personnel number, training, use of science and/or technology (like crime statistics and databases) and technical equipment and social facilities (e.g., efficiently and effectively located police station buildings). Moreover, these studies draw attention to the fact that crime cannot be thought free from society and the participation of *bewared* public is inevitable in prevention of criminal activities.

Few other existing studies adopt *new crime ecology* or integrate *new ecology* to *traditional ecology* to inspect distribution of the incidents (Gül, 2002; Düzgün and Erdoğan, 2003; Akpınar, 2005), and to inspect patterns of incident, offenders, and victims (Ünlü et al, 2000), respectively.

The former group of studies of *new crime ecology* (Gül, 2002; Düzgün and Erdoğan, 2003; Akpınar, 2005) and one of the studies stated above, which is based on *traditional ecolgoy* (i.e., Alpdemir, 2006) have a common premise: The idea of usefulness and effectiveness of GIS-based systems and spatial data analysis tools in exploration of crime patterns. These studies primarily aim at proving the advantages of utilizing such geographical data analysis techniques and methods. They differentiate patterns (clustered, etc.) of incidents or incident types in urban areas (Gül, 2002; Düzgün and Erdoğan, 2003; Akpınar, 2005). In this way, they confirm to the main assumption of *new ecological theories,* which is certain types of criminal events do not occur or distributed randomly in *space* and *time*, but they show distinct patterns (Ekblom, 1988 and Hirschfield et al, 1995 in Nelson et al, 1996:411). That is, there are *spatio-temporal* factors, which determine the occurrence and distribution of such criminal events.

To achieve their aim, some researchers take into account either one type of incidents (thefts) in a police station zone in Bursa (Gül, 2002) or two incidents (auto thefts and thefts from auto) in metropolitan districts of Konya in 2000 (Düzgün and Erdoğan, 2003). On the contrary, the study by Akpınar (2005) analyses and compares more than two incidents between two police station zones (five property or violent incidents), which are Bahçelieveler and Çankaya in Ankara in 2003.

The study which integrates *new ecology* to *traditional* one (Ünlü et al, 2000), accordingly integrated spatial structure to social structure in the areas where almost all types of incidents took place and explored for incident patterns in four residential neighbourhoods in a central district of İstanbul for the years 1983, 1988, 1993 and 1998. The main emphasis of this study was the effects of configuration or organization of spatial and social entities on distribution of criminal activities in residential neighbourhoods.

Similar to previously mentioned *traditional ecology* studies, these studies, which either adopt *new ecology* or integrate it with the *traditional ecology*, were carried out at 'mezo' *spatial* and *temporal* levels, and some of them used statistical testing and detailed spatial data analysis methods (e.g., Ünlü et al, 2000; Düzgün and Erdoğan, 2003). As an additional finding, some of the existing studies mentioned about the importance of public participation and interdisciplinary approach and *environmental* design in prevention of crime like target hardening and lightening or offenders' *environmental* preferences, etc. (Sayın, 1998; Akpınar, 2005).

As stated previously, this thesis is the first scientific research that is being carried out in the context of a relatively recent research protocol ("The Protocol of Research Cooperation between General Directorate of Security and the Middle East Technical University") signed on August 26, 2003. Therefore, its motivation comes not only from an urgent present need in prevention of crime; but also in contributing, or at least raise an awareness in the planning authorities on *place-based crime prevention* possibilities, which is lacking at the present.

This study approaches the above stated problem from the *comparative* and *systematic analytical* perspective in *exploration of incidents, their types* and *commitment types.* It concentrates both on their *spatial* and/or *temporal* aspects in terms of *general* (*global scale*) and *localized* (*local scale*) *properties* in the *three* different development patterns at *'mezo'-'micro' scale*. In doing this, it also searches for the validity of *new crime ecological theories* and possibilities of their adoption from a *critical* perspective to achieve *concrete place-based strategies* for *urban planning* and *policing* in *place-based prevention*/reduction of incidents.

[1] When the term “public order” is used as a correspondence to “*asayiş*”, it covers a more general meaning than the cases when it is referred in the 5th part of the Felonies (Felonies against public order) or 1st Part of the Misdemeanors (Misdemeanors against public order) according to the Turkish Criminal Code used in this study. As explained, in short, they correspond to “predatory” crimes, “serious” crimes, or “street crimes” in western crime literature.

[2] In this study, the TCC, dated March 1, 1926 and numbered 765, is used. It was effective until a new one is passed on September 26, 2004, and numbered 5237 and put into effect in several steps with one article in October 2004, the main body in June 2005, and two partial articles in October 2006.

[3] In Turkish: “*cürümler*”. It is a type of crime which violates and endangers the existence of a society, or life-conditions, or the main-advantages of individuals or a society. For example; Homicide, theft, use, sale and purchase of narcotics…etc. People committing a felony are punished with the capital punishment, heavy imprisonment, heavy fine, disqualification from holding public office mentioned in the 1st - 6th items of the article 11/1 under the Turkish Criminal Code (dated March 1, 1926 and numbered 765) (SIS, 2002:58).

[4] In Turkish: “*kabahatler*”. It is a type of crime which disturbs the improvement of public and public order. For example; Gambling, drunkenness, public disturbances…etc. People committing a misdemeanour are punished with the light imprisonment, imprisonment, light fine, disqualification to exercise of a definite profession or trade mentioned in the 1st – 3rd items of the article 11/2 under the Turkish Criminal Code (dated March 1, 1926 and numbered 765) (SIS, 2002:58).

[5] This assumption is referred as “ecological fallacy problem” by the *new* theories emerged as critics to *traditional* approaches.

[6] As stated, there is not a particular separation of *‘early’* and *‘late new ecological theories’* in literature where they are combined in one group called as *‘new crime ecology theories’* which also take different names such as *“Place-based Crime Theories”, “Crime Place Theories”, “Event Theories”, “Opportunity Theories”* or *“Environmental Criminology Theories”.*

[7] The design principles of the other two stages’ cover periods of 1930s-1940s and 1980s- Present, which refer to “the courtyard plan stage”, and “the ‘neighbourhood connection’ stage”, respectively (Franck and Mostoller, 1995 in Schneider and Kitchen, 2002:126-127).

[8] The principles of this ‘City of Towers’ style of urban renewal are given as follows: “Generally tilted off the street grid of surrounding neighbourhoods, these designs freed up as much land as possible, reducing lot ‘coverage’, and creating super-blocks of vast self contained communities, complete with their own identity and project names. Like their predecessors in stage one, it was held as an article of faith by architects, planners and the popular press that the architectural and site distinctiveness of these new high-rises would help them ‘break with adjacent “slums”’, thereby insulating their occupants from the social and physical disorder of the surrounding blight (Franck and Mostoller, 1995)” (Schneider and Kitchen, 2002:127).

[9] “CPTED practitioners and consultants have categorized original and derived defensible space strategies, such as surveillance and access control, by their methods of implementation. For example Crowe (1991, 2000) defines surveillance in terms of three elements: *natural* surveillance (facilitated by design, which was Newman’s fundamental conception), *organized* surveillance (conducted by people, such as guards or police), or *mechanical* surveillance (facilitated by electronic or mechanical devices). In practice, these are not mutually exclusive categories and spaces may be defended by any combination of techniques or by all of them together. The same subcategories also apply to the principle of access control, so that entrances to apartment complexes may, for example, be protected by the placement of windows that look out onto entry paths and doorways (natural surveillance), by security guards or doormen (organized surveillance), or by CCTV (mechanical surveillance). Again, it is not uncommon to find all three elements operating at once, especially in upscale developments.” (Schneider and Kitchen, 2002:102).

[10] The explanation of this theory is given in Section 2.2.4.

[11] “integration R=3 measures the relationship of every line to all other lines that are within three steps away from the lines being measured.” (Hillier, 1996:160 in Fanek, 1997:40).

[12] Discussions related to such residential segregations, which in literature most of the time are referred as “gated communities”, are made in Chapter 6.

[13] For *SCP* techniques and examples in the respective matrices, see Oc and Tiesdell (1997:59) and Schneider and Kitchen (2002:105).

[14] Awareness space of offenders is a mental map indicating how to find specific shops, train stations, etc. Activity space of offenders exists in the awareness space and centered around their Routine Activities of home, work, entertainment, etc. (Brantingham and Brantingham, 1981b; Brantingham and Brantingham, 1984 in Harries, 1999; Brantingham and Brantingham, 1993 in Wu, 2001:32) These two contain ‘search areas’ in which victims and targets with low risk are identified (Brantingham and Brantingham, 1981b).

[15] For a detailed summary of the Brantinghams’ Model for Crime Site Selection, see Oc and Tiesdell (1997:47).

[16] The model underlining this method is known as Criminal Geographic Targeting (CGT) (Mason, 1996).

[17] As mentioned in Section 2.1, 155 Police Emergency Calls in Turkey are equivalent to the 911 Calls for Police Service in the US.

CHAPTER 3

URBANIZATION AND URBAN DEVELOPMENT IN TURKEY AND IN ANKARA; THE STUDY AREA AND ITS CHARACTERISTICS

In this chapter, first, urbanization and urban development processes of Turkey are explained both in a historical and comparative framework. In this respect, it first elaborates on spatial and social restructuring of Turkey, its similarities to the general trends of urban development in other developing countries, and contrasting characteristics with western countries with a particular emphasis on crime phenomenon and in a historical approach. Second, these explanations are extended to Turkey's second largest metropolis, that is, Capital city of Ankara within which the study area was selected. The remaining sections of this chapter present detailed explanations related to the study area and its neighbourhood characteristics with respect to the three different development patterns of *planned, squatter*, and *in-transition.*

3.1 Urbanization and Urban Development in Turkey, and Similarities/Differences between Turkey and Other Countries

The urbanization and urban development processes in Turkey have taken place in an almost contrasting manner as compared to the western countries and in a similar manner to other developing countries. The rapid urbanization process characterized by rural-urban migration in Turkey took place within several decades after the 2nd World War and was not accompanied by rapid industrialization. On the other hand, urbanization in the western countries lasted in a relatively smooth manner during more than 150 years period (Erişen, 2003:78), and reflected itself in a very different spatial and social structuring of the cities.

At this point it will be useful to give a short description of the spatial and social restructuring of Turkey between early 1920s and mid 1940s. This period is distinguished by the early years of newly founded Republic of Turkey (1923) after the 1919-1922 Independence War. It was a period of "radical modernism" (Tekeli, 1998 in Erişen, 2003:79), and of reforms in all aspects of the social, cultural and economic life, and a recovery period from the negative economic consequences of the War. The newly established Nation State policies for economic development were characterized by orientation towards self-sufficiency, where much importance is given to industrialization under high level of state control and one-party government.

During this period, the rates of urbanization was fairly low in the country and even in 1945 only about 25% of population were living in cities, and a noteworthy population growth was observed only in the capital city of Ankara (Işık and Pınarcıoğlu, 2002:95,111; ACC, 1998 in Erişen, 2003:83). Accordingly, basic sector of the economy was still agriculture (Zürcher, 1995:285). The social and spatial structures of urban areas were characterized by the patterns precedented from the Ottoman Empire era, where limited social and spatial differentiation prevailed (Kıray, 1992 in Osmay and Duruöz, 1995:141-149).

In the post-2nd World War period until late 1970s, which is referred as the period of "popular modernism" (Tekeli, 1999 in Ürger, 2004:17), is different from the previous period with its distinct social, cultural, economic, and political structuring and shares similar characteristics with other developing countries. Turkey witnessed a rapid urbanization process starting in the post-2nd World War period (Şenyapılı, 1995 in Osmay and Duruöz, 1995:204). The economic models adopted were rapid industrialization until the early 1960s and import substitution afterwards (Şenyapılı, 1995 in Osmay and Duruöz, 1995:204; Işık and Pınarcıoğlu, 2002:99). Also during this era socio-political dynamics involved consensus, co-operation, and solidarity dominated relations parallel to mediating stance maintained by the state (Işık and Pınarcıoğlu, 2002:101,110,120), which turned to right wing origin with newly emerged multi-party democracy practice after 1946. Out of millions of rural migrants only a minor portion was being employed in the emerging industries, most became a part of labor market of informal sector with marginal and temporary employment.

In the post-2nd World War period until late 1970s, similar to other developing countries and in contrast to western ones, Turkish big metropolises were distinguished by formation of informal squatter *(gecekondu)* housing of the rural migrants in the peripheries (at least when they were first constructed) of these cities. This rapid urbanization is quite dissimilar to the case experienced by the western countries. In other words, the western "cities had an economic underpinning, a foundation in industry and commerce" (McElrath, 1980:215) that were able to absorb and provide almost full employment for the large number of migrants, who were housed in the inner city areas and near their workplaces, and in slums that were built by the capital owners themselves (CYMRU, 2006). Similarly, as McElrath (1980:215-

216) states, the rapidly growing number of populations in urban areas of developing countries did not have a viable supporting agricultural hinterland in contrast to the western cities.

Early stage gecekondu[1] housing is characterized by their means of land acquisition in the form of squatting on the publicly owned lands in non-market conditions, and distinguished by similar non-market conditions prevailed in their construction and use (Işık and Pınarcıoğlu, 2002:159-163). In short, this housing, which was seen as legitimate "in the moral economy of the society" (Erman and Eken, 2004:2), had dwellers called as *"gecekondulu"*, who came from similar villages, ethnic and religious background, and constructed their dwellings for their "own use" within a network relations composed of strong cohesion and solidarity (Zürcher, 1995:392-393; Işık and Pınarcıoğlu, 2002:116-117).

They have been different from slums in the western countries, which were "densely populated collectivities of urban poor, living in substandard housing…usually composed of aging, often decaying properties within or fairly close to a commercial area" (Mangin, 1980:362). Moreover, the physical conditions of slums and *early stage gecekondu* housing have contrasting features. Unlike slums, the latter were constructed in the *cities' peripheries* and *newly* and organically in accordance with topography. Moreover, these *squatters* were similar to their dwellers' former village housing and although they were small and primitive one story dwellings within small gardens, some rural activities still could be continued (Zürcher, 1995:392; Işık and Pınarcıoğlu, 2002:113).

Their flexibility allowed their *builder-occupier* households to make some additions in time when required (Şenyapılı, 1995 in Osmay and Duruöz, 1995:203). This flexibility and household type caused these settlements to have a higher environmental and spatial quality as compared to slums (Işık and Pınarcıoğlu, 2002:99,113). Although in the beginning, they had no infrastructure, mainly after 1980s, through "amnesties, political favors, and clientalistic relations" (Erman and Eken, 2004:2), they were legalized, obtained title deeds, and were supplied with infrastructure.

The social and cultural composition of the poor *gecekondulu* also differed from the poor living in slums. *Squatter* dwellers in Turkey, as in other developing countries had strong internal community ties, cohesive organization and solidarity, and shared a common background (Mangin, 1980:363; Zürcher, 1995:393; Işık and Pınarcıoğlu, 2002:96-97). With their will to live through, and be a part of the urban society and of a higher social class, they have the capacity or potential to develop strategies for transforming their hopelessness, discouragement, and uneducatedness into positive results. Lack of such dynamism in an informal space, and the hopelessness would give rise to a continuous dissolution and increase in crime/criminal capacity (Işık and Pınarcıoğlu, 2002:53). This would be similar to the western slum dwellers that formed an impoverished *underclass* -like *les misérables* in France-, exhausted their means, and feel themselves as desperate, helpless, and not a part of the society (Whitt, 2001:230-231; Işık and Pınarcıoğlu, 2002:97; Zürcher, 1995:392-393). Therefore, *early stage gecekondu* housing dwellers are very much different than their slum counterparts in transitional zones of the western countries, where the crime and vice emerge (Park et al, 1925 in Wu, 2001:14) as it is hypothesized by the *traditional ecologists* (primarily by *Chicago School* and *Social Disorganization Theorists*).

The urbanization of middle and higher income groups between the late 1940s and late 1970s, were characterized by a process called *"apartmanlaşma*" (Işık and Pınarcıoğlu, 2002:102-103) through which multi-storey apartments were being constructed by small-scale contractors in "build-and-sell" mode *(yapsatçılık)* in inner city settlements. This mode of housing is based on small scale contractor *(yapsatçı)* who

> build apartment houses with their own account and utilize their own financial resources, and then sell these units to generally middle and upper-middle class income groups. The land is either bought or supplied by mutual agreements with the landowner on the basis of certain number of flats. (Erişen, 2003:92).

This housing provision also kept its peculiarity and effectiveness for both density increase and transformation of former *gecekondu* areas through *yapsatçılık* when it was practiced in "demolish-and-rebuild mode" (Erişen, 2003:92). In this period, within the prevailing mediator role of the state and the positive socio-political relations in the society, middle and higher income dwellings were mostly not segregated and were located in the inner city and core areas (Kıray, 1992 in Osmay and Duruöz, 1995:147).

The spatial and social structure of the post 2nd World War period until late 1970s can shortly be described by emerging metropolises, informal but concordant *early stage gecekondu* settlements in the periphery, and mostly non-segregated higher and middle income neighbourhoods with apartment buildings built by small-scale contractors' initiatives (build-and-sell mode) in the inner city and core areas.

As in the developed world, the impacts of the economic crisis, which took place in the mid 1970s, was very influential in 'restructuring' the economy of the developing world. The effects of globalization or post-fordism most significantly showed itself in the shift of fordist production systems from developed to developing world (Lea, 1997:49). In parallel to this new organization of the economy, starting with the 1980s, Turkey, along with other developing countries (Gilbert, 1994 in Osmay and Duruöz, 1995:229) adopted a liberal economic model, which promotes exports (Zürcher, 1995:425) in a political context dominated by upward moving of liberal right parties (Erman and Eken, 2004:3).

In the period starting with early 1980s, the policies of adjustment and stabilization reflected their effects dramatically on the economy in terms of recession, unemployment, and inflation. As a result, the real wages fell, and urban poverty has increased (Şenyapılı, 1995 in Osmay and Duruöz, 1995:205; Gilbert, 1994 in Osmay and Duruöz, 1995:231-232). This social differentiation based on increasing income inequality and socio-economic polarization was accompanied by rise of a new consumption culture (Erişen, 2003:88,94), with new consumption and life style patterns. They also had deep impacts on the spatial restructuring of the cities including landuse and macro-form. In addition to these, the diminishing mediator role of the state resulted in a restructuring of social context and urbanization process in which the consensus, co-operation, and solidarity relations of the previous period were being replaced by the conflicting, separating, and excluding relations (Işık and Pınarcıoğlu, 2002:128).

As a result of these changing social, economic and political conditions, the characteristics of *gecekondu* settlements also started to change. Since the 1980s these *squatter* developments has taken place in the form of *late stage gecekondu* housing. As compensation for the economic deterioration of especially the poor income groups, several important acts were passed. These acts (between 1983 and 1987) on the one hand, legalized these settlements by amnesties, and provided *gecekondulu* with title deeds and infrastructure, and also caused a new stage of *gecekondu* housing development to emerge. These housing are commodified and all the non-market relations and processes, which essentially defines a dwelling to be a *gecekondu,* for land acquisition[2], construction, and its use were destroyed and new markets for these with their peculiar informal and/or formal conditions emerged (Işık and Pınarcıoğlu, 2002:159-163).

On another hand, by 'Improvement Plans'[3], these acts formed the basis for their transformation through a process of redevelopment into *planned* settlements with high density apartment buildings (Duyar-Kienast, 2001:23; Işık and Pınarcıoğlu, 2002:164-167). In most of these settlements, these acts resulted in another unauthorized process, i.e., their replacement by poorly built multi-storey apartment building (Erman and Eken, 2004:4). Such apartment buildings had one dwelling per floor on the former narrow, organic street pattern with the inefficient existing infrastructure (Şenyapılı, 1995 in Osmay and Duruöz, 1995:207).

This *late stage gecekondu* housing is distinguished by continuously degrading environmental and spatial quality mainly due to their building for not own-use, lack of physical and social infrastructure including open/green spaces, and degrading social structure due to increasing rental housing occupied by heterogeneous newcomers, and reducing social cohesion, and solidarity, and ghettoizing based on ethnic/religious sect/regional ties (Erman and Eken, 2004:8). Therefore, since the 1980s in the oldest *gecekondu* areas, after becoming part of inner metropolitan areas and which did not experience a successful redevelopment program, started to turn into problem areas that western cities experienced with their slums and transitional zones. The diminishing mediator role of and the negative relations dominating in the socio-political domain (Işık and Pınarcıoğlu, 2002:128) contributed to this process.

By turning into "*varoş*" and "*varoşlu*" stages, such areas, among *late stage gecekondu* and their dwellers *gecekondulu* have already lost their sympathy in society's view[4]. *Gecekondu* was now perceived not as the problem of housing of *gecekondulu,* that is the harmless "Rural Other" (Erman and Eken, 2004:4). On the contrary, they were thought as a means for seizing the emerging urban rent and as a condition for living through in the city (Işık and Pınarcıoğlu, 2002:164) with their dwellers that changed into *varoşlu,* who are *contra the city* (Etöz, 2000) and *threatening other* (Erman, 2001:983). As indicated previously, their hopelessness gave rise to a continuous dissolution and increase in a new wave of urban violence starting in Turkey's biggest city, i.e., İstanbul since 1990s (Işık and Pınarcıoğlu, 2002:53) as in some other developing countries' big cities since 1980s (Erman and Eken, 2004:2).

The impacts of globalization and restructuring under the economic conditions after 1980s, income discrepancies and resultant spatial and social differentiation are felt more heavily in the largest metropolises (Işık, 1996 in Erişen, 2003:91). For example, the rate of skyscraper developments for headquarters of national and international companies in CBD, and gated community developments within and around the metropolis, and changing face of *gecekondu* settlements are much more effective in İstanbul than in any other Turkish metropolises. Accordingly, Ankara and other cities have not experienced such urban violences in their oldest *gecekondu* areas. Nevertheless, this does not mean that they would not experience in the near future. Even by the start of 2000s, there are some oldest "former decent and proper gecekondu residences" (Şenyapılı, 1995 in Osmay and Duruöz, 1995:209) such as *Çinçin Bağları* quarter (in *Gültepe* neighbourhood) in Altındağ District, which became a feared locality not only for ordinary citizens, but even for the police to go in (Görgülü, 2006; Gürel, 2006). It is hoped that, new initiations, such as the one to be carried out by Altındağ Municipality and Mass Housing Administration in this locality including the start of an urban renewal project[5] will soon have a positive impact in changing the negative image of the quarter. However, there is also a likelihood that social and physical improvement based on large scale urban renewal programs and accompanying decrease in crime rates in one part of a city might result in a corresponding increase in an inferior neighbourhood that does not benefit from those renewal funds as in some of the western countries (Schumacher and Leitner, 1999:10-11).

Similar to the urban poor, the urbanization of higher income groups also displayed contrasting patterns particularly after early 1980s. The compensation of higher income groups for the deteriorating economic conditions after 1980s involved establishment of the Mass Housing Authority in 1984, which made a flexible credit mechanism available especially when people organized themselves as housing cooperatives (Şenyapılı, 1995 in Osmay and Duruöz, 1995:205). Due to their scales and larger area requirements for construction, housing cooperatives became effective in restructuring the macro-form of big cities. They shifted the form of development from enlargement through addition of concentric zones towards enlargement through satellite developments around the urban areas. Whatever their first establishment purposes were, they could be viewed as a means for obtaining a share from urban rent and suburbanization in a wild, uncontrolled, and speculative way at the expense of degradation of environmental values and of urban peripheries (Işık and Pınarcıoğlu, 2002:133-136).

Furthermore, similar to emergence of a new middle and higher classes due to increasing and varying service and business sectors through globalization process, this process and the adopted new economic models caused an accumulation of capital in the hands of large scale contractors[6]. In turn, they reinforced mainly satellite suburban developments[7] including formation of gated communities. These suburban developments are distinguished by

> mostly of high-rise, high density apartments blocks with duplex, and two storey garden houses within the same layout.…enjoy the advantages of large recreational areas around, adequate parking lots, spacious layout, green areas, fresh air, and are distinguished from their inner city counterparts (Erişen, 2003:110).

The changed role of the state and resultant negative socio-political relations in the society (Işık and Pınarcıoğlu, 2002:123-128) also became effective in separation of middle and high income residential areas in the inner cities (Işık and Pınarcıoğlu, 2002:131). As parallel to the emerging new commercial and business services and a new "consumption culture" (Erişen, 2003:95), the urban restructuring in this period was also further affected by the decentralization through campus like public buildings' settlements, university campuses and big companies' headquarters established outside the city, increased car ownership, and establishment of big shopping centres or shopping malls around the metropolitan core and in the newly formed suburban areas (Erişen, 2003:92; Işık and Pınarcıoğlu, 2002:132).

3.2 Urbanization and Urban Development in Ankara

This research is carried out within a part of Ankara Metropolitan Area, and thus, the current section concentrates on its urbanization and urban development and the next section focuses on the study area. Although Ankara displays a uniqueness particularly from early 1920s until mid 1940s, it presents urbanization and urban development similar to all other big cities in Turkey in parallel to the two different social, economical and political contexts since late 1940s: between late 1940s and late 1970s; and the period after early 1980s.

Ankara was the only city with increasing population (Table 3.1) between the early 1920s and mid 1940s after being the headquarter for the Independence War (1919) and as the Capital City (1923) of the Republic after the War (ACC, 1998 in Erişen, 2003:83; Işık and Pınarcıoğlu, 2002:111). Until the early 1920s Ankara was a small Anatolian city and was precedented by inadequate facilities of the Empire era and had no infrastructure, proper housing, and even built up area for its increasing population. However, in parallel to early policies of the Republic, i.e., the "radical modernism" (Tekeli, 1998 in Erişen, 2003:79), the City was given extraordinary importance for modern and planned development as a model for other cities of the country.

Table 3.1 A comparison for Turkey's and Ankara's population growth (*)

Years	Turkey National Total Population	Turkey Total Urban Population	Ankara Urban Population	% share of Ankara in National Total	% share of Ankara in Urban Population
1927	13 648 270	3 305 879	74 553	0,55	2,26
1935	16 158 018	3 802 642	122 720	0,76	3,23
1940	17 820 950	4 346 249	157 242	0,88	3,62
1945	18 790 655	4 687 102	226 712	1,21	4,84
1950	20 947 188	5 244 337	288 536	1,38	5,50
1955	24 064 763	6 927 343	451 241	1,88	6,51
1960	27 754 820	8 859 731	650 067	2,34	7,34
1965	31 391 421	9 382 621	905 660	2,89	9,65
1970	35 605 176	12 753 367	1 236 152	3,47	9,69
1975	40 347 719	16 706 528	1 701 004	4,22	10,18
1980	44 736 826	20 330 065	1 877 755	4,20	9,24
1985	50 664 458	25 889 750	2 235 035	4,41	8,63
1990	56 473 035	31 804 551	2 584 594	4,58	8,13
1997	62 865 574	40 882 357	2 984 099	4,75	7,30
2000	67 803 927	44 006 274	3 203 362	4,72	7,28

(*) Ankara's urbanization still continue despite its total population (urban+rural) was decreased from 1985 to 1990 due to separation of four districts from the Province in 1989 (Topçu, 2004:57).
Source: Erişen, 2003:85 who prepared from different years' SIS census of population publications.

Ulus, which is located in the north, is the traditional core of the Capital City. Its central characteristic has been reinforced in early Republic period as the first administrative buildings were all built around it. In the following years, some other new developments took place, among these, one of the most important include foundation of Presidential House in Çankaya District in the south. The dual structure of the City i.e., "old and new Ankara", was further reinforced and in fact, triggered by the implementation of partial plans prepared by Lörcher for old and new (today's Yenişehir) Ankara, the latter of which was seen as a solution for the increasing housing problem (Bademli, 1987:105) in the mid 1920s.

First comprehensive plan for Ankara was prepared by a German Architect, and is known as Jansen's Plan and was approved in 1932. The plan was prepared with reference to principles of "Garden City Movement" (Cengizkan, 2000:54) which "came forth as a response to the problems emerged with the effects of the industrialization in the European cities" (Ürger, 2004:13) for a city found in a yet unindustrialized country. Thus, the plan soon became inefficient and ineffective for meeting the needs of sudden and unexpected population increase, and speculative pressures after mid 1930s (Tankut, 1984 in Bademli, 1987:107), although it was implemented to a great extend.

In the early 1950s, the population of the City (Table 3.1) had already surpassed the estimated population in the Jansen's plan, which was 300000 for the year 1978. Concurrently, the *gecekondu* housing became a 'permanent reality' for the city's uncontrolled and unplanned development in addition to increasing speculative tendencies. Accordingly, by second half of 1950s the City appeared as if it developed without plan.

In need of an urgent new plan, a new competition was organized in 1955 whereby the proposal of Nihat Yücel and Raşit Uybadin was selected. This plan was approved in 1957 after its preparation for implementation. The incorrect population estimation also became a bad fortune of this plan, and it remained far from directing the future development (AİM, 1954 and 1955 in Bademli, 1987:107). It had only some additions to the previous plan by Jansen, proposed density increase, and was based on one-CBD perspective, (i.e., Ulus), and did not give adequate emphasis on the peripheral *gecekondu* development (AİM, 1954 and 1955 and AMANPB, 1977a in Bademli, 1987:107). In addition, it became a basis for *apartmanlaşma* and accordingly for blooming of build-and-sell apartment building by small-scale contractors *(yapsatçı)* especially for their production in demolish-and-rebuild mode (Erişen, 2003:101) until late 1970s.

In 1969, Ankara Metropolitan Area Master Plan Office was established and after detailed researches and participatory planning process in the first half of 1970s, the *first strategic plan* of Ankara for the year 1990 was realized. This plan was relatively more correct in its population estimation which predicted a population between 2,8 and 3,6 millions for 1990 (Table 3.1). It was also more successful in directing the future developments particularly until its approval in 1982 (Bademli, 1987:109-110). With this plan, the changes in the macro-form with new decentralization corridors towards west and south west of the metropolis were achieved (Yıldırım, 2004:65). Another challenge that affected the macro-form of the city in this period was the increased car ownership as result of increase in the development of car industry in the 1970s. Its decentralization effect supported this process in changing the city's compact shape into a satellite form. The economic conditions of the 1970s allowed large-scale contractors to emerge and become highly effective in residential developments of the upper-middle and high income groups, which were in the periphery and also in disconnected locations to the metropolitan core, at least in their first set up.

In summary, between late 1940s and late 1970s, the dual urban structure for both CBD and the residential areas (Erişen, 2003:103-104) was observed in continuing north-south development, mostly upper middle-high income residential areas in the south and around the southern core, and continuing *gecekondu* development in the periphery.

In the post-1980s period, capital accumulation of large-scale companies and increasing number of cooperatives became very effective in decentralization (Işık and Pınarcıoğlu, 2002:133) of the Capital City mainly in west and south-west corridors in apartment and single family housing forms, which was also accompanied by the continuous density increase in the core areas. Inefficiencies in all urban services due to very high density in the metropolitan core and need for further decentralization were also the main concern for the *Structure Plan* of Ankara for 2015. This plan was prepared in 1986 by a group of academicians in preparing an urban transportation plan for the City with support of the newly established Municipality of Greater Ankara (Erişen, 2003:105) and became effective for some development patterns afterwards (Ankara Bülteni, 1990 in Erişen, 2003:106) even though it was not officially approved.

The effects of globalization on the increasing income discrepancies and resultant spatial and social differentiation, and changing face of *gecekondu* settlements (such as violence in these settlements) became more obvious in large metropolises where these effects are experienced more severely (Erman and Eken, 2004:1,3; Işık, 1996 in Erişen, 2003:91). For example, these changes were more severe in İstanbul, which is the commercial and industrial centre of the country, than in Ankara, which is smaller than İstanbul and which is the administrative and political centre of the country.

By the mid 1990s, Improvement Plans were developed and approved for 92% of *gecekondu* settlements of Ankara (Duyar-Kienast, 2001:23). Even though there are different mechanisms for the accompanying redevelopment and gentrification processes, the most common mechanism for the redevelopment process is small scale contructors' demolish-and-rebuild (build-and-sell) mode. However, by whatever the mechanism is, these transformations are not always successful. Even in fine transformations problems such as "deficits in the quality of the new apartments and poor environmental qualities in the new urban spaces" (Duyar-Kienast, 2001:23) arise.

To sum up, the urban structure of Ankara in the post-1980 period is distinguished by further specializations for all land uses of residential, central, commercial, and industrial developments in the existing centres and in the newly emerginf sub-centres. All these lead to previous dual social and spatial structure of the City to turn into a multifaceted form (Erişen, 2003:106-107,110).

3.3 Study Area and Its Neighbourhood Characteristics

The sections below provide detailed information for the study area and its physical and social neighbourhood characteristics. These findings[8] are based on the field surveys, and Buildings and Roads maps, interviews with police officers, resident population and urban planners working in Keçiören Municipality**.**

As described earlier, Ankara Metropolitan Area display and represent a good example for both regular planning practices since early 1930s, rapid urbanization process and resultant and spontaneous and irregular development of squatter *(gecekondu)* settlements starting in the late 1940s, and their current transformation process by means of Improvement Plans starting in the mid 1980s. As far as the study period, which is the year 2000, is concerned metropolitan districts of Ankara display the three different development patterns, namely, the *planned, squatter* (*gecekondu*), and *in-transition* areas (for details on the process of study area selection, see Appendix A).

The chosen study area *(R),* which is in the Brantinghams' (1998:264) terms at "mezo" level, is analyzed also at "micro" level. The area covers developed (built urban) part of the Etlik Police Station Zone (EPSZ) comprising all, most or some part of nine neighbourhoods in Keçiören District situated in the northern part of Ankara Metropolitan Area (Figure 3.1)[9]. The size of the Etlik Police Station Zone is approximately 13,30 square kilometres. However, the study area covers less than this zone, which is approximately 9,5 square kilometres (949,71 hectare) and as stated above, it excludes the undeveloped areas, namely the agricultural fields an the vacant land belonging to the Police Intelligence Department. The perimeter of *R* is 22,30 km, and it is bounded by 32,796684 degrees longitude, 39,968178 degrees latitude in the lower left, and 32,854703 degrees longitude, 40,013852 degrees latitude in the upper right.

The neighbourhoods within Etlik Police Station Zone are presented in Table 3.2. In the north, the study area is bordered by the transit highway. In the east, the boundaries are formed by the three other Keçiören District Police Station Zones that is "Esertepe", "Keçiören Merkez", and "100. Yıl" (Figure 3.1). The western and southern boundaries of the study area are formed by the two other neighbouring Police Station Zones, which are "Şentepe", and "Yenimahalle Merkez", located in Yenimahalle District.

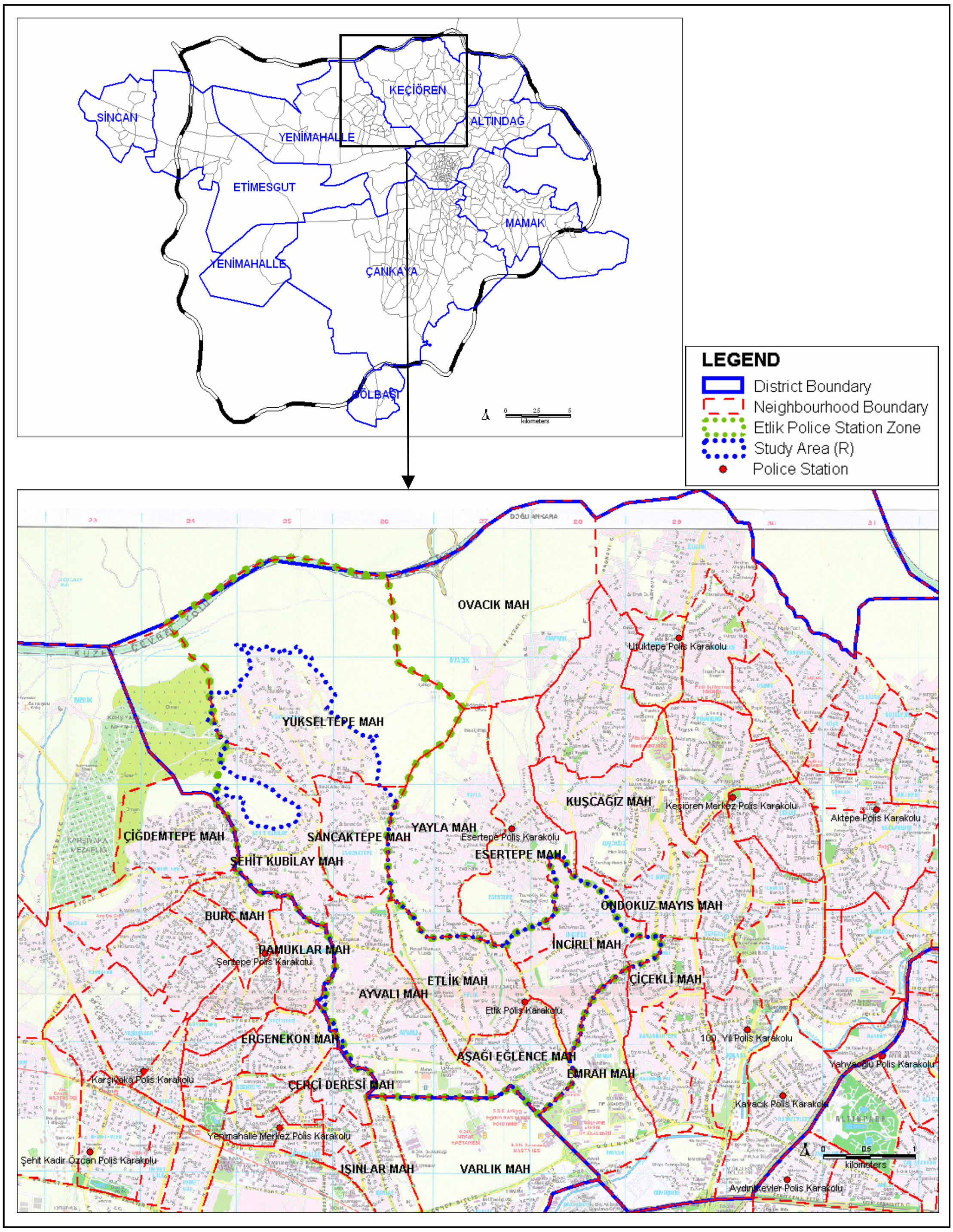


Figure 3.1 Study Area (*R*): Developed (built urban) Part of the Etlik Police Station Zone
Source: Ankara Kent Planı, 2001-2002; AWSW LIS, 2004

Table 3.2 Neighbourhoods of the study area

		Etlik Police Station Zone (EPSZ)		Study Area (*R*)	
Neighbourhoods	**Area (ha)**	**Characteristics of the neighbourhood part covered in the EPSZ (3)**	**Part covered in the EPSZ (ha)**	**Characteristics of the neighbourhood part covered in *R* (3)**	**Part covered in *R* (ha)**
Yükseltepe (1)	512,61	Urban settlement+Vacant land	512,61	Urban settlement	164,51
Şehit Kubilay (2)	283,14	"	148,55	"	119,94
Sancaktepe (1)	93,68	"	93,68	"	91,54
Ayvalı	213,10	Urban settlement	210,08	"	210,08
Etlik	130,36	"	130,36	"	130,36
Aşağı Eğlence	85,58	"	85,58	"	85,58
İncirli	138,45	"	123,40	"	123,40
Esertepe	183,65	"	14,67	"	14,67
19 Mayıs	75,61	"	9,63	"	9,63
TOTAL	**1716,18**	**-**	**1328,56**	**-**	**949,71**

(1) The vacant land consists of agricultural fields.
(2) The vacant land belongs to the Police Intelligence Department.
(3) The urban settlements consists of either a combination of planned and in-transition settlements or a combination of squatter and in-transition settlements. For areal portions of these areas, see Chapter 5.

3.3.1 *Squatter (Gecekondu)* Areas

All the neighbourhoods in the northern half of the study area (*R*) and some parts of the neighbourhoods in the south experienced urban development process starting with *squatter* settlements. These areas involve the total area of the developed urban sections of *Yükseltepe*, *Sancaktepe*, *Şehit Kubilay* neighbourhoods; and small sections of *Ayvalı*, *Etlik* and *İncirli* which reflect *early stage gecekondu* settlement features as far as the study period is concerned. The development pattern of these neighbourhoods for the study period of 2000 is presented in Figure 3.2. Here, it should be noted that the *in-transition* areas were once *squatter* settlements. Accordingly, the *squatter* settlements of the study area during the study period of 2000 are probably experiencing a transformation process at the present. These originally unplanned and organically developed neighbourhoods at the northest fringe of Ankara, started to develop in the early 1960s and 1970s (Figure 3.3) and accelerated in late 1970s by rural migrants. These migrants came mostly from the villages of central Anatolian small provinces and districts like *Aksaray, Çankırı, Yozgat, Çorum, Kızılcahamam*, and *Kırıkkale* and invaded either private or state ownership plots, which were previously covered mainly with vineyards and fruit trees[10].

These neighbourhoods are areas where privacy prevails intensively inside and outside the housing units; most homogenous and isolated social structure and life style exists; everyone knows each other by name; mostly relatives and people from the same villages or region sharing a common origin/ethnicity/religious sect (Erman and Eken, 2004:16) live;

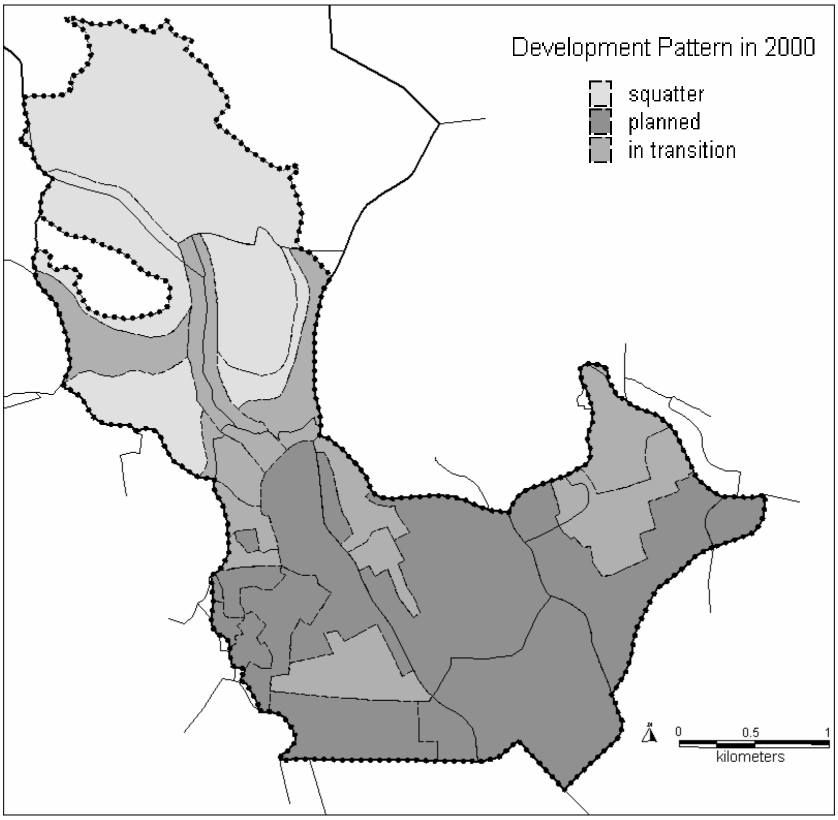


Figure 3.2 Development pattern in 2000 in the neighbourhoods of the study area

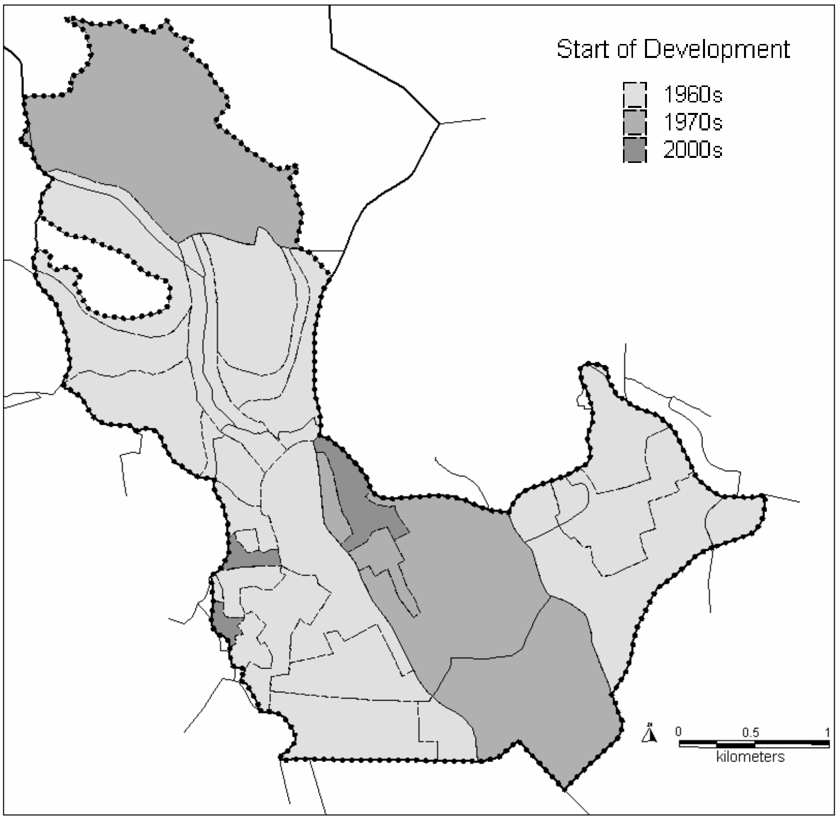


Figure 3.3 The years when the settlements were initially established in the neighbourhoods of the study area

neighbourhood relations and sense of community is very high; everyone wonders and takes care for the other particularly within the neighbourhoods of the common origin/ethnicity/religious sect; no strangers are tolerated and people are very curious about them; daily life style reflects almost a continuation of rural life including activities like fruits-vegetables drying, poultry feeding, wool picking into fibres, etc. Examples for economic activities include marginal employments such as street selling of liquid gas, sacks of potato and the like, garbage picking for selling of recycling materials, and driving the public minibuses. However, during the field study, people who work and/or retired in/from public sector were encountered, as well. It is also observed that, people generally have low education level. Similarly, mostly low income families live in these neighbourhoods. However, a contrasting observation was car ownership in about one-fourth of squatters. More interestingly, during the field study in *Yükseltepe*, some of the farthest north-east squatters were observed to have additional economic security measures like special breed dogs, and half closed/closed garages for their luxury automobiles (Figure 3.4).

Figure 3.4 A section from one of the *squatter* settlements of the study area

Another remarkable occurrence in these neighbourhoods includes a number of very small and unknown societies/associations probably established right after their residents migrated from the same place of origin. The names of these social groups include words such as "…support for ...Village", "…Village solidarity" and "Keens of …" to reflect their yearn for, and their sympathy with their original places of residence, and to help the socialization of the newcomers. However, in time, some of these Societies turned into places with rooms where their unemployed attendees kill time by gambling and drinking tea/coffee all through the day. Several of them became places where the incidents against public morality like gambling and incidents against people take place.

Here are some notes taken on 22 October 2004 from an interview with a typical squatter resident who is a man of above his fifties and runs a grocery in 8th Street of *Sancaktepe*

> *…I am from Kırıkkale,…and I am Alevi, and all my neighbours are my relatives and my villagers… I am retired from PTT, and currently I also work as a taxi driver….My father and my wife has retired from this grocery shop. ...I think there is discrimination in municipal services….even street naming is made with reference to our religious origin. ...Indeed, turn of my surroundings into apartments is something that I do not want; because I am afraid the neighbourhood will be lost. ….The day before, my grandchild had fallen and injured himself. My neighbours helped and took him to the Health Centre and I was informed all these happenings much later…*

In terms of physical structure, these neighbourhoods are areas where homogeneous settlements, land use and housing type exist. Houses are made for supply of urgent housing needs, in primitive but architecturally unique way. They are originally built as one-storey and one-room and in time expanded to supply additional needs including a poultry-house. All houses have one or more of the security measures like walls, barbed wires, fences, railing (installation of iron bars) in all windows, and closed garage. The road pattern is organic and unpredictable. In the beginning of development (Figure 3.3) there was no infrastructure and urban services in these neighbourhoods. Subsequently, they had drinking water, sewage system, electricity, roads and transportation after they gained legal status with regulations in the early 1980s. During the field study on 24 October 2004, a middle aged housewife living in 160th Street of *Yükseltepe* stated that

> *…We came here sixteen years ago. In the first 3-4 years we lacked drinking water. ...currently we have it, sewage system and all others,…*

3.3.2 *Planned* Areas

In the study area, *Aşağı Eğlence* and *19 Mayıs*, majority of *Ayvalı* and *Etlik*, and some parts of *Esertepe* and *İncirli* neighbourhoods experienced *planned* urban development process (Figure 3.5 and Figure 3.6) which are mainly covered in the Yücel-Uybadin Plan (Bademli, 1987:108) approved in 1957. As far as the boundaries of study area is concerned, urban planners in Keçiören Municipality and police officers state that since 1970s, almost all areas in *Etlik, Aşağı Eğlence*, and *19 Mayıs*; and since 1960s, *Esertepe* and south part of *İncirli* are composed of regular and legal (*planned*) residences. However, from the Municipality it is learned that the *planned* development in *Ayvalı* is result of an earlier Improvement Plan(s) approved for this area. In other words, the original settlement in *Ayvalı* had been in the form of *squatter* development.

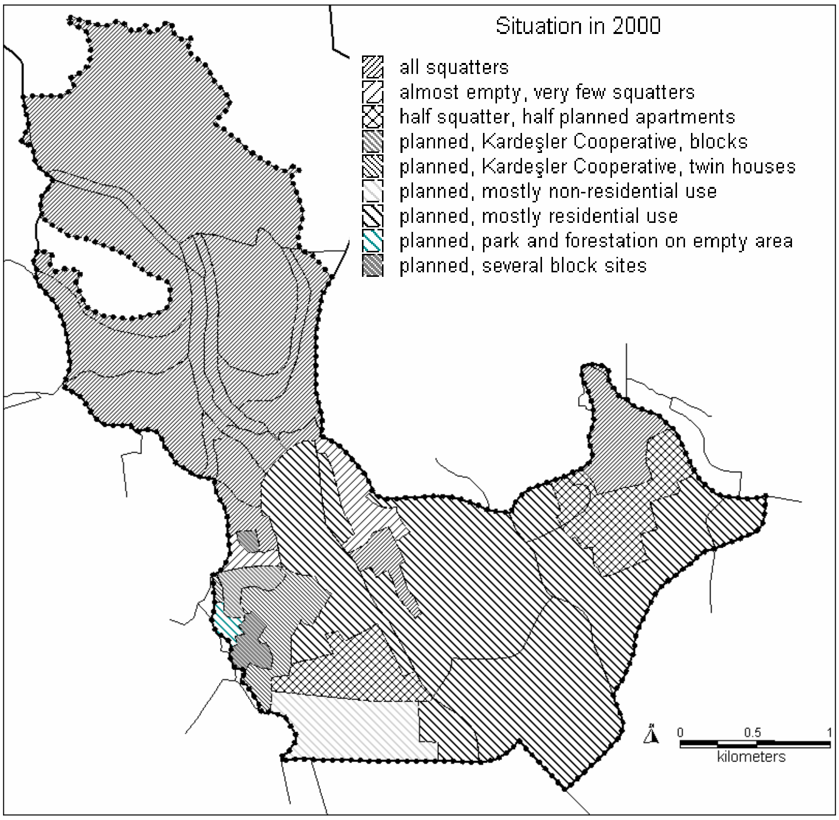


Figure 3.5 Situation in 2000 in the neighbourhoods of the study area

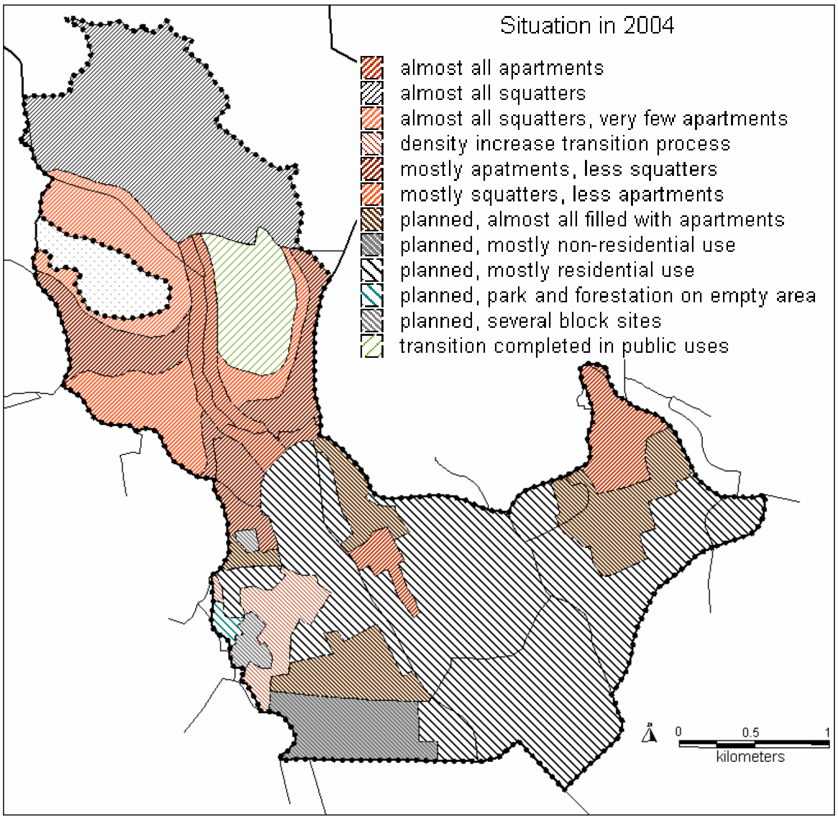


Figure 3.6 Situation in 2004 in the neighbourhoods of the study area

As for the observed socio-economic structure, the *planned* settlements are areas where privacy is inside the housing units in contrast to *squatter* settlements where privacy was found both inside and outside the houses. Moreover, in contrast to *squatter* areas, the *planned* areas are areas where highest heterogeneity is found; un-isolated social structure and life style exist; almost no one knows the other; mostly mixed origin people live, neighbourhood relations and sense of community is very low; no one wonders and takes care for the other; strangers are well tolerated and people are rarely curious about them; urban life style and economic activities prevail in daily life and economy. The observations in *planned* neighbourhoods and particularly in *Aşağı Eğlence* confirms the police officers' statements that the nearby Gülhane Military Medicine Academy campus and its social facilities have supported their socio-economic and cultural development, and that the people living in these above stated *planned* neighbourhoods have higher income and education levels.

In general, physically, these settlements (Figure 3.7) are areas where urban functions like commerce give rise to heterogeneous settlements and mixed land use; houses have *planned* urban structure since the settlement's earlier and/or starting development stages. Moreover, the architecture of buildings are alike with differentiating multi-storey and/or high rise apartments; housing security measures include apartment garden walls, banisters that are mostly on windows of ground and first floor flats.

Figure 3.7 A section from one of the *planned* settlements of the study area

3.3.3 *In-Transition* Areas

In-transition areas could be defined as areas that are originally *squatter*, which experience a transformation period into *planned* urban structure by means of Improvement Plans. All the originally *squatter* settlements in the study area have these plans. On the other hand, these approved plans are at different stages of implementation. When Figure 3.5 and Figure 3.6 are compared, it is observed that between 2000 and 2004 (the field survey year) considerable amount of areas that were previously *squatter* settlements turned into *in-transition* areas. It is predicted that they will turn into *planned* areas in the near future parallel to beginning year of the transformation process (Figure 3.8) and the transformation pace (Figure 3.9). In line with this, at the present, it very likely that all the *in-transition* settlements of the study area during the study period of 2000, turned into *planned* settlements.

Physically and socio-economically these settlements cover areas where semi and mixed characteristics of both squatter and planned type of development exist; shift from rural to urban life takes place; urban structure and functions have recently started to prevail in some parts. The notable physical condition of the transformation from squatters to multi-storey apartment urban form cause these neighbourhoods to gain appearance of construction sites, which include all stages including current squatters, demolished squatters, ongoing constructions, half finished and finished apartments (Figure 3.10). Another noteworthy observation in these areas was that the names of some of the new or large size apartment buildings were inspired from the religious symbols and concepts like “Takva”, “Uhud”, “Miraç”, and “Hilal”.

On 23 October 2004, a typical middle aged resident living in a *in-transition* area located in the 130th Street (currently *Estergon Road*) of *Şehit Kubilay* neighbourhood stated

> *…I live here since 1968,…and I am working in Yenimahalle District Security Directorate…I have moved from my squatter to this building recently. I gave my squatter to the developer-seller, now it is demolished and our apartment is under construction.…I will be a renter here for a few years more…then we will soon move to our new house.…In this area there are people who migrated from nearby provinces like Nevşehir, Yozgat, and Kırşehir in the mid 1960s.…This place is generally secure, except for few simple house burglaries…*

The following summary table (Table 3.3) presents information concerning the observed and/or computed socio-economic and physical (spatial) structures of the neighbourhoods covered in the study area, *R*.

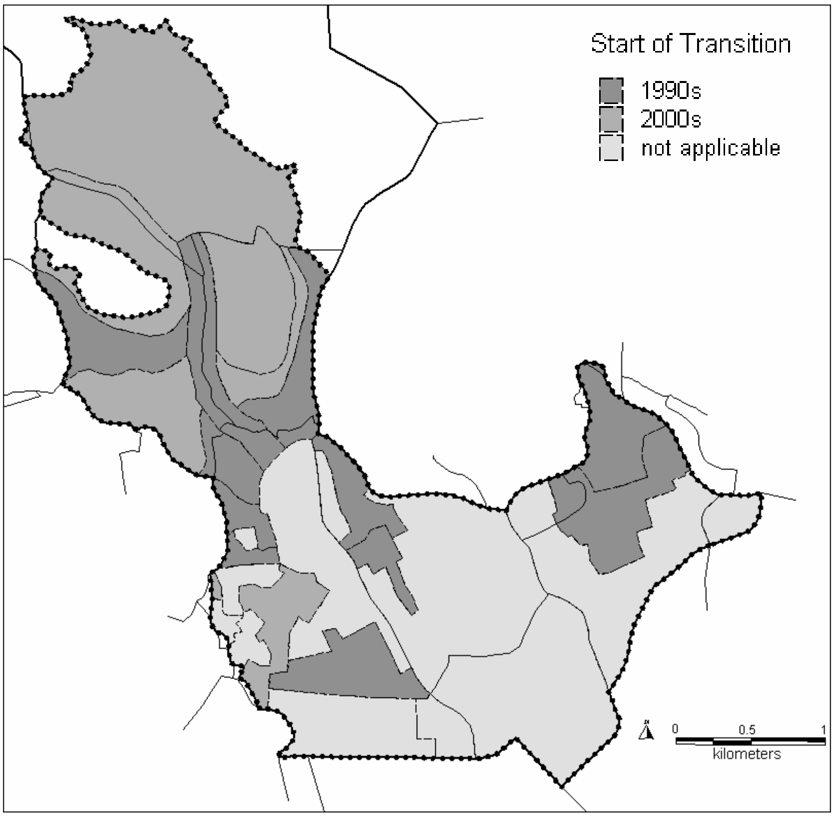


Figure 3.8 The initial years of transition in the neigbourhoods of the study area

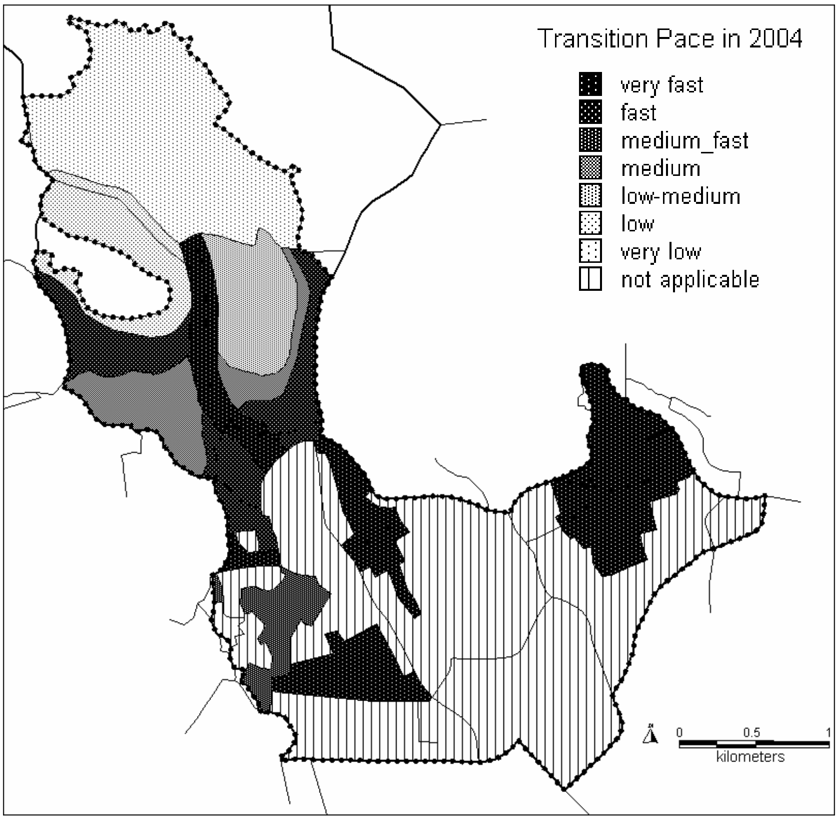


Figure 3.9 Transition pace in 2004 in the neighbourhoods of the study area

Figure 3.10 A section from one of the *in-transition* settlements of the study area

Table 3.3 Summary of socio-economic and physical (spatial) structures in study area neighbourhoods

	Neighbourhoods (Portions covered in the study area)	**Observed socio-economic structure**	**Observed physical (spatial) structure (*)**
Planned development	Ayvalı (All except for two areas in the north-northwest and middle) Etlik (All except for an area in the northwest) Aşağı Eğlence (All) İncirli (Western, southern and eastern parts) Esertepe (Western part) 19 Mayıs (All)	• Privacy is in home • Heterogeneous and non-isolated social structure • Low level of neighbourhood relations • High proportion of people with mixed origins • Low sense of community • High tolerance for strangers • Urban life style/activities • Higher education level • Higher income families • Smaller household size	• More number of social facilities for education, etc. • Heterogeneous settlements and mixed land use • Similar architectural styles • Planned urban structure including predictable roads, no dead ends • Multi-storey and/or high rise apartments • Less number of differentiation in housing security measurements • Higher density of population
In-transition development	Yükseltepe (A minor area in the south) Şehit Kubilay (A continuous area in the middle, east and south) Sancaktepe (A continuous area in the west south and east) Ayvalı (Two areas in the north-northwest and middle) Etlik (An area in the northwest) İncirli (Middle and northern parts) Esertepe (Eastern part)	• Semi and mixed characteristics of both squatter and planned type of development • Shift from rural life, social structure and functions to urban life, social structure and functions	• Semi and mixed characteristics of both squatter and planned type of development • Shift from squatter urban structure and functions to planned urban structure and functions • Construction site appearance due to transformation from squatters to multi-storey apartment urban form
Squatter development	Yükseltepe (All except for a minor area in the south) Şehit Kubilay (Two areas in the north and south) Sancaktepe (Middle and northern parts)	• High privacy in and outside home • Homogenous and isolated social structure • High level of neighbourhood relations • Concentration of people from similar origin • High sense of community • Less no tolerance for strangers • Daily life resembles rural life/activities • Lower education level • Lower income families • Larger household size	• Less number of social facilities for education, etc. • Homogeneous settlements, land use dominated by housing • Houses are primitive but architecturally unique • Organic and unpredictable road structure, dead-ends • Majority of housing are one-storey • One or more security measurements for housing with differentiating means • Lower density of population

(*) Some of these properties are found by counting the social facilities, or by calculating the density based on data obtained.

[1] *Gecekondu* housing in this period is distinguished by being at their *early stage,* which is different from *late stage gecekondu* development dominated in big metropolises since 1980s.

[2] This situation led to foundation of new commercial, speculative, and/or rather illegal relations concerning the land, which is called as "mechanism of shared titles", and it increasingly became the new means of land acquisition in Turkey (Işık and Pınarcıoğlu, 2002:161),

[3] The redevelopment process introduced by these plans also introduced a new way out, i.e., demolish-and-rebuild mode for the small-scale contractor, *yapsatçı*, who already been severely obstructed by the spatial, social, and economic conditions of the cities and thus, diminished in construction works starting in the late 1970s (Işık and Pınarcıoğlu, 2002:166; Erişen, 2003:92).

[4] According to Işık and Pınarcıoğlu (2002:176) the deteriorating and eroding socio-cultural values should be considered within a wider context of social groups. That is, the informal and lower income groups should not be thought as the only one who lost their innocence and legitimacy after the 1980s.

[5] Gültepe (Çinçin) Mass Housing Project comprise demolition of old *gecekondu* dwellings and construction of about 780 flats on approximately 48.200 m² of land in four blocks, and of the required technical and social infrastructure and planned to be finished in 2008 (Altındağ Belediyesi, 2007).

[6] As quoted from Tekeli (1987/1991 in Erişen, 2003:91 and in Işık and Pınarcıoğlu, 2002:128) the urbanization after 1980s became "the speculation of large capital" unlike the one before 1980s which is viewed as "the speculation of small capital".

[7] Such residential developments of middle and higher income groups generally assumed the name *"site"*, which has different meaning of the word "site" in English. As quoted by Erişen (2003:108) Öncü (1997b:63) states that "sites are novel phenomenon both architecturally and as a way of life". "Öncü (1997b) refers to "site life" as a clean social environment provided by the homogeneity of its residents on the basis of social and occupational backgrounds." (Erişen, 2003:108). They could be both or either in the form of high rise developments, semi-attached detached duplex or triplex residences (Erişen, 2003:117) whereby the *Kat Mülkiyeti Kanunu* (Flat Ownership Law) is applied vertically or horizontally. Although most of them are developed in the suburbs, the *"sites"* could also be developed in the inner metropolitan areas. As for the high rise *"site"* developments, the management of one or more buildings is performed by one administration, called as *"site administration"* (*sites* that are developed as low rise are also managed by such administrations). Such management is different from their individual "apartment administration" counterparts practiced for the standard apartment buildings developed in the inner cities.

[8] The attribute and spatial data and database construction is elaborated in the next Chapter.

[9] This and all other maps in the current chapter were prepared in MapInfo ® GIS.

[10] This information is obtained from both police officers, and from the interviews with the old households living in the area during the field study.

CHAPTER 4

METHODOLOGY AND FORMATION OF THE LOOSE-COUPLED GIS-BASED SYSTEM

This chapter concentrates on the methodology for the case study and explains how the loose-coupled GIS-based system was developed. These latter sections, first, give detailed explanation on what are the attribute (tabular) data to be utilized in the case study and how a database is designed for them to be entered afterwards by the Police Authority, and the resultant variable set to be used in the analyses. Second, the spatial data to be used in the study and the spatial database construction within the loose-coupled system are explained. Geocoding process for incidents and update of road/street centerline map for the study area are only a few examples of this database construction for further analyses.

4.1 Methodology

In this study, the methodology for exploring the spatial and/or temporal distribution of the incidents is performed within the framework of *new ecological theories*. The related methods rely heavily on "crime pattern analysis", which became a basic tool in the analysis of unequal distribution of crime across *space* and *time* since the late 1970s. Particularly, since the 1990s the advances in computerized mapping and spatial data analysis tools have gradually replaced the traditional pin mapping of crimes and related interpretive bases (Wu, 2001).

Crime pattern analytical methods are mainly quantitative, and almost all studies utilizing such methods are empiric in nature and majority of them consist of different analytical tools and statistical approaches (Balkwell, 2001). Such an approach, that is, quantitative analysis on which the current study is also based on, requires definition of:

- Scale of measurement of the variable, e.g., categorical, or numerical (Boba, 2001);
- Measure of crime, e.g., counts, rates, percentages, or location quotients (Brantingham and Brantingham, 1998; Balkwell, 2001); and
- Measure of spatial and temporal levels of resolution or aggregation, e.g., 'macro', 'mezo', or 'micro' (Brantingham and Brantingham, 1998).

The level of spatio-temporal resolution and measure of incidents are conceptually linked and play important role in crime analytical studies (Brantingham and Brantingham, 1998:264). Measures of crime differ from each other and have some advantages and disadvantages over the other (Brantingham and Brantingham, 1998:266,270). The three measures of crime, which are also utilized in this study, are described below.

Measure of *crime/incident counts or frequencies* simply represents the number of crimes/incidents which actually take place in a given spatio-temporal level. They are used to assess the locations where the crimes/incidents concentrate (hotspots). They are not estimates or ratios (Brantingham and Brantingham, 1998:266).

Measure of *crime/incident rates* is a means for assessing the risk of crimes/incidents to particular people in a given spatio-temporal level, and for assessing effects of changing level of social conditions of the risk of crime/incident. The rates are found by dividing a measure of crime/incident occurrence like number of incidents by units at risk of crime/incident such as resident population, number of dwellings, or number of automobiles in a spatial unit, when the crimes are committed against people, as residential burglary, or as auto theft, respectively (Brantingham and Brantingham, 1998:266). It is worthwhile to note that the computation of *rates* is subject to what is known as *Modifiable Area Unit Problem* since the rate values could be changed when the areas that they are computed for are changed. In social sciences, most of the time, these areas "may have been designed rather arbitrarily on the basis of administrative convenience or ease of enumeration….It can be a particularly significant problem…where…the areas have rarely been arrived at on any basis which relates to the data under study." (Bailey and Gatrell, 1996:256).

Measure of *location quotients* is originally developed in regional planning and is used to indicate a comparison of one economic activity with respect to its surrounding areas (Brantingham and Brantingham, 1998:267). In criminological analysis this dimensionless relative measure display in the Brantinghams (1998:270-271) words the

> preference or choice of crime type in the smaller unit compared to a larger trend….LQC equal to 1.00 for a specific crime, that means that it has a proportional mix of that crime similar to the larger comparison area….When the value of the LQC falls below 1.00, the relative proportion of that crime in the smaller study area is below the normal trend in the larger comparison area. When the LQC is above 1.00, the specific crime is above the normal trend.

The adoption of regional planning LQ formula into criminological analysis is given as:

$$LQC_{i_n} = (C_{i_n} / C_{t_n}) \Big/ (\sum_{n=1}^{N} C_{i_n} / \sum_{n=1}^{N} C_{t_n})$$

where n: area under study, N: total number of areas, C_i: count of crime I, and C_t: total count of all crimes (Brantingham and Brantingham, 1998:269).

The three levels for the spatio-temporal analysis of incidents in *ecology of crime,* i.e., “macro”, “mezo”, and “micro” were described in the second chapter. The two levels, which are utilized in this study in analysing the distribution of incidents against people, property, and people and property, are *mezo* (intra-urban) level, i.e., the study area (*R*); and its *micro* level sub-regions such as the streets, squares or vicinities of specific land uses (Chapter 1). Moreover, in this study, spatial analysis tools in the developed loose-coupled (Sui, 1998:653) GIS[1]-based system are utilized. For this purpose, in the GIS-based system, first data collection and database construction, which are covered in this chapter, are carried out. Subsequently, as described in the next chapter, *spatial, temporal* and *spatio-temporal* analysis of incidents are performed from both *general* and *localized* perspectives. These analyses first cover the exploration of the three types of incidents together, followed by the exploration of incident types and commitment types. Afterwards, the relationship of incident distribution and clustering with the urban structure are discussed. Finally, the urban planning and policing implications are explained. A flowchart for the methodology of this study is presented in Figure 4.1.

4.2 Formation of the Loose-Coupled GIS-Based System

The GIS-based framework established in this study is composed of a “loose-coupled GIS-based system” (Figure 4.2), and is based on integration of:

- a relational database management system (RDBMS) (MS Access ®);
- a standard desktop GIS software (MapInfo ®);
- a software comprising a set of spatial data analysis (SDA) tools (CrimeStat ®),
- a statistical package which performs almost all kinds of non-spatial statistical analysis for the spatial data (SPSS ®); and
- several additional document or spreadsheet softwares (MS Office ® Applications)

by means of data exchange without a common interface among them (Sui, 1998).

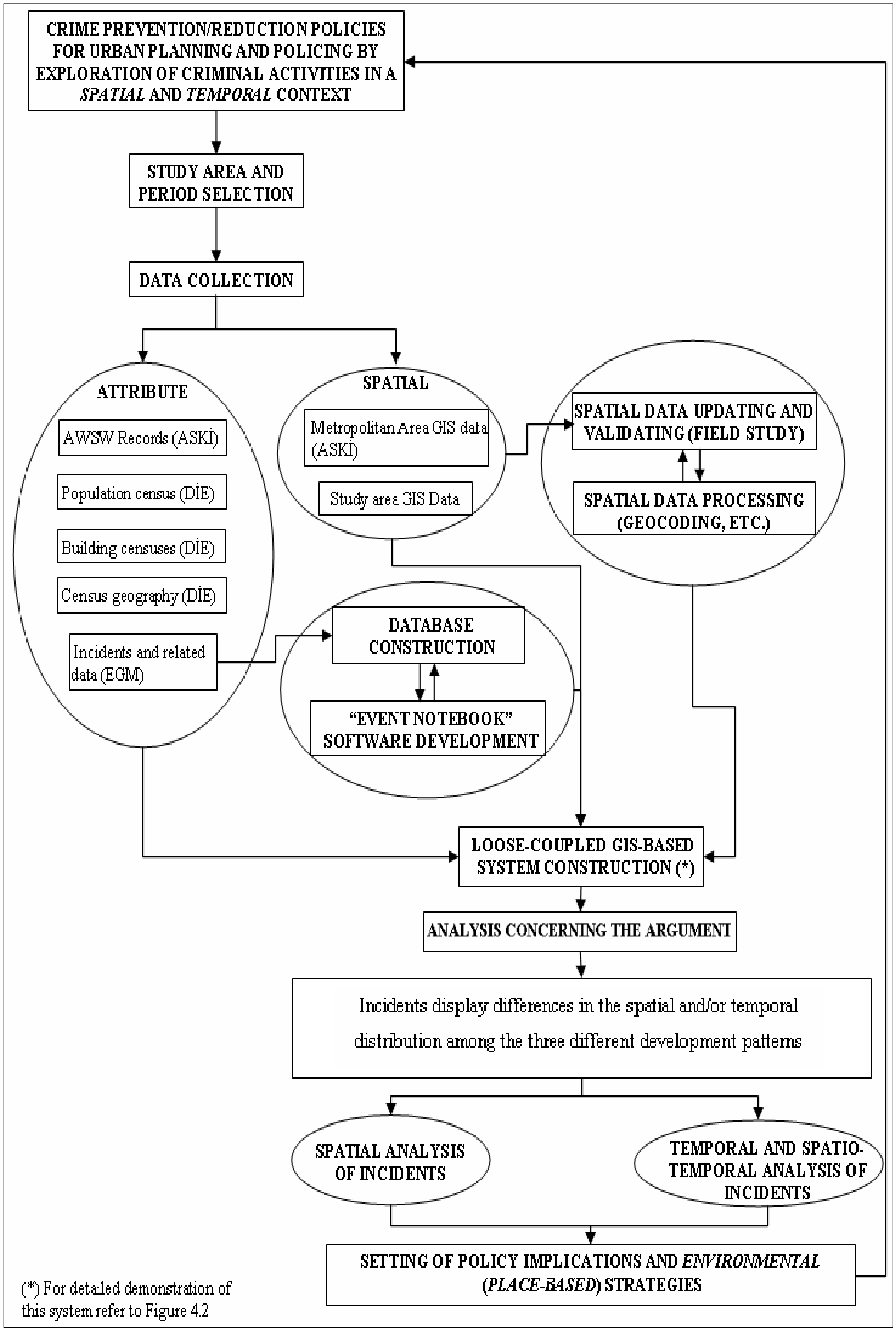


Figure 4.1 Flowchart of the methodology

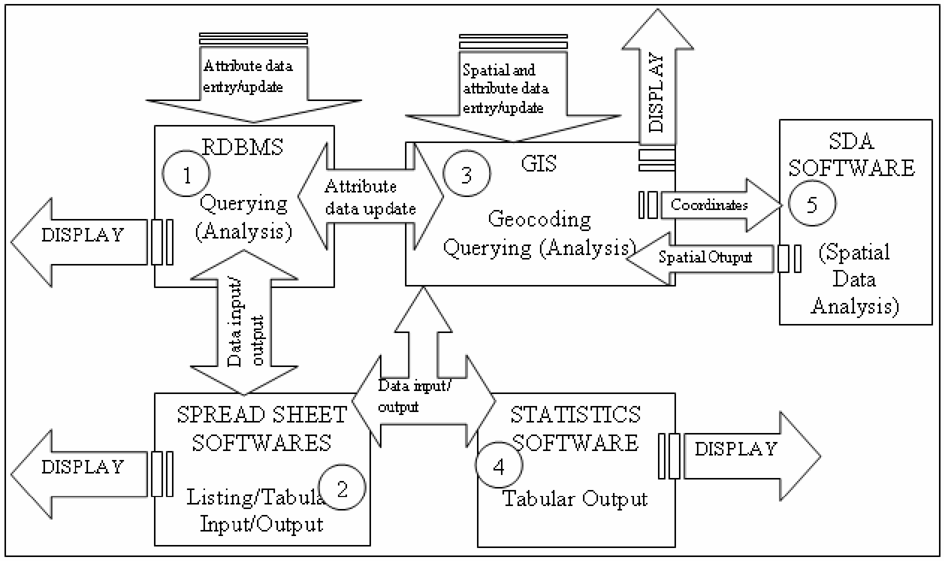


Figure 4.2 Developed loose-coupled GIS-based system showing the main relationships between the components

The aim in the development of the loose-coupled system is to derive the results out of each component such that they serve as a spatial decision support system for the development of efficient urban planning and crime prevention policies. Loose-coupling also allows flexibility for the system, since different softwares can be adopted depending on the availability. In the following sections, the components of the developed loose-coupled system are explained.

The first component (Figure 4.2) of the loose-coupled system includes a developed relational database model by means of RDBMS (MS Access ®) for data collection and database construction for incidents and related data. These data sets afterward were processed in the third and fourth components of the loose-coupled system.

The second component (Figure 4.2) covers spreadsheet softwares (MS Wordpad ®, MS Excel ®) for data collection which include Records of Ankara Water and Sewage Works, Population and Building Censuses, and Data for Census Geography in tabular form. There is a data input/output exchange between this component and all other components of the loose-coupled system.

The third component (Figure 4.2) of the loose-coupled system is a standard desktop GIS (MapInfo ®). The GIS not only serves for geocoding and geographical visualization of background data with the crime incidents and their associated attributes, but also provides spatial and non-spatial analyses. In general, the background data include GIS layers such as street, district, parcel maps, maps of socio-economic indicators, land-use maps, etc. which can be obtained from various sources (e.g. city information systems, census statistics). In this study, while the geographical data for incidents data set is produced by geocoding of them with their prepared tabular database in the first component and revised with reference to field observations and surveys, the background data set is obtained from Municipality of Greater Ankara, and particularly revised and detailed for the study area with reference to field observations and surveys.

The fourth component (Figure 4.2) covers a statistical software (Statistical Package for the Social Sciences-SPSS ®) for analytical purposes. Whenever required all the data sets either produced or processed in all other components are converted into this software for further analytical results for explorative or explanatory analyses and testing.

The fifth component (Figure 4.2) of the loose-coupled system is composed of spatial statistical analyses tools for the detection of crime pattern (CrimeStat ®). Spatial statistical analyses can be performed in two levels such as explorative (level I) and modeling (level II). Level I is usually prerequisite for level II. Explorative analyses (level I) involve determining hotspots by using clustering algorithms, computing the spatial densities such as *kernel density estimates* and analyzing interactions between the incidents by using distance analyses; namely the *K function* or *nearest neighbor distances*. Modeling (level II) is more sophisticated and can include journey-to-crime or space-time analysis depending on the purpose (Levine and Associates, 2002). If required, the results obtained from this component are further converted into the third component format to be visualized and interpreted.

4.2.1 Attribute Data and Database Construction

In this section, the first stage, which includes the attribute data and database construction in the developed loose-coupled system, is explained. Since the spatial data of the incidents is produced by means of the incidents and related tabular data, especially the correct entry and update of these data is essential for the reliability of further analyses.

4.2.1.1 Incidents and Related Data

Incidents and related offender and victim data is obtained from Ministry of Interior, General Directorate of Security, and they only include incidents known to police, and which are registered[2] during the period of 1 January 2000-31 December 2000 in Etlik Polis Station.

Even though the study area is limited to Etlik Police Station Zone, a general use database was designed for digitalization of the analogue incidents data in the “Event Notebook”s of the Police Stations, which started to be utilized in its more sophisticated form since 1993 for standard and regular registration of the incidents known to police (Dağ, 2002). Although the resultant design can be utilized in the whole country’s Police Stations equipped with “Event Notebook”s after minor changes, it specifically targeted Ankara Metropolitan Area. Fields of “Event Notebook”s are seen in Appendix B.

This database design include development of a conceptual Entity-Relationship Model and its operational Relational Database Model. Moreover, it has user-friendly interfaces for easy, correct, and complete data entry/update. The design is made in a way that it ensures referential integrity for the incidents that have more than one offenders and/or victims and enable computerized mapping (geocoding in GIS) of incidents, offenders and victims and their attributes.

The structure of the analogue one-whole-table in the “Event Notebook”s (see Appendix B) is utilized to divide it into its entities and relational components. In this way, the designed conceptual Entity-Relationship Model is later converted to the operational Relational Database Model. Different database schemes and related interfaces are obtained during the design process. These differences resulted mainly from particular attention paid for finding the optimum and the best address data entry medium for the police officers. This concern occupied majority of the time spent for the whole design. The achievement to this correct tabular geocoding data has also been the most critical section of the design because every other data would be attached to those mapped points and the reliability of all the future spatial analyses would be dependent on their correctness.

In an elaborative and comparative process, different versions of the design are evaluated in terms of their advantages and disadvantages in approaching to the final form of the Relational Database Model and its interfaces. During the comparison of different versions of the design, a particular emphasis is given to the primary and foreign key structure and combo lists that are used in preparation of the interfaces. The collection of all the designed interfaces is called “Event Notebook Program”, which contains totally twenty-two main and address forms. Figures 4.3-4.5 illustrate the developed interfaces.

Similarly, the resultant Relational Database Model contains three main relational tables, which are “Incident”, “Incident-Offender”, and “Incident-Victim”, and eight tables used in the designed data entry interfaces. Figure 4.6 shows the finalized Relational Database Model used for data entry.

After data were entered into these relational tables, some fields (variables) were needed to be added particularly the “Incident Table” for the purposes of data formatting, correction, and analysis. In this context, these additions (which is shown by (*)), explanations, and measurement scales of all the variables of this final “Incident Table” are seen in Table 4.1.

The explanations, data formatting, and corrections to some of the fields in this table including Incident Date, Incident Hour, Registration Date, Registration Hour, Against What, Number of Events, ...Incident Type[3], ...Commitment Type[4], ...Detail are given in Appendix C.

At this point; it is worth to give some general information for the 1139 incidents registered in Etlik Police Station “Event Notebook”s during the year 2000. When the events are evaluated totally with respect to “Against What” field (variable), Table 4.2 is obtained. As seen here, the most frequent incidents (the first three modes in the data set) took place “Against People”, “Against Property”, and “Against People and Property”.

The selection of incidents (a subset of 529 incidents) to be used in spatio-temporal and detailed analyses, among all the registered ones in the year 2000 (1139 incidents), is based on the categories, which are generally accepted as related to *place* in the literature, as stated previously.

For this selection, “Incident-Victim Table” and “Incident Date”, “Against What” fields of the “Incident Table” were used. First of all; with respect to “Incident Date”, the incidents happened before the year 2000, and the ones that happened right after the midnight on 31st December 2000 (totally 8 incidents) were removed from 1139 incidents. Secondly, from the

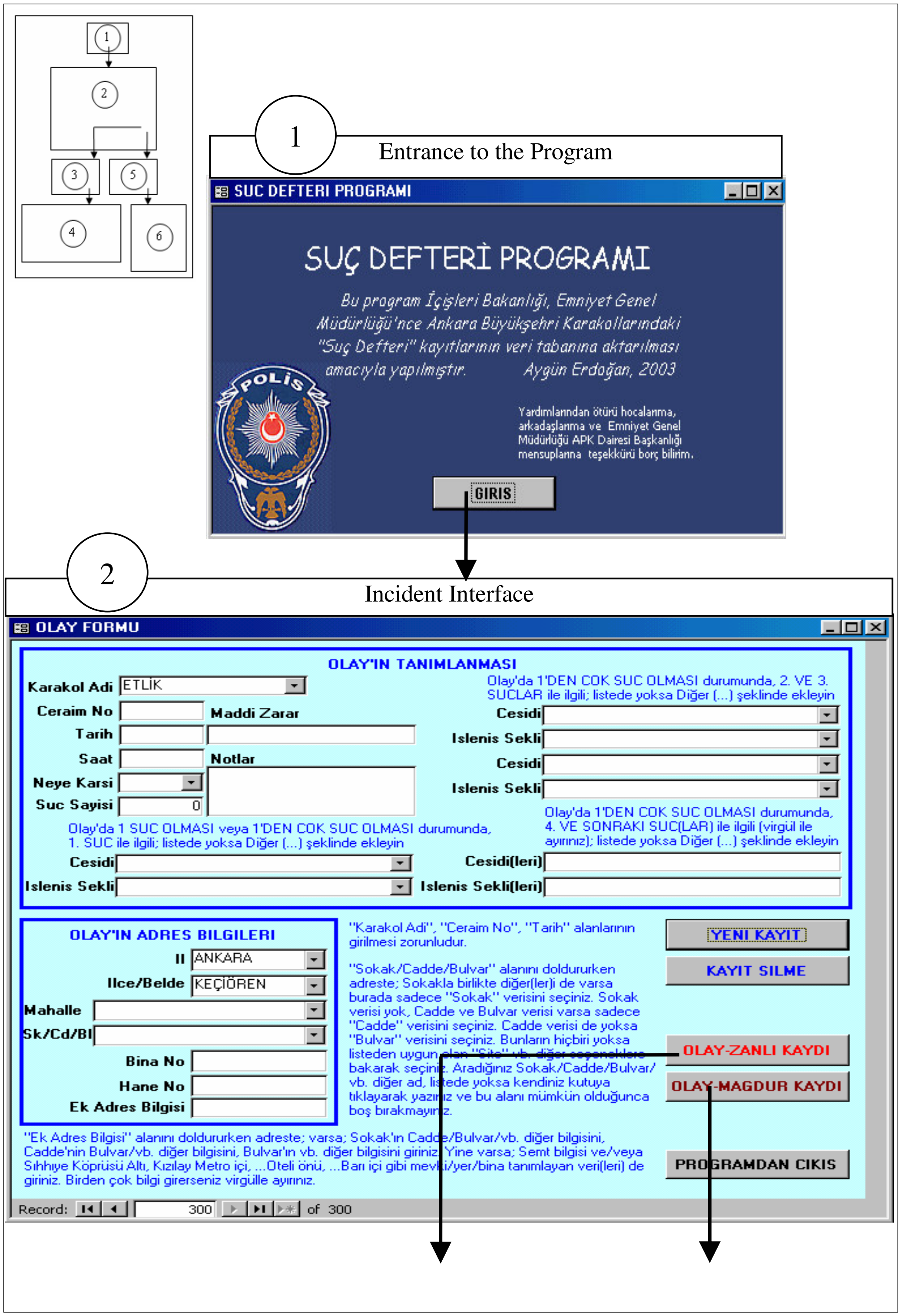


Figure 4.3 The first two interfaces of "Event Notebook Program"

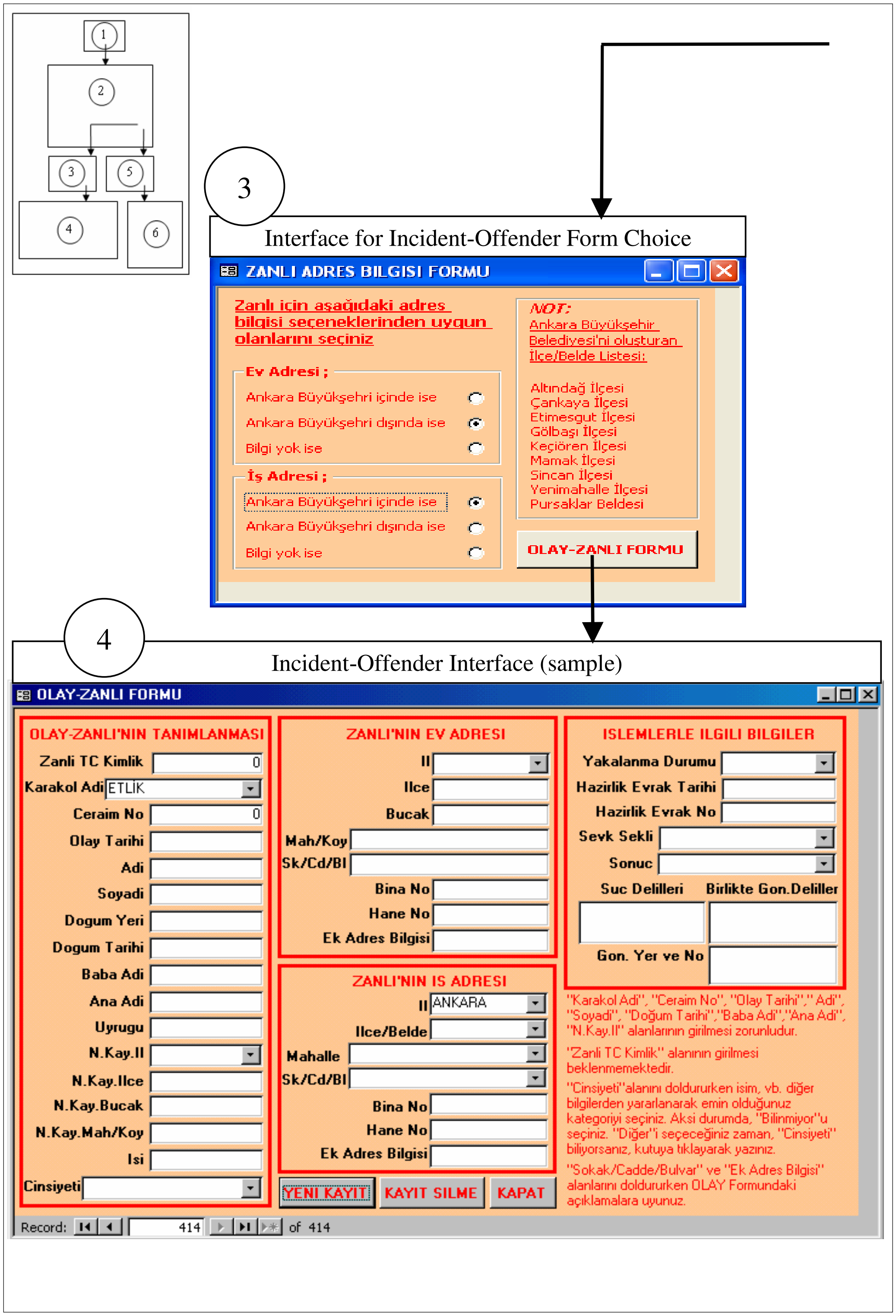


Figure 4.4 The third and fourth interfaces of “Event Notebook Program”

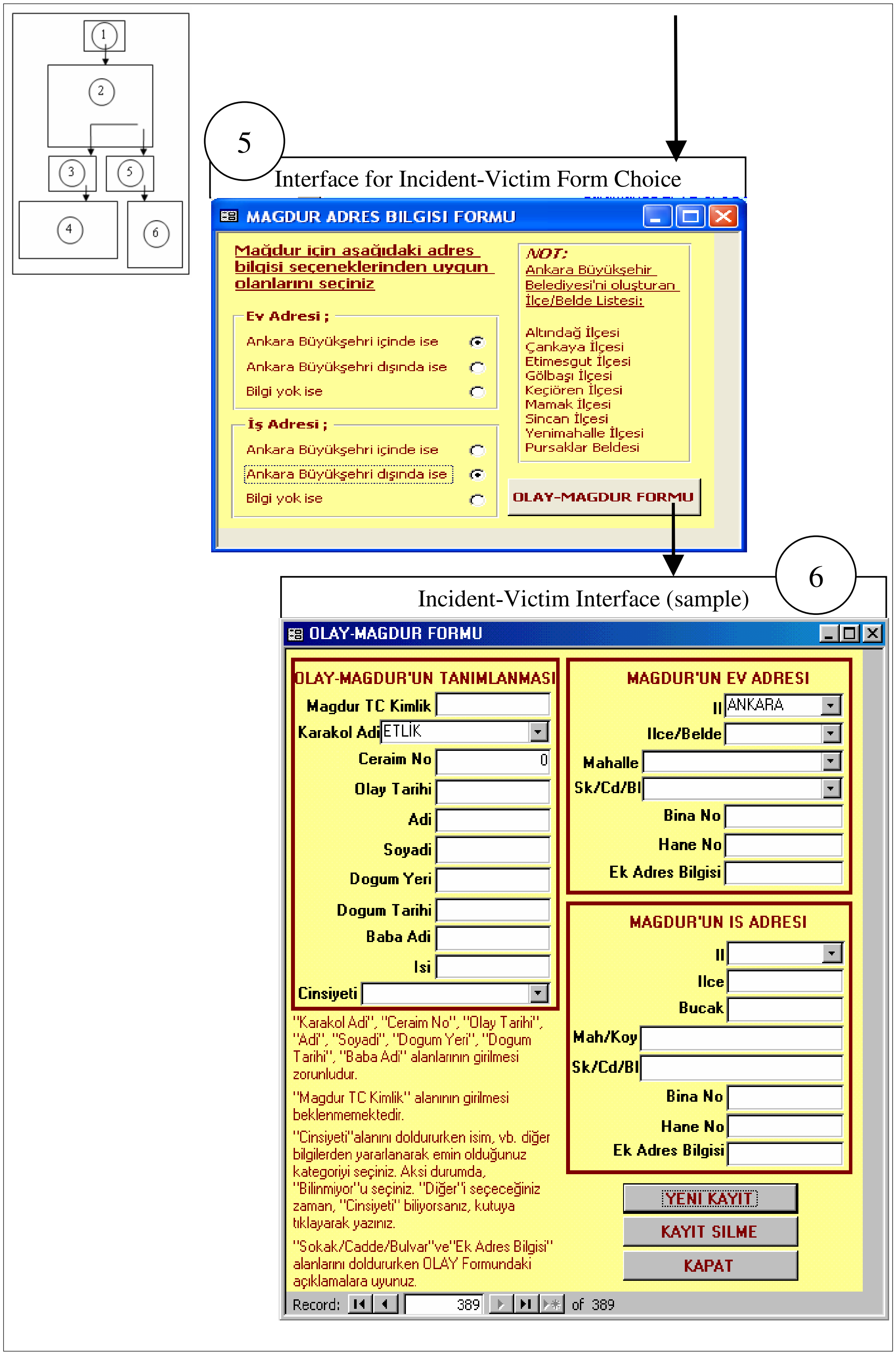


Figure 4.5 The fifth and sixth interfaces of "Event Notebook Program"

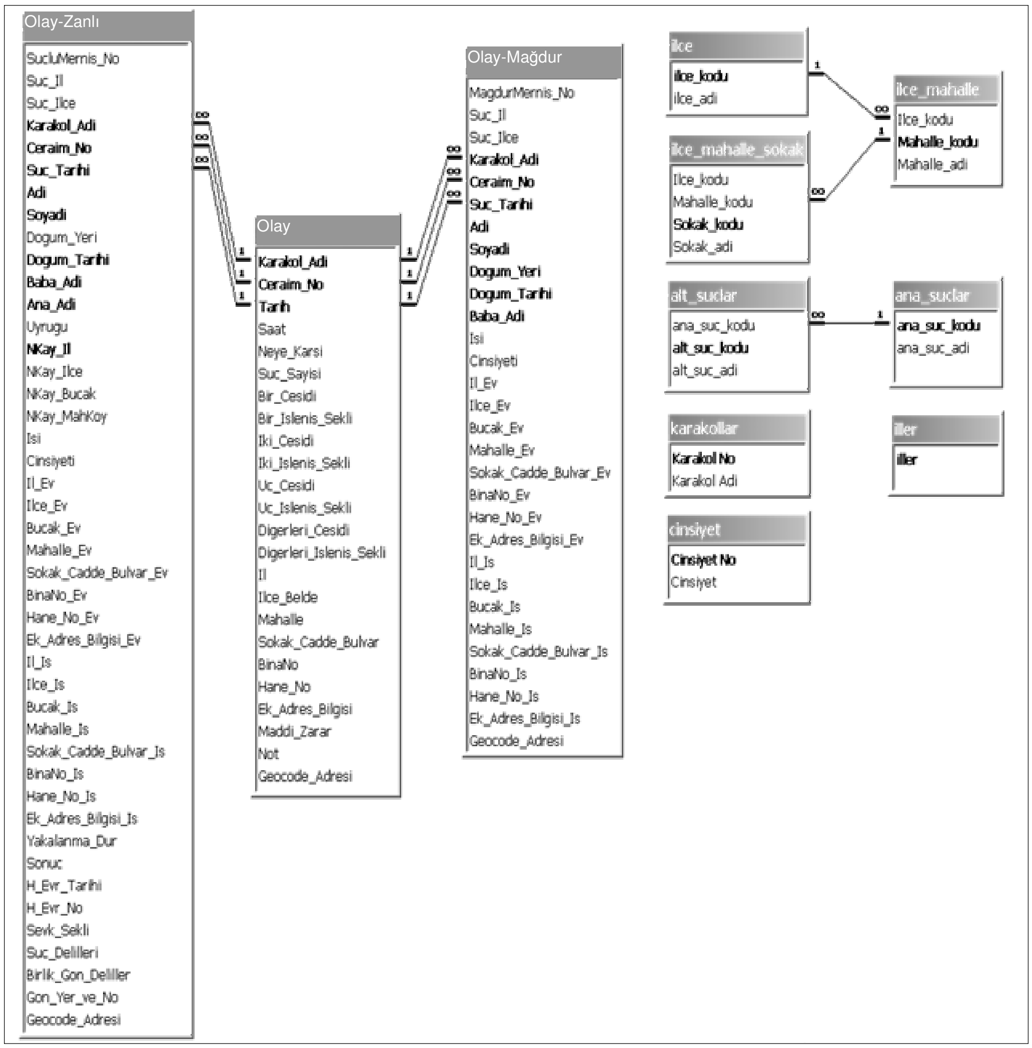


Figure 4.6 Relational Database Model used for data entry

Table 4.1 Revized “Incident Table”

Fields	Explanation	Scale of Measurement
Karakol_Adi	Which Police Station (Default is “Etlik”)	Categorical
Ceraim_No	Unique id number given to each event	-
Tarih	Incident date	Interval
Saat	Incident hour	Interval
* Intikal_Tarih	Registration date	Interval
* Intikal_Saat	Registration hour	Interval
Neye_Karsi	Against what	Categorical
Suc_Sayisi	The number of events in the incident	Ratio
Bir_Cesidi	Type of 1st event in the incident	Categorical
Bir_Islenis_Sekli	Commitment type of 1st event in the incident	Categorical
* Bir_Detay_Bilgi	Detail of 1st event in the incident	Categorical
Iki_Cesidi	Type of 2nd event in the incident	Categorical
Iki_Islenis_Sekli	Commitment type of 2nd event in the incident	Categorical
* Iki_Detay_Bilgi	Detail of 2nd event in the incident	Categorical
Uc_Cesidi	Type of 3rd event in the incident	Categorical
Uc_Islenis_Sekli	Commitment type of 3rd event in the incident	Categorical
* Uc_Detay_Bilgi	Detail of 3rd event in the incident	Categorical
* Dort_Cesidi	Type of 4th event in the incident	Categorical
* Dort_Islenis_Sekli	Commitment type of 4th event in the incident	Categorical
* Dort_Detay_Bilgi	Detail of 4th event in the incident	Categorical
* Bes_Cesidi	Type of 5th event in the incident	Categorical
* Bes_Islenis_Sekli	Commitment type of 5th event in the incident	Categorical
* Bes_Detay_Bilgi	Detail of 5th event in the incident	Categorical
Il	Province of the incident (Default is “Ankara”)	Categorical
Ilce_Belde	District of the incident (Default is “Keçiören”)	Categorical
Mahalle	Neighbourhood of the incident	Categorical
Sokak_Cadde_Bulvar	Street/Road/Boulevard of the incident	Categorical
BinaNo	Building number of the incident	-
Hane_No	Number in the building	-
Ek_Adres_Bilgisi	If exists the additional address information	-
Maddi_Zarar	Material loss caused by the incident	-
Notlar	Notes	-
Geocode_Adresi	Geocode address (not used during data entry)	-

(*) The additions made to “Incident Table” for the purposes of data formatting, correction, and analysis

Table 4.2 “Against What” the incidents took place

“Against What”	**Frequency**	**Percentage**
Judicial Administration	1	0,09
Government Administration	29	2,55
Government Administration, and Public Morality	2	0,18
Government Administration, and Public Confidence	1	0,09
Government Administration, and Property	8	0,70
Government Administration, and People	10	0,88
Government Administration, People, and Public Morality	2	0,18
The State	2	0,18
Other	56	4,92
Public Decency and Family Order	20	1,76
Public Decency and Family Order, and Liberty	1	0,09
Public Decency and Family Order, and Property	1	0,09
Public Decency and Family Order, and People	3	0,26
Public Morality	19	1,67
Liberty	3	0,26
Liberty, and Public Morality	2	0,18
Liberty, and Public Confidence	1	0,09
Liberty, and People	4	0,35
Liberty, People, and Property	2	0,18
Public Order	7	0,61
Public Welfare	5	0,44
Public Confidence	6	0,53
Property	**201**	**17,65**
Property, and Public Welfare	1	0,09
Special Laws	1	0,09
People	**652**	**57,24**
People and Public Morality	2	0,18
People and Property	**93**	**8,17**
People, Property, and Public Morality	2	0,18
People, Property, and Public Confidence	1	0,09
People, Property, and Special Laws	1	0,09
Total	**1139**	**100**

remaining data of 940 incidents, which took place "Against People", "Against Property", and "Against People and Property" were selected. Thirdly, this data set was controlled with "Incident-Victim Table" so that the incidents which do not have any victim and opened as "public trial" in the court were excluded. These turned to be 1 incident "Against People" and 1 "Against Property". Finally, from the remaining 938 incidents, the ones seen in Table 4.3 and assumed to be not having direct relation with space or occurred accidentally were removed, for the cases that they took place as whole in "single event" incidents and in any part of the "multi event" incidents. As a result; 293 incidents "Against People", 195 incidents "Against Property", and 41 incidents "Against People and Property" summing up to 529 were obtained to be used in the rest of the study.

Table 4.3 The incidents excluded from the set of space related incidents

"Incident Type" in whole or in a part of an incident	**"Commitment Type"** in whole or in a part of an incident	Frequency
Death, Homicide Incidents	Death as a Result of Negligence and Carelessness	94
	Poisoning as a Result of Negligence and Carelessness	
	Self-poisoning as a Result of Negligence and Carelessness	
	Suicide	
	Attempt for Suicide	
	Death as a Result of Burning	
Battery	Battery (Incidents with information of "Self-battery by….")(*)	36
	Battery as a Result of Negligence and Carelessness	
	Self-battery as a Result of Negligence and Carelessness	
Obscenity Felonies	Obscene Acts	3
Traffic Accidents	Traffic Accidents with Death	276
	Traffic Accidents with Battery	
	Traffic Accidents with Material Loss	

(*) The three "multi event" incidents in which one event has happened as "Self-battery by…" were not excluded.

4.2.1.2 Records of AWSW[5], Population and Building Censuses, Data for Census Geography

In this section, the data set and the database construction for the variables, which are used to explore the spatial distribution of the chosen three types of incidents, is presented.

The first set of data covers the year 2000 Records of Ankara Water and Sewage Works Department of Municipality of Greater Ankara, which is obtained from the same Department. This tabular data set composed of each registered user of water-discharge services in Municipality of Greater Ankara and contains information on User no, Name of user, User type, Street code, Building and House no, District name, Neighbourhood name, and Street name.

The data sets, which are Population and Building Censuses, and Data for Census Geography, were obtained from the State Institute of Statistics (SIS)[6] for the year 2000. Population Census data cover "total population" counts for all the neighbourhoods in Ankara Metropolitan Area. As for the Building Census data, which is also available at the level of neighbourhoods in Ankara Metropolitan Area, cover sixteen different variables, which are seen with their measurement scale in Table 4.4.

Table 4.4 Building Census variables collected by SIS at the neighbourhood level in the year 2000

Fields	Scale of Measurement
Completed Year of Building	Interval (Classes)
Use of Building	Categorical
The Person Who Constructed the Building	Categorical
Invester of Building on the Census Time	Categorical
Structural System of Building	Categorical
Material of Building	Categorical
Floor Area of Building	Interval (Classes)
Total Field Area of Building	Interval (Classes)
Number of Stories of Building	Ratio
Number of Dwelling Units of Building	Ratio
Number of Rooms of Dwelling Units of Building	Ratio
Waste Water Drainage System of Building	Categorical
Facilities of Building	Categorical
Heating System of Building	Categorical
Fuel Type Using for Heating in the Building	Categorical
Physical Case of Building	Categorical (Could be Ordinal, as well)

The Data for Census Geography covers also Ankara Metropolitan Area, where similar building related data are collected at a more detailed spatial resolution (at building level), which include address information use of building, number of resident/working people in the building, and if exists, information for another entrance to the building and data about the development level of the squares/boulevards/roads/streets/set of buildings. The complete form including information on how this data were collected is given in Appendix D.

Editing and correcting the Data for Census Geography is performed with respect to final form of roads/streets centerline map layer and also the buildings map layer used whenever needed for proper division of land use information among all the roads/streets segments in terms of the building units updates for neighbourhood and road/street name (see Sections 4.2.2.1 and 4.2.2.2).

The land-use values in the related field has also controlled and corrected for data inconsistencies. The final categorization of the land uses revealed 16 different categories found in the study area. In the first instance, this final detailed categorization as compared to the original 6 categories in the Data for Census Geography is determined to be used in further descriptive and explorative statistical analyses. However, the similar new categories needed to be combined under less number of categories in order to decrease the number of empty cells in the cross tabulation and to obtain much significant results in further statistical analyses. This process is seen in the following table (Table 4.5).

Table 4.5 “Use” categories

16 different categories	**New category obtained as a result of combining**	**Variable name in the analyses**
Residence (Konut)	Residential Use (İskan)	iskan
Dormitory (Yurt)		
Private Workplace (Özel İşyeri)	Workplace (Işyeri)	isyeri
State Workplace (Kamu İşyeri)		
Education Facility (Eğitim Tesisi)	Social Facility (Sosyal Donatı)	sosdonat
Health Facility (Sağlık Tesisi)		
Religious Facility (Dini Tesis)		
Social Facility, etc.(Sosyal Tesis, vb.)	Social Use (Sosyal Kullanım)	soskulla
Assosciation, etc. (Dernek, vb.)		
Vacant Plot (Arsa)	Open Area (Açık Alan)	acikalan
Green Area (Yeşil Alan)		
Under Construction (İnşaat)	Construction-Vacant-Demolished Use (İnşaat-Boş-Yıkık Kullanım)	inbosyik
Warehouse, etc. (Depo, vb.)		
Vacant Workplace (Boş İşyeri)		
Vacant Residence (Boş Konut)		
Demolished (Yıkık)		

4.2.2 Spatial Data and Database Construction

In this section, the spatial data and database construction within the loose-coupled system is explained. The developed GIS database is used for both geocoding and spatial analyses of incident points, their associated attributes, and other spatial data sets with related attributes. These analyses are performed with reference to different spatial entities of point, lines and/or areas in order to achieve descriptive (visualization, etc.), and explorative results.

4.2.2.1 Ankara Metropolitan Area GIS Data

The Ankara GIS data for Ankara Metropolitan Area is obtained from Municipality of Greater Ankara. This data were produced by photogrammetric evaluation of the aerial photos taken in 1995 (in the central Metropolitan Area where no much change occurred) and in 1998 and 1999 in other parts of the Metropolitan Area (Gürbüz et al, 1999).

The set of Ankara Metropolitan Area GIS map layers used in this study is seen in Table 4.6 and some of these are mapped in Figure 4.7.

4.2.2.2 Incidents Geocoding and Etlik Police Station Zone GIS Data

The spatial component related to incident and offender data in GIS database requires mapping of these point data produced by a process called geocoding. This process originally has its roots in pin mapping which had long been utilized before the expansion of computers in this field. Its purpose is to assign tabular data to an earth surface location to visualize their spatial characteristics (COPS, 2000:4). Moreover, the non-spatial component of these data in GIS database includes related numeric and text data stored in tables for all the located points.

The geocoding process is performed in the following stages:

1. Automatic geocoding covers a process to geocode 529 incidents by the Street/Road/Boulevard field of the “Incident Table” by comparing it with “Road name” field of the Road text map layer in GIS without any intervention. This geocoding has resulted in mapping of 487 incidents on the streets/roads, and unmapped 42 incidents due to null values of Street/Road/Boulevard field in the “Incident Table” (first coarse geocoding ratio: 92 %);
2. Manual geocoding for mapping of 42 incidents on the streets/roads were performed (cumulative coarse geocoding ratio: 100%);
3. For 28 data left on the streets/roads due to lack of map information, and refined geocoding is performed for all the 501 incidents, by means of either being able to carry the incidents points to their almost exact places by utilizing the “Building number” information (Table 4.6) with less than hundred meters range correctness for 365 data. In addition, it was possible to place and 136 incident points on their most probable address on the map;
4. In order to place the 164 (28+136) incidents again within also less than hundred meters correct address points, a three-months field study was performed;
5. By field study which was performed on the bases of the “Grid map” created for the study area seen in Figure 4.8, and the Buildings map obtained from Municipality of Greater Ankara, 135 incidents were revised and added to the data set of 365

Table 4.6 The list of GIS layers for Ankara Metropolitan Area

Map Layers	Vector Data Type	Main Attributes
Buildings	Discontinuous regions	Building number
Buildings point	Points	Building number for one roof multi buildings and new buildings
Roads	Lines	Road name, Neighbourhood name
Road centrelines	Lines	Road name, Neighbourhood name
Road text	Text	Road name
Districts	Continuous regions	District name
Neighbourhoods	Continuous regions	Neighbourhood name, District name
Police stations	Point	Police station name
Police station zones	Continuous regions	Police station name, District name
Bus lines	Lines	Bus numbers
Schools	Points	School name
Hospitals/Health centres	Points	Hospital/Health Centre name
Mosques	Points	Mosque name
Land use	Continuous and discontinuous regions	Land use type

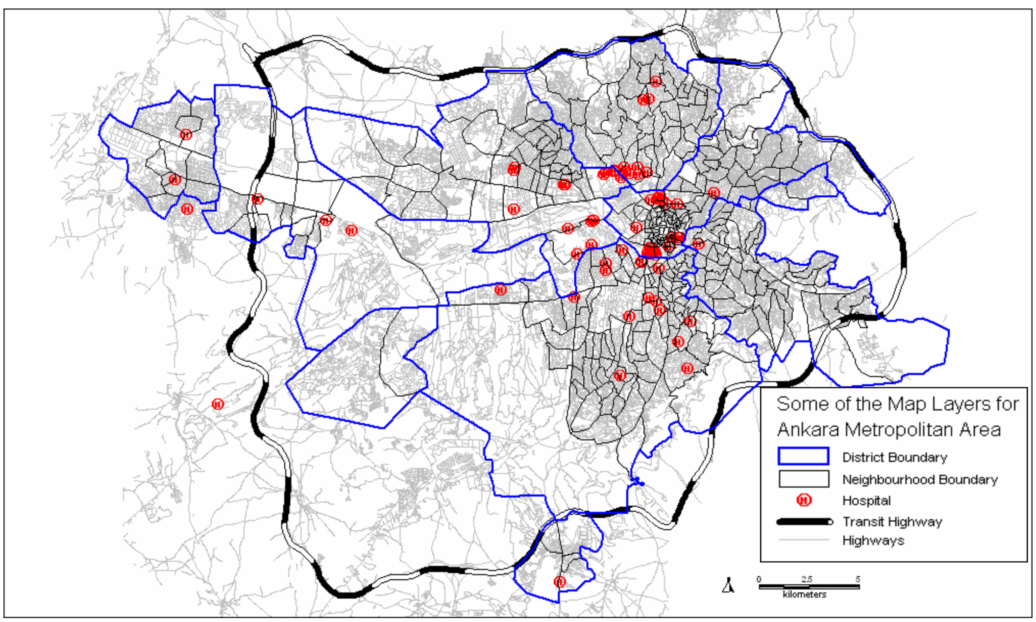


Figure 4.7 Several GIS layers mapped for Ankara Metropolitan Area

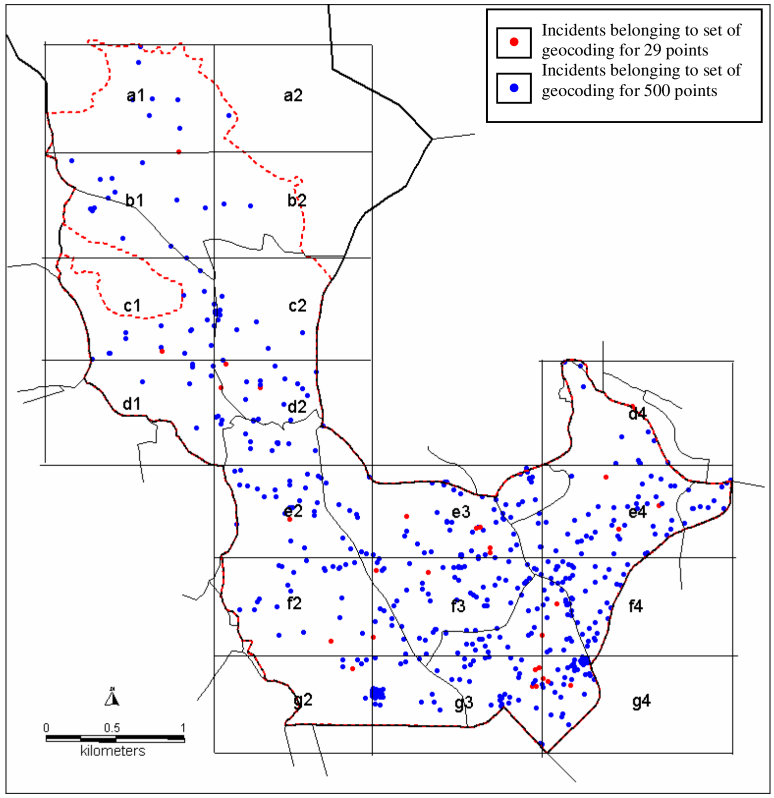


Figure 4.8 Geocoded 529 incidents

incidents. However, 29 incidents were carried to about the midway of the streets/roads/linear parks due the lack of more detailed address information in the “Event Notebook”s and “Event Report”s;

6. The final geocoding results after revision of the field study is such that out of 529 incident points, 500 (blue points) are placed to their almost exact places within less than hundred meters range correctness, and 29 (red points) are placed to their street/road/linear park addresses, mid points of which were assumed to be the incident places (less than 100 m accuracy geocoding ratio: 94,52%, refined mid point geocoding ratio: 5,48%).The final geocoding results for 529 incidents are in Figure 4.8.

Before, after, and during the three-months field study period (September-November 2004) spent in Etlik Police Station Zone, six GIS layers were created. These layers are listed below.

Grid map line-text layer was prepared before the field study to support a systematic walking during the field study (Figure 4.8).

Etlik Police Station Zone region layer was obtained after the revision of the GIS layer "Police Station Zone" explained in Chapter 3 (see Figure 3.1).

Photos point layer was produced by placing the 113 different points from where either single or panoramic pictures were taken. Then, for each of these points a link was established for the photos they are related (Figure 4.9).

Photo areas region layer was produced to cover the areas where the photos are taken for (Figure 4.9).

Parks region layer was produced to obtain the park or sports recreational areas that were encountered and delineated on the field maps in each grid during the field study.

Situation: This region layer was obtained by means of combining field study observation notes, photographs taken throughout the grids of the study area and by making use of the

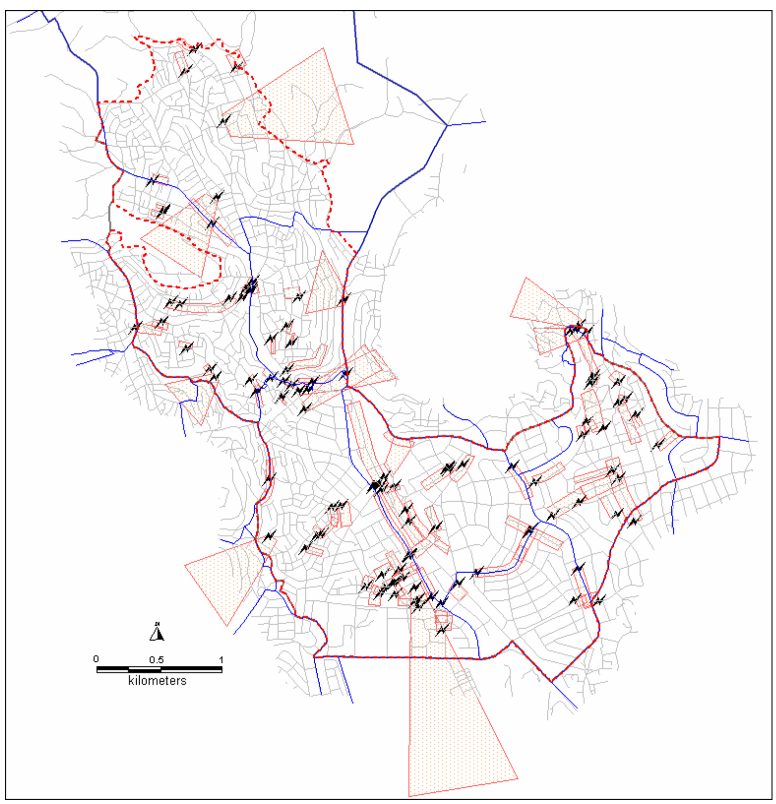


Figure 4.9 Points and areas of the pictures taken during the field study

boundaries of the different patterns seen in the Buildings and Roads map layers. Afterwards, six fields of attributes, which are described in Table 4.7 (Situation in 2000, Situation in 2004, Development Pattern in 2000, Transition Pace in 2004, Start of Development, Start of Transition), were added to this map layer to enter their related characteristics for today's and inferred past situation based on field observations, interviews with police officers, households, and with planners working in Keçiören Municipality. For mapping of these attributes see Figures 3.2-3.3, 3.5-3.6, 3.8-3.9.

Table 4.7 Attributes of the Situation map and their explanations

Fields	Explanation
Situation in 2000	Physical situation of the settlements in 2000
Situation in 2004	Physical situation of the settlements in 2004
Development Pattern in 2000	Development pattern of the settlements in 2000
Transition Pace in 2004	Physical characteristics defining the settlement's transition pace in 2004 (how fast it is being developed from squatter settlements into planned settlements)
Start of Development	Period that defines when the first development is seen
Start of Transition	Period that defines when the first transition process is seen

Study Area region layer (e.g., Figure 3.1, Figures 4.8-4.9) was produced from the *Situation* map layer by combining its areas with any urban development by excluding the areas, which correspond to Police Intelligence Department's vacant land, and agricultural fields.

Updated Roads/Streets line layer (Figure 4.10) was obtained by correcting and update of the Road centrelines of Ankara Metropolitan Area GIS Data for the Study Area. In order to obtain this map, which is populated with attributes of number of incidents, variables of Data for Census Geography at the first step, the following processes are performed:

1. A corrected and updated roads/streets centerline map layer is produced. In its final form this map contained totally 707 different objects of roads/streets and their segments for the ones crossing through two or more neighbourhoods. 585 of them were given updated and correct names according to data controlled with other map layers and data obtained during the field surveys;
2. Since the incidents are distributed with respect to boundaries of neighbourhoods and not exactly onto the centerline of updated roads/streets, a buffer zone of 25 m around each incident was drawn;
3. One attribute field of the incident buffers layer is populated with the names of the updated roads/streets according to the address information associated with each incident; and

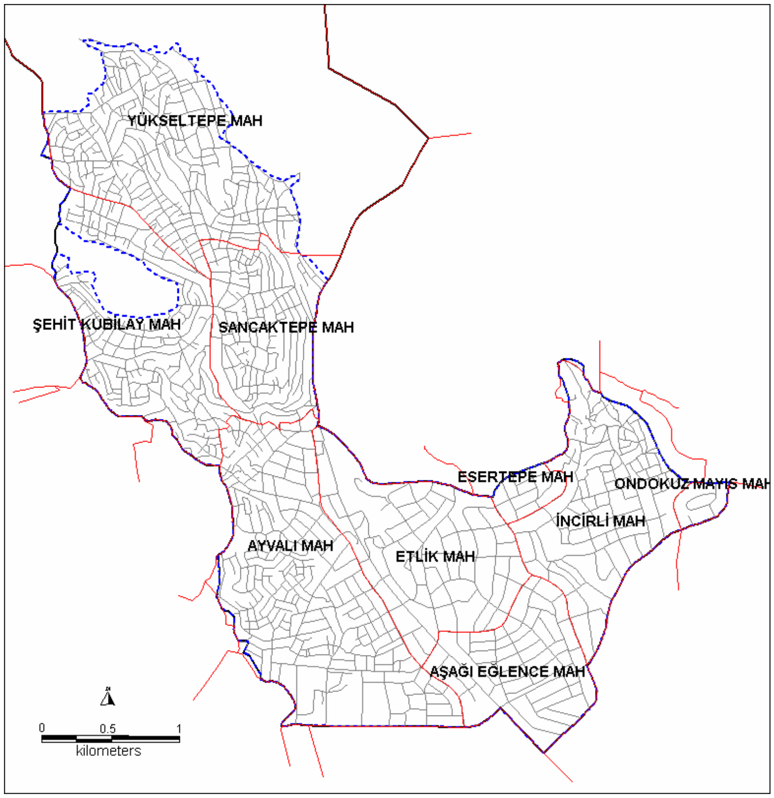


Figure 4.10 Updated Roads/Streets centreline map of the Study Area

4. The buffer map layer and updated roads/streets centerline map layer were intersected and the incorrect intersections giving unequal results (due to relative nearness of the buffers to the roads/streets other than the ones they really occurred) for updated road/street address information of buffer map layer and updated roads/street centerline map layer were controlled. Out of 529 incidents 28 incidents have intersected with a road/street other than the one it has an address information, 121 incidents did not intersect with any road/street because they occurred in further distances than 25m while 408 has intersected with at least one road/street.

A redistribution of attributes onto final updated roads/streets map layer is performed for the number of incidents, which were previously distributed with respect to neighbourhoods, and other attributes coming from the Data for Census Geography. This final map includes streets or street segments passing through or located on the boundaries of two or more different neighbourhoods, or boundaries of the study area. The attribute redistribution involved the processes of:

- Renaming of the neighbourhood with respect to road/street name, which crosses through two or more neighbourhoods, when necessary,
- Combining/ dividing/ assignment of the road/street, which crosses through two or more neighbourhoods, and the respective combining/ dividing/ assignment of the number of incidents and Data for Census Geography values for either side of the road/street, which forms the boundaries of two or more different neighbourhoods, or the boundaries of the study area,
- A controlling was made to ensure the total number of incidents is again 529.

The GIS data of updated roads/streets centerline map layer and the Access Database of Data for Census Geography are compared for combining variables they include. As a result of such querying the Access Database table turned to have information for 565 roads/streets as compared to 585 roads/streets obtained in the GIS Database.

When controlled, these 20 roads/streets turned to have no occurrence of incidents. These roads/streets only compose the 3 % of the whole data set (585), and dropped from further analysis concerning to Data for Census Geography.

After all these corrections and filling in the related fields of updated roads/streets centerline map table with some additional GIS and Access Database functions such as road/street segment length, total number of land use units falling into different categories, the resultant attribute table mainly contained the variables given in Table 4.8, for analysis.

Table 4.8 Attributes of Updated Roads/Streets centreline map layer and their explanations

Fields / Variable name	Explanation
Mah	Neighbourhood name
cad_sok	Road/street name
Olay	Number of incidents
* (16 variables)	Number of different landuse units for 16 different categories
* (6 variables)	Number of different landuse units for 6 different categories formed through the combination of 16 categories
* (6 variables)	Percentages of the different landuse units for 6 categories
** gelismislik	Development level
uzunluk	Length of a road/street or its segment
top_birim	Total number of land use units
olaypermt	Number of incidents per meter
Birimpermt	Total number of land use units per meter

** For these variables see Table 4.5.*
*** See Section 4.2.1.2.*

[1] With its best known definition, GIS is a computerized database system for capturing/preparation, storage, retrieval, analysis and display of geographically referenced spatial data (Aronoff, 1991:1).

[2] The number of these registered incidents is 1139; however 8 of these did not occur during this period.

[3] The name of this column should not be confused with the general use of the term ‘Incident Type’ throughout the study except for this chapter, which in fact corresponds to information entered in the ‘Against What’ field.

[4] The name of this column should not be confused with the general use of the term ‘Commitment Type’ throughout the study except for this chapter, which in fact corresponds to information entered in the ‘(1st) Incident Type’ field.

[5] Ankara Water and Sewage Works

[6] Name of this Institute turned into “Turkish Statistical Institute” with law numbered 5429, which is in effect since November 18, 2005 (Official Gazete numbered 25 997).

CHAPTER 5

ANALYSES AND FINDINGS

This chapter aims to analyze and discuss the findings concerning the distribution of incidents in *space* and/or *time*. Subsequently, these findings are used to develop the urban planning and policing (*kent planlama ve polisliği*) strategies for crime prevention and reduction, as elaborated in the next chapter.

As stated previously, this study is based on a search for *spatial* and/or *temporal* differentiations of incidents in the study area characterized by different development patterns, i.e., *planned, early stage gecekondu* (*squatter*), and *in-transition.* These patterns provide differentiating *environmental opportunities* for criminal acts. In line with the *new crime ecological theories*, it is expected that the incidents are not distributed randomly in *space* and *time*, but they are clustered in the areas and times where more *opportunities* exist and that the *planned* areas have more of these *opportunities.*

Two main sections are presented below: First, *spatial;* and second, *temporal* and *spatio-temporal* analysis of incidents are performed from both *general* and *localized* perspectives. These two main sections are further divided into two subsections: the three incident types together; and the incidents differentiated with respect to their types and their commitment types.

5.1 Spatial Analysis of Incidents

In the above stated two subsections, firstly the *spatial* distribution of incidents is explored in a general or *global* perspective. This scale of analysis is based on the expectation of differences in the spatial distribution of incidents in the study area distinguished by *planned, squatter,* and *in-transition* development patterns. *Spatial* distribution of incidents is explored in terms of both *quantity* and *nature of pattern* (i.e., whether it is *random, clustered*, or *regular (dispersed)*). Secondly, the problem is analyzed from a localized or *local* perspective. This scale of analysis is based on the expectation of incidents to display different *local* scale patterns or *spatial* *interaction* (that is, whether the incidents are *clustered* (attract each other), or *dispersed* (repel each other at the *local* scale). Thirdly, the relationship of incident distribution and clustering with the urban spatial structure are discussed.

5.1.1 The Three Incident Types Together

At this first stage of the analysis, the incidents are not differentiated with respect to their types and their commitment types, but are taken into consideration as a whole.

5.1.1.1 Spatial Distribution of Incidents: General ("Global Scale") Distribution

In the study area, the *planned* areas show heterogeneous and mixed land use features. These features become more dominant in their sections having near-to-CBD functionalities, and less dominant in their residential functions. These sections in the *planned* settlements have more near-to-CBD functions and less residential functions as compared to their correspondents in *in-transition* settlements, and as compared to their correspondents in *squatter* settlements (i.e., *squatter* settlements have much less of near-to-CBD functions and much more residential functions).

Descriptive Analyses. In the following, it is aimed to find out whether the *planned* areas generate higher amount of spatial *opportunities* for occurrence of criminal incidents, as compared to other development patterns; specifically, as compared to less, and least amount of those *opportunities* generated by the *in-transition* and *squatter* settlements, respectively.

Findings for comparing the incident occurrences (for N=529 incidents[1] (Appendix E)) in the neighbourhoods with respect to their differentiating development patterns revealed that, on the average, the incidents occur more frequently[2] and with higher rates in the southern neighbourhoods (84 % of incidents), where most of the (3/4) development is *planned* and partially (1/4) *in-transition.* The respective sub-means for frequencies and rates (incidents per 10000 population) are found to be 105 (z score=0,34) and 32,96 (z score=0,36). On the other hand, it is found that, on the average, incidents occur less frequently and with lower rates in the northern neighbourhoods (16 % of incidents), where most of the (3/4) development is *squatter* and partially (1/4) *in-transition.* The respective sub-means for frequencies and rates (incidents per 10000 population) are found to be 28 (z score= -0,68) and 24,22 (z score= -0,71). Accordingly, in terms of z scores, while one of the northern neighbourhoods (mostly *squatter*) has an extremely low incident rate when compared with the standard mean of “0” (z score of *Yükseltepe*=-2,13 where 98,52% is *squatter*), one neighbourhood in the south (mostly *planned*) has an extremely high incident rate (z score of *Aşağı Eğlence*=1,31 where 100% is *planned*) (Table 5.1 and Figure 5.1[3]).

Statistical Tests for Differences Between the Three Development Patterns. In controlling these findings, two tests were carried out: One-way ANOVA for rates; Pairwise Multiple Comparison tests for assessing which development pattern really differ from the other in terms of incident rates[4].

In accordance with the expectation that the incidents are not distributed equally among the three development patterns in terms of rates, significant differences with respect to development

Table 5.1 Comparison of different descriptive measures of incidents in the neighbourhoods (1)

Development pattern	**Neighbourhoods**	**Squatter area (%)**	**Planned area (%)**	**In-transition area (%)**	**Frequency of Incidents**	**Rate of Incidents (Incidents per 10000 population)**	**Z Scores of Freq.**	**Z Scores of Rates**
Mostly *squatter* (~3/4) and partially *in transition* (~1/4)	Yükselte	98,52	0,00	1,48	18	14,73	-0,91	-2,13
	Şehit	64,69	0,00	35,31	37	26,72	-0,48	-0,48
	Sancakte	63,31	0,00	36,69	29	33,67	-0,66	0,47
Sub Mean (Percentage)		**75,51**	**0,00**	**24,49**	**28 (16 %)**	**24,22**	**-0,68**	**-0,71**
Mostly *planned* (~3/4) and partially *in transition* (~1/4)	Ayvalı	0,00	70,81	29,19	102	31,67	0,96	0,20
	Etlik	0,00	80,29	19,71	97	26,19	0,85	-0,55
	Aşağı	0,00	100,00	0,00	120	39,73	1,36	1,31
	İncirli	0,00	49,76	50,24	101	36,59	0,94	0,88
	Esertepe	0,00	62,03	37,97	14	33,33	-1,00	0,43
	19 Mayıs	0,00	100,00	0,00	11	29,33	-1,06	-0,12
Sub Mean (Percentage)		**0,00**	**77,15**	**22,85**	**105* (84 %)**	**32,96**	**0,34**	**0,36**
Total					529 ** (100 %)			
Mean					58,78 72*	30,22		
Standard dev.					44,96	7,28		
Standard error					14,99	2,43		
95%Confidence Int. based on *t* dist.					24,22 - 93,34	24,62 - 35,81		

(1) A summary of social, physical structures, and different descriptive measures of incidents, see Appendix F.
(*) Mean excludes the two extreme neighbourhoods of Esertepe and 19 Mayıs because of their relatively much smaller areal proportions in R. The weighted mean (weighted by size of areas) also gave a result (70,72) that is similar to this trimmed mean.
(**) See Endnote 1.

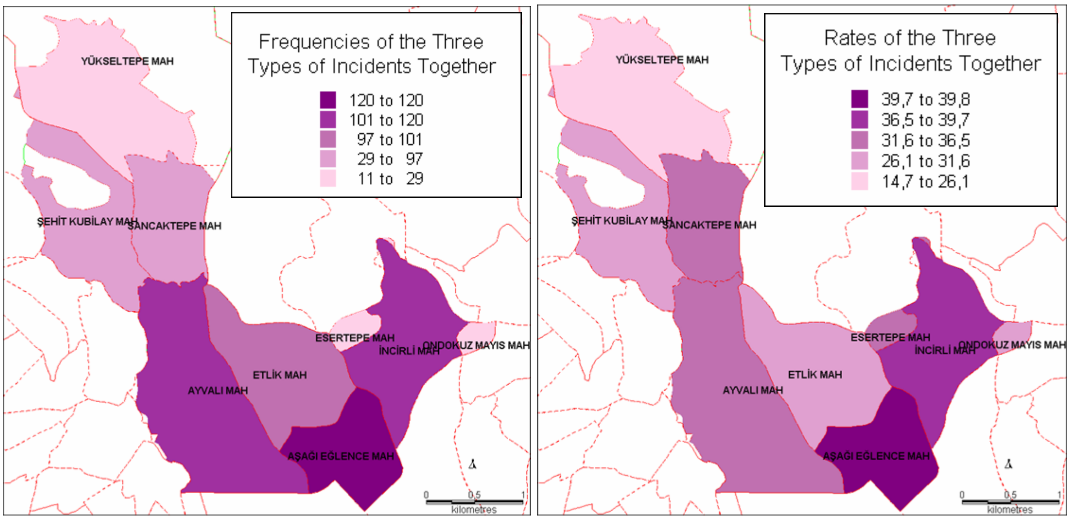


Figure 5.1 Neighbourhoods with respect to counts and rates of the three types of incidents together
Note: The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

patterns is found in one-way ANOVA[5]. The rates in this analysis are computed for 560 road/streets in the study area. They represent the number of incidents (total of 529) per 1000 population in each road/street (total of 560) (see Endnote 1). For both F-test (p=0,002), and Welch (p=0,018) and Brown-Forsythe (p=0,001) tests, differences in mean rates were statistically significant (Table 5.2).

In order to find from where the real difference(s) among the development patterns come(s) from, four Pairwise Multiple Comparison tests[6] (Tamhane, Dunnett T3, Games-Howell, Dunnett C) were performed. It is found that the difference among the mean incident rates results from the significant difference between *squatter* and *planned* settlements ($p \leq 0,05$), and between *in-transition* and *planned* settlements ($p \leq 0,05$). However, the difference in mean rates between the *squatter* and *in-transition* settlements were not significant ($p > 0,05$, respectively) (Table 5.3).

Statistical Tests for Point Distribution and Its Differences Between the Three Development Patterns. In the next stage, a detailed assessment on the spatial pattern or density of the incident distribution is made. That is, it is aimed to find whether the incidents are evenly (randomly) distributed in space. As expected, the results of the analyses suggested clustered distribution, where incidents display more number of clusters and higher density in mostly *planned* areas.

Table 5.2 Results of one way ANOVA for the rates of incidents in the three different development patterns (1)

Related Statistics			ANOVA						Robust Tests of Equality of Means (2)				
	N	**Mean**											
Squatter	213	2,29		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Statistic (3)**		**df 1**	**df 2**	**Sig.**
Planned	193	9,82	Between Groups	6638,718	2	3319,359	6,482	0,002	Welch	4,053	2	344,085	0,018
In transition	154	3,03	Within Groups	285230,969	557	512,084			Brown-Forsythe	6,767	2	294,010	0,001
Total	**560 (1)**	**5,09**	**Total**	**291869,686**	**559**								

(1) Incidents belonging to set of geocoding for 529 points, which are assigned onto N=560 road/streets in R. See Endnote 1.
(2) These tests are performed and are preferred to F test due to significant Levene test (p<0,0005) that implied inequality of variances.
(3) Asymptotically F distributed.

Table 5.3 Results of the Pairwise Multiple Comparison tests in the one way ANOVA for the incident rates

Test	Development pattern		Mean Difference	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Tamhane	squatter	planned	-7,53	2,64	0,014	-13,88	-1,17
(Conservative		in-transition	-0,73	1,29	0,920	-3,82	2,35
pairwise comparisons	planned	squatter	7,53	2,64	0,014	1,17	13,88
test based on a t test)		in-transition	6,79	2,64	0,032	0,44	13,15
	in-transition	squatter	0,73	1,29	0,920	-2,35	3,82
		planned	-6,79	2,64	0,032	-13,15	-0,44
Dunnett T3	squatter	planned	-7,53	2,64	0,014	-13,88	-1,17
(Pairwise comparison		in-transition	-0,73	1,29	0,920	-3,82	2,35
test based on the	planned	squatter	7,53	2,64	0,014	1,17	13,88
Studentized maximum		in-transition	6,79	2,64	0,032	0,44	13,15
modulus)	in-transition	squatter	0,73	1,29	0,920	-2,35	3,82
		planned	-6,79	2,64	0,032	-13,15	-0,44
Games-Howell	squatter	planned	-7,53	2,64	0,013	-13,76	-1,29
(Pairwise comparison		in-transition	-0,73	1,29	0,836	-3,76	2,30
test that is sometimes	planned	squatter	7,53	2,64	0,013	1,29	13,76
liberal)		in-transition	6,79	2,64	0,029	0,56	13,02
	in-transition	squatter	0,73	1,29	0,836	-2,30	3,76
		planned	-6,79	2,64	0,029	-13,02	-0,56
Dunnett C	squatter	planned	-7,53	2,64	(*)	-13,77	-1,28
(Pairwise comparison		in-transition	-0,73	1,29		-3,78	2,31
test based on the	planned	squatter	7,53	2,64	(*)	1,28	13,77
Studentized range)		in-transition	6,79	2,64	(*)	0,55	13,04
	in-transition	squatter	0,73	1,29		-2,31	3,78
		planned	-6,79	2,64	(*)	-13,04	-0,55

(*) The mean difference is significant at the 0,05 level.
Source: Explanations for the tests were quoted from SPSS, 2005.

In line with this, three analyses were carried out: Quadrat Method tested by Chi-square for finding whether the incident point pattern displays clustering; Kernel Estimation and One-way ANOVA on its results for finding whether the incident densities are different in the three development patterns; Pairwise Multiple Comparison tests to assess which development pattern really differs from the other in terms of incident densities.

In *Quadrat Method*, different indexes are estimated by different size quadrats (see Appendix E). According to the Chi-square test, incident points are found to display significant clustering in *space* at 4,80871E-89, 2,25399E-91, 3,5321E-99, 4,3619E-107 significance levels for 100, 200, 300, and 400 meters quadrats, respectively (Table 5.4).

Table 5.4 Testing of quadrats for CSR (1)

Quadrat size	**ID**	**ICS**	**Number of quadrats (N)**	**Degrees of freedom**	**Test Value of Chi-square (2)**	**Significance level**
100 m	2,11	1,11	1101	1100	2318,56	4,80871E-89
200 m	3,59	2,59	312	311	1117,41	2,25399E-91
300 m	5,88	4,88	144	143	840,35	3,5321E-99
400 m	8,54	7,54	90	89	760,00	4,3619E-107

(1) The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.
*(2) Test value of Chi-square=df * VMR for each set of N*

As hypothesized, results obtained by the *Quadrat Method* (Figure 5.2)[7] and the *Kernel Estimation* (Figure 5.3 and Figure 5.4)[8] (see Appendix E) displayed more number of clusters and higher densities in the southern neighbourhoods, where all the *planned* development took place (3/4 *planned* and 1/4 *in-transition*); as opposed to less number of clusters and relatively regular and lower densities in the northern neighbourhoords, where all the *squatter* development took place (3/4 *squatter* and 1/4 *in-transition*).

One-way ANOVA[9] suggested statistically significant differences (p<0,0005) in the mean densities (Table 5.5) among all three development patterns (p≤0,05 for the Pairwise Multiple Comparison tests[10]) (Table 5.6).

These findings are contrary to the results of Pairwise Multiple Comparison tests performed earlier for incident rates, which revealed no statistically significant difference between *squatter* and *in-transition* development patterns (Table 5.3).

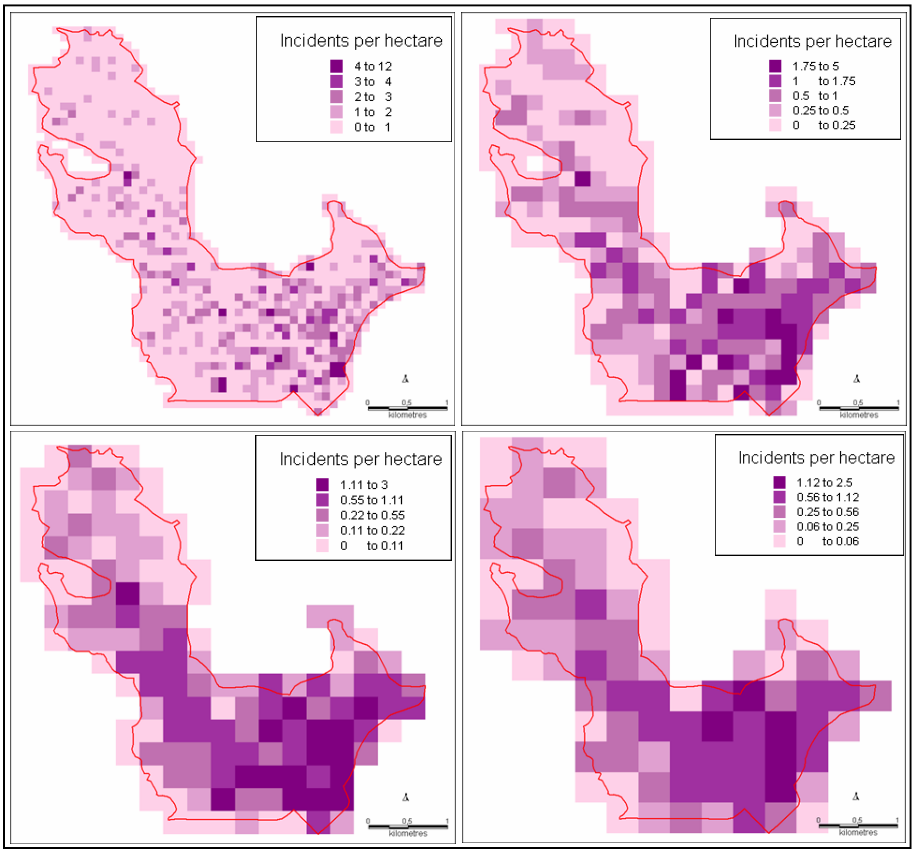


Figure 5.2 Results of the Quadrat Method with units of incidents per hectare

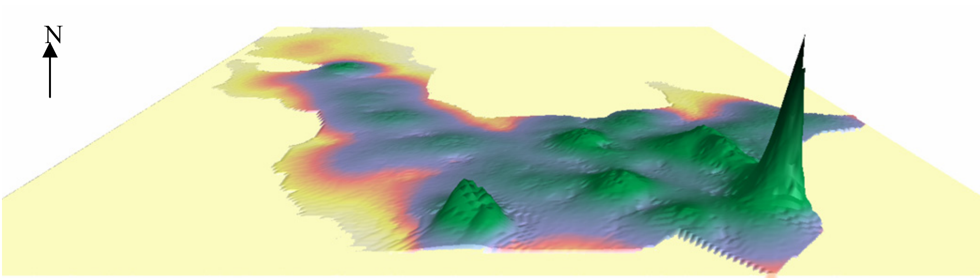


Figure 5.3 3D coloured view of the chosen *Kernel Estimate* from south of the *R* with a surface exaggeration of 3

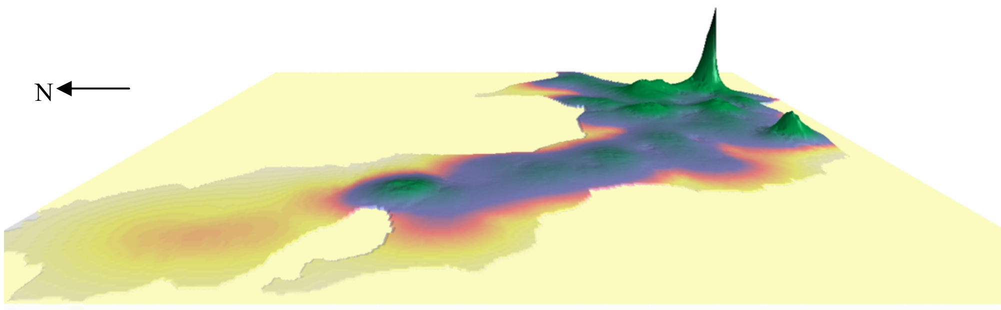


Figure 5.4 3D coloured view of the chosen *Kernel Estimate* from west of the *R* with a surface exaggeration of 3

Table 5.5 Results of one-way ANOVA for Kernel Estimation of incidents in the three different development patterns (1)

Related Statistics			ANOVA						Robust Tests of Equality of Means (2)				
	N	**Mean**											
Squatter	7447	0,14		**Sum of Squares**	**df**	**Mean Sq.**	**F**	**Sig.**	**Statistic (3)**		**df 1**	**Df 2**	**Sig.**
Planned	10474	0,74	Between Groups	1692,87	2	846,43	4079,23	*p*<0,0005	Welch	5986,48	2	12574,48	*p*<0,0005
In transition	5813	0,35	Within Groups	4924,15	23731	0,21			Brown-Forsythe	5840,21	2	14445,50	*p*<0,0005
Total	**23734**	**0,46**	**Total**	**6617,01**	**23733**								

(1) Incidents belonging to set of geocoding for 500 points. See Endnote 1.
(2) These tests are performed and are preferred to F test due to significant Levene test (p<0,0005) that implied inequality of variances.
(3) Asymptotically F distributed.

Table 5.6 Results of the Pairwise Multiple Comparison tests in one way ANOVA for *Kernel Estimation* of incidents

Test	**Development pattern**		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval Lower Bound**	**Upper Bound**
Tamhane	squatter	Planned	-0,61	0,006	<0,0005	-0,62	-0,59
(Conservative		in-transition	-0,22	0,003	<0,0005	-0,23	-0,21
pairwise comparisons	planned	Squatter	0,61	0,006	<0,0005	0,59	0,62
test based on a t test)		in-transition	0,39	0,007	<0,0005	0,37	0,41
	in-transition	squatter	0,22	0,003	<0,0005	0,21	0,23
		planned	-0,39	0,007	<0,0005	-0,41	-0,37
Dunnett T3	squatter	planned	-0,61	0,006	<0,0005	-0,62	-0,59
(Pairwise comparison		in-transition	-0,22	0,003	0,001	-0,23	-0,21
test based on the	planned	squatter	0,61	0,006	<0,0005	0,59	0,62
Studentized maximum		in-transition	0,39	0,007	<0,0005	0,37	0,41
modulus)	in-transition	squatter	0,22	0,003	0,001	0,21	0,23
		planned	-0,39	0,007	<0,0005	-0,41	-0,37
Games-Howell	squatter	planned	-0,61	0,006	<0,0005	-0,62	-0,59
(Pairwise comparison		in-transition	-0,22	0,003	<0,0005	-0,23	-0,21
test that is sometimes	planned	squatter	0,61	0,006	<0,0005	0,59	0,62
liberal)		in-transition	0,39	0,007	<0,0005	0,37	0,41
	in-transition	squatter	0,22	0,003	<0,0005	0,21	0,23
		planned	-0,39	0,007	<0,0005	-0,41	-0,37
Dunnett C	squatter	planned	-0,61	0,006	(*)	-0,62	-0,59
(Pairwise comparison		in-transition	-0,22	0,003	(*)	-0,23	-0,21
test based on the	planned	squatter	0,61	0,006	(*)	0,59	0,62
Studentized range)		in-transition	0,39	0,007	(*)	0,37	0,41
	in-transition	squatter	0,22	0,003	(*)	0,21	0,23
		planned	-0,39	0,007	(*)	-0,41	-0,37

(*) The mean difference is significant at the 0,05 level.
Source: Explanations for the tests were quoted from SPSS, 2005.

5.1.1.2 Spatial Interaction of Incidents: Localized ("Local Scale") Distribution

In the previous section, *general* spatial distribution of incidents were explored. The structure of the study area in general was found to be effective in the *global* distribution of incidents in *space*. In this section, on the other hand, *local* spatial properties or *spatial interaction* of incidents in terms of clustering or dispersion is searched.

In other words, it is anticipated that the *local* effects are also observable under conditions of high level of *global* effects (where density for incidents distribution across the study area varies greatly due to overall heterogeneity (Gatrell et al, 1996:264)) characterized by different development patterns. That is, whether incidents *interact* in urban *space* or if there are any *spatial dependence* (Gatrell et al, 1996:259) among them. Furthermore, in case of such interactions, the distances at which incidents cluster with (attract) each other, or disperse from (repel) each other is estimated.

The findings indicate significant (p=0,0001) locally clustered distribution of incidents. For this purpose, *Nearest Neighbour Index* method tested by z (Clark-Evans) statistic is utilized (see Appendix E). Furthermore, it is found that such *local* interaction in terms of clustering or spatial dependence (Gatrell et al, 1996:259) among the incidents (for N=500, see Endnote 1) revealed increasing interaction up to 360 m with a prior critical distance at 115 m. *K Function* (*Ripley's K*) which is assessed by Monte Carlo Simulation is utilized (Figure 5.5) in this exploration.

5.1.1.3 Relationship of Incident Distribution and Clustering with the Urban Structure

In this section, the aim is to explore the ways in which the urban spatial and social structure could be effective in the incident distribution and clustering.

First, the high level of concentration is elaborated with reference to spatial characteristics of the incident clusters, i.e., hotspots. In line with the previous findings, visualization and mapping of incidents[11] suggested that 5 out of 6 clusters (Clusters "2" to "6") that are identified in the study area remain in the *planned* sections of the southern (mostly *planned*) neighbourhoods. On the contrary, only one (Cluster "1") remains in the *in-transition* area located in the northern

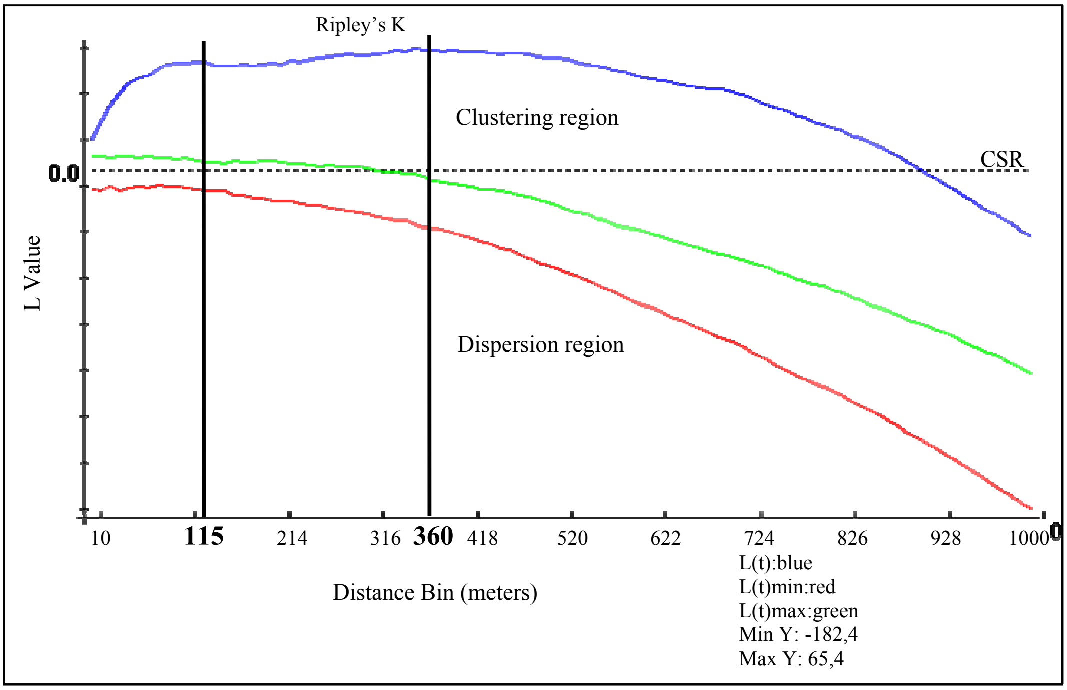


Figure 5.5 Plot of L value versus distance bin with no edge correction
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1. Moreover, the analysis is carried out with 1000 simulations.

neighbourhoods (mostly *squatter*). Therefore, it is worthwhile to emphasize that none of the clusters are found in the *squatter* settlements (Figure 5.6).

The high level of concentration and the characteristics of the clustering areas in the *planned* settlements, which are stated below, verify the *new ecological theories.* In line with these theories, (*Routine Activities, Rational Choice, Crime Pattern*) incidents display a clustered distribution. Contrary to the *squatter* areas, *planned* developments, then *in-transition* areas provide more *opportunities* for incident occurrences. These *opportunities* in the sub-regions of the neighbourhoods are effective in clustering of higher number of incidents in smaller areas, i.e., in creating hotspots, have both similar and/or dissimilar environmental features for incident concentration. However, when a general statement is to be made about the structure of hotspots, it is seen that they contain one or more of the following characteristics as suggested by the *new ecology* studies.

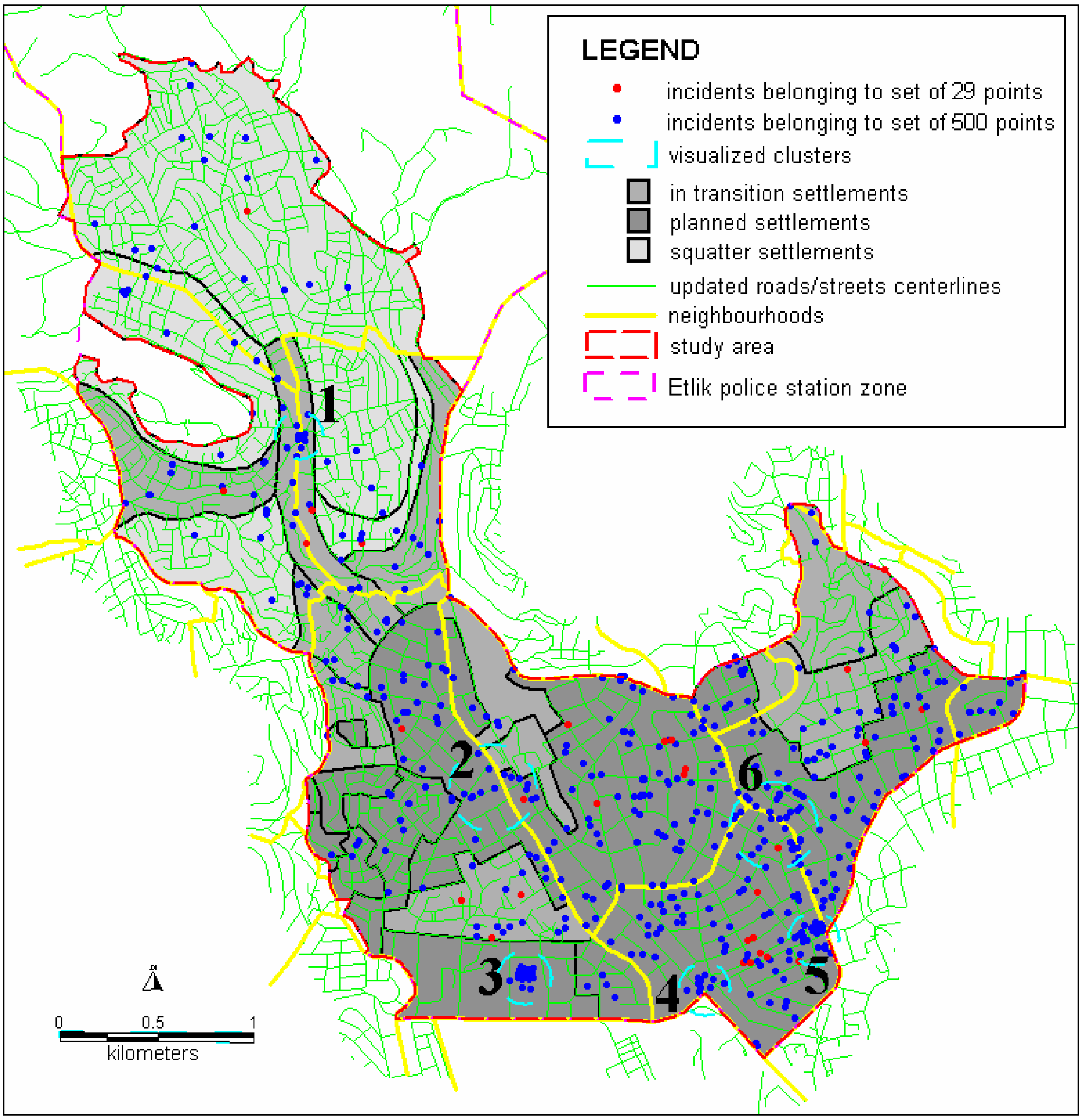


Figure 5.6 Visualization of the incidents with respect to development patterns of the neighbourhoods

- High accessibility;
- Point/on route of public transportation;
- Mostly mixed land use, occasionally commercial/service;
- Relatively crowded, displaying a level of CBD properties; and
- Mostly having open areas such as parks within or beside.

A detailed investigation on the urban structure for the six clusters reveal some common as well as differentiating properties concerning the development pattern, high accessibility, land use, CBD functionalities, and crowdedness and vividness (Table 5.7, Figure 5.7 and Figure 5.8). As stated, these *environmental* properties are mostly relevant to the *planned* and to a certain degree to the *in-transition* areas, and not to the *squatter* developments, where no incident cluster is found.

Table 5.7 Detailed spatial properties of the urban areas of the six incident hotspots

Clusters (Hotspots)	**Development**			**High accessibility**				**Land use**					**CBD functionality**		**Crowdedness and vividness**
	In transition	Planned	Squatter	End-beginning point of public transport route	On a public transport route	On or nearby a main junction	On one or more main road(s)	Mixed (residential dominate)	Regional scale wholesale	Park	Separate and large auto park	Education facility in or nearby	Retail commerce and service	Cultural	
1	X		NONE	X		X		X					X		
2		X			X		X	X		X		X		X	
3		X			X		X		X		X	X			
4		X			X	X		X		X					X
5		X			X	X		X		X	X		X		X
6		X			X	X		X				X	X		X

On one hand, the *planned* section, with more heterogeneous and mixed land uses and higher densities of population and places for different *Routine Activities* of targets, increase the likelihood of occurrence for the three conditions (Cohen and Felson, 1979:589) for incidents (motivated offender, suitable target, and lacking crime suppressor) in these places. The low level of neighbourhood relations, high concentration of people with mixed origins and low sense of community also contributes to this likelihood. Therefore, according to this theory, *planned* settlements are vulnerable for incident occurrences, mainly in *routine activity spaces* and *times*

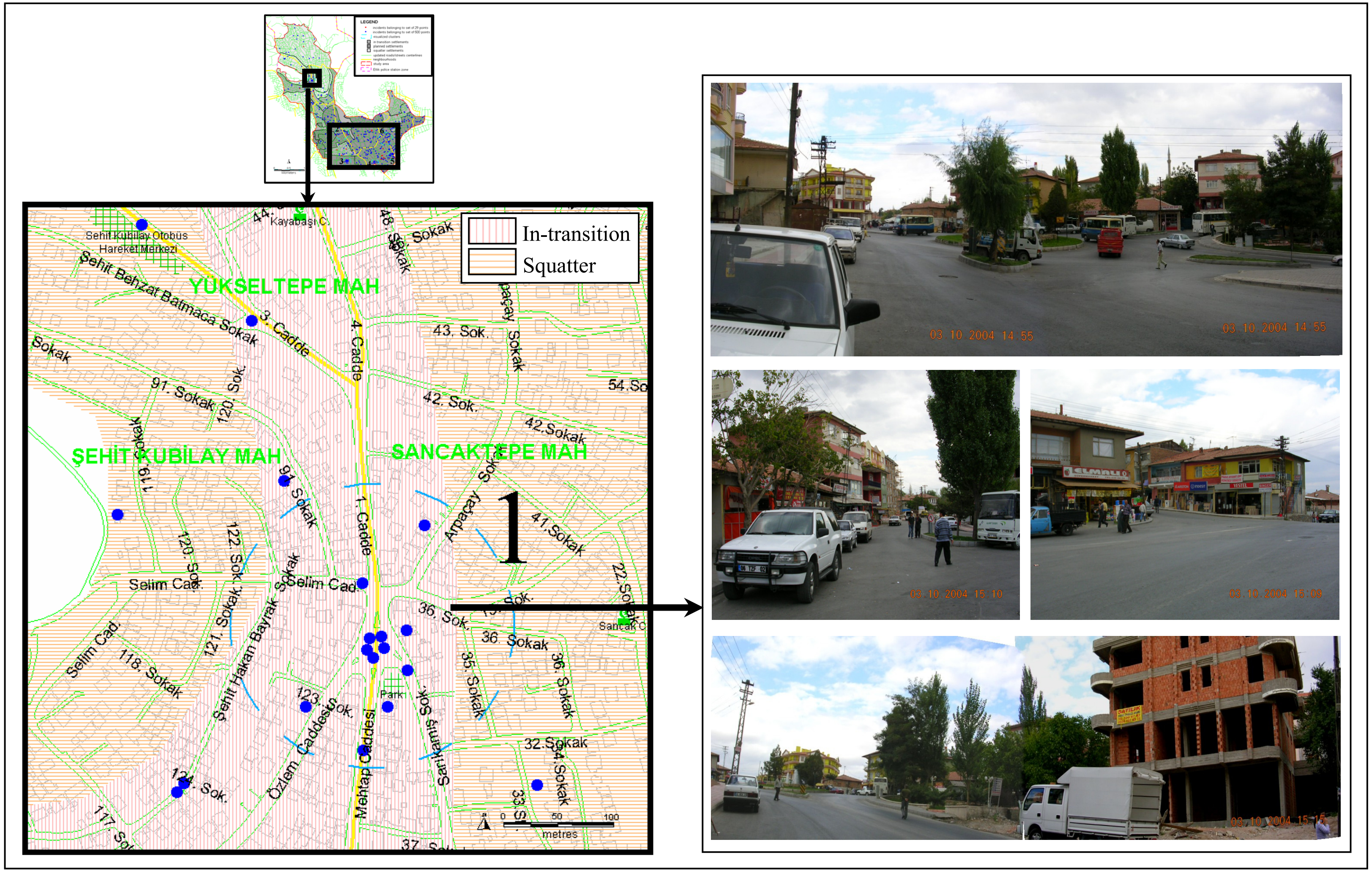


Figure 5.7 Incident hotspot area observed in the northern neighbourhoods (Hotspot “1”)

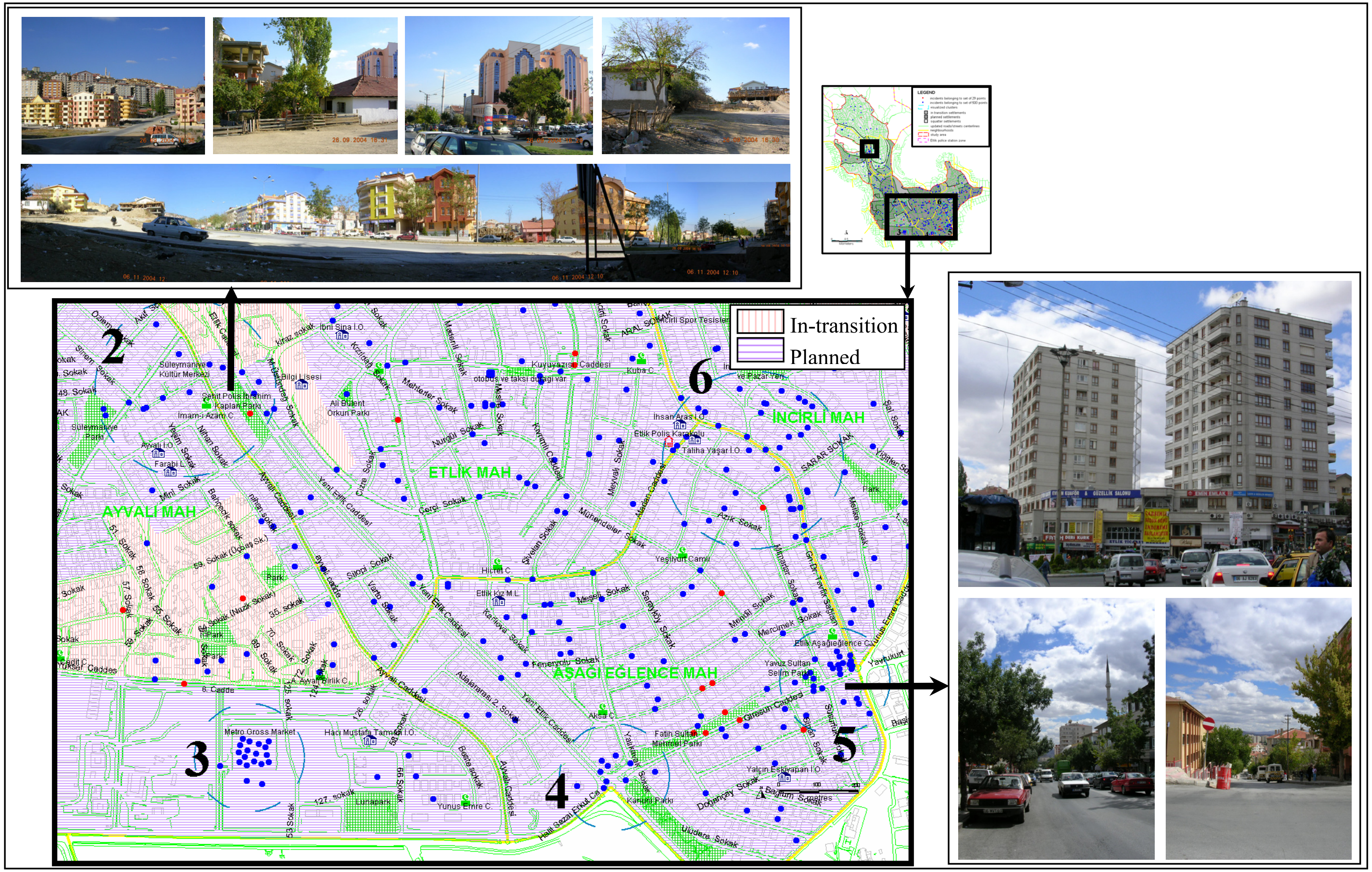


Figure 5.8 Incident hotspot areas observed in the southern neighbourhoods (Hotspots “2” to “6”)

such as residences, diverse commercial and service workplaces, and places for different kinds of transportation facilities.

On the other hand, the *planned* settlements have more suitable *environmental* conditions for a rational offender. In other words, as suggested by the *Rational Choice Theory*, when an offender would commit an incident (s)he thinks that the *opportunities* offered by the *planned* settlements have more benefits (more rewards) and less costs and risks as compared to other types of settlements. For example, the *planned* neighbourhoods attract the offenders to commit incidents with their more number of *opportunistic* targets of commercial and business workplaces, and of residential and market areas where more affluent people live/use, and more number of automobiles. Furthermore, *planned* settlements offer more supportive *environmental* conditions for offenders' easy escape from the incident scene with their highly accessible, predictable roads, crowded places/streets, and indifference to strangers.

In addition to physical (spatial) means or *opportunities* offered by the *planned* settlements, their social contexts also make them more vulnerable for occurrence of incidents. For instance, heterogeneous social composition, the high level of existence of people who are foreigners for each other at one place at a time increases the likelihood of occurrence of an incidence. As an example, an incident against people or against people and property can take place due to some minor traffic or car parking quarrel among two drivers, even though they did not have a planned intention to commit an incident. Such an incident can occur just by the spatial and social *opportunities* that make possible an instantaneous coincidence of two angry people who are foreign to each other at some traffic junction or in a car park experiencing a small dispute among themselves[12].

In complementing these elaborations from also urban policing (*kent polisliği*) perspective, the locational characteristics of incidents are further measured in terms of both centrality-dispersion, and of incident clusters (Figures 5.7 and 5.8)[13]. The findings suggested interestingly that all incident clusters remained in the *planned* developments in the south (5 out of 6, i.e., the hotspots "2" to "6"), and are located within a distance of 1,5 km radius from Etlik Police Station, which was located at the same place since its early establishment years (Dağ, 2002). In addition, 73% (365 out of 500) of the incidents occur in the near vicinity of the police station. This distance drops down to about 400 m for the 6th cluster.

It needs to be noticed that the area including the 4th, 5th and 6th hotspots collectively compose the most crowded, vivid and colourful section of the study area, have central city or central business district characteristics, and functions as a sub centre in the south west of Keçiören District when a wider metropolitan region is considered (see Appendix G).

In order to further elaborate on the relationship of incident distribution and clustering with the urban structure, the bivariate statistics (measures of centrality, dispersion, and directionality) for N=500 incidents (see Endnote 1) are explored[14] (see Appendix E). The centrality measures (arithmetic mean and the median centre of the incidents), respectively are found at points, which are not much away from the Etlik Police Station, either. That is, 670 m for the mean centre, and 390 m for the median centre. Similarly, one of the dispersion statistics of the incidents (the standard deviation of X and Y coordinates of the incidents) is found to be covering majority of the mostly *planned* southern settlements. The other measure (standard distance deviation) is found to have 1400 meters radius (Figure 5.9).

In general, it can be suggested that the rapid urbanization process characterized by migration from the rural areas did not cause directly an increase in the occurrences of incidents, at least in its *early stages*, e.g., until mid 1990s, a period after which the processes of transformation of *gecekondu* into its *varoş* stage and *gecekondulu* into its *varoşlu* stage (see Section 3.1) has started in İstanbul. Interestingly, this is still the case as far as the study area and period (2000) is concerned, in which the *squatter* development started mainly in the 1960s (Figure 3.3). What happened, in fact, is that with urbanization process these people who have rural origin regenerated their rural life styles and neighbourhood relations in the urban peripheries. They created peaceful and socially supportive communities similar to those in their rural origins. In the study area, in 2000, these settlements are found to be relatively securer places in terms of incident occurrences through their social and physical characteristics (Table 3.3).

Therefore, in the *early stage gecekondu* settlements with their mostly residential characteristics and homogenous physical and social environment, the crime incidents is not high, e.g., it is less than the ones observed in *planned* and *in-transition* neighbourhoods. Even though people living in these *squatter* areas are economically in more inferior status[15], the sense of community they experience and their feeling of belonging to a place and being a part of the community have probably prevented them to be exposed to high incidents rates despite some fragmentation between the different ethnic/religious groups. The second reason concerning their low rates of incidents can be because such areas do not provide

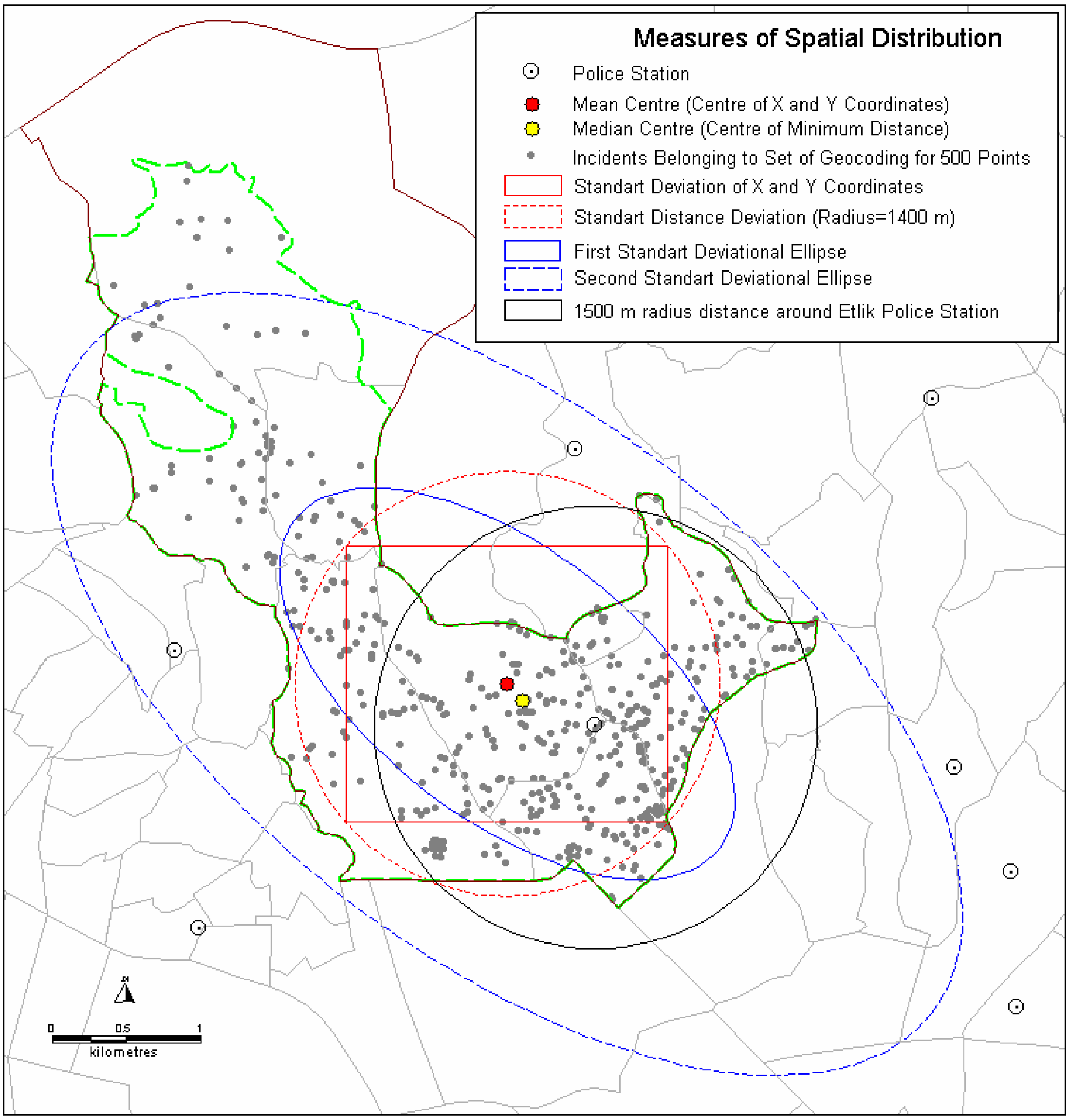


Figure 5.9 Bivariate measures of central tendency and dispersion of the three types of incidents together
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.

opportunities for incidents occurrences. Since the incidents display higher frequencies and rates in the *planned* settlements contrary to *squatter* areas, the hypothesis that the urban functions and urban life style, which generate *environmental* conditions for incident occurrences, is confirmed.

In order to build a causal relationship between the incident rates (incidents per 10000 population) and the development patterns of the neighbourhoods a multiple regression analysis is performed where the rates of incidents are explained in terms of two independent variables, i.e., areal ratio of *squatter* and *planned* areas to the *in-transition* areas[16]. Since this analysis is performed with a small number of cases (n=9) and due to the consequent limitations[17] including the significance value, which is *p*=0,10 (Stevens, 1996:249 in Pallant, 2001:173), the results should be approached cautiously if they are to be generalized.

With reference to the analysis results the model and its standardized form are constructed as in the following, whereby the significances of the coefficients are also given under the model itself.

Model: $Y = 31{,}145 - 0{,}248X_1 + 0{,}001X_2$

Significances: (p<0,0005) (p=0,008) (p>0,05)

Standardized Model: $Y = -0{,}747X_1 + 0{,}388X_2$

where Y : Predicted incident rate (incidents per 10000 population),

X_1 : Ratio of *squatter* area over *in-transition* area;

X_2 : Ratio of *planned* area over *in-transition* area.

The result of the analysis implies that combined effect of relative sizes of *squatter* and *planned* development to the *in transition* areas in the neighbourhoods accounts significantly for 71,6% (adjusted R square (Pallant, 2001:145)) of the variance in incident rates. Moreover, the standardized coefficients of the model suggest that while 1 standard unit of change in X_1 variable contribute with -0,747 standard unit of change in the dependent variable Y, significantly at 0,01 level (*p*=0,008), 1 standard unit of change in X_2 variable contribute with 0,388 standard unit of change in Y, which is significant at 0,10 (*p*=0,087) level.

From the current trend of urban transformation in Turkey, it is apparent that all *in-transition* and *squatter* areas will be completely redeveloped into *planned* settlements through the Improvement Plans in the near future. The regression analysis practically resulted in high probability for *in-transition* and *squatter* settlements to acquire similar *spatial* distribution of incidents that are currently being experienced in the *planned* sections. At least for the study area as a whole, this implies an overall increase in the incident occurrences, while the likelihood for similar trends in similar inner metropolitan areas should not be under-estimated.

However, for the study area, the shift of criminal acts from one *place* to another as a result of intervention in the *environment* (Repetto, 1976 in Weisburd, 2002:199; Oc and Tiesdell, 1997:58,71-72), i.e., the displacement effect (see Section 2.2.4), seems to be less realistic. Nevertheless, the question on the probability of displacement effect in a wider metropolitan region is yet to be addressed.

5.1.2 Incidents Differentiated with respect to Their "Types" and "Commitment Types"

In the following sections, incidents are differentiated with respect to their *Types* and *Commitment Types*[18]. The incident types include incidents against people; against property; and against people and property. The first six most frequent commitments types include aggravated batteries, simple batteries, and domestic violences within the incident group of against people; commercial burglaries/thefts, residential burglaries, and thefts from auto within the incident group of against property. For the purposes of clarity the remaining commitment types are described when a relevant analysis is performed in the sections below.

5.1.2.1 Spatial Distribution of Incidents: General ("Global Scale") Distribution

In the sections below, first the descriptive analyses for each type of incidents are carried out, and next, statistical tests are performed in order to assess the previous results on the distribution of incident types in the study area from a general (*global* scale) perspective.

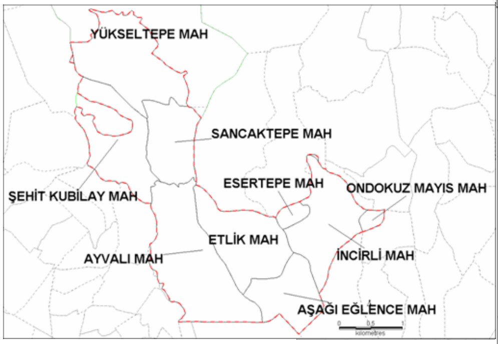
Descriptive Analyses. Previously, it was verified that *planned* areas are more *opportunistic* for occurrence of all the three types of incidents in aggregate. In the following sections, each type of incidents is analyzed in the three development patterns. Subsequently, the relationship between the incident types and the development patterns (*planned, squatter, in-transition*) is explored.

In the study area (*R*), the frequencies of incidents, which belong to set of geocoding for 529 points (see Endnote 1), are 293 (55,39 %); 195 (36,86 %); and 41 (7,75 %) for incidents against people, against property, and against people and property, respectively. The respective rates, which are computed per 10000 population (in 2000) are 17,27; 11,49; and 2,42. These figures reveal that majority of incidents are committed against 'people' relative to incidents against 'property', and against 'people and property'.

The same ordering of three incident types in terms of frequencies, percentages, and rates, is observed in both two main divisions of the study area. In all three measures, incidents against people have the highest values. For example, the percentages, in the mostly *squatter* neighbourhoods in the north are 73,81 %; 17,86 %; and 8,33 %. The respective percentages in the mostly *planned* settlements in the south are 51,91%; 40,45%; and 7,64%. In terms of rates (incidents per 10000 population) the values are 17,78, 5,07, 2,19; and 16,28, 14,03, 2,51, respectively. However, although the incidents against people display the highest occurrences in both types of settlements, the percentages and the rates of incidents against 'property' are predominant in the southern (mostly *planned*) neighbourhoods. For example, the value in terms of percentage is about two times (40,45 % versus 17,86 %), and in terms of rates is three times (14,03 versus 5,07) that of the northern (mostly *squatter*) settlements (Figure 5.10[19] and Table 5.8). These findings suggest that mostly *planned* southern settlements provide most of the *opportunities* in the study area for especially the commitments against property with their physical and socio-economic conditions. On the hand, whenever incidents occur in the mostly *squatter* northern settlements, they are mainly committed against people rather than against property (in terms percentages 73,81 % versus 17,86 %; and in terms of rates per 10000 population, 17,78 versus 5,07) (Figure 5.10[20] and Table 5.8).

Among incidents against people, highest percentage of commitment types in two main types of settlements is for aggravated and simple batteries in aggregate (74,19 % and 59,74 %) (Table 5.9). Although the percentages of aggravated and simple batteries are almost equal in the northern mostly *squatter* settlements (38,71 % and 35,48 %), in the southern mostly *planned* settlements the percentage of simple batteries is more than double of the aggravated batteries (41,56 % versus 18,18 %). Second highest percentage is for domestic violences in both northern and southern neighbourhoods (20,97 % and 32,03 %, respectively) (Table 5.9).

For incidents against property the commitment types having the highest three rates are evaluated as follows: In mostly *squatter* northern settlements residential burglaries has the



Development pattern	Neighbourhoods	Squatter area (%)	Planned area (%)	In Transition area (%)
Mostly *squatter* (~3/4) and partially *in transition* (~1/4)	Yükseltepe	98,52	0,00	1,48
	Şehit Kubilay	64,69	0,00	35,31
	Sancaktepe	63,31	0,00	36,69
Sub Mean		**75,51**	**0,00**	**24,49**
Mostly *planned* (~3/4) and partially *in transition* (~1/4)	Ayvalı	0,00	70,81	29,19
	Etlik	0,00	80,29	19,71
	Aşağı Eğlence	0,00	100,00	0,00
	İncirli	0,00	49,76	50,24
	Esertepe	0,00	62,03	37,97
	19 Mayıs	0,00	100,00	0,00
Sub Mean		**0,00**	**77,15**	**22,85**

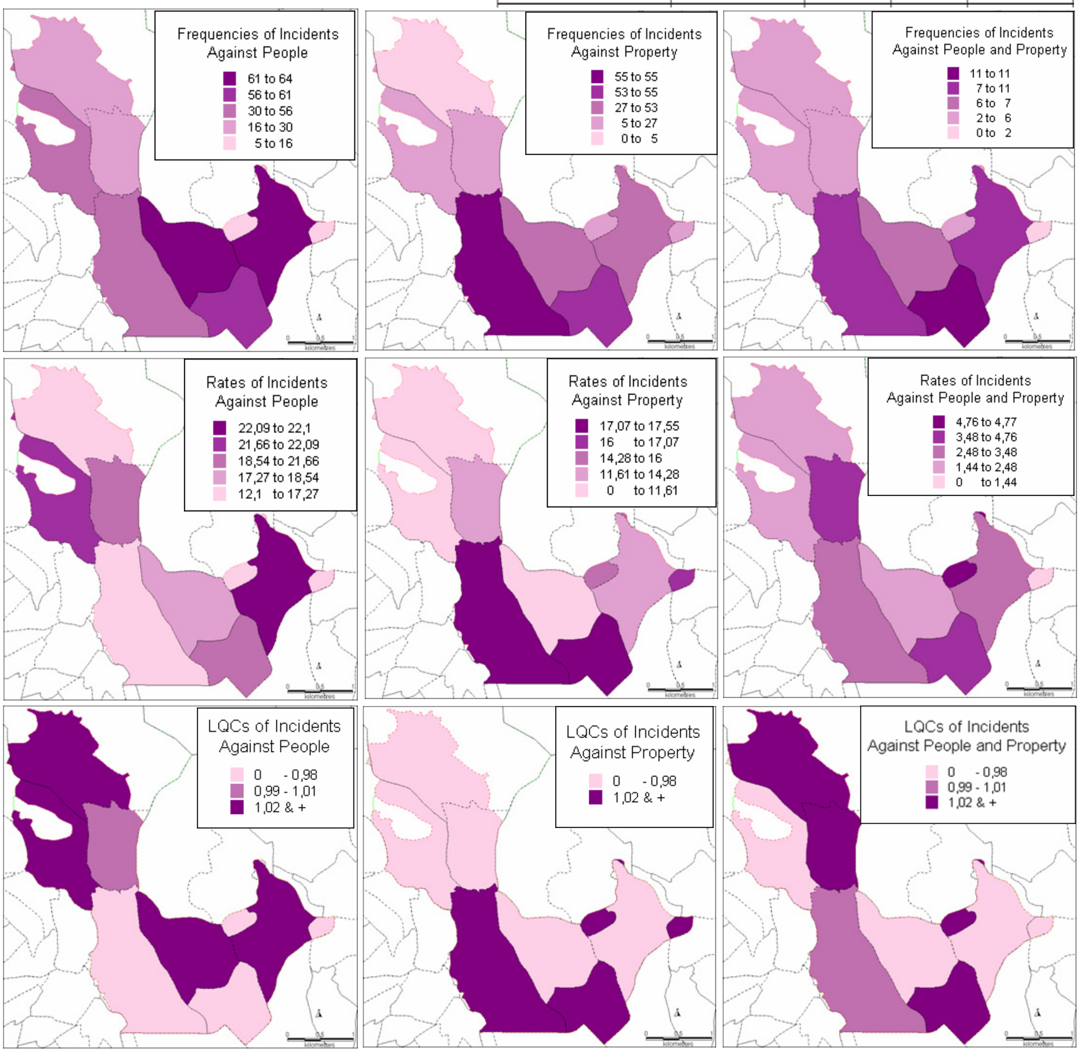


Figure 5.10 Neighbourhoods with respect to counts, rates, and LQCs of each of the three types of incidents and information on size of the development patterns

Note: The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

Table 5.8 Comparison of different descriptive measures of the three types of incidents in the neighbourhoods (1)

Development pattern	**Neighbourhoods**	**Development Pattern Area (%)**			**Frequency (Z Scores)**			**Rate: Freq.per 10000 pop. (Z Scores)**			**Location Quotient**		
		Squatter	Planned	In Tran.	Peop.	Prop.	Pe.&Pr.	Peop.	Prop.	Pe.&Pr.	Peop.	Prop.	Pe.&Pr.
Mostly *squatter* (~3/4) and partially *in transition* (~1/4)	Yükseltepe	98,52	0,00	1,48	16 (-0,71)	0 (-1,02)	2 (-0,71)	13,10 (-0,98)	0,00 (-1,78)	1,64 (-0,54)	1,60	0,00	1,43
	Şehit Kubilay	64,69	0,00	35,31	30 (-0,11)	5 (-0,78)	2 (-0,71)	21,67 (1,30)	3,61 (-1,20)	1,44 (-0,67)	1,46	0,37	0,70
	Sancaktepe	63,31	0,00	36,69	16 (-0,71)	10 (-0,55)	3 (-0,43)	18,58 (0,48)	11,61 (0,09)	3,48 (0,76)	1,00	0,94	1,33
Sub Mean		**75,51**	**0,00**	**24,49**	**20,67 (-0,51)**	**5 (-0,78)**	**2,33 (-0,62)**	**17,78 (0,27)**	**5,07 (-0,96)**	**2,19 (-0,15)**	**1,35**	**0,44**	**1,15**
Percentage Total: (100%)					**73,81**	**17,86**	**8,33**						
Mostly *planned* (~3/4) and partially *in-transition* (~1/4)	Ayvalı	0,00	70,81	29,19	39 (0,27)	55 (1,57)	8 (0,95)	12,11 (-1,25)	17,08 (0,98)	2,48 (0,06)	0,69	1,46	1,01
	Etlik	0,00	80,29	19,71	64 (1,34)	27 (0,25)	6 (0,40)	17,28 (0,13)	7,29 (-0,61)	1,62 (-0,55)	1,19	0,76	0,80
	Aşağı Eğlence	0,00	100,00	0,00	56 (1,00)	53 (1,47)	11 (1,78)	18,54 (0,47)	17,55 (1,05)	3,64 (0,87)	0,84	1,20	1,18
	İncirli	0,00	49,76	50,24	61 (1,21)	33 (0,53)	7 (0,68)	22,10 (1,42)	11,96 (0,15)	2,54 (0,10)	1,09	0,89	0,89
	Esertepe	0,00	62,03	37,97	6 (-1,13)	6 (-0,74)	2 (-0,71)	14,29 (-0,67)	14,29 (0,52)	4,76 (1,66)	0,77	1,16	1,84
	19 Mayıs	0,00	100,00	0,00	5 (-1,17)	6 (-0,74)	0 (1,26)	13,33 (-0,92)	16,00 (0,80)	0,00 (-1,69)	0,82	1,48	0,00
Sub Mean		**0,00**	**77,15**	**22,85**	**38,5 (0,25) 55***	**30 (0,39) 42***	**5,67 (0,73) 8***	**16,28 (-0,14)**	**14,03 (0,48)**	**2,51 (0,08)**	**0,9**	**1,16**	**0,95**
Percentage Total: (100%)					**51,91**	**40,45**	**7,64**						
Total					293	195	41						
Mean					32,56 40,28*	21,67 26,14*	4,56 5,57*	16,78	11,04	2,40			
Standard dev.					23,47	21,28	3,61	3,75	6,19	1,42			
Standard error					7,82	7,09	1,20	1,25	2,06	0,47			
95%Confidence Int. based on *t* dist.					14,51- 50,60	5,31- 38,03	1,78- 7,33	13,90- 19,66	6,29- 15,80	1,31- 3,49			
Overall Total						529**							
Overall Mean									30,22				

(1) A summary of social, physical structures, and different descriptive measures of incidents, see Appendix F.
(*) Mean excludes the two extreme neighbourhoods of Esertepe and 19 Mayıs because of their relatively much smaller areal proportions in R.
(**) See Endnote 1.

Table 5.9 Incidents against people further differentiated by their commitment types (commitment types of first events in ‘multi event’ incidents)

	Incident Rate: Frequency per 10000 pop.					Location Quotient				
	Most serious incidents		Serious incidents		Petty incidents					
	Homicide	Aggrav. battery (1)	Simple batt. (1)(2)	Domestic violence (3)	Others (4)	Homicide	Aggravated battery	Simple battery	Domestic violence	Others
Yükseltepe	0,00	4,91	4,91	3,27	0,00	0,00	1,66	0,93	0,84	0,00
Ş. Kubilay	0,72	7,94	7,94	3,61	1,44	1,95	1,63	0,91	0,56	1,15
Sancaktepe	0,00	8,13	5,81	4,64	0,00	0,00	1,94	0,78	0,84	0,00
Mean	**0,24**	**6,99**	**6,22**	**3,84**	**0,48**	**0,65**	**1,74**	**0,87**	**0,75**	**0,38**
Percentage Total:(100%)	**1,61**	**38,71**	**35,48**	**20,97**	**3,23**					
Ayvalı	0,31	2,79	3,73	4,35	0,93	1,50	1,02	0,76	1,21	1,33
Etlik	0,54	2,97	6,21	6,48	1,08	1,83	0,76	0,89	1,26	1,08
A. Eğlence	0,33	2,65	9,27	4,97	1,32	1,05	0,63	1,24	0,90	1,23
İncirli	0,00	4,71	9,06	6,88	1,45	0,00	0,95	1,02	1,05	1,13
Esertepe	0,00	0,00	11,90	2,38	0,00	0,00	0,00	2,07	0,56	0,00
19 Mayıs	0,00	2,67	8,00	2,67	0,00	0,00	0,89	1,49	0,67	0,00
Mean	**0,20**	**2,63**	**8,03**	**4,62**	**0,80**	**0,73**	**0,71**	**1,25**	**0,94**	**0,79**
Percentage Total:(100%)	**1,73**	**18,18**	**41,56**	**32,03**	**6,49**					
Over. mean *Specif. value*	**0,21**	**4,09**	**7,43**	**4,36**	**0,69**	***1,00***	***1,00***	***1,00***	***1,00***	***1,00***

(1) See Endnote [21].
(2) Two incidents (one in Ayvalı and the other in İncirli), which were previously categorized under another commitment type called as ‘attack’ and neither in aggravated battery nor in simple battery and included the use of a dangerous weapon but did not result in bodily harm, in this analysis, are considered in simple battery.
(3) See Appendix C.
(4) Comprise incidents of ‘plain stalking’, ‘forcible stalking’, ‘defamation’, ‘sexual annoyance’, or ‘weapon display’.

highest percentage (40 %) while in mostly *planned* southern settlements, commercial burglaries/thefts has the highest percentage (33,89 %). In the northern neighbourhoods the second highest percentage is for the damages to auto (20 %) followed by thefts from auto (13,33 %). In the southern settlements commercial burglaries/thefts (33,89 %) is higher than the residential burglaries (27,78 %) and thefts from auto (15,56 %). In other words, in the mostly *planned* southern settlements 77,23 % of all incidents against property is committed as commercial burglaries/thefts, residential burglaries, and thefts from auto (Figure 5.10, Tables 5.8 and 5.10).

Statistical Tests for Differences Between the Three Development Patterns. Relationship between the incident types and the development patterns is explored by Chi-square Test of Independence for frequencies; and One-way ANOVA for rates. Pairwise Multiple Comparison tests are also performed for assessing which development pattern really differs from the other in terms of incident rates.

Table 5.10 Incidents against property further differentiated by their commitment types (commitment types of first events in 'multi event' incidents)

	Incident Rate: Frequency per 10000 pop.								Location Quotient							
	Residential burglary (1)	Commercial burglary/theft (2)	Theft from person / robbery	Burglary from construction	Theft from auto	Auto theft	Damage to auto	Others (3)	Residential burglary	Commercial burglary/theft	Theft from person / robbery	Burglary from construction	Theft from auto	Auto theft	Damage to auto	Others
Yükseltepe	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	_	_	_	_	_	_	_	_
Şehit Kubilay	1,44	0,72	0,00	0,00	0,00	0,00	0,72	0,72	1,39	0,71	0,00	0,00	0,00	0,00	7,80	6,50
Sancaktepe	4,64	1,16	0,00	0,00	2,32	0,00	2,32	1,16	1,39	0,35	0,00	0,00	1,30	0,00	7,80	3,25
Mean	**2,03**	**0,63**	**0,00**	**0,00**	**0,77**	**0,00**	**1,01**	**0,63**	**1,39**	**0,53**	**0,00**	**0,00**	**0,65**	**0,00**	**7,80**	**4,88**
Percentage Total:(100%)	**40,00**	**13,33**	**0,00**	**0,00**	**13,33**	**0,00**	**20,00**	**13,33**								
Ayvalı	3,42	7,45	1,24	0,93	1,86	1,55	0,31	0,31	0,70	1,55	1,01	1,52	0,71	1,27	0,71	0,59
Etlik	2,16	2,70	0,00	0,27	1,35	0,54	0,00	0,27	1,03	1,31	0,00	1,03	1,20	1,03	0,00	1,20
Aşağı Eğlence	4,64	6,62	1,99	0,00	2,65	0,66	0,33	0,66	0,92	1,34	1,58	0,00	0,98	0,53	0,74	1,23
İncirli	4,71	1,45	1,45	1,09	1,81	1,45	0,00	0,00	1,37	0,43	1,69	2,53	0,98	1,69	0,00	0,00
Esertepe	4,76	4,76	0,00	0,00	2,38	2,38	0,00	0,00	1,16	1,18	0,00	0,00	1,08	2,32	0,00	0,00
19 Mayıs	5,33	2,67	0,00	0,00	8,00	0,00	0,00	0,00	1,16	0,59	0,00	0,00	3,25	0,00	0,00	0,00
Mean	**4,17**	**4,28**	**0,78**	**0,38**	**3,01**	**1,10**	**0,11**	**0,21**	**1,06**	**1,07**	**0,71**	**0,85**	**1,37**	**1,14**	**0,24**	**0,50**
Percentage Total:(100%)	**27,78**	**33,89**	**7,78**	**3,89**	**15,56**	**7,78**	**1,11**	**2,22**								
Overall mean *Specific value*	**3,46**	**3,06**	**0,52**	**0,25**	**2,26**	**0,73**	**0,41**	**0,35**	***1,00***	***1,00***	***1,00***	***1,00***	***1,00***	***1,00***	***1,00***	***1,00***

(1) This category also includes burglaries from the auxiliary structures of the residential units
(2) See Endnote [22].
(3) Damage to residence, Burglary from mosque, Burglary from school, Bicycle theft, Other thefts

The expectation that the incident types and the three development patterns are not independent of each other in terms of frequencies for N=500 incidents (see Endnote 1) is found to be statistically significant (p<0,0005). *Planned* settlements witnessed more incidents against property (adjusted standardized residual=5,0) and fewer incidents against people (adjusted std. residual= -4,5) than expected. On the other hand, *squatter* and *in-transition* settlements displayed fewer incidents against property (adjusted std. residuals of -4,4 and -2,6 respectively); and more incidents against people (adjusted std. residuals of 4,6 and 1,9 respectively) (Table 5.11) than expected. However, the results for the *squatter* settlements, as compared to *in-transition* areas, suggested relatively more dependence with both types of incidents: i.e., incidents against property (adjusted std. residual of -4,4 versus -2,6), and against people (adjusted std. residual of 4,6 versus 1,9) (Table 5.11).

As for the rates of incident types (incidents (from total of 529) per 1000 population in each road/street (total of 560)) (see Endnote 1), a significant difference with respect to development patterns is found for incidents against 'property' (p<0,0005) and against 'people and property' (p≤0,026) (Table 5.12)[23]. As for the rates incidents against people the relationship was not statistically significant (for F test p=0,057; for Welch test p=0,150; for

Table 5.11 Results of Chi-square test for independence (1)

			INCIDENT TYPE			Total
			Property	**People**	**People and Property**	
DEVELOPMENT TYPE	**In-transition**	Count	25	62	10	97
		Expected Count	36.3	53.5	7.2	97.0
		% within Development Type	25.8%	63.9%	10.3%	100.0%
		% within Incident Type	13.4%	22.5%	27.0%	19.4%
		% of Total	5.0%	12.4%	2.0%	19.4%
		Residual	-11.3	8.5	2.8	
		Std. Residual	-1.9	1.2	1.1	
		Adjusted Residual	-2.6	1.9	1.2	
	Planned	Count	160	178	25	363
		Expected Count	135.8	200.4	26.9	363.0
		% within Development Type	44.1%	49.0%	6.9%	100.0%
		% within Incident Type	85.6%	64.5%	67.6%	72.6%
		% of Total	32.0%	35.6%	5.0%	72.6%
		Residual	24.2	-22.4	-1.9	
		Std. Residual	2.1	-1.6	-.4	
		Adjusted Residual	5.0	-4.5	-.7	
	Squatter	Count	2	36	2	40
		Expected Count	15.0	22.1	3.0	40.0
		% within Development Type	5.0%	90.0%	5.0%	100.0%
		% within Incident Type	1.1%	13.0%	5.4%	8.0%
		% of Total	.4%	7.2%	.4%	8.0%
		Residual	-13.0	13.9	-1.0	
		Std. Residual	-3.4	3.0	-.6	
		Adjusted Residual	-4.4	4.6	-.6	
Total		**Count**	187	276	37	500 (1)
		Expected Count	187.0	276.0	37.0	500.0
		% within Development Type	37.4%	55.2%	7.4%	100.0%
		% within Incident Type	100.0%	100.0%	100.0%	100.0%
		% of Total	37.4%	55.2%	7.4%	100.0%

(1) Incidents belonging to set of geocoding for 500 points. See Endnote 1.

Table 5.12 Results of one way ANOVA for the rates of three incident types (1)

	Related			ANOVA						Robust Tests of Equality of Means (2)				
		N	**Me**		**Sum of**	**df**	**Mean**	**F**	**Sig.**	**Statistic (3)**		**df 1**	**df 2**	**Sig.**
People	**Sq.**	213	2,15	Bet.Grps	2050,10	2	1025,05	2,87	0,057	Welch	1,91	2	344,014	0,150
	Plan.	193	6,09	Wit.Grps	198750,59	557	356,82			Bro.-Forsy.	3,05	2	306,887	0,049
	In-tr.	154	1,96	**Total**	**200800,69**	**559**								
	Total	**560** (1)	**3,46**											
Property	**Sq.**	213	0,08	Bet.Grps	1066,46	2	533,23	11,09	<0,0005	Welch	10,00	2	230,487	<0,0005
	Plan.	193	3,23	Wit.Grps	26774,59	557	48,07			Bro.-Forsy.	11,20	2	254,967	<0,0005
	In-tr.	154	0,85	**Total**	**27841,05**	**559**								
	Total	**560** (1)	**1,38**											
People and Property	**Sq.**	213	0,06	Bet.Grps	19,21	2	9,60	3,77	0,024	Welch	3,88	2	258,835	0,022
	Plan.	193	0,49	Wit.Grps	1419,97	557	2,55			Bro.-Forsy.	3,70	2	324,697	0,026
	In-tr.	154	0,22	**Total**	**1439,17**	**559**								
	Total	**560** (1)	**0,25**											

(1) Incidents belonging to set of geocoding for 529 points, which are assigned onto N=560 road/streets in R. See Endnote 1.
(2) These tests are performed and are preferred to F test due to significant Levene test (p<0,0005) that implied inequality of variances.
(3) Asymptotically F distributed.

Brown-Forsythe test p=0,049). This supports the expectation that the incidents against people are distributed relatively more evenly among the three types of development.

For incidents against people, similar to the findings in ANOVA as presented above (see Table 5.12) where no significant difference was found between the development patterns; the four Pairwise Multiple Comparison tests[24] (Tamhane, Dunnett T3, Games-Howell, Dunnett C) between pairs of settlement types are not significant ($p>0,05$). Relatively, the least statistically significant difference is found between *squatter* and *in-transition* settlements (p=0,997, p=0,997, p=0,983, and p>0,05). However, relatively, the highest statistically significant difference is found between *planned* and *in-transition* settlements (p=0,149, p=0,149, p=0,127, and p>0,05) (Table 5.13).

On the other hand, for the incidents against property, four Pairwise Multiple Comparison Tests show that the statistically significant differences are found both between *squatter* and *planned* settlements ($p\leq0,05$); and between *in-transition* and *planned* settlements ($p\leq0,05$); but not between the *squatter* and *in transition* settlements ($p\geq0,05$) (Table 5.13).

Finally, as for the incidents against people and property the only statistically significant difference is found between *squatter* and *planned* developments ($p\leq0,05$) (Table 5.13).

Statistical Tests for Point Distribution and Its Differences Between the Three Development Patterns. In the next stage, first, a detailed assessment on the spatial pattern or density of the distribution of incident types is made to find whether the incidents are evenly (randomly) distributed in space. As expected, the results of the analyses suggested clustered distribution for each of the incident types but with relatively the least clustering for incidents against people and property, moderate for incidents against people, and the highest for incidents against property. Moreover, each of the incident types is found to display more clustering and higher density in the *planned* settlements. Secondly, an additional evaluation is made for the distribution of incident types, whereby they are compared on the basis of their centrality and dispersion. Confirming the expectation to a certain extend, as a result, the incidents against people is found to be relatively more concentrated than the incidents against property in *squatter* settlements.

In line with these, five analyses were carried out: Quadrat Method tested by Chi-square to find whether the incident type point patterns display clustering; Kernel Estimation and One-

Table 5.13 Results of the Pairwise Multiple Comparison tests in one way ANOVA for the rates of incidents

			Against People					**Against Property**					**Against People and Property**				
Test	**Development pattern**		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
						Lower Bound	**Upper Bound**				**Lower Bound**	**Upper Bound**				**Lower Bound**	**Upper Bound**
Tamhane	squatter	planned	-3,94	2,22	0,214	-9,28	1,40	-3,15	0,80	<0,0005	-5,08	-1,22	-0,43	0,17	0,041	-0,85	-0,01
(Conservative		in-trans.	0,20	1,10	0,997	-2,45	2,85	-0,77	0,35	0,093	-1,62	0,09	-0,16	0,11	0,398	-0,44	0,11
pairwise	planned	squatter	3,94	2,22	0,214	-1,40	9,28	3,15	0,80	<0,0005	1,22	5,08	0,43	0,17	0,041	0,01	0,85
comparisons test		in-trans.	4,14	2,12	0,149	-0,96	9,24	2,38	0,88	0,020	0,28	4,49	0,27	0,20	0,457	-0,22	0,76
based on a t test)	in-trans.	squatter	-0,20	1,10	0,997	-2,85	2,45	0,77	0,35	0,093	-0,09	1,62	0,16	0,11	0,398	-0,11	0,44
		planned	-4,14	2,12	0,149	-9,24	0,96	-2,38	0,88	0,020	-4,49	-0,28	-0,27	0,20	0,457	-0,76	0,22
Dunnett T3	squatter	planned	-3,94	2,22	0,214	-9,28	1,40	-3,15	0,80	<0,0005	-5,08	-1,22	-0,43	0,17	0,041	-0,85	-0,01
(Pairwise		in-trans.	0,20	1,10	0,997	-2,45	2,85	-0,77	0,35	0,092	-1,62	0,09	-0,16	0,11	0,397	-0,44	0,11
comparison test	planned	squatter	3,94	2,22	0,214	-1,40	9,28	3,15	0,80	<0,0005	1,22	5,08	0,43	0,17	0,041	0,01	0,85
based on the		in-trans.	4,14	2,12	0,149	-0,96	9,24	2,38	0,88	0,020	0,28	4,49	0,27	0,20	0,456	-0,22	0,76
Studentized	in-trans.	squatter	-0,20	1,10	0,997	-2,85	2,45	0,77	0,35	0,092	-0,09	1,62	0,16	0,11	0,397	-0,11	0,44
maximum modulus)		planned	-4,14	2,12	0,149	-9,24	0,96	-2,38	0,88	0,020	-4,49	-0,28	-0,27	0,20	0,456	-0,11	0,22
Games-Howell	squatter	planned	-3,94	2,22	0,180	-9,17	1,29	-3,15	0,80	<0,0005	-5,05	-1,26	-0,43	0,17	0,037	-0,84	-0,02
(Pairwise		in-trans.	0,20	1,10	0,983	-2,40	2,80	-0,77	0,35	0,080	-1,61	0,07	-0,16	0,11	0,330	-0,43	0,11
comparison test that	planned	squatter	3,94	2,22	0,180	-1,29	9,17	3,15	0,80	<0,0005	1,26	5,05	0,43	0,17	0,037	0,02	0,84
is sometimes liberal)		in-trans.	4,14	2,12	0,127	-0,87	9,14	2,38	0,88	0,019	0,32	4,45	0,27	0,20	0,379	-0,21	0,75
	in-trans.	squatter	-0,20	1,10	0,983	-2,80	2,40	0,77	0,35	0,080	-0,07	1,61	0,16	0,11	0,330	-0,11	0,43
		planned	-4,14	2,12	0,127	-9,14	0,87	-2,38	0,88	0,019	-4,45	-0,32	-0,27	0,20	0,379	-0,75	0,21
Dunnett C	squatter	planned	-3,94	2,22		-9,18	1,30	-3,15	0,80	(*)	-5,05	-1,26	-0,43	0,17	(*)	-0,84	-0,02
(Pairwise		in-trans.	0,20	1,10		-2,41	2,81	-0,77	0,35		-1,61	0,07	-0,16	0,11		-0,43	0,11
comparison test	planned	squatter	3,94	2,22		-1,30	9,18	3,15	0,80	(*)	1,26	5,05	0,43	0,17	(*)	0,02	0,84
based on the		in-trans.	4,14	2,12		-0,87	9,15	2,38	0,88	(*)	0,32	4,45	0,27	0,20		-0,21	0,75
Studentized range)	in-trans.	squatter	-0,20	1,10		-2,81	2,41	0,77	0,35		-0,07	1,61	0,16	0,11		-0,11	0,43
		planned	-4,14	2,12		-9,15	0,87	-2,38	0,88	(*)	-4,45	-0,32	-0,27	0,20		-0,75	0,21

(*) The mean difference is significant at the 0,05 level.
Source: Explanations for the tests were quoted from SPSS, 2005.

way ANOVA to find whether the incident type densities are different in the three development patterns; Pairwise Multiple Comparison tests to assess which development pattern really differs from the other in terms of incident type densities; Two-sample *t* test with Bonferroni adjustment for assessing the differences between the mean centres of incidents against people and against property; between the incidents against people and against people and property; F test (Equality of Variances Test) to test the variation (standard distance deviation (SDD)) between the point distributions of the three incident types (Appendix E).

According to Index of Dispersion (*ID*) and Index of Cluster Size (*ICS*), which are calculated for 300 m quadrats for *R* (see Appendix E) and evaluated by means of Chi-square test, incident points for each of the three types are found to display significant clustering in space. However, the incidents against property display the highest level of clustering as compared to relatively less and least clustering of incidents against people, and against people and property. The respective significance levels are 1,71E-29, 1,21E-64, 1,83E-05 for incidents against people, property, and people and property (Table 5.14). This implies relatively homogenous distribution of incidents against people, and against people and property compared to incidents against property.

Table 5.14 Quadrat (300 m)* testing for CSR for incident types

Incident Types	**Index of Dispersion (N=144, df=143)**	**Index of Cluster Size (N=144, df=143)**	**Test Value of Chi-square (1)**	**Significance level**
People	2,96	1,96	423,13	1,71E-29
Property	4,50	3,50	643,89	1,21E-64
People and Property	1,56	0,56	223,76	1,83E-05

(*) 300 m quadrat was chosen due to its reflection of an optimum size to in representing the areal differentiation
*(1) Test value of Chi-square=df * VMR for N=144*

The result of *Kernel Estimation* (see Appendix E) verified the *Quadrat Method* by revealing that clusters and high densities exist in the study area. In addition, as expected, the number of clusters and level of densities are found to be higher in the southern (mostly *planned*) settlements. The findings indicated they are less in the northern (mostly *squatter*) settlements (Figure 5.11)[25]. One-way ANOVA (see Endnote 9) suggested significant different mean densities among the three development patterns for each of the incident types at the level of $p \leq 0{,}0005$ (Table 5.15).

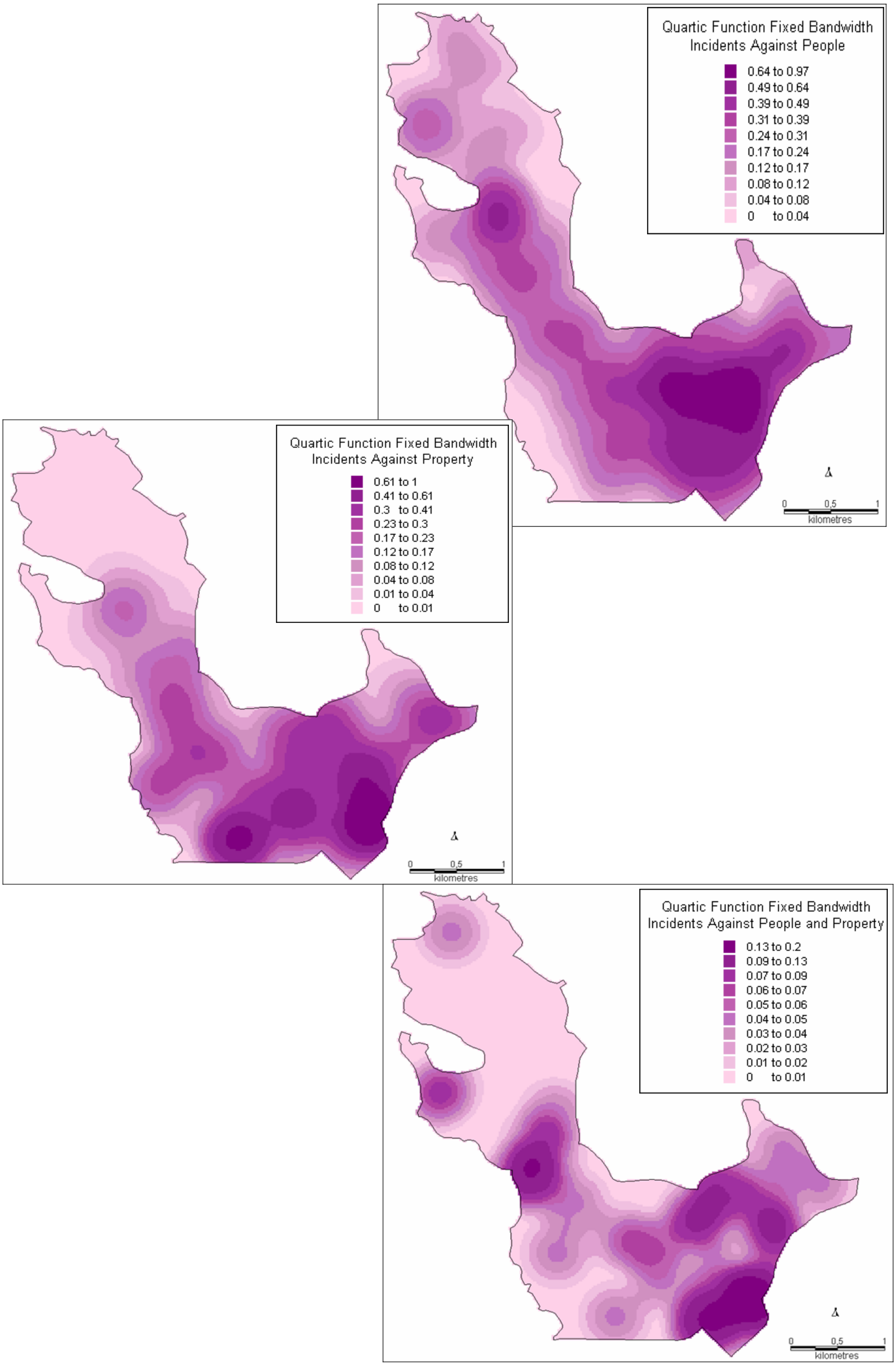


Figure 5.11 Results of the *fixed bandwidth (500 m) Kernel Estimation*
Note: The incidents belonging to set of geocoding for 500 points (see Endnote 1) with units of incidents per hectare

Table 5.15 Results of one-way ANOVA for Kernel Estimation of the incident types in the three different development patterns (1)

		Related Statistics		ANOVA						Robust Tests of Equality of Means (2)				
		N	**Mean**		**Sum of Sq.**	**df**	**Mean Sq.**	**F**	**Sig.**	**Statistic (3)**		**df 1**	**df 2**	**Sig.**
People	**Sq.**	7447	0,13	Between Groups	257,86	2	128,93	4554,25	<0,0005	Welch	5285,03	2	14026,65	<0,0005
	Plan.	10474	0,37	Within Groups	671,82	23731	0,028			Brown-Forsyt.	5564,47	2	20405,04	<0,0005
	In-tr.	5813	0,22	**Total**	**929,68**	**23733**								
	Total	**23734**	**0,26**											
Property	**Sq.**	7447	0,02	Between Groups	410,57	2	205,29	12062,18	<0,0005	Welch	15487,75	2	11476,64	<0,0005
	Plan.	10474	0,32	Within Groups	403,88	23731	0,02			Brown-Forsyt.	15550,61	2	17134,67	<0,0005
	In-tr.	5813	0,12	**Total**	**814,45**	**23733**								
	Total	**23734**	**0,17**											
People and Property	**Sq.**	7447	0,01	Between Groups	8,14	2	4,07	3945,19	<0,0005	Welch	6598,67	2	12040,76	<0,0005
	Plan.	10474	0,05	Within Groups	24,49	23731	0,001			Brown-Forsyt.	4413,22	2	17230,92	<0,0005
	In-tr.	5813	0,04	**Total**	**32,64**	**23733**								
	Total	**23734**	**0,03**											

(1) Incidents belonging to set of geocoding for 500 points. See Endnote 1.
(2) These tests are performed and are preferred to F test due to significant Levene test ($p<0,0005$) that implied inequality of variances.
(3) Asymptotically F distributed.

The four Pairwise Multiple Comparison tests[26] are carried out for point pattern densities to find differences in the distribution of each incident type between each pair of development patterns. The results suggest statistically significant difference between all pairs of the three development patterns for each of the three incident types ($p<0,05$) (Table 5.16).

Two sample t test is based on the expectation that mean of X coordinate of the incidents against people is expected to be more on the western part of the study area (R), and mean of the Y coordinate to be more on the northern part of it (due to north-west location of the squatter settlements), as compared to mean centres of incidents against property and people and property. Results suggested, for incidents against people, northern (mostly *squatter*) settlements affected their mean centre to be pulled towards north-west part of R; and for incidents against property, which are relatively more concentrated than incidents against people in southern (mostly *planned*) settlements that are mainly located in the south-east part of R, affected their mean centre to be pulled towards this direction (p=0,0024 for west-east comparison, p=2,6E-09 for north-south comparison). However, a similar result expected for the incidents against people and property was not found (Figure 5.12 and Table 5.17).

Table 5.16 Results of the Pairwise Multiple Comparison tests in one way ANOVA for *Kernel Estimation* of incident types

			Against People					Against Property					Against People and Property				
Test	**Development pattern**		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
						Lower Bound	**Upper Bound**				**Lower Bound**	**Upper Bound**				**Lower Bound**	**Upper Bound**
Tamhane	squatter	planned	-0,24	0,0024	<0,0005	-0,24	-0,23	-0,30	0,0018	<0,0005	-0,30	-0,29	-0,04	0,0004	<0,0005	-0,04	-0,04
(Conservative		in-trans.	-0,10	0,0021	<0,0005	-0,10	-0,09	-0,10	0,0014	<0,0005	-0,10	-0,10	-0,03	0,0005	<0,0005	-0,03	-0,03
pairwise	planned	squatter	0,24	0,0024	<0,0005	0,23	0,24	0,30	0,0018	<0,0005	0,29	0,30	0,04	0,0004	<0,0005	0,04	0,04
comparisons test		in-trans.	0,14	0,0028	<0,0005	0,14	0,15	0,20	0,0022	<0,0005	0,19	0,20	0,01	0,0006	<0,0005	0,01	0,02
based on a t test)	in-trans.	squatter	0,10	0,0021	<0,0005	0,09	0,10	0,10	0,0014	<0,0005	0,10	0,10	0,03	0,0005	<0,0005	0,03	0,03
		planned	-0,14	0,0028	<0,0005	-0,15	-0,14	-0,20	0,0022	<0,0005	-0,20	-0,19	-0,01	0,0006	<0,0005	-0,02	-0,01
Dunnett T3	squatter	planned	-0,24	0,0024	<0,0005	-0,24	-0,23	-0,30	0,0018	<0,0005	-0,30	-0,29	-0,04	0,0004	<0,0005	-0,04	-0,04
(Pairwise		in-trans.	-0,10	0,0021	<0,0005	-0,10	-0,09	-0,10	0,0014	0,001	-0,10	-0,10	-0,03	0,0005	0,001	-0,03	-0,03
comparison test	planned	squatter	0,24	0,0024	<0,0005	0,23	0,24	0,30	0,0018	<0,0005	0,29	0,30	0,04	0,0004	<0,0005	0,04	0,04
based on the		in-trans.	0,14	0,0028	<0,0005	0,14	0,15	0,20	0,0022	<0,0005	0,19	0,20	0,01	0,0006	<0,0005	0,01	0,02
Studentized	in-trans.	squatter	0,10	0,0021	<0,0005	0,09	0,10	0,10	0,0014	0,001	0,10	0,10	0,03	0,0005	0,001	0,03	0,03
maximum modulus)		planned	-0,14	0,0028	<0,0005	-0,15	-0,14	-0,20	0,0022	<0,0005	-0,20	-0,19	-0,01	0,0006	<0,0005	-0,02	-0,01
Games-Howell	squatter	planned	-0,24	0,0024	<0,0005	-0,24	-0,23	-0,30	0,0018	<0,0005	-0,30	-0,29	-0,04	0,0004	<0,0005	-0,04	-0,04
(Pairwise		in-trans.	-0,10	0,0021	<0,0005	-0,10	-0,09	-0,10	0,0014	<0,0005	-0,10	-0,10	-0,03	0,0005	<0,0005	-0,03	-0,03
comparison test that	planned	squatter	0,24	0,0024	<0,0005	0,24	0,24	0,30	0,0018	<0,0005	0,29	0,30	0,04	0,0004	<0,0005	0,04	0,04
is sometimes liberal)		in-trans.	0,14	0,0028	<0,0005	0,14	0,15	0,20	0,0022	<0,0005	0,19	0,20	0,01	0,0006	<0,0005	0,01	0,02
	in-trans.	squatter	0,10	0,0021	<0,0005	0,09	0,10	0,10	0,0014	<0,0005	0,10	0,10	0,03	0,0005	<0,0005	0,03	0,03
		planned	-0,14	0,0028	<0,0005	-0,15	-0,14	-0,20	0,0022	<0,0005	-0,20	-0,19	-0,01	0,0006	<0,0005	-0,02	-0,01
Dunnett C	squatter	planned	-0,24	0,0024	(*)	-0,24	-0,23	-0,30	0,0018	(*)	-0,30	-0,29	-0,04	0,0004	(*)	-0,04	-0,04
(Pairwise		in-trans.	-0,10	0,0021	(*)	-0,10	-0,09	-0,10	0,0014	(*)	-0,10	-0,10	-0,03	0,0005	(*)	-0,03	-0,03
comparison test	planned	squatter	0,24	0,0024	(*)	0,23	0,24	0,30	0,0018	(*)	0,29	0,30	0,04	0,0004	(*)	0,04	0,04
based on the		in-trans.	0,14	0,0028	(*)	0,14	0,15	0,20	0,0022	(*)	0,19	0,20	0,01	0,0006	(*)	0,01	0,02
Studentized range)	in-trans.	squatter	0,10	0,0021	(*)	0,09	0,10	0,10	0,0014	(*)	0,10	0,10	0,03	0,0005	(*)	0,03	0,03
		planned	-0,14	0,0028	(*)	-0,15	-0,14	-0,20	0,0022	(*)	-0,20	-0,19	-0,01	0,0006	(*)	-0,02	-0,01

(*) The mean difference is significant at the 0,05 level.
Source: Explanations for the tests were quoted from SPSS, 2005.

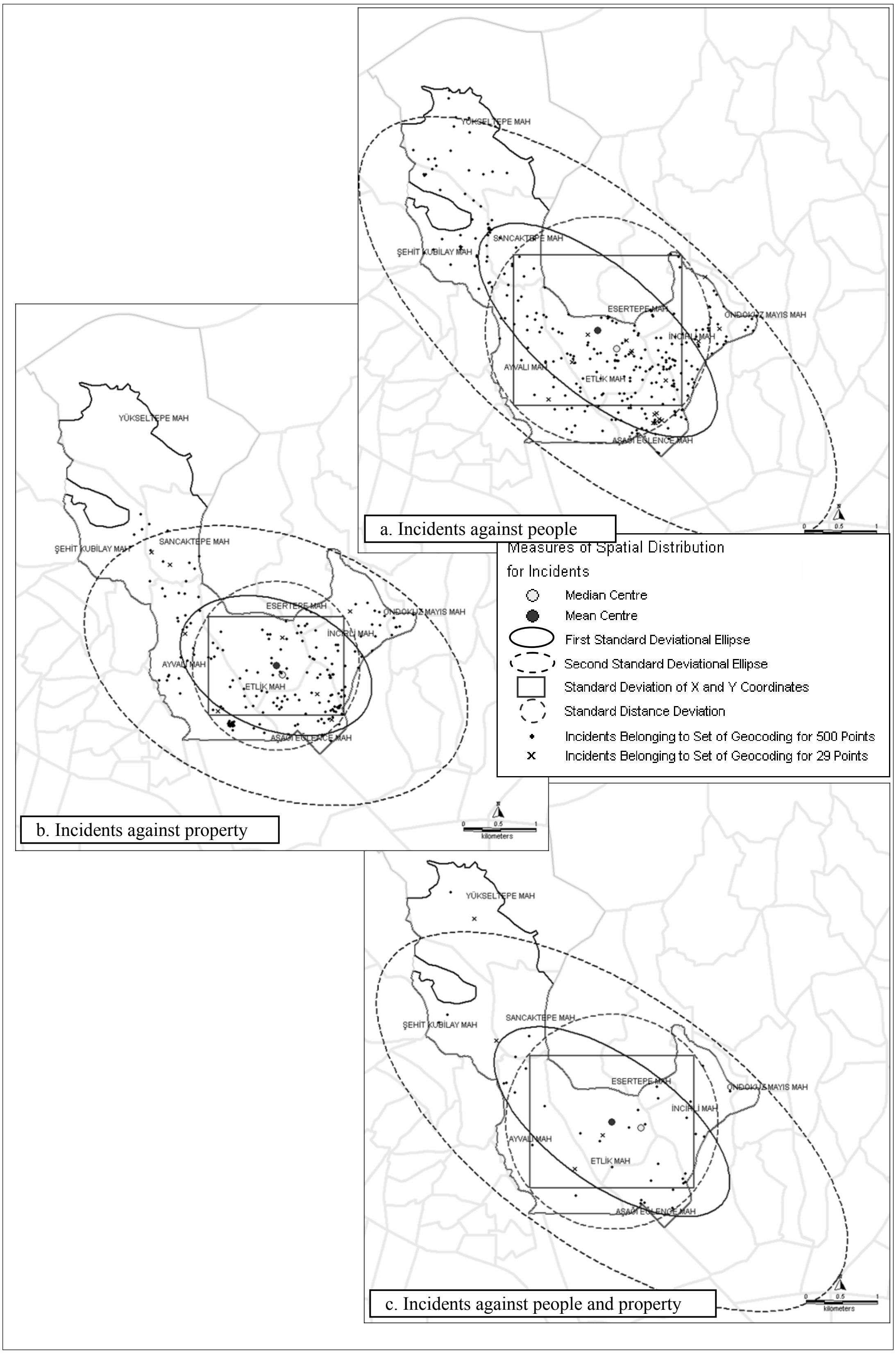


Figure 5.12 Bivariate measures of central tendency and dispersion for each of the three incident types
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1. For explanation of the bivariate statistics, see Appendix E.

Table 5.17 Two sample *t* test results for difference in the mean centres of incident types belonging to set of 500 points

	One tailed probability of F	Two tailed probability of t test		Test value of p with Bonferroni Adjustment (1)
		equal variance (homoscedastic)	unequal variance (heteroscedastic)	
X of incid. against people and X of incid. against property (N1=276, N2=187)	0,0012		0,0056	0,0024
Y of incid. against people and Y of incid. against property (N1=276, N2=187)	1,3E-09		1E-10	2,6E-09
X of incid. against people and X of incid. against peop. & pr. (N1=276, N2=37)	0,9543	0,4778		1,9086
Y of incid. against people and Y of incid. against peop. & pr. (N1=276, N2=37)	0,3901	0,1327		0,7802

(1) Bonferroni test (Anselin, 1995 and SYSTAT, 1996 in Levine and Associates, 2002:B-2) was utilized with a "both-and" condition, through which the set probability value is found by multiplying the critical p value (0,05) by the number of test (Levine and Associates, 2002:B-2), i.e., a pair of test for each comparison (0,05x2=0,10).

The bivariate statistics (measures of centrality and dispersion)[27] for N=500 incidents (see Endnote 1) (see Appendix E) computed and mapped for each of the three incident types (Figure 5.12) suggest differentiating amount, extends, and patterns for each of the three incident types. The location of mean and median centres, the standard distance deviations and the forms and orientations of the standard deviational ellipses for each of the point distributions verify the previous findings for differentiating distributions of each incident type. These differences are more distinguishable by bare eye especially for the forms and orientations of the ellipses of incidents against people (Figure 5.12a) and against property (Figure 5.12b). That is, while the former ellipses have relatively narrower width and longer height and oriented in more north-south direction, the latter ellipse have relatively wider width and shorter height and oriented in more west-east direction.

F test (Equality of Variances Test)[28] (Kanji, 1993:37 in Levine and Associates, 2004:B-7) is based on the expectation that the test statistic is significantly larger for the incidents against people due to their more homogeneous spread in *R*, than the F statistics of the other two types of incidents, which are expected to be more confined to southern *planned* neighbourhoods (Figure 5.12 and Table 5.18). While the result of this test (Table 5.18) is found to be confirming the larger SDD for incidents against people with respect to incidents against property (p=1,41E-05), it did not produce a significant result (p=0,7646) for the expected larger value of SDD for incidents against people with respect to the one for against people and property (Figure 5.12 and Table 5.18), in accordance with the respective results found for the mean centers.

Table 5.18 *F* test (Equality of Variances Test) results for the differences in the standard distance deviations of incident types belonging to set of 500 points

Std Dist Dev (m), N	One tailed probability of F	Test value of p with Bonferroni Adjustment (1)
For incid. against people: SDD=1559,64; N=276 For incid. against property: SDD=1155,29; N=187	Between SDD of inc. against peop. and SDD of inc. against prop: 7,0285E-06	1,41E-05
For incid. against people: SDD=1559,64; N=276 For incid. against peop. & pr.: SDD=1489,14; N=37	Between SDD of inc. against peop. and SDD of inc. against people and property: 0,3823	0,7646

(1) Bonferroni test (Anselin, 1995 and SYSTAT, 1996 in Levine and Associates, 2002:B-2) was utilized with a "both-and" condition, through which the set probability value is found by multiplying the critical p value (0,05) by the number of test (Levine and Associates, 2002:B-2), i.e., a pair of test (0,05x2=0,10).

5.1.2.2 Spatial Interaction of Incidents: Localized ("Local Scale") Distribution

In the previous section general spatial distribution of incident types and commitment types were explored (though the latter were at descriptive level). As a main result, the structure of the study area in general was found to be effective in the *global* distribution of incidents in space leading to contrasting patterns between incidents against people and especially against property, and between *squatter* and *planned* developments. Furthermore, in Section 5.1.1.2, *local* spatial properties or *spatial interaction* of incidents in terms of clustering or dispersion was explored. Complementarily, in this section, under condition of *global* effects, such properties (i.e., whether incidents *interact* in urban *space* or if there are any *spatial dependence* (Gatrell et al, 1996:259) among them) are discussed and compared for each of the three incident types and for the first six most frequent commitment types[29] belonging to set of geocoding for 500 points (see Endnote 1).

The findings indicate that the *local* clustering in the general trend of incidents (i.e., when all the incidents are explored together) is in fact, mainly relevant for incidents against property and among them mostly relevant for commercial burglaries/thefts and to a certain degree equally relevant for residential burglaries and thefts from auto. So as to assess these *local* scale differences, *K-order nearest neighbor index analysis*[30] (15^{th} Order), which is tested for its first order by *z* (Clark-Evans) test (see Appendix E), is utilized (Figures 5.13 and 5.14). The observed order, that is, from higher *local* clustering to higher *local* dispersion, of property; people; and people and property is also confirming the results of *z* statistics computed for the 1^{st} order *NNI*[31]. Similarly, the observed order for commitment types are also supported by the result of *z* tests computed for the 1^{st} order *NNI*, with significant clustering for the three commitments against property with an increasing order of residential

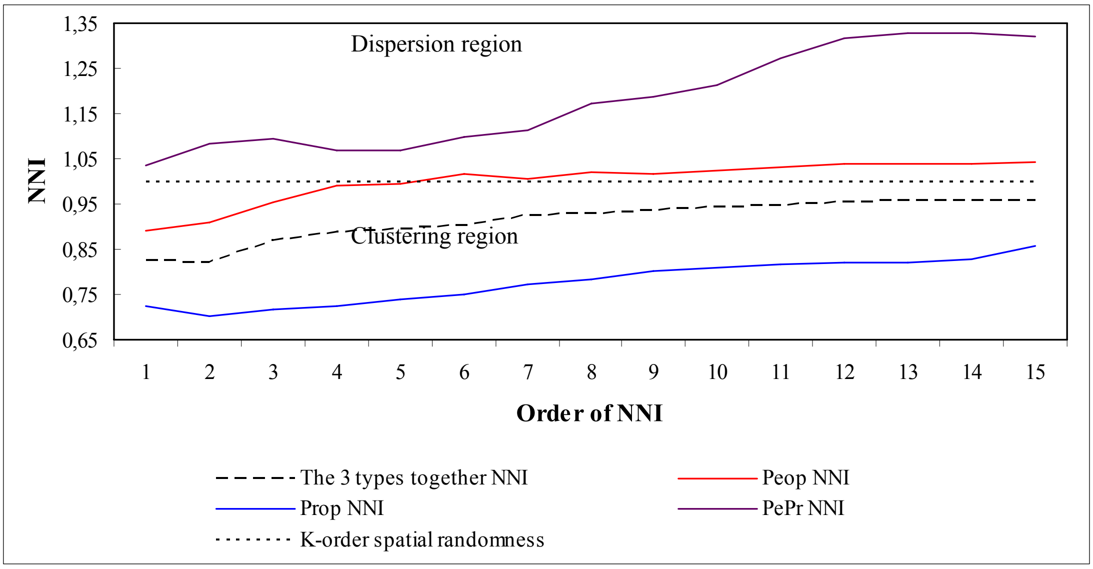


Figure 5.13 Plots of *nearest neighbour indexes* up to 15th order versus their orders for the three types of incidents together and for each of the three incident types with no edge correction
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1. For a comparison with the edge corrected results, see Appendix E.

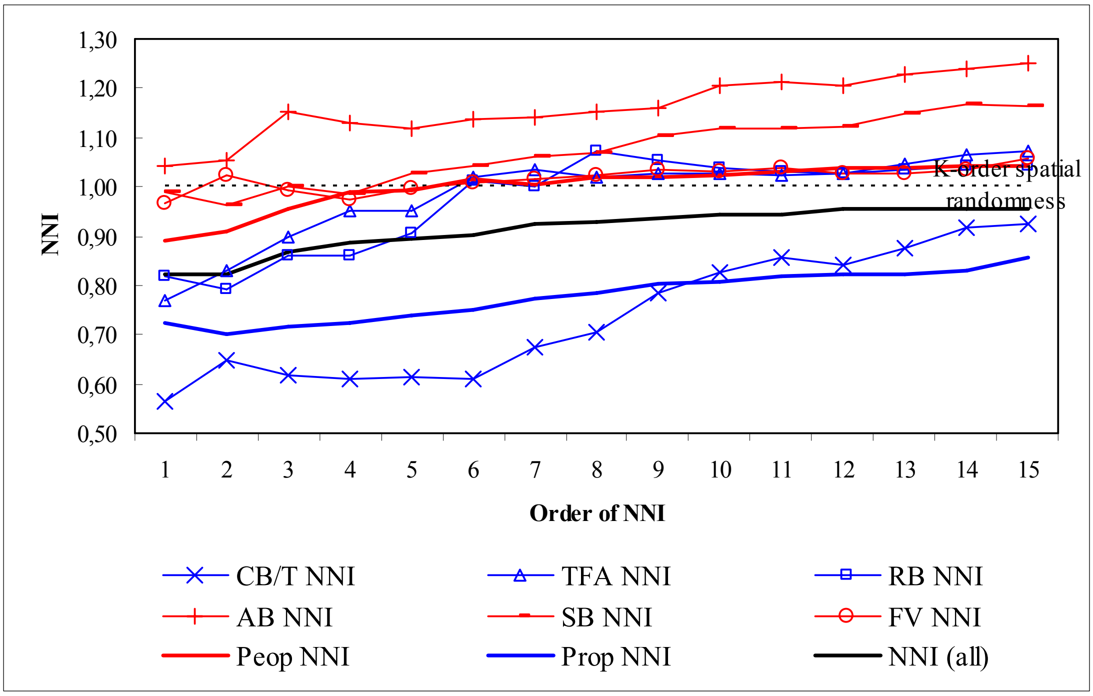


Figure 5.14 Plots of NNI values up to 15th order versus their orders for the three types of incidents together, for each types, and for their most frequent commitment components with no edge correction
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.

burglaries, thefts from auto, and commercial burglaries/thefts; and insignificant clustering and in fact, dispersion for the three commitments against people (aggravated batteries, simple batteries and domestic violences) (See Appendix E).

Moreover, significant *local* scale differences are found to exist among all the pairs of incident types. Similarly, as for commitment types the *local* scale differences are found be among all the pairs of commitments except for pairs of theft from auto-residential burglary (TFA-RB), theft from auto-domestic violences (TFA-DV), and residential burglary-domestic violences (RB-DV). For analyzing these; i.e., for testing whether the differences in the means of the *nearest neighbor indexes* up to 15^{th} order are significant, One-way Repeated Measures ANOVA; and for controlling from where the real difference(s) come(s) from among the pairs of incidents within each grouping, Paired *t* test were used (see Appendix E).

5.1.2.3 Relationship of Incident Distribution and Clustering with the Urban Structure

The aim of this section is to elaborate on the ways that the spatial and social structure could be effective in the incident distribution and clustering at the incident type level. In the first instance it is seen that the development patterns and incident types are not independent of each other. The main *spatial* differences existed between *squatter* and *planned* settlements and incidents against 'people' and against 'property', respectively. *Early stage gecekondu* (*squatter*) settlements witness much less occurrences of incidents, and when they witness, they are found to be dominated by incidents against 'people', contrary to the higher relationship of incidents against 'property' with the *planned* areas (Figure 5.15 and Figure 5.16).

It might be stated that in the areas, such as *early stage gecekondu* (*squatter*) settlements, where physical and socio-economical *opportunities* are not provided for incidents against property to occur, the incidents against people are likely to take place while the reverse is true for settlements such as *planned* areas. For the incidents, which include both type of offence components, i.e., incidents against people and property, the spatial distribution displayed no clear pattern (Figure 5.17).

The lower level of clustering of the incidents against people in the study area, reflect its relatively homogenous distributional characteristic. The only exception to the uniform distribution of incidents against people in the mostly *squatter* settlements is one clustering of

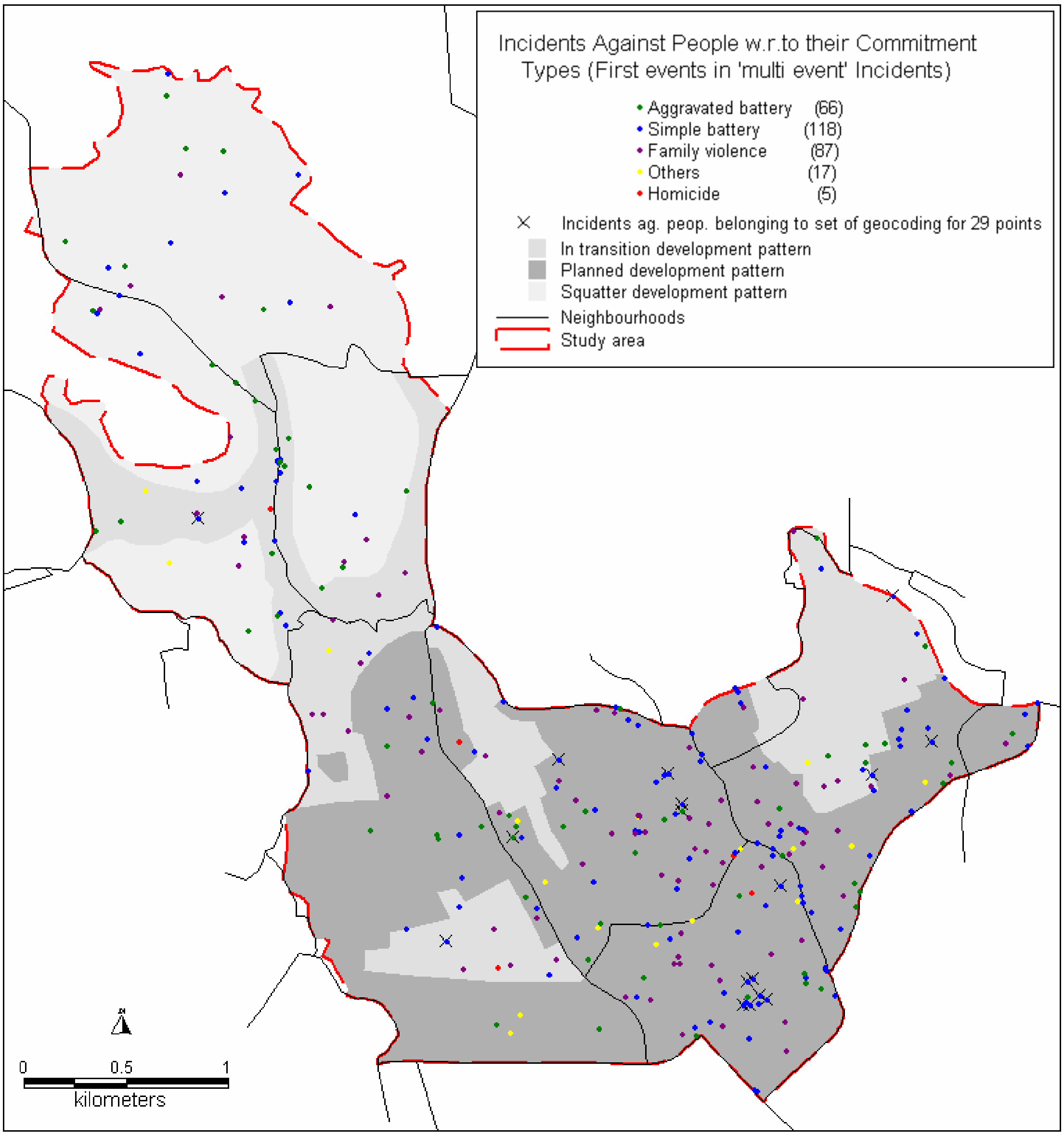


Figure 5.15 Incidents against people differentiated with respect to their commitment types

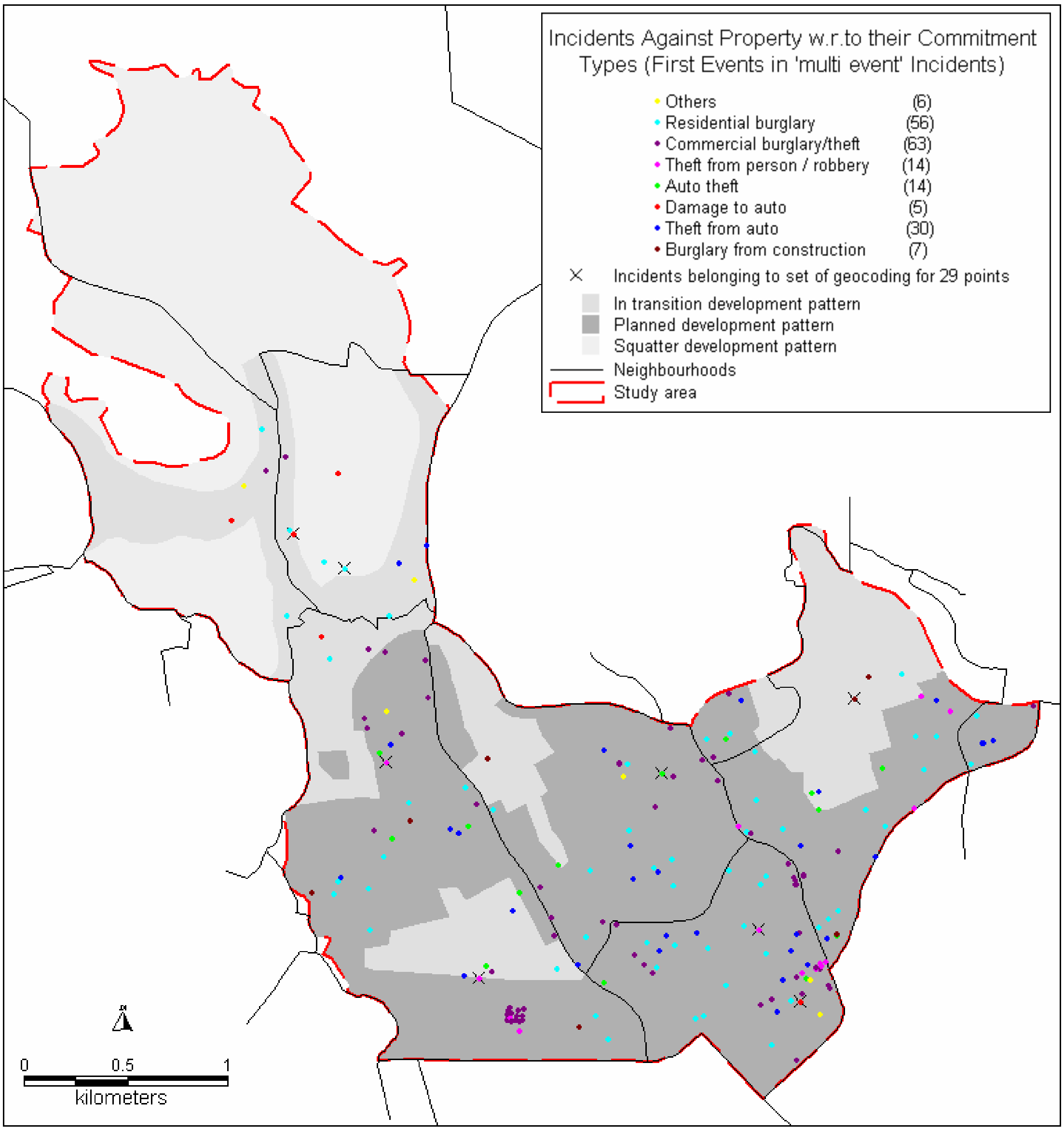


Figure 5.16 Incidents against property differentiated with respect to their commitment types

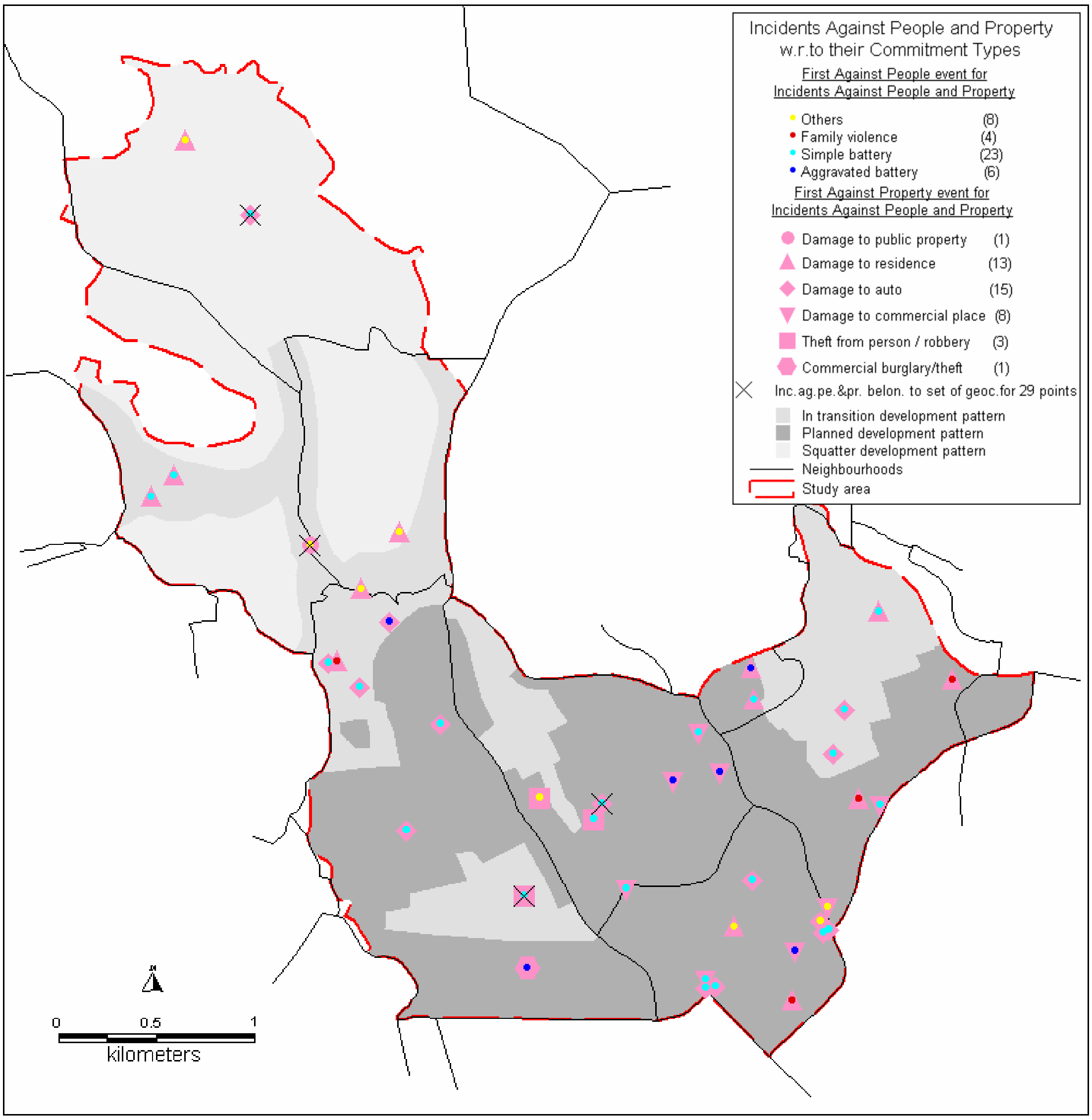


Figure 5.17 Incidents against people and property differentiated with respect to their commitment types

aggravated batteries and simple batteries in their *in-transition* areas. Moreover, when the incidents against property (mainly in the form of residential burglary and damage to auto) are committed, most of the time they take place in their *in-transition* areas, which display similar physical characteristics to those that are found within the *planned* ones. For this reason, the separation of *in-transition* areas from the other two settlements is found worthwhile although such areas are in between the two others with their “semi” and “mixed” physical and social characteristics, and displayed similarities to either of the two in terms of incident distribution.

In addition to the effect of homogeneous urban structure on the relatively random (e.g., in Figure 5.16, compare the relatively clustered distribution of commercial burglaries/thefts with relatively random distribution of residential burglaries) distribution of incidents, other reasons should also be considered. It is likely that while some incidents are distributed more evenly in *space* due to their less relevance to *environmental* settings (such as domestic violences); for some others, such pattern is due to relatively even distribution of targets in *space* (such as residential burglaries and auto thefts).

An elaboration on the hotspots (Appendix G) in terms of incident types and commitments revealed that the clusters are mainly composed of either one (clusters “1” and “3”), two (clusters “2”, “4”, “6) or three (cluster “5”) incident types (Figure 5.18).

The accepted idea of differences in motivations (Buettner and Spengler, 2003:7) and different spatial behaviour (Portnov and Rattner, 2003:13) of offenders, which is referred in the *new ecology* studies, is supported to a certain extend by this comparative analysis at the incident type level. However, further analyses on commitments verified those *ecological*

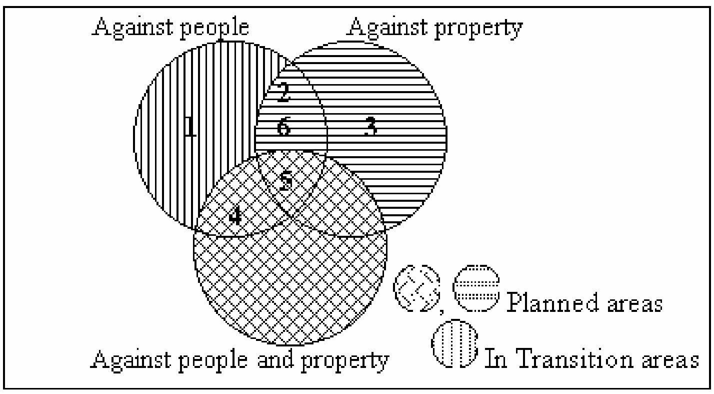
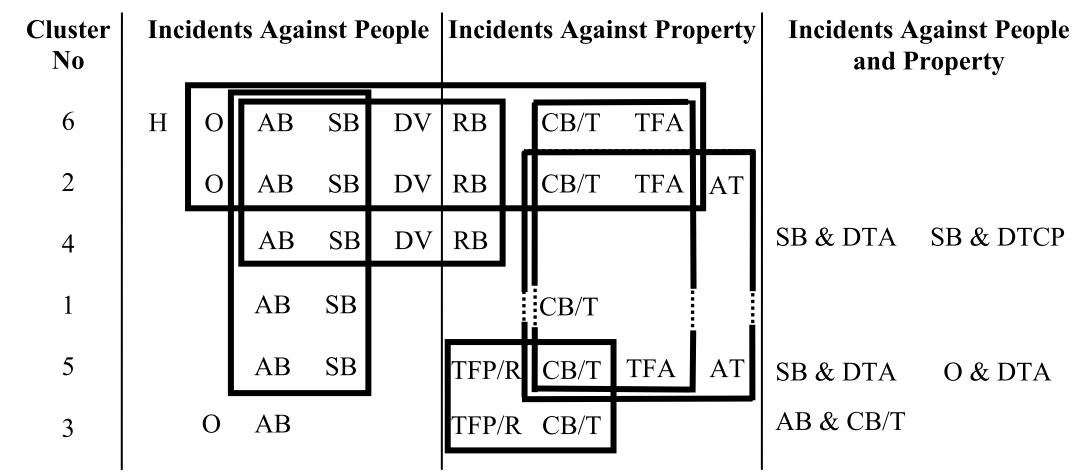


Figure 5.18 The distribution of hotspot areas with respect to incident types

researches to a greater extend. This finding provided more evidence for certain areas to attract different offenders for different commitments. With the analysis in which commitment types are grouped with respect to the clusters (Figure 5.19), it is found that there are probably similar offender motivations behind commitments such as their similar *awareness* and *activity spaces* (see Section 2.2.4).



<u>Most serious incidents against people</u>: H: Homicide, AB: Aggravated battery
<u>Serious incidents against people</u>: SB: Simple battery, DV: Domestic violence
<u>Petty incidents against people</u>: O: Others (either plain stalking, forcible stalking, defamation, sexual annoyance, or weapon display)

<u>Incidents against property</u>: RB: Residential burglary, CB/T: Commercial burglary/theft, TFA: Theft from auto, AT: Auto theft, TFP / R: Theft from person / Robbery

<u>Incidents against people and property</u>: SB & DTA: Simple battery and Damage to auto, SB & DTCP: Simple battery and Damage to commercial place, O & DTA: Others (either plain stalking, forcible stalking, defamation, sexual annoyance, or weapon display) and Damage to auto, AB & CB/T: Aggravated battery and Commercial burglary/theft

Figure 5.19 Hotspots vs. commitment types grouped with respect to at least two commitment types in common

For example, the hotspots from “2” to “6” witness a broader set of commitments. Nevertheless, in line with *Routine Activities* and *Offenders’ Search Area Theories,* while the hotspot areas of “2”, “4” and “6” provided opportunities for particularly residential burglaries, domestic violences, aggravated batteries and simple batteries to take place; hotspot areas of “3” and “5” are commonly preferred by offenders of thefts from person / robbery and commercial burglary/theft. As explained previously, all of these above mentioned clusters are located in the *planned* sections of the southern neighbourhoods. In addition, the detailed information on these clusters, bring out that, on the one hand, the former group of clusters (“2”, “4”, “6”) are found to be located in mainly residential area, but also distinguished with other land uses such as commercial or cultural centres, parks and the like besides high accessibility. On the other hand, the latter group ("3", "5") are mainly dominated by mixed land uses including big commercial centres and with less or even no residential uses and also with high accessibility. By almost continuously ensuring diverse *routine activities* including shopping, business, social services, parks, and also a certain level of housing, particularly the "5th" clustering area also create *opportunities* for other commitments like commercial burglaries/thefts, thefts from auto, aggravated and simple batteries.

The hotspot "1", which is the only clustering in the *in-transition* section of the northern (mostly *squatter*) settlements, relatively witnesses much less variety of incidents. It has high accessibility and functions as the point of change for different transportation modes and leading to-from one of the two main CBDs of the Metropolis. Moreover, it has commercial and service areas in lower stories of residential uses around this hotspot. Hence, it is potentially attractive for aggravated and simple battery offenders.

Similarities/dissimilarities in motivations of offenders could also be supported by the mean number of events in incidents, which is either committed as "single event" incidents[32] as for those against property, or committed as "multi-event" incidents[33] as for the remaining incident types. For the former incident type (i.e., against property) this number implies a single intention in their commitment whereas for the latter two types (i.e., against people, and against people and property) they imply continuous criminal acts.

Other similarities/differences of offenders can be found in the incidents-offender type relationship, which include the incidents to be committed by resident and/or non-resident offenders. The analyses made for the first six most frequent commitment types (Table 5.19) revealed higher percentages (out of known and/or apprehended offenders) of residential offenders for the incidents against people (aggravated batteries (82,8%), simple batteries (79,8%), domestic violences (95,3%)), and higher percentages (out of known and/or apprehended offenders) for non-residential offenders of most of the incidents against property (commercial burglaries/thefts (74,5%), residential burglaries (45,4%), thefts from auto (69%)) validates one of the previously stated critics of *traditional crime ecology theories*, which ignore non-residential offenders and assume that crimes are product of local residents (Anstey, 1998:v).

Table 5.19 Home origin of known and/or apprehended offenders of the most frequent incident commitments belonging to set of 529 points

	Incidents Against People			Incidents Against Property		
	AB	SB	DV	CB/T	RB	TFA
Occurrences (n)	66	118	87	63	56	30
Known and/or apprehended offenders and thus, known residences (n and %)	64 **(97%)**	114 **(97%)**	87 **(100%)**	47 **(75%)**	22 **(39%)**	29 **(97%)**
All or majority of offenders are from the same neighbourhood/home based (%)			87,3			
All or majority of offenders are from nearby neighbourhoods (%)			8,0			
All or majority of offenders are from the same/nearby neighbourhoods (%)	82,8	79,8		21,3	54,5	20,7
Sub Total	**82,8**	**79,8**	**95,3**	**21,3**	**54,5**	**20,7**
All or majority of offenders are from the farther neighbourhoods within AMA (%)	17,2	11,4	3,4	66,0	22,7	34,5
All or majority of offenders are outside of AMA/Ankara Province (%)		1,75	1,1	8,5	22,7	34,5
Sub Total	**17,2**	**13,15**	**4,5**	**74,5**	**45,4**	**69,0**
Half of offenders are from the same/nearby neighbourhoods and half from the farther neighbourhoods within AMA (%)		5,3				10,3
Half of offenders are from the same/nearby neighbourhoods and half from outside of AMA/Ankara Province (%)		1,75				
Half of offenders are from the farther neighbourhoods within AMA and half from outside of AMA/Ankara Province (%)				4,2		
Sub Total	**0,0**	**7,05**	**0,0**	**4,2**	**0,0**	**10,3**
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**

On the contrary, these results are in line with empirical studies stating that motivation of offenders (Buettner and Spengler, 2003:7) and determinants of the *spatial* distribution of violent crime or offenders are different from that of non-violent crime or offenders (Hesseling, 1992 in Quimet, 2000). As Hesseling (1992:10 in Quimet, 2000) further concludes "violent crimes in neighbourhoods are more often the result of the residence of offenders in these neighbourhoods, while the variation in property crimes is more often the result of differences in opportunity structure" and the latter are generally committed by offenders living the outside of the crime commitment locality (Portnov and Rattner, 2003:13).

5.2 Temporal and Spatio-temporal Analysis of Incidents

As stated previously, in *place-based (new ecological) crime theories*[34], the "place" dimension of crime, in fact, refers to "a discrete location in time and space" (Brantingham and Brantingham, 1981a:8). Therefore, according to these theories "*time*" is as important as "*space*" element in occurrence of criminal activities. The main premise of these theories is stated as *spatio-temporal* conditions affect the distribution of criminal events such that some targets (in terms of *space* and *time*) become more attractive than others. In line with this, so as to have a complete understanding of ecology of incidents and to achieve more elaborate implications for urban planning and policing, in the following sections, "*time*" component of incidents are explored both separately and together with the "*space*" component.

In the first subsection, the three incident types are explored together and in the second subsection they are differentiated with respect to their types and commitment types. In both of these subsections, first, a *temporal* analysis is carried out. This analysis is performed with a general or *global* perspective. *Temporal* distribution of incidents is explored to find whether it is *random, clustered*, or *regular (dispersed)*). Secondly, analyses concerning the general or *global spatial* distribution of incidents in time (months) are presented. Thirdly, contrary to the previous stage, at this stage of the analysis, "*space*" and "*time*" variables are treated simultaneously and the problem is approached form a localized or *local* perspective. Thus, an elaboration for *space-time interaction* of incidents became possible. This scale of analysis is based on the expectation of incidents to display different *local* scale space-time patterns or *space-time interaction.* That is, whether the incidents are *clustered* in *space* and *time* (attract each other) or *dispersed* (repel each other) or whether the incidents attract each other in *space* while repelling each other in *time* or vice versa. Fourthly, relationship of incident distribution and clustering with the urban structure in terms of both *space* and *time* is discussed.

In Appendix H, limitations of and resolutions for the date-time variables of the incident data set are explained.

5.2.1 The Three Incident Types Together

At this first stage of the analysis, the incidents are not differentiated with respect to their types and their commitment types, but are taken into consideration as a whole.

5.2.1.1 Temporal Distribution of Incidents: General ("Global Scale") Distribution

Similar to heterogeneity of the study area, which offers differentiating levels of *spatial opportunities* for occurrences of criminal activities, the study period also expected to display differentiating *temporal opportunities*. The analyses below are based on the expectation of non-random distribution of incidents in *time* as they did in *space*.

Descriptive Analyses. In order to assess what periods of the year witness more number of incident occurrences, a frequency analysis is performed for months and weeks of the study period (Figures 5.20a and 5.20b).

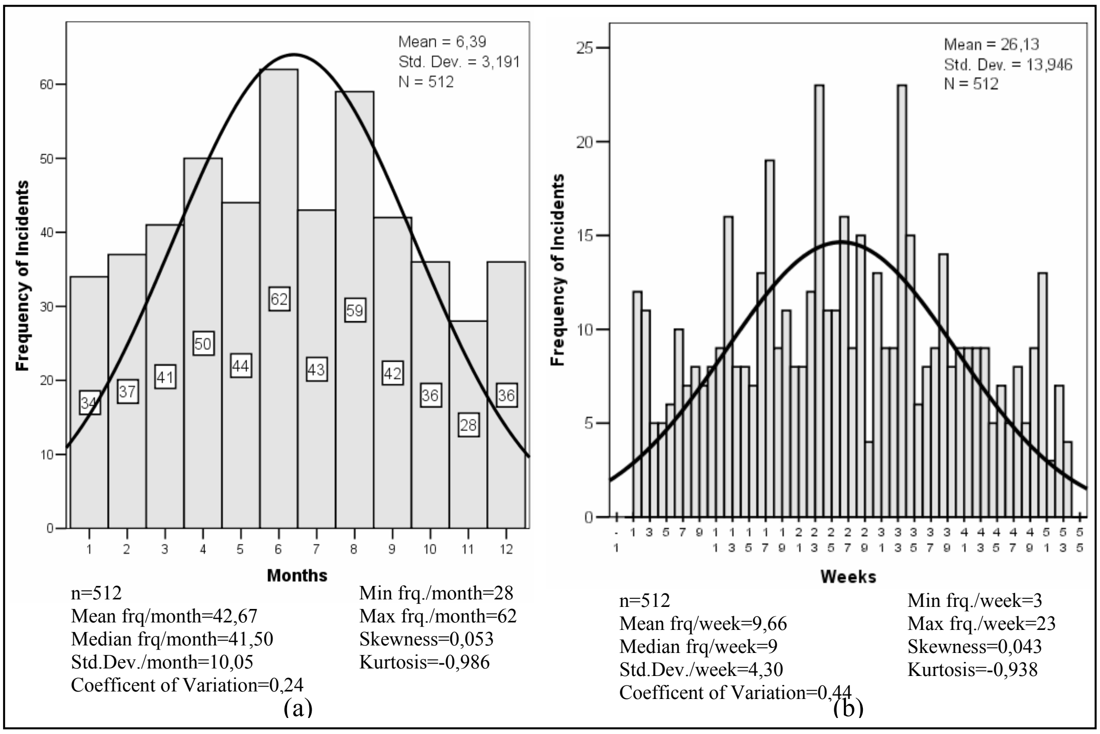


Figure 5.20 Distribution of the three types of incidents together according to the months of the year 2000
Note: The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

When the frequencies of all the three types of incidents with respect to months of the year (Henry and Bryan, 2000:13-14) 2000 are compared, it is observed that the distributions are peaked in mid period of the year, i.e., in April, June, and August (50, 62, 59, respectively) (Figure 5.20a). From these peaks in the middle towards the first and the last months of the year, the incidents decrease in number. The smallest amount of incidents occurred in November (28) and second smallest amount took place in January (34) (Figure 5.20a). Likewise, the weekly distribution of incidents suggest increase of incidents mainly in the middle period of the year, the highest weekly frequencies (23) correspond to 24th ad 34th weeks, which belong to June and August, respectively (Figure 5.20b).

Statistical Tests. In order to find whether the observed uneven incident distribution in *time* is statistically significant, a test for *Complete Spatial Randomness (CSR)* is performed. However, this time, the word "*spatial*" for the Poisson distribution is better to be replaced by the word "*temporal*", implying *Complete Temporal Randomness (CTR)*. For this purpose, Quadrat Method (see Appendix E) is applied and tested by Chi-Square (Table 5.20).

Table 5.20 Testing of quadrats for Complete Temporal Randomness (1)

Quadrat size	**ID**	**ICS**	**Number of quadrats (N)**	**Degrees of freedom**	**Test Value of Chi-square (2)**	**Significance level**
daily time intervals	1,12	0,12	1098	1097	1234.50	0,002
days	1,19	0,19	366	365	434.24	0,007
Weeks	1,53	0,53	53	52	93,93253968	0,0003
Months	2,20	1,20	12	11	24.24	0,01

(1) The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.
*(2) Test value of Chi-square=df * VMR for each set of N.*

Similar to different size *spatial* quadrats for *R*, Poisson distribution for *temporal* analysis is performed by using different *time* quadrats for the year 2000 (Figure 5.21 and Table 5.21).

With reference to the Chi-square testing of *Index of Dispersion (ID)* (or Variance-Mean Ratio (VMR), and equivalently *Index of Cluster Size (ICS)*), the results found to be statistically significant for months, weeks, days, and three daily time intervals (*p*=0,02; *p*=0,007; *p*=0,0003; *p*=0,01, respectively). That is, the indexes display clustering at these different *temporal* levels with their values larger than 1 and 0, respectively (Bailey and Gatrell, 1996:97) (Table 5.20).

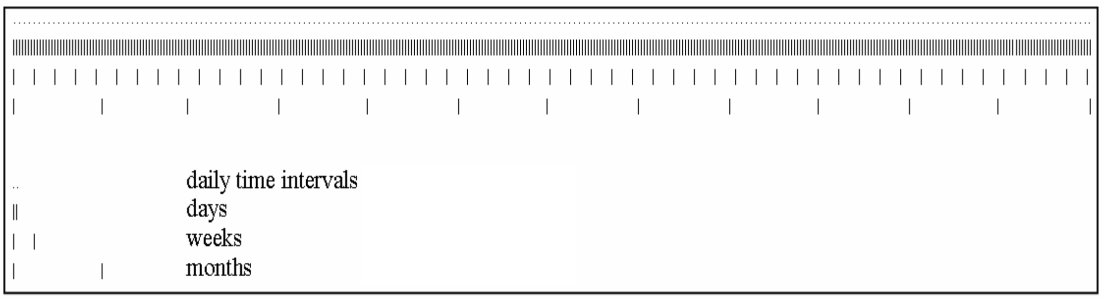


Figure 5.21 The visualization of dividing the study period (the year 2000) into different quadrats of time

Table 5.21 Different size time quadrats chosen for the study period (*)

Size of the quadrats	Number of quadrats (N)	Number of empty quadrats	Mean count per quadrat	Percentage of quadrats with zero counts
daily time intervals	1098 (1)	712	0.46	65%
days	366 (2)	102	1.38	28%
Weeks	53 (3)	0	9.51	0%
Months	12 (4)	0	42	0%

(*) The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.
(1) Even though the time intervals 00-08, 08-18, 18-00 have respective hours of 8, 10, 6 they were assumed to be the same (8 hours) in this analysis.
(2) The year 2000 has 366 days due to the February month which had 29 days duration.
(3) In this analysis, the 366 days equals to 52,28 weeks. This number is rounded up to 53.
(4) Even though the durations of the months was either 29, 30 or 31 days, they were assumed to be the same in this analysis (30,5 days).

5.2.1.2 Spatial Distribution of Incidents in Time (Months): General ("Global Scale") Distribution

Similar to heterogeneity of the study area characterized by the three development patterns (*planned, squatter* and *in-transition*), which offered differentiating levels of *spatial opportunities* for occurrences of criminal activities, the study period also offered differentiating *temporal opportunities*. In the following, *spatial* dimension of incidents are explored with respect to months.

Descriptive Analyses. The spatial distribution of incidents (with units of incidents per hectare) are computed and mapped[35] with respect to months of the year 2000 through Kernel Estimation (Figure 5.22).

The visualization of the *Kernel Estimation* densities of the incidents with respect to months suggests differences not only among the hotspots places but also among the amounts and densities of them. Accordingly, among winter season months, January; and among the spring and summer months of 2000, April, May, June, and August, have the highest number of hotspots that are located in near proximities and in relatively continuous manner and with larger sizes (see Figures 5.22 b, e, f, g, i). On the other hand, *spatial* distribution of incidents has the least number of clusters and smaller areas during several months in autumn and winter, which are November, December and February in 2000 (see Figures 5.22 l, a, c). These clusters are observed in different areas and not in near proximities of each other. The remaining months of the year display still different distribution of hotspots in between these two different extremes. As for the differences with respect to development patterns, the areas having mostly *planned* patterns in the southern neighbourhoods (e.g., *Etlik, Aşağı Eğlence,*

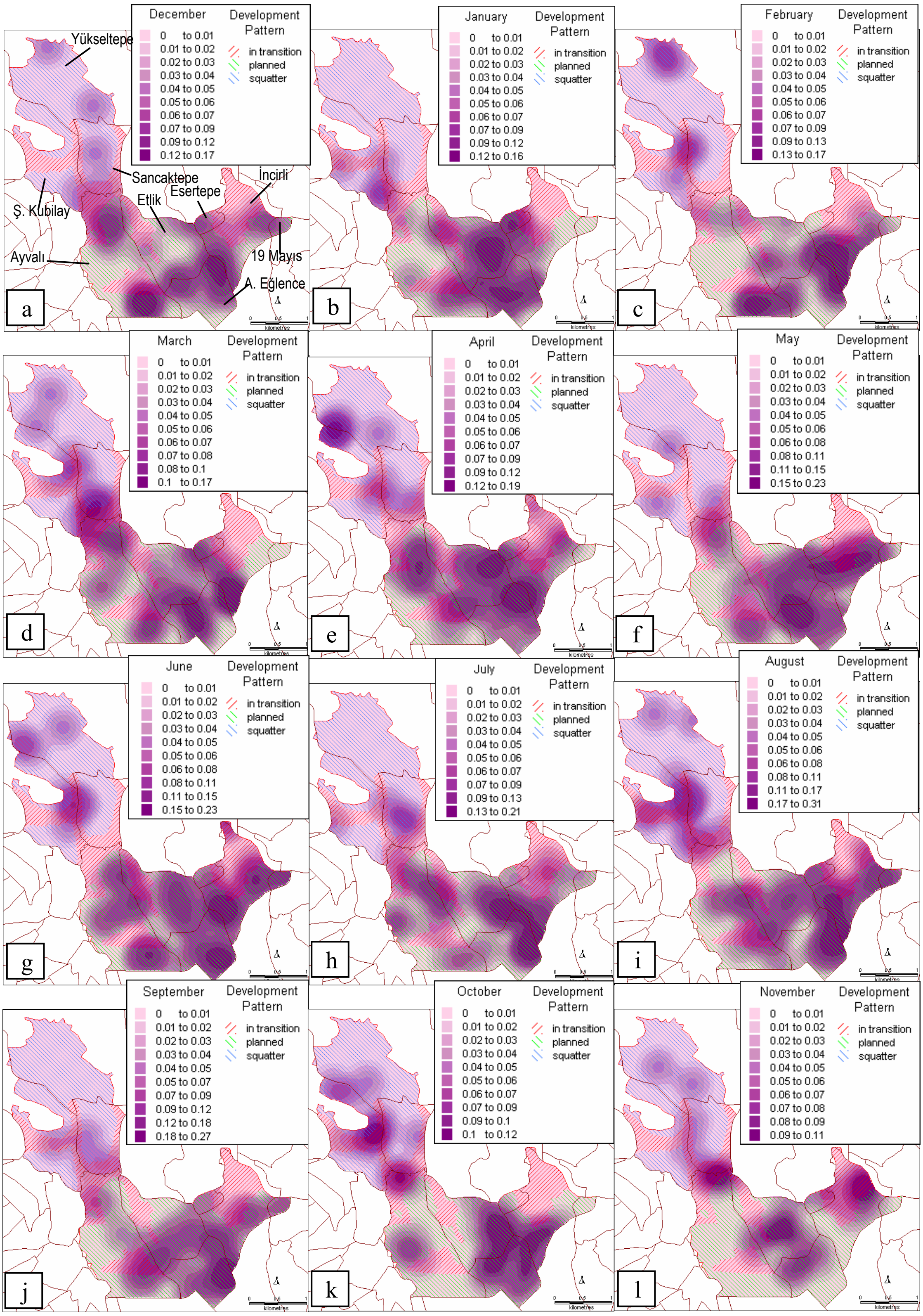


Figure 5.22 Results of the *fixed bandwidth (500 m) Kernel Estimation*
Note: The incidents belonging to set of geocoding for 500 points (see Endnote 1) with units of incidents per hectare with respect to months of the year (year 2000)

Ayvalı İncirli) turn to have the most frequent number of such hotspots while the mostly *squatter* settlements (i.e., *Yükseltepe, Sancaktepe, Şehit Kubilay*) have the least number these hotspots (Figure 5.22). Furthermore, whenever such hotspots are observed in the mostly *squatter* northern neighbourhoods, most of the time (e.g., in the months of February, March, June, August, October) they are found to take place nearby their *in-transition* sections, which is almost located in the intersection of the boundaries of the neighbourhoods (see Figures 5.22 c, d, g, i, k).

Statistical Tests. In order to test the spatial differences with respect to months observed by mapping, One-way Repeated Measures ANOVA is performed (Table 5.22). Paired t test analyses with Bonferroni adjustment (Stevens, 1986:423) is carried out to find the differences between months (Table 5.19).

The multivariate results[36] found by comparison of the monthly observations on the same subjects (the *Kernel Density* grid values) revealed significant (p<0,0005) Wilks' Lambda result (0,586) with eta sq (0,414) for differences having large effect sizes (Cohen 1988 in Pallant, 2001:199). In other words, the results of the One-way Repeated Measures ANOVA suggested statistically significant (p<0,0005) differences among the *spatial* distributions of the incidents among months (Table 5.22).

As stated above, the real source of differences among the *spatial* distributions with respect to months is assessed by the paired *t* test with Bonferroni restrictions where *p* value=0,00076, which is calculated by dividing the critical significance level of 0,05 by number of tests (66). It is found that among the 66 monthly pairs only 6 pairs were similar. These pairs are January and December; February and October; February and December; March and July; June and August; and October and December (Table 5.23).

Table 5.22 One-way Repeated Measures ANOVA Multivariate Tests Results for months (1)

Effect	**Tests**		**F** (Exact statistic)	**Sig.**	**Partial Eta Squared**
Months (2)	Pillai's Trace	0,414	1525,867	p<0,0005	0,414
	Wilks' Lambda	0,586	1525,867	p<0,0005	0,414
	Hotelling's Trace	0,708	1525,867	p<0,0005	0,414
	Roy's Largest Root	0,708	1525,867	p<0,0005	0,414

(1) Incidents belonging to set of geocoding for 500 points. See Endnote 1. n=12, df=11, error n=23734, error df=23723. Multivariate Test Design: Intercept
(2) Within Subjects Design

Table 5.23 Paired *t* test results with Bonferroni adjustment for the differences between monthly distribution (*)

Pairs	Paired Differences					t	Sig.
	Mean	Std. Dev.	Std. Error Mean	95% Con. Int. of the Difference		(df=23733)	(2-tailed)
				Lower	Upper		
January-February	0,00103	0,04268	0,00028	0,00049	0,00157	3,711	<0,0005
January-March	-0,00297	0,03383	0,00022	-0,00340	-0,00254	-13,534	<0,0005
January-April	-0,01123	0,03706	0,00024	-0,01170	-0,01076	-46,682	<0,0005
January-May	-0,00902	0,03735	0,00024	-0,00949	-0,00854	-37,195	<0,0005
January-June	-0,01859	0,04420	0,00029	-0,01915	-0,01803	-64,796	<0,0005
January-July	-0,00283	0,03776	0,00025	-0,00331	-0,00235	-11,532	<0,0005
January-August	-0,01911	0,04944	0,00032	-0,01974	-0,01848	-59,544	<0,0005
January-September	-0,00489	0,03800	0,00025	-0,00538	-0,00441	-19,833	<0,0005
January-October	0,00117	0,03667	0,00024	0,00070	0,00163	4,904	<0,0005
January-November	0,00895	0,03998	0,00026	0,00844	0,00946	34,486	<0,0005
January-December	0,00048	0,03750	0,00024	0,00000	0,00096	1,966	0,049
February-March	-0,00400	0,03670	0,00024	-0,00447	-0,00353	-16,792	<0,0005
February-April	-0,01226	0,04340	0,00028	-0,01281	-0,01170	-43,503	<0,0005
February-May	-0,01005	0,04707	0,00031	-0,01065	-0,00945	-32,883	<0,0005
February-June	-0,01962	0,03908	0,00025	-0,02011	-0,01912	-77,341	<0,0005
February-July	-0,00385	0,03636	0,00024	-0,00432	-0,00339	-16,332	<0,0005
February-August	-0,02014	0,04249	0,00028	-0,02068	-0,01960	-730,004	<0,0005
February-September	-0,00592	0,03771	0,00024	-0,00640	-0,00544	-24,186	<0,0005
February-October	0,00014	0,04117	0,00027	-0,00038	0,00066	0,522	0,602
February-November	0,00792	0,04721	0,00031	0,00732	0,00852	25,847	<0,0005
February-December	-0,00055	0,03039	0,00020	-0,00094	-0,00016	-2,785	0,005
March-April	-0,00826	0,03478	0,00023	-0,00870	-0,00781	-36,572	<0,0005
March-May	-0,00605	0,04462	0,00029	-0,00661	-0,00548	-20,877	<0,0005
March-June	-0,01562	0,04587	0,00030	-0,01620	-0,01503	-52,450	<0,0005
March-July	0,00014	0,03833	0,00025	-0,00034	0,00063	0,583	0,560
March-August	-0,01614	0,04902	0,00032	-0,01676	-0,01551	-50,715	<0,0005
March-September	-0,00192	0,04208	0,00027	-0,00246	-0,00139	-70,031	<0,0005
March-October	0,00414	0,03168	0,00021	0,00374	0,00454	20,127	<0,0005
March-November	0,01192	0,03731	0,00024	0,01145	0,01240	49,221	<0,0005
March-December	0,00345	0,03084	0,00020	0,00306	0,00384	17,233	<0,0005
April-May	0,00221	0,04567	0,00030	0,00163	0,00279	7,457	<0,0005
April-June	-0,00736	0,04021	0,00026	-0,00787	-0,00685	-28,198	<0,0005
April-July	0,00840	0,03516	0,00023	0,00795	0,00885	36,813	<0,0005
April-August	-0,00788	0,04758	0,00031	-0,00849	-0,00727	-25,515	<0,0005
April-September	0,00634	0,04018	0,00026	0,00583	0,00685	24,294	<0,0005
April-October	0,01240	0,03738	0,00024	0,01192	0,01287	510,095	<0,0005
April-November	0,02018	0,04159	0,00027	0,01965	0,02071	74,748	<0,0005
April-December	0,01171	0,03629	0,00024	0,01125	0,01217	49,695	<0,0005
May-June	-0,00957	0,04500	0,00029	-0,01014	-0,00900	-32,764	<0,0005
May-July	0,00619	0,04769	0,00031	0,00558	0,00680	200,002	<0,0005
May-August	-0,01009	0,05394	0,00035	-0,01078	-0,00940	-28,817	<0,0005
May-September	0,00413	0,04268	0,00028	0,00358	0,00467	14,894	<0,0005
May-October	0,01019	0,04533	0,00029	0,00961	0,01076	34,620	<0,0005
May-November	0,01797	0,04422	0,00029	0,01740	0,01853	62,596	<0,0005
May-December	0,00950	0,04202	0,00027	0,00896	0,01003	34,819	<0,0005
June-July	0,01576	0,03695	0,00024	0,01529	0,01623	65,725	<0,0005
June-August	-0,00052	0,04272	0,00028	-0,00106	0,00002	-1,875	0,061
June-September	0,01370	0,04077	0,00026	0,01318	0,01422	51,749	<0,0005
June-October	0,01976	0,04571	0,00030	0,01917	0,02034	66,578	<0,0005
June-November	0,02754	0,05179	0,00034	0,02688	0,02820	81,912	<0,0005
June-December	0,01907	0,04212	0,00027	0,01853	0,01960	69,741	<0,0005
July-August	-0,01628	0,03942	0,00026	-0,01678	-0,01578	-63,633	<0,0005
July-September	-0,00207	0,03367	0,00022	-0,00249	-0,00164	-9,449	<0,0005
July-October	0,00399	0,03621	0,00024	0,00353	0,00445	16,993	<0,0005
July-November	0,01178	0,04495	0,00029	0,01120	0,01235	40,354	<0,0005
July-December	0,00331	0,03522	0,00023	0,00286	0,00375	14,457	<0,0005
August-September	0,01422	0,03401	0,00022	0,01378	0,01465	64,393	<0,0005
August-October	0,02028	0,04821	0,00031	0,01966	0,02089	64,791	<0,0005
August-November	0,02806	0,05619	0,00036	0,02734	0,02877	76,922	<0,0005
August-December	0,01959	0,04883	0,00032	0,01897	0,02021	61,795	<0,0005
September-October	0,00606	0,04306	0,00028	0,00551	0,00661	21,679	<0,0005
September-November	0,01384	0,05068	0,00033	0,01320	0,01449	420,071	<0,0005
September-December	0,00537	0,03666	0,00024	0,00490	0,00584	22,570	<0,0005
October-November	0,00778	0,03913	0,00025	0,00728	0,00828	30,632	<0,0005
October-December	-0,00069	0,04218	0,00027	-0,00123	-0,00015	-2,516	0,012
November-December	-0,00847	0,04062	0,00026	-0,00899	-0,00795	-32,125	<0,0005

(*) Incidents belonging to set of geocoding for 500 points. See Endnote 1.

These findings enabled more elaborate comparison of incident patterns in different months than by simple mapping. For example, the differences between months go up to 91% (i.e., 60 out of 66 comparisons) when a detailed statistical comparison of space is performed. This comparison is made with the units of incidents per hectare through very fine grids of *Kernel Estimation*.

5.2.1.3 Space-time Interaction of Incidents: Localized ("Local Scale") Distribution

In the previous stage, *spatial* and *temporal* distributions of incidents were considered separately. Although *spatial* distributions with respect to monthly *temporal* level were assessed, these analyses did not cover simultaneous treatment of *space* and *time* attributes of the incident data. In other words, previously, it was assumed that "spatial and temporal effects…operate independently." (Diggle et al, 1995:124). Nevertheless, in the following sections, it is expected that the incident data would display *space-time interaction*, in terms of either clustering or dispersion. Therefore, the analyses below deal with the *space* and *time* attributes of incidents simultaneously for different time periods (months, weeks, days, and days with three daily time intervals). The questions such as "Are incidents which found to be clustering in *space* and also in *time* separately, display such a clustering simultaneously or do they interact in a reverse manner exhibiting dispersion?" are tried to be answered.

Space-time interaction of incidents is explored by utilizing *Mantel Index* and assessed by Monte Carlo Simulation (see Table 5.24). *Mantel Index* is used in order to avoid arbitrary definitions of the *space* (distance) and *time* intervals as in Knox Index. A comparison between the two methods is given in Appendix E. *Mantel Index,* is simply, the Pearson's r between the distance (direct measurement in meters) and time intervals (distances between time units)[37] (Mantel, 1967 in Levine and Associates, 2004:9.8) for the pairs of incidents. Therefore, with *Mantel Index* both the direction, and the strength of the relationship between the distance and time for the pairs of incidents can be explored.

The existence of significant *spatial interaction* (in terms of both clustering and dispersion) is indicated by significant difference of *Mantel Index* from zero, which cannot be attributed to random distribution[38] (Table 5.24). A positive observed *Mantel Index* larger than the 95% percentile (one-tail test) simulated index, or larger than the 97,5% percentile (two-tail test) simulated index displays significant *space-time clustering*. Similarly, a negative observed *Mantel Index* smaller than the 95% percentile (one-tail test) simulated index, or smaller than

Table 5.24 Mantel Index analysis for the three types of incidents together (*)

Time Unit (selected in the software) Months(1) Weeks (2) Days* (3) Days**(4)	**n**	**Mantel Index** **(Pearson's r)**	**Distribution of simulated index (percentile):**			Decision for rejecting the null hypotheses stating **there is no space-time interaction** and/or **there is no space-time clustering**	
			2,5	**97,5**	**95,0**	Decision on **space-time interaction** (two-tail) lower tail (if MI < 2,5 simul. percentile then **dispersion** exists) or upper tail (if MI > 97,5 simul. percentile then **clustering** exists) *p*=0,025 level	Decision on **space-time clustering** (one-tail) upper tail (if MI > 95 simulated percentile then **clustering** exists) *p*=0,05 level
Months	483	-0,00216	-0,02018	0,01986	0,01669	(no dispersion, or clustering)	(no clustering)
Weeks	483	-0,00016	-0,01863	0,02092	0,01684	“	“
Days*	483	-0,00084	-0,02029	0,01993	0,01598	“	“
Days**	475	-0,00301	-0,01884	0,01988	0,01675	“	“

(*) Incidents belonging to set of geocoding for 500 points (see Endnote 1) for four different time periods with direct measurement of space (distance) with 1000 Monte Carlo simulations.
(1) "Months" has integer values between 1 and 12, and 0 for null values.
(2) "Weeks" has integer values between 1 and 53, and 0 for null values.
(3) "Days" has integer values between 1 and 366, and 0 for null values.*
*(4) "Days**" time unit has real values obtained by addition of days and the three daily time intervals divided by 10 and the values range from 1,1 to 366,3 and 0 is used for null values.*

the 97,5% percentile (two-tail test) simulated index displays significant *space-time dispersion* (Levine and Associates, 2004:9.10, 9.42). As the absolute values of the observed index approach to 1, the strength of the clustering or dispersion increases, respectively.

The analysis results indicated that there is no significant *space-time interaction* in terms of either clustering or dispersion among the pairs of incidents for months, weeks, days, and days with three daily time intervals.

5.2.1.4 Relationship of Incident Distribution and Clustering with the Urban Structure

In this section, the aim is to explore the ways in which the urban the *spatial* and *temporal* structure could be effective in the incident distribution and clustering.

From this point of view, not only the characteristics of *spaces* for high level of concentration of incidents, but also their persistence in *time* (i.e., *spatio-temporal* incident hotspots) is elaborated. This elaboration is made through the comparison of monthly *Kernel Estimations* in terms of the areas and roads/streets in nearby of which the highest density hotspots exist in the three different development patterns (Table 5.25).

Table 5.25 The areas and roads/streets in nearby of which hotspots are observed in monthly *Kernel Estimations*

Row Total =114 Mean=9.5	Months	*The most northern section of Yükseltepe*	*The southern section of Sancaktepe*	3 Road	1 Road (1)	Mehtap Road	Özlem Road	130 Street (2)	Seval Road (3)	Kardeşler Cooperative	Ayyalı Road (4)	6 Road (5)	Metro Gros Market	Adnan Yüksel Road	Yeni Etlik Road (6)	Kasalar Kavşağı (Kasalar Junction)	Giresun Road	Gen. Dr. Tevfik Sağlam Road	Atadan Road	Meşeli Street	Kuyuyazısı Road	İncili Street	Altıyol Street	Ahmet Şefik Kolaylı Road (7)	Refik Saydam Road (3)	Şehit Mehmet Altanlar Street (3)	Sümbüllü Street (3)	Yunus Emre Road
6	December								X			X	X					X	X						X			
11	January							X			X	X			X	X	X	X		X	X	X		X				
6	February	X									X		X					X									X	X
9	March	X	X		X	X					X		X			X		X	X									
10	April			X		X			X	X	X			X				X		X			X		X			
11	May					X			X				X	X	X			X	X	X			X			X		X
15	June			X		X			X	X	X		X				X	X		X	X	X	X		X		X	X
9	July		X						X	X	X		X				X	X				X			X			
13	August	X				X	X	X		X	X			X			X	X			X			X	X			X
8	September										X	X		X		X	X	X								X		X
9	October			X	X	X	X			X								X		X	X							X
7	November				X	X									X					X	X			X	X			
Column Tot.=114 Mean = 4.2		3	2	3	3	7	2	2	5	5	8	3	6	4	3	3	5	11	3	6	5	3	3	3	6	2	2	6

Display *squatter* area properties
In its whole or partial section(s) display(s) both *squatter* and *in transition* area properties
Display *in transition* area properties
In its whole or partial section(s) display(s) both *in transition* and *planned* area properties
Display *planned* area properties

(1) Incidents occurred in proximities of its both properties, 3 sections (two have squatter, one has in-transition properties)
(2) Incidents occurred in proximities of its in transition properties, 2 sections (one has squatter, one has in-transition properties)
(3) Incidents occurred in proximities of its both properties, 1 section (has in-transition and planned properties)
(4) Incidents occurred in proximities of its both properties, 2 sections (one has both in-transition and planned, one has planned properties)
(5) Incidents occurred in proximities of its in transition properties, 1 section (northern side has in-transition, southern side has planned properties)
(6) Incidents occurred in proximities of its both properties, 3 sections (one has both in-transition and planned, two have planned properties)
(7) Incidents occurred in proximities of its planned properties, 2 sections (one has in-transition, one has planned properties)

In line with this, the following comparison involves the evaluation of the persistency of incidents first, by utilizing their monthly and overall means computed for certain areas and roads/streets in nearby of which the highest density hotspots exist, and which display either one or two of the three development patterns. Secondly, the persistency of incidents is evaluated in relation to the characteristics of these areas by utilizing their observed monthly means for the hotspots.

It is observed that the months of November, December and February witness the smallest number of such hotspots (7, 6 , 6, respectively), which is below the mean value of 9,5. On the other hand, the months of January, April, May, June and August have more number of such locations (11, 10, 11, 15 and 13, respectively), which is larger than the mean value of 9,5 (Table 5.25). When the locations are compared it is seen that the most persistent areas of incidents occurrence have *planned* development pattern. In other words, the hotspots which have at least 5 months duration in the year 2000 (where the mean is 4,2) are found in nearby of such locations and roads/streets. There are eleven of such proximities, which have *in-transition* (1), and both *in-transition* and *planned* (3), or *planned* (7) characteristics.

The highest number (11) of persistent clusters, i.e. throughout the year except for November, is seen around the *Gen. Dr. Tevfik Sağlam Road* (Table 5.25). Directly connected to this area, which has the densest, most heterogeneous, and highest diversity of land uses in the study area, there are four main roads. While two of them resemble more to the above stated *Gen. Dr. Tevfik Sağlam Road*, the others have more residential areas with more homogeneous social structure composed of relatively higher income groups. In the *planned* settlements, the surroundings of *Kardeşler Cooperative*, which is designed with two types of residential areas composed of twin houses and apartment buildings, witness relatively small number of monthly hotspots (5) as compared to *Metro Gros Market* (6), and as compared the more heterogeneous residential sections like surroundings of *Meşeli Street* (6), and *Yunus Emre Road* (6), which provide opportunity for occurrence of incidents (Table 5.25).

One of the four remaining road/streets in nearby of which hotspots are seen persistently during at least 5 months period (higher than the mean of 4,2) displays *in-transition* characteristics, and the other three display both *in transition* and *planned* properties. In the *planned* sections of two of these roads, which were developed in earlier periods the spatial structure is distinguished by a relatively lower density mainly up to maximum three residential upper floors and one commercial ground floor. However, in the newly *planned* developments and in already redeveloped areas of *in transition* developments, this density increases generally to a minimum of four residential upper floors and one commercial ground floor.

In the following, temporal periods during which the incidents occurred less frequently are investigated. Particularly, the periods during which socio-cultural behaviours (e.g., benevolence, and fraternity) may have a lowering impact on the level of criminal activities are explored. In Table 5.26, the religiously holiest periods, which have been respected by a considerable portion of the population in the year 2000, are presented. It was observed that all of these religious periods coincide with the early and late months of the year 2000, during which incident occurrences show a decreasing trend. Such a coincidence between the socio-culturally divine periods and lower level of incident occurrences suggest a likelihood of a relationship between the two. Similarly, relatively low frequencies of the most frequent commitment types observed cumulatively for all the Fridays of the year, may suggest a possible limiting factor of religious importance of Fridays on incident commitments.

Table 5.26 Holy periods during the study year (2000)

Part/Whole of Ramadan Month	Ramadan Holy Days	Sacrifice Holy Days
From 01 January 2000 (Saturday) to 07 January 2000 (Friday) (*)	From 08 January 2000 (Saturday) to 10 January 2000 (Monday)	From 16 March 2000 (Thursday) to 19 March 2000 (Sunday)
From 27 November 2000 (Monday) to 26 December 2000 (Tuesday)	From 27 December 2000 (Wednesday) to 29 December 2000 (Friday)	

(*) Ramadan month involves 30 days. For the year 2000, one Ramadan month period continuing from the year 1999 coincides with the first 7 days of 2000 and a full Ramadan month coincides with the period from November 27 to December 26.

5.2.2 Incidents Differentiated with respect to Their "Types" and "Commitment Types"

In the following sections, incidents are differentiated with respect to their *Types* and *Commitment Types* for which the same analytical approach is followed.

5.2.2.1 Temporal Distribution of Incidents: General ("Global Scale") Distribution

In this section, the aim is to explore the distribution of incident types and commitment types in time. First, incident commitments are analyzed on the basis of their *temporal* distribution to find out which commitment types concentrate in which months, during which days of the week or in what period of the day[39] (Henry and Bryan, 2000:9-14). Furthermore, the clustering in *time* is statistically tested so as to find whether incidents also display significant clustering in *time* when they are differentiated with respect to their types. The analyses below are based on the expectation of non-random distribution of incident types in *time.*

Descriptive Analyses. In assessing what different *temporal* resolutions (Henry and Bryan, 2000:9-14) are accompanied by occurrence of the first six most frequent commitment types, frequency distribution analyses are performed below. The *temporal* resolutions cover the levels of months of the year, days of the weeks, and three daily time intervals of the days of the study year (year 2000). The most frequent commitment types were selected as aggravated batteries, simple batteries, and domestic violences concerning the incidents against people; and residential burglaries, commercial burglaries/thefts, and thefts from auto concerning the incidents against property.

When the distribution of incidents with respect to months of the year (Henry and Bryan, 2000:13-14) are evaluated for their commitment types it is seen that while aggravated and simple batteries are mostly concentrated on several spring and summer months starting from April until August (CoVs are 0,50 and 0,51, and Skewnesses are 0,184 and 0,185, respectively), domestic violences display a more even distribution throughout the year (CoV=0,34 and Skewness=0,022). The respective minimum frequencies are observed in February (4), July (4), and December (3) (Figure 5.23 and Table 5.27). The distinguishing pattern of residential burglaries and thefts from auto is that they have distinctively uni-modal frequency distribution with a highest maximum value in August (12 and 8, respectively). However, for the commercial burglaries/thefts majority of incidents are observed from May to September (totally 26 out of 58) (Figure 5.23).

As for the distribution of commitment types at the level of days of the weeks (Henry and Bryan, 2000:11-13), the most marked observation can be stated as positively skewed occurrences of simple batteries (CoV=0,24, Skewness=0,316) and residential burglaries (CoV=0,54, Skewness=0,394) versus negatively skewed occurrences of aggravated batteries (CoV=0,36, Skewnees=-0,301) and thefts from auto (CoV=0,87, Skewness=-1,007) (Figure 5.24 and Table 5.28). In other words, while the former distribution implies concentration in the first weekdays, the latter implies concentration towards the weekends and during the weekends. On the contrary, domestic violences (CoV=0,27, Skewness=-0,041) and

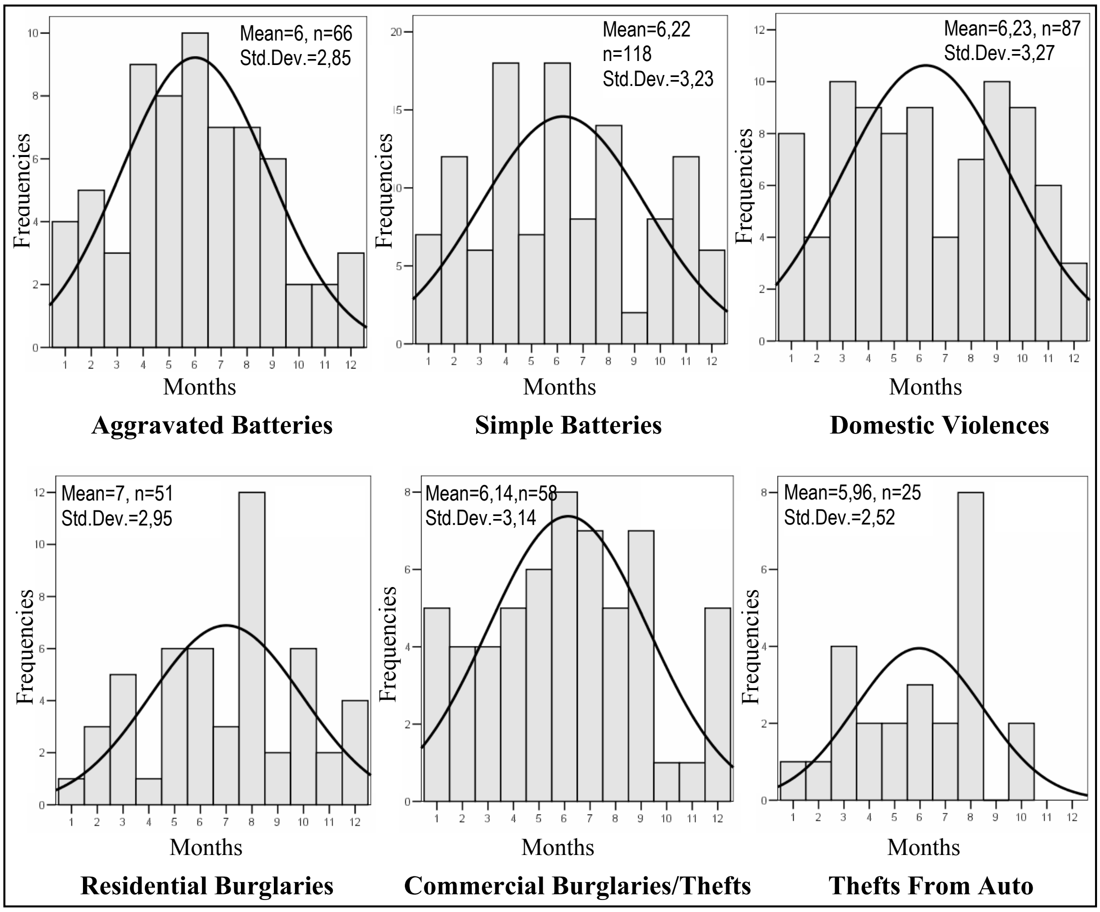


Figure 5.23 Distribution of the six most frequent commitment types of incidents according to the months of 2000
Note: The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

Table 5.27 Descriptive statistics of the six most frequent commitment types of incidents for months of the year 2000

Six most frequent commitment types	n (1)	Mean frq/month	Median frq/month	Std.Dev./ month	Coef. of Varia.	Min frq./month	Max frq./month	Skewness	Kurtosis
Aggravated Batteries	66	5,5	5,5	2,75	0,50	2	10	0,184	-0,497
Simple Batteries	118	9,83	8	4,99	0,51	2	18	0,185	-1,014
Domestic Violences	87	7,25	8	2,45	0,34	3	10	0,022	-1,190
Residential Burglaries	51	4,25	3,5	3,08	0,72	1	12	-0,141	-0,764
Com.Burglaries/Thefts	58	4,83	5	2,17	0,45	1	8	0,140	-0,673
Thefts From Auto	25	2,78	2	2,17	0,78	1	8	-0,289	-0,960

(1) The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

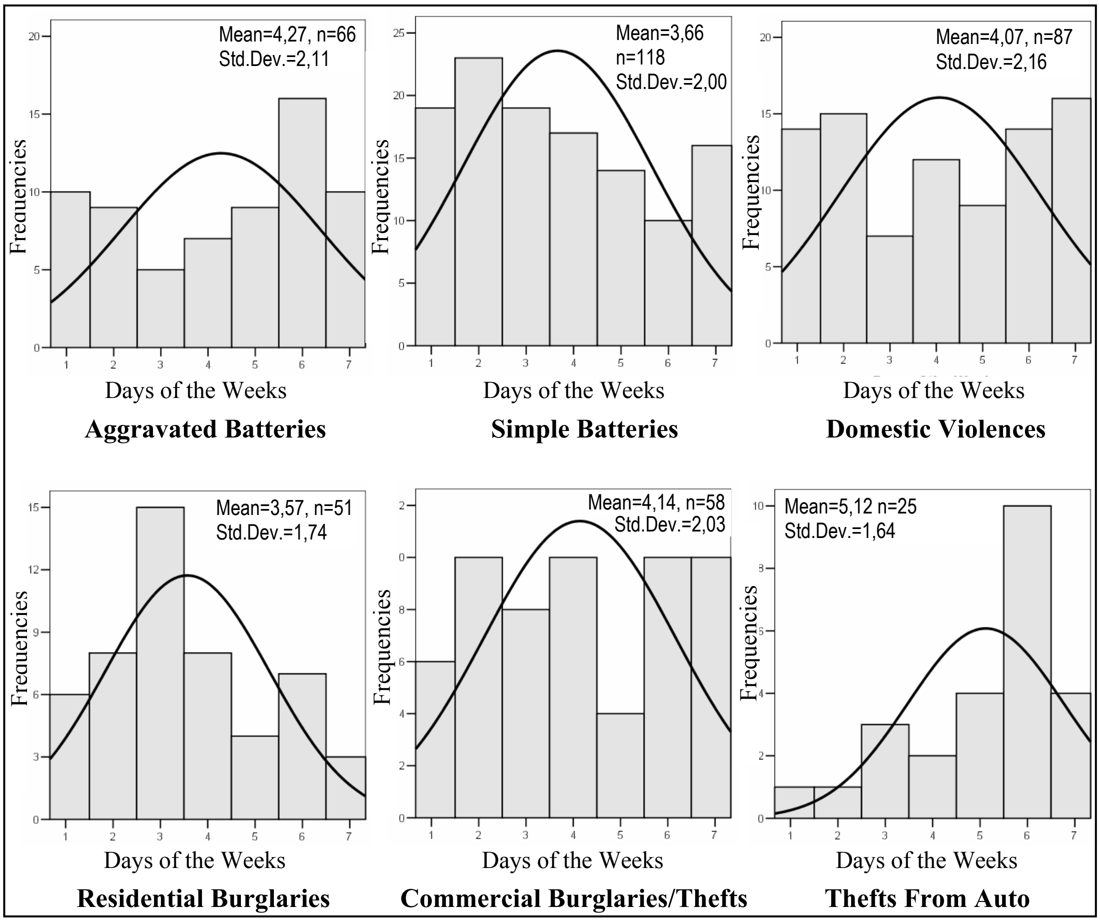


Figure 5.24 Distribution of the six most frequent commitment types of incidents according to days of 2000
Note: The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

Table 5.28 Descriptive statistics of the six most frequent commitment types of incidents for days of the weeks of the year 2000

Six most frequent commitment types	**n (1)**	**Mean frq/ days of the weeks**	**Median frq/ days of the weeks**	**Std.Dev./ days of the weeks**	**Coef. of Varia.**	**Min frq./ days of the weeks**	**Max frq./ days of the weeks**	**Skewness**	**Kurtosis**
Aggravated Batteries	66	9,43	9	3,41	0,36	5	16	-0,301	-1,353
Simple Batteries	118	16,86	17	4,14	0,24	10	23	0,316	-1,117
Domestic Violences	87	12,43	14	3,31	0,27	7	16	-0,041	-1,445
Residential Burglaries	51	7,28	7	3,90	0,54	3	15	0,394	-0,728
Com.Burglaries/Thefts	58	8,28	10	2,43	0,29	4	10	0,014	-1,331
Thefts From Auto	25	3,57	3	3,10	0,87	1	10	-1,007	0,293

(1) The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

commercial burglaries/thefts (CoV=0,29, Skewness=0,014) occur in a more even distribution throughout the days of the weeks (Figure 5.24 and Table 5.28).

For comparison of commitment types in terms of the three time intervals during the days (Henry and Bryan, 2000:9-11; Dağ, 2005; Şahin, 2005) of the year 2000, the results suggest two main striking temporal patterns that are contrasting (Figure 5.25 and Table 5.29). Among the most frequent commitment types of incidents against people, i.e., aggravated batteries, simple batteries, and domestic violences display a negatively skewed distribution (Skewnesses are -0,927, -0,688, -0,633, respectively) with increasing number of commitments towards the 3rd time interval (18:00-00:00). On the other hand, the most frequent incidents committed against property, i.e., residential burglaries, commercial burglaries/thefts, and thefts from auto[40] display a positively skewed distribution (Skewnesses are 0,363, 0,477, 1.250, respectively) implying increasing number of incidents towards the 1st time interval (00:00-08:00) (Figure 5.25 and Table 5.29).

Statistical Tests. In the next stage, the uneven *temporal* distribution is tested for each of the incident types. For this purpose, again, *Complete Temporal Randomness (CTR)* analysis is performed through Quadrat Method (see Appendix E) tested by Chi-Square (for N=529, see Endnote 1).

According to Index of Dispersion (*ID*) and Index of Cluster Size (*ICS*) found for weekly quadrats applied onto the study period and tested by Chi-square, incident occurrences against people (p=0,0055) and against property (p=0,00021) are found to display significant clustering in time (Table 5.30). On the other hand, incidents against people and property, which relatively occurred much less frequently as compared to others, displayed no significant (p=0,058) timely clustering on basis of weekly periods (Table 5.30).

5.2.2.2 Spatial Distribution of Incidents in Time (Months): General ("Global Scale") Distribution

In the following section, the aim is to explore the *spatial* distribution of incident types in different *time* periods, mainly in terms of months. Below, the two types of incidents, which are the ones against people, and against property, are taken and the third type, i.e., incidents against people and property, is not considered due to very small n (37) out of the incident set of N=500 (see Endnote 1).

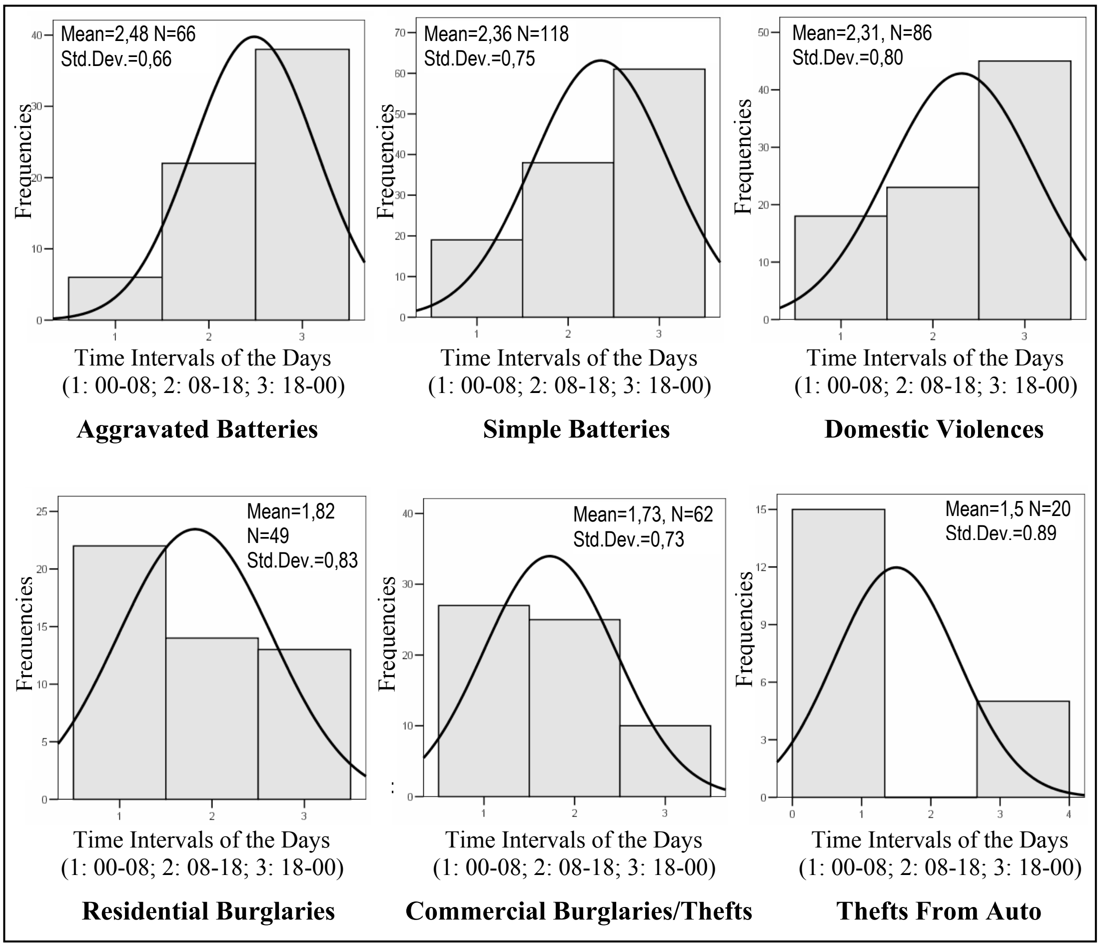


Figure 5.25 Distribution of the six most frequent commitment types of incidents according to the three daily time intervals of the days of 2000

Note: The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

Table 5.29 Descriptive statistics of the six most frequent commitment types of incidents for the three time intervals during the days of the year 2000

Six most frequent commitment types	**n (1)**	**Mean frq/ three time intervals during the days**	**Median frq/ three time intervals during the days**	**Std.Dev./ three time intervals during the days**	**Coef. of Varia.**	**Min frq./ three time intervals during the days**	**Max frq./ three time intervals during the days**	**Skewness**	**Kurtosis**
Aggravated Batteries	66	22	22	16	0,73	6	38	-0,927	-0,239
Simple Batteries	118	39,33	38	21,03	0,53	19	61	-0,688	-0,886
Domestic Violences	86	28,67	23	14,36	0,50	18	45	-0,633	-1,150
Residential Burglaries	49	16,33	14	4,93	0,30	13	22	0,363	-1.470
Com.Burglaries/Thefts	62	20,67	25	9,29	0,45	10	27	0,477	-0,966
Thefts From Auto	20	10	10	7,07	0,71	5	15	1.250	-0.497

(1) The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.

Table 5.30 Quadrat (weekly) testing for CSR for incident types (1)

Incident Types	Index of Dispersion (N=53,df=52)	Index of Cluster Size (N=53,df=52)	Test Value of Chi-square (2)	Significance level
People	1,57	0,57	81,54	0,0055
Property	1,84	0,84	95,86	0,00021
People and Property	1,32	0,32	68,88	0,058

(1) The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1. Weekly quadrat was chosen due to its reflection of an optimum size to in representing the temporal differentiation
*(2) Test value of Chi-square=df * VMR for N=53*

Descriptive Analyses. Frequencies of the two incident types are analyzed in the three development patterns within twelve months (Tables 5.31 and 5.32, Figures 5.26 and 5.27). The results of the analysis suggest that the highest frequencies of both types of incidents occur in the *planned* sections throughout the twelve months. Mean frequency per month for incidents against people is 14,83, and 12 for against property (Tables 5.31 and 5.32).

It is observed that the highest frequency of incidents against people took place during the months of April (36), May (24), June (35), and August (28) as compared to the mean (23) (Table 5.31). The corresponding months for the incidents against property are March (16) and May to September (15, 20, 15, 27 and 16) compared to the mean (14,17) (Table 5.32). Incidents against people display peak frequencies in the *squatter* areas in April (7), in *in-transition* areas in August (11), and in *planned* areas in June (23) (Table 5.31 and Figure 5.26).

As for the incidents against property, except for two months (March and December), no such incidents occurred in the *squatter* settlements (Table 5.32 and Figure 5.27). However, in the *in-transition* and *planned* areas, in which these incidents are observed more frequently throughout the year, the peaks were observed during March (5) and October (5) in the *in-transition* settlements, and during August (25) in the *planned* settlements (Table 5.32 and Figure 5.27).

Statistical Tests. The spatial differences of the two types of incidents with respect to months are tested by means of One-way Repeated Measures ANOVA. The multivariate analysis results suggested that there is no statistically significant difference (at p=0,05) among the spatial distribution of the incidents against people with respect to months (Wilks' Lambda=0,462 with p=0,109); and among the spatial distribution of the incidents against property with respect to months (Wilks' Lambda=0,542 with p=0,262) (Table 5.33).

Table 5.31 Incidents against people in the three development patterns with respect to months (*)

	Squatter	In-Transition	Planned	Total		Squatter	In-Transtion	Planned
January	1	3	18	22	Mean frq/month	3	5,17	14,83
February	4	2	16	22	Median frq/month	2	5	13,5
March	4	2	12	18	Std.Dev./month	1,81	2,79	4,76
April	7	7	22	36	Coef. of Varia.	0,60	0,54	0,32
May	2	3	19	24	Min frq./month	1	2	9
June	5	7	23	35	Max frq./month	7	11	23
July	2	6	10	18	Skewness	0,99	0,70	0,55
August	2	11	15	28	Kurtosis	0,56	-0,10	-1,05
September	1	6	12	19				
October	4	3	11	18				
November	2	8	9	19				
December	2	4	11	17				
Total:	**36**	**62**	**178**	**276**				

(*) The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.

Table 5.32 Incidents against property in the three development patterns with respect to months (*)

	Squatter	In-Transition	Planned	Total		Squatter	In-Transtion	Planned
January	0	2	7	9	Mean frq/month	0,17	2,00	12,00
February	0	1	10	11	Median frq/month	0	1,5	11,5
March	1	5	10	16	Std.Dev./month	0,39	1,60	5,75
April	0	1	9	10	Coef. of Varia.	2,34	0,80	0,48
May	0	2	13	15	Min frq./month	0	0	3
June	0	1	19	20	Max frq./month	1	5	25
July	0	1	14	15	Skewness	2,06	1,13	0,91
August	0	2	25	27	Kurtosis	2,64	0,44	1,51
September	0	3	13	16				
October	0	5	8	13				
November	0	1	3	4				
December	1	0	13	14				
Total:	**2**	**24**	**144**	**170**				

(*) The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.

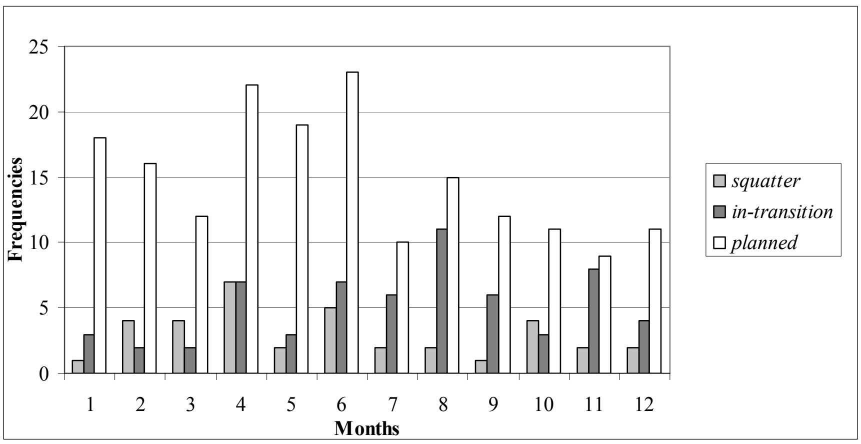


Figure 5.26 Frequencies of incidents against people in the three development patterns with respect to months
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.

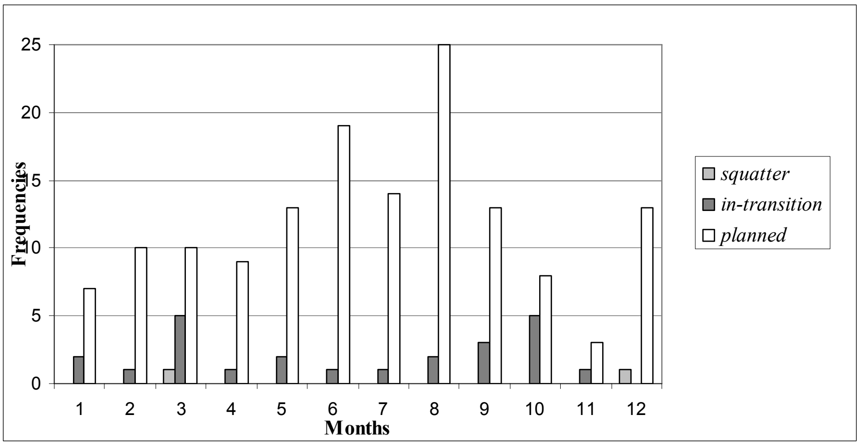


Figure 5.27 Frequencies of incidents against property in the three development patterns with respect to months
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.

Table 5.33 One-way Repeated Measures ANOVA Multivariate Tests Results for months (1)

	Effect	Tests		F (Exact statistic)	Sig.	Partial Eta Squared
Against People	Months (2)	Pillai's Trace	0,538	1,902	0,109	0,538
		Wilks' Lambda	0,462	1,902	0,109	0,538
		Hotelling's Trace	1,162	1,902	0,109	0,538
		Roy's Largest Root	1,162	1,902	0,109	0,538
Against Property	Months (2)	Pillai's Trace	0,458	1,381	0,262	0,458
		Wilks' Lambda	0,542	1,381	0,262	0,458
		Hotelling's Trace	0,844	1,381	0,262	0,458
		Roy's Largest Root	0,844	1,381	0,262	0,458

(1) Incidents belonging to set of geocoding for 500 points. See Endnote 1. n=12, df=11, error error df=18. Multivariate Test Design: Intercept
(2) Within Subjects Design

5.2.2.3 Space-time Interaction of Incidents: Localized ("Local Scale") Distribution

The aim of this section is to simultaneously analyze the *space* and *time* variables of incident types and the commitment types. It deals with questions such as "Is a *space-time interaction* and/or clustering observable when incidents evaluated with respect to their types and with respect to their commitment types? If such interactions exist, are there any differences in their nature? For example, do some incident types and commitments display clustering while some others display dispersion?"

The findings are summarized in Table 5.34, which convey similar information that were given in Table 5.24 and explained previously in Section 5.2.1.3. The results of the tests for incidents against 'property' for different periods (months, weeks, days and days with three daily time intervals) indicate *space-time* clustering at 0,05 significance level for all above stated different periods. This significant simultaneous linear increase in *space* (distance) and

Table 5.34 Mantel Index analysis for different incident types and the six most frequent commitment types (*)

Incident Groups	Time Unit (selected in the software) Months(1) Weeks (2) Days* (3) Days**(4)	N	Mantel Index (Pearson's r)	Distribution of simulated index (percentile):			Decision for rejecting the null hypotheses stating **there is no space-time interaction** and/or **there is no space-time clustering**	
				2,5	97,5	95,0	Decision on **space-time interaction** (two-tail) lower tail (if MI < 2,5 simul. percentile then **dispersion** exists) or upper tail (if MI > 97,5 simul. percentile then **clustering** exists) *p*=0,025 level	Decision on **space-time clustering** (one-tail) upper tail (if MI > 95 simulated percentile then **clustering** exists) *p*=0,05 level
Against people	Months	276	-0,02055	-0,02776	0,02632	0,02104		
	Weeks	276	-0,01764	-0,02643	0,02873	0,02288		
	Days*	276	-0,01862	-0,02536	0,02875	0,02408		
	Days**	275	-0,01900	-0,02624	0,03011	0,02484		
Against property	Months	170	0,03645	-0,03444	0,03886	0,03096		X (clustering)
	Weeks	170	0,03438	-0,03611	0,03739	0,03104		X (clustering)
	Days*	170	0,03405	-0,03406	0,03529	0,03025		X (clustering)
	Days**	163	0,03511	-0,03599	0,03687	0,03137		X (clustering)
Against people and property	Months	37	0,01949	-0,08863	0,11462	0,09096		
	Weeks	37	0,02259	-0,09301	0,09489	0,11206		
	Days*	37	0,02156	-0,09336	0,11042	0,08843		
	Days**	37	0,02159	-0,08495	0,11184	0,08799		
CB/T	Months	58	-0,01195	-0,06876	0,07513	0,06344		
	Weeks	58	-0,02146	-0,06214	0,08106	0,06127		
	Days*	58	-0,02224	-0,06744	0,07181	0,06104		
	Days**	58	-0,02232	-0,06597	0,07677	0,06429		
TFA	Months	25	-0,04481	-0,11644	0,16417	0,12852		
	Weeks	25	-0,05199	-0,12234	0,15412	0,12109		
	Days*	25	-0,04734	-0,11384	0,15247	0,12733		
	Days**	20	-0,00925	-0,13994	0,20449	0,14867		
RB	Months	50	0,07866	-0,07123	0,08795	0,07450		X (clustering)
	Weeks	50	0,08442	-0,07283	0,08354	0,06532	X (clustering)	X (clustering)
	Days*	50	0,08008	-0,07277	0,08865	0,07127		X (clustering)
	Days**	48	0,08948	-0,07755	0,08836	0,07250	X (clustering)	X (clustering)
AB	Months	64	0,04971	-0,06132	0,07085	0,06044		
	Weeks	64	0,04764	-0,06393	0,06898	0,05662		
	Days*	64	0,04644	-0,06331	0,06887	0,05875		
	Days**	64	0,04640	-0,06823	0,07640	0,06082		
SB	Months	103	-0,06054	-0,04674	0,04729	0,04122	X (dispersion)	
	Weeks	103	-0,06238	-0,04725	0,04824	0,04166	X (dispersion)	
	Days*	103	-0,06428	-0,04704	0,04818	0,03810	X (dispersion)	
	Days**	103	-0,06430	-0,04648	0,05211	0,04324	X (dispersion)	
DV	Months	87	0,00573	-0,05203	0,05568	0,04513		
	Weeks	87	0,01731	-0,05157	0,05929	0,04873		
	Days*	87	0,01626	-0,05081	0,06225	0,04891		
	Days**	86	0,01494	-0,05160	0,06496	0,04940		

(*) Incidents belonging to set of geocoding for 500 points (see Endnote 1) for four different time periods with direct measurement of space (distance) with 1000 Monte Carlo simulations.
(1) "Months" has integer values between 1 and 12, and 0 for null values.
(2) "Weeks" has integer values between 1 and 53, and 0 for null values.
(3) "Days" has integer values between 1 and 366, and 0 for null values.*
*(4) "Days**" time unit has real values obtained by addition of days and the three daily time intervals divided by 10 and the values range from 1,1 to 366,3 and 0 is used for null values.*

time intervals for these incidents mean that they occurred in similar and nearby places repeatedly over time periods of months, weeks, days, and days with three daily time intervals.

The respective statistically significant correlation coefficients (*Mantel Indexes*) are very small with reference to Cohen's (1988 in Pallant, 2001:120) classification[41]. It ranges between 0,034 and 0,036 (Table 5.34) and suggests no practical significance (Pallant, 2001:112)[42] and the respective shared variance[43] between the two variables changes only between 0,12% and 0,13%. In spite of these, the results were found worth to be reported for indication of *space-time* clustering following similar results (Pallant, 2001:112) found in studies in this field (e.g., Levine and Associates, 2004)[44]. As for the other incident types, which are incidents against 'people' and against 'people and property', no statistically significant *space-time interaction* is found.

In order to further investigate the commitment type component/components of the incidents against property is/are accounted for the above mentioned significant *space-time* clustering of these incidents and accounted for no clustering for incidents against people, the analyses were repeated for the respective most frequent commitment types. For the commitment types of incidents against property the results revealed that there is a significant (p=0,025) *space-time interaction* in terms of clustering of residential burglaries. This clustering is indicated by the positive *Index* value. In other words, such criminal acts cluster not only in *space* (in particular areas) but also in *time* for the four different time periods, which are months, weeks, days and days with three daily time intervals. The *Mantel Index* (r) values change between 0,079 and 0,089 (Table 5.34). However, no significant (p>0,05) *space-time interaction* in terms of either clustering or dispersion is observed for commercial burglaries/thefts and thefts from auto (Table 5.34).

As for incidents against people, the analyses confirmed that there is no statistically significant (p>0,05) *space-time interaction* in terms of clustering for none of the respective commitment types (aggravated batteries, simple batteries and domestic violences) for none of the four time periods (Table 5.34). It is also found that there is no statistically significant (p>0,05) *space-time interaction* in terms of dispersion for aggravated batteries and domestic violences (Table 5.34). However, a significant *space-time interaction* in terms of dispersion, which is indicated by the negative *Index* value, is found for simple batteries (at p=0,025 level with *Mantel Index* ranging between -0,060 and -0,064) for all the four time periods (Table

5.34). That is, these commitments occur in a way that either they are close in *time* and far apart in *space,* or far apart in *time* and close in *space* during periods of months, weeks, days and days with three daily time intervals.

5.2.2.4 Relationship of Incident Distribution and Clustering with the Urban Structure

In this section, the relationship of incident distribution is further evaluated with reference to the urban structure. The clustering of incidents in time is very likely to reveal that their occurrences can be attributed to certain *Routine Activity* times and urban spatial structure as pointed by the *new ecological theories*.

For example, when the higher frequencies of commitment types for incidents against people between April and June are examined, it is seen that they are mainly composed of aggravated batteries and simple batteries. This period corresponds to mid spring-early summer period, as compared to no clear monthly patterning of domestic violences. When further *spatial* and offender profile peculiarities of the commitment types of incidents against people are analyzed, it can be stated that although all the three, i.e., aggravated batteries, simple batteries and domestic violences, are mainly committed by residents and/or, by nearby neighbourhood offenders (Table 5.19), they display contrasting characteristics in their occurrence place and age grouping of their offenders (Tables 5.35 and 5.36).

In other words, on one hand, aggravated batteries (AB) and simple batteries (SB) were committed most of the time in open urban spaces (73%) by offenders mainly younger than 30 years old (81% and 66% for AB and SB, respectively[45]). On the other hand, domestic violences were committed primarily in private spaces, which are mostly dwellings (96,5%) and by an older age offender group who are at least 30 years old (78%)[46] (Tables 5.19, 5.35 and 5.36).

Unlike the commitments against people, the commitments against property, which are mainly residential burglaries (RB), commercial burglaries/thefts (CB/T) and thefts from auto (TFA), occurred in the closed spaces or in the targets themselves (Table 5.35). Moreover, offenders who are over 30 years old, mostly commit residential burglaries (81%)[47] and commercial burglaries/thefts (75%)[48], while only half of that group of offenders[49] commits thefts from auto (Tables 5.19 and 5.36).

Table 5.35 Closed-open space analysis results for the six most frequent commitment types of incidents

Commitment type (2)	n (1)	Number and percentage of closed space occurrences (out of n)	Number and percentage of open space occurrences (out of n)
Aggravated Batteries (AB) + Simple Batteries (SB)	167	45 (27%) (3)	122 (73%) (3)
Domestic Violences (DV)	87	84 (96,5%) (3)	3 (3,5%) (3)
Residential Burglaries (RB) + Commercial Burglaries/Thefts (CB/T) + Thefts From Auto (TFA)	148	148 (100%) (4)	-

(1) The incidents belonging to set of geocoding for 500 points is used in this analysis. See Endnote 1.
(2) The respective n for AB and SB are 64 and 103; for RB, CB/T, and TFA are 55, 63, and 30.
(3) Closed-open space analyses were made by means of overlay function between incidents and buildings maps.
(4) All these incidents occurred in the closed space or in the target itself such as automobiles.

Table 5.36 Offender-age group and offender residence analyses results for the six most frequent commitment types of incidents (1)

Commitment type	Known and/or apprehended offenders					
		Under age 30		Over age 30		All or majority of offenders are from the same/nearby neighbourhoods
	Total (n)	(n)	(%)	(n)	(%)	(%) (2)
Aggravated Batteries	156	127	81	29	19	82,8
Simple Batteries	233	153	66	80	34	79,8
Domestic Violences	99	22	22	77	78	95,3
Residential Burglaries	36	29	81	7	19	54,5
Commercial Burglaries/Thefts	81	61	75	20	25	21,3
Thefts From Auto	60	30	50	30	50	20,7

(1) The incidents belonging to set of geocoding for 529 points is used in this analysis. See Endnote 1.
(2) See Table 5.19.

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[1] In this study, different sample sizes are used with respect to nature of the analysis and with respect to availability of the data. In sum, the reason for using different N are given as below:

- N=500 is used when a one-to-one locational information of the incidents is needed. As explained in Chapter 4, 500 out of the total 529 incident points are geocoded in a way that they are placed to their almost exact places within less than hundred meters range correctness.
- N=529 is used when a one-to-one locational information of the incidents is not needed. As explained in Chapter 4, 29 out of the total 529 incident points are geocoded in a way that they are placed to their street/road/linear park addresses, mid points of which were assumed to be the incident places.
- N=560 is used in the ANOVA analysis whereby the rates found for the roads/streets in *R* are compared. It represents the number of incidents per 1000 population in each road/street or their segment in the study area. For computational details of these rates, refer to Appendix E.

[2] The two extremely small (area-wise) neighbourhoods (*Esertepe* and *19 Mayıs*) are excluded in the sub mean computation for frequencies in the southern neighbourhoods, and in the overall mean computation in all the neighbourhoods. These means are also computed without such exclusion.

[3] For this mapping MapInfo ® GIS is used and the density classes are obtained by natural break algorithm in the software, to reduce error and obtain a truer representation of data where the "range breaks are determined according to an algorithm such that the difference between the data values and the average of the data values is minimized on a per range basis" (MAPINFO, 2001).

[4] Although Pairwise Multiple Comparison tests are already involved in ANOVA, and in fact not separate tests, the reason for considering them separately is the emphasis on the different purpose of the analysis.

[5] For this analysis the SPSS ® Software was used.

[6] These tests are based on the unequal variance assumption (Levene Test at p<0,0005).

[7] For Quadrat Method mapping MapInfo ® GIS is used and the density classes are obtained by natural break algorithm.

[8] The *Kernel Estimation* results obtained by the CrimeStat ® Software were visualized in the Vertical Mapper ®, which is the 3D module of the MapInfo ® GIS.

[9] For this purpose first, an additional variable for the reference grid of the *Kernel Estimation* is required. This is done by using the "Development Pattern in 2000" variable in the *situation* region GIS layer by means of updating the related field of the *Kernel Estimate* with a "within" spatial querying such that the centroids of the reference grid lie within the *situation* layer's entities (see Appendix E).

[10] These tests are based on the unequal variance assumption (Levene Test at p<0,0005).

[11] These are general approaches in most crime analytical studies.

[12] In the total number of incidents against people (mostly in the form of battery) and against people and property (mostly in the form of battery and inflicting damage to property) from the set of geocoding for 529 points, the proportion of such incidents are as much as 5,80% and 17,07%, respectively.

[13] Computational verification of the visually identified clusters is not only achieved through the *Kernel Estimation* performed previously but also found by the hotspot analysis performed by the STAC Routine (see Appendix E) with different trials (computed by CrimeStat ® Software and were displayed in MapInfo ® GIS).

[14] These statistics are computed by CrimeStat ® Software and displayed in MapInfo ® GIS.

[15] At least, for the study period majority of them did not benefit from the rent of *gecekondu* transformation.

[16] In order not to have missing values in the analysis, the assumption made in the computation of the independent variables involve ensuring a minimum of 0,01 ha (100 m^2) size for each of the development type in each of the neighbourhood. That is, if for instance, a neighbourhood is composed of only *planned* development pattern (like all *Aşağı Eğlence* neighbourhood with a size of 85,58 ha) then it is assumed it has a 100 sqm *squatter* and 100 sqm *in transition* development, as well.

Furthermore, although the same information is utilized in obtaining the two independent variables (sqdivbyitr and pldivbyitr), the multicollinearity and singularity assumptions are met. "Multicollinearity exists when the independent variables are highly correlated…Singularity occurs when the independent variable is actually a combination of other independent variables." (Pallant, 2001:136-137). The correlations and one-tail significance levels are presented below.
Rate vs. sqdivbyitr: r = -0,799 (p=0,005, which is significant at p =0,05 level)
Rate vs. pldivbyitr: r = 0,489 (p=0,091, which is significant at p =0,10 level adopted)
sqdivbyitr vs. pldivbyitr: r = -0,134 (p =0,365, which is not significant)

In addition, according to Tabachnick and Fidell (1996 in Pallant, 2001:137) definition of outliers, i.e., having standardized residual values above 3,3 or less than -3,3, this assumption is also turned to be not violated. Moreover, although normal probability plots suggests that the results of analysis to meet the assumptions concerning the normality, linearity, and homoscedasticity; the residual plot displays some departure from them. Because of these, and the previously mentioned limitations, it should be reemphasized that the analysis results should be considered cautiously. On the contrary, the results are worth to be presented at least for the study area.

[17] This multiple regression analysis was performed with the minimum number of independent variables that is required. That is, the number of independent variables is two, and cases-to-independent variables ratio is approximately 5 (i.e., 9/2), which conforms the 5 to 1 ratio of Hair et al (1998:166), under which no generalization could be made.

[18] Only the first events were taken into consideration for all incidents. This means that the 'multi event' incidents, in which more than one event took place in their commitment, are represented by their beginning event. Among 529 total number of incidents mean number of events for incidents are:
1,02 for incidents against property (n=195);
1,59 for incidents against people (n=293); and
2,61 for incidents against people and property (n=41).

For the first type this number implies a single intention in their commitment as they imply continuous criminal acts in their commitment for the latter two types. The rate analyses could have been based on the weighting of the incidents with the number of events. However, such an analysis would have been overestimating the rate of an incident that includes for example 3 relatively less serious events (e.g., simple battery, plain stalking, or defamation) to be more important than an incident that include 1 event of homicide.

[19] For this mapping MapInfo ® GIS is used and the density classes are obtained by natural break algorithm.

[20] For this mapping MapInfo ® GIS is used and the density classes are obtained by natural break algorithm.

[21] Battery is "the crime or tort of intentionally or recklessly causing offensive physical contact or bodily harm (as by striking or by administering a poison or drug) that is not consented to by the victim.…[A]ggravated battery [is] criminal battery that is accompanied by aggravating factors: as …criminal battery that causes or is intended to cause serious bodily injury esp. through the use of a dangerous weapon… [S]imple battery [is] criminal battery that is not accompanied by aggravating factors (as a dangerous weapon)." (Merriam-Webster, 1996).

[22] This category also includes the thefts from commercial places committed through fraud. If they were further distinguished, the corresponding values for rates would have taken the values of 0,00; 0,72; 1,16; 6,21; 2,70; 5,96; 1,09; 2,38; 2,67 with a mean of 2,54 for the commercial burglary/theft; and; values of 0,00; 0,00; 0,00; 1,24; 0,00; 0,66; 0,36; 2,38; 0,00 with a mean of 0,52 for the fraud. The corresponding LQCs would have been _; 0,71; 0,35; 1,29; 1,31; 1,20; 0,32; 0,59; 0,59 for the commercial burglary/theft; and _; 0,00; 0,00; 1,77; 0,00; 0,92; 0,74; 4,06; 0,00 for the fraud. Moreover, the commercial burglary/theft category given in the table also includes one event starting with 'Damage to commercial place' and continuing with commercial burglary. That is, since the main intention in the commitment of the incident was to burglar the commercial place, here the second event is taken for commitment type consideration.

[23] For this analysis SPSS ® Software was used.

[24] These tests are based on the unequal variance assumption (Levene Test at $p<0,0005$).

[25] *Kernel Estimations* is performed in CrimeStat ® Software and mapped with classes obtained by natural break algorithm in MapInfo ® GIS.

[26] These tests are based on the unequal variance assumption (Levene Test at $p<0,0005$).

[27] These statistics are computed by CrimeStat ® Software and displayed in MapInfo ® GIS.

[28] The SDD statistics are calculated in CrimeStat ® Software and the *F* test is performed in MS Excel ® Software.

[29] The most frequent commitments against people, which are aggravated batteries ($n_{AB}=66$), simple batteries ($n_{SB}=118$), and domestic violences ($n_{DV}=87$), constitute 92,5% (271 out of 293) of this incident type within the 529 points set. Similarly, the most frequent commitments against property, which are residential burglaries ($n_{RB}=56$), commercial burglaries/thefts ($n_{CB/T}=63$), and thefts from auto ($n_{TFA}=30$), constitute 76,4% (149 out of 195) of this incident type within the same set.

[30] Since sample size, which should be more than hundreds, is an important constraint for precise results of the *K Function* (Levine and Associates, 2004:5.33), the differences among the level of interactions in the spatial distribution of incidents against people, property and people and property are evaluated by means of *K-order nearest neighbor indexes.* The analysis is performed without edge correction for the same reason as non-utilizing those patterns in the interpretation of *L Function.* In addition, most of the time the edge corrected *nearest neighbour indexes*, resulted in patterns that are very similar to non-corrected ones. Even if they were utilized, the general trends in the interpretation of almost all of the plots would not have changed (see Appendix E).

"For each order, *CrimeStat* calculates the K^{th} nearest neighbor distance for each observation and then takes the average. The expected nearest neighbor distance for each order is calculated by:
Mean Random Distance to K^{th} nearest neighbor = $d(K_{ran}) = \dfrac{K(2K)!}{(2^K K!)^2 SQRT[N/A]}$ …
where K is the order and ! is the factorial operation … The K^{th} nearest neighbor index is the ratio of the observed K^{th} nearest neighbor distance to the K^{th} mean random distance." (Levine and Associates, 2004:5.8)

[31] The results suggested significant highest level of *local scale* clustering of incidents against property (z = -7,1945 at computed p=0,0001 for one tail test and at computed p=0,0001 for two tail test), moderate level of *local scale* clustering of incidents against people (z = -3,4546 at computed p=0,001 for one tail test and at computed p=0,001 for two tail test), and dispersion of incidents against people and property with its insignificance (z = 0,4045).

[32] Incidents in which only one event took place.

[33] Incidents in which more than one event took place.

[34] These theories refer to both *early new ecological theories of CPTED, Defensible Space,* and *Space Syntax;* and *late new ecological theories of Routine Activities, SCP, Rational Choice,* and *Crime Pattern* together.

[35] SPSS ® is utilized to perform "oneway within subjects anova analysis" and MapInfo ® GIS is used for mapping and the density classes are obtained by natural break algorithm.

[36] For univariate one-way repeated measures analysis, the assumptions are independence of measurements, normality, and sphericity and for multivariate one the sphericity requirement is not needed to be fulfilled (Stevens, 1986:412; Pallant, 2001:198). In none of these analyses the sphericity assumption is met.

[37] The values for the four time variables for the study period (the year 2000) in interval or real scales were obtained from the "Incident date" and "Incident hour" variables defined earlier (see Section 4.2.1.1 and Appendix H).

- "Months" variable: Extracted from the month information of the "Incident date" variable, has integer values changing from 1 to 12, and the null values were set as "0".
- "Weeks" variable: Starting from the first day of the study period (Jan. 1, 2000) until the last day (Dec. 31, 2000) each consequent 7 days was assigned into a week period. The variable has integer values from 1 to 53, and the null values were set as "0".
- "Days" variable: To obtain this variable the month and day information in the "Incident date" variable were utilized to obtain the integer values starting from 1 and ending at 366. The null values were set as "0".
- "Days with three daily time intervals" variable: Obtained by addition of the already computed "Days" variable and the previously obtained three daily time intervals divided by 10. Therefore, the variable has the highest variety with real numbers coming from the set (1,1 , 1,2 , 1,3 , 2,1 , 2,2 , 2,3 , 3,1 ,…, 366,1 , 366,2 , 366,3). The null values, which are coming from either component, were set as "0".

[38] The problem of interdependency between observations, which cause the usual significance tests to be inappropriate for assessing the observed Pearson product-moment correlation (*Mantel Index*), is handled by performing Monte Carlo simulations in Crime Stat ®.

[39] In this analysis the incident types are not included so as to achieve a meaningful analysis when discontinuity in time (at least when days of the weeks and three daily time intervals of the days) is considered.

[40] Even though the number of incidents, which have unknown time interval information compose one third of the data set (10 out of 30), it is assumed that not all of them would fall into the 3rd time interval, which would suggest equal and even distribution among the 1st and 3rd time intervals.

[41] Cohen (1988 in Pallant, 2001:120) classifies the strength of r as small if it is between ±0,10 and ±0,29; as medium if it is between ±0,30 and ±0,49; and large if it is between ±0,50 and ±1,0.

[42] According to Pallant (2001:112) the practical significance of an r of 0,2 is very limited.

[43] This 'percentage of variance' is simply calculated by coefficient of determination (r squared) multiplied by 100 (Pallant, 2001:121).

[44] Levine and Associates (2004:9.9-9.11) report that *Mantel Indexes* (*r*) as small as 0,0348 (*p*=0,025), 0,0544 (*p*=0,01) and 0,0630 (*p*=0,001) display significant space-time clustering.

[45] Out of 97% of known and/or apprehended offenders for each incident group.

[46] Out of 100% of known and/or apprehended offenders.

[47] Out of 39% of known and/or apprehended offenders.

[48] Out of 75% of known and/or apprehended offenders.

[49] Out of 97% of known and/or apprehended offenders.

CHAPTER 6

IMPLICATIONS FOR URBAN PLANNING AND URBAN POLICING

This chapter aims to develop the urban planning and policing (*kent planlama ve polisliği*) strategies for crime prevention and reduction. It is believed that the implications obtained by this study would relate to other metropolitan areas not only within other similar parts of the Ankara Metropolitan Area, but also other metropolises of Turkey. In addition, they would possibly relate to parts of other metropolises in some other developing and western countries to the extent that the underlying *spatio-temporal* and social patterns are elaborately compared and found to have similarities with those of the study area.

The implications that are developed in this chapter are stated with reference to the main argument of the study, which maintains the differences in *spatial* and/or *temporal* distribution of incidents in the three development patterns. These implications will provide the possibilities for *place-based crime prevention* or *opportunity* reduction in crime occurrences with urban planning and policing.

Nevertheless, it should always be remembered that "planning/designing out crime" (Schneider and Kitchen, 2002:280) cannot be the only means (Mathéy, 2005:22) to achieve this goal. The occurrences of criminal activities in a society should always be looked from a much broader perspective consisting social, cultural, economical, and political conditions, which are experienced by the society in question. This study consider itself successful if it could at least raise an awareness among the planning and policing authorities on the possibilities of taking small steps for initiating crime prevention/reduction through their activities. These steps are thought to be effective in reducing the *spatio-temporal* opportunities that the urban areas provide for occurrences of criminal acts, and on the utility of crime pattern analysis techniques, and the importance of accurate and up-to-date data entry to systems such as the one that is developed by this research.

In the following sections urban planning and policing implications are given in parallel to the order of analyses and findings that were presented in the previous chapter. In other words, mainly the implications on exploration of incidents are presented in two stages: First; *spatial* implications, and second; *temporal* and *spatio-temporal* implications. The first section is further divided into two subsections. First, the implications for exploration of the three incident types together are presented in Section 6.1. Second, the implications are presented for exploration of incidents when they are differentiated with respect to their types and their commitment types (Section 6.2). However, in the subsequent section for *temporal* and *spatio-temporal* findings, these two groups of implications for incident types together and incidents differentiated with respect to their types and commitment types are discussed together (Section 6.3).

6.1 Implications for Spatial Analysis for the Three Incident Types Together

In the following sections, urban planning and policing implications and concrete strategies in prevention/reduction of criminal activities that are suggested after the spatial analysis of the three incident types together is presented.

6.1.1 Case in the Squatter Settlements and Deficiencies of Current Planning

The intensive occurrences of incidents in the *planned* areas imply the ineffectiveness of the current medium-large scale (1/5000 Structure Plan and 1/1000 Implementation Plan) planning system in the prevention/reduction of criminal activities. In fact, in the areas to be newly planned in the future and in the already planned settlements, which at present cover at least half of the inner metropolitan area, there are some aspects that should be adopted from the *early stage gecekondu* settlements. The positive intuitive design aspects[1], such as the relationship between closed and open spaces and human scale spatial organization, in the built structure of these neighbourhoods had resulted in a homogeneous spatial and social organization leading to lower incident rates. These positive aspects prevent incident occurrences by decreasing the *spatial opportunities* for their occurrence, and in building a peaceful social life style accompanied by co-operative, caring, protective and daily face-to-face community relations.

It is very likely that high level of neighbourhood relations, high level of sense of community, low tolerance for foreigners, high feeling of being stranger, low density and socially and physically homogenous residential areas formed by migrants sharing the similar, if not the same, background and similar income levels have been the most important factors for lower level of incident occurrences.

In addition to deficiencies of the current planning system, which are explained in the following, the *planned* areas provide more *spatial* (e.g., larger number of commercial places) and *social* (e.g., more concentration of high socio-economic status residents) *opportunities* for incident occurrences (see Chapter 5).

The planning system, which is currently in effect since 1985[2], is applied with the same principles in planning of new settlements through Structure Plans (*Nazım Plan*) (at 1/5000 scale) and Implementation Plans (*Uygulama Planı*) (at 1/1000 scale); and transformation of current *squatter* settlements through Improvement Plans[3]. This current legislation, at the same time, is responsible for the prevailing physical appearance of the current Turkish cities, where the urban identity is lost to a great extend.

The main problematic of this planning process is that except for some decisive natural inputs or thresholds such as geology and topography and existing cadastral division that would be influencing the future ownership pattern, it does not take into account social and demographic structure of the community. Although the respective analyses and field studies are included in the planning report, the plans themselves in reality reflect these components neither for the existing community nor for the new population to reside/work in that locality.

A further basic problem with this system is that it does not contain any urban design component and does not define the relationships of buildings with their immediate and further distance *environments*. With this approach each building is constructed by itself as an entity, independent from its surroundings without considering functional use of the grounds or the relationship of buildings to the ground area that it might share with other buildings (Newman, 1973 in Schneider and Kitchen, 2002:128). In this planning scheme, the boundaries of blocks[4] into which plots of the buildings will be applied afterwards and the densities of the buildings within these blocks in terms of floor area ratio and use area ratio and/or maximum height of the building are defined. The blocks are formed in such a way that a group of plots are combined -usually- in two rows. In this block, the implementation of plan realizes construction of monotonous and repetitive apartment buildings per plot whereby their backs look each other and fronts to the surrounding roads through which they are accessed and/or serviced. In Figure 6.1, a section of Implementation and/or Improvement Plan(s) and accompanying parcel plan(s) from the study area are presented.

In general, most Implementation and/or Improvement Plan(s) enable construction of housing units with increased floor area ratio and use area ratio resulting in high-rise buildings with large floor areas in certain parts of the metropolitan areas in Turkey. In the study area, such high-density apartment buildings are mainly observed in the *in-transition* and to certain extend in the *planned* areas. For instance, the apartment buildings in some parts of *R* have up to 20 floors, with more than 3 dwellings per floor. Placing large number of households (as much as a small village population size) into one enormous apartment building (Figure 6.2) might give rise to conditions that increase the occurrences of incidents.

In the areas where Improvement Plans are implemented, with these high-rise buildings, the previous physical and social relationships established among the former *squatter* residents is almost completely destroyed. Previously they were used to live in organically developed neighbourhoods of one-storey buildings in gardens with many daily face-to-face and community relationships among the neighbours. However, now they need to adopt to a completely new life style, where almost nobody knows and take care of the others in a completely alienated, anonymous and isolated physical and social *environments* with many newcomers in high-density building settlements giving rise to a loss in sense of community.

In addition to “anonymity and alienation” (Newman, 1973 in Oc and Tiesdell, 1997:53), Newman’s (Newman, 1972:79) second criterion for increasing crime rates in any large residential building, which is “lack of surveillance” in the semi-public interiors of the buildings can be of concern in these apartment buildings. However, his (Newman, 1972:34) third criterion, which is “availability of the escape routes” in the buildings, by means of which offenders could easily escape from the incident scene after their commitments, might be less relevant.

As a result, in this planning system, formation of spaces with special layouts and design measures, which would enable the reproduction of social and community relations and prevailed in some respects in the physical context of *early stage gecekondu* (*squatter*) development, is not

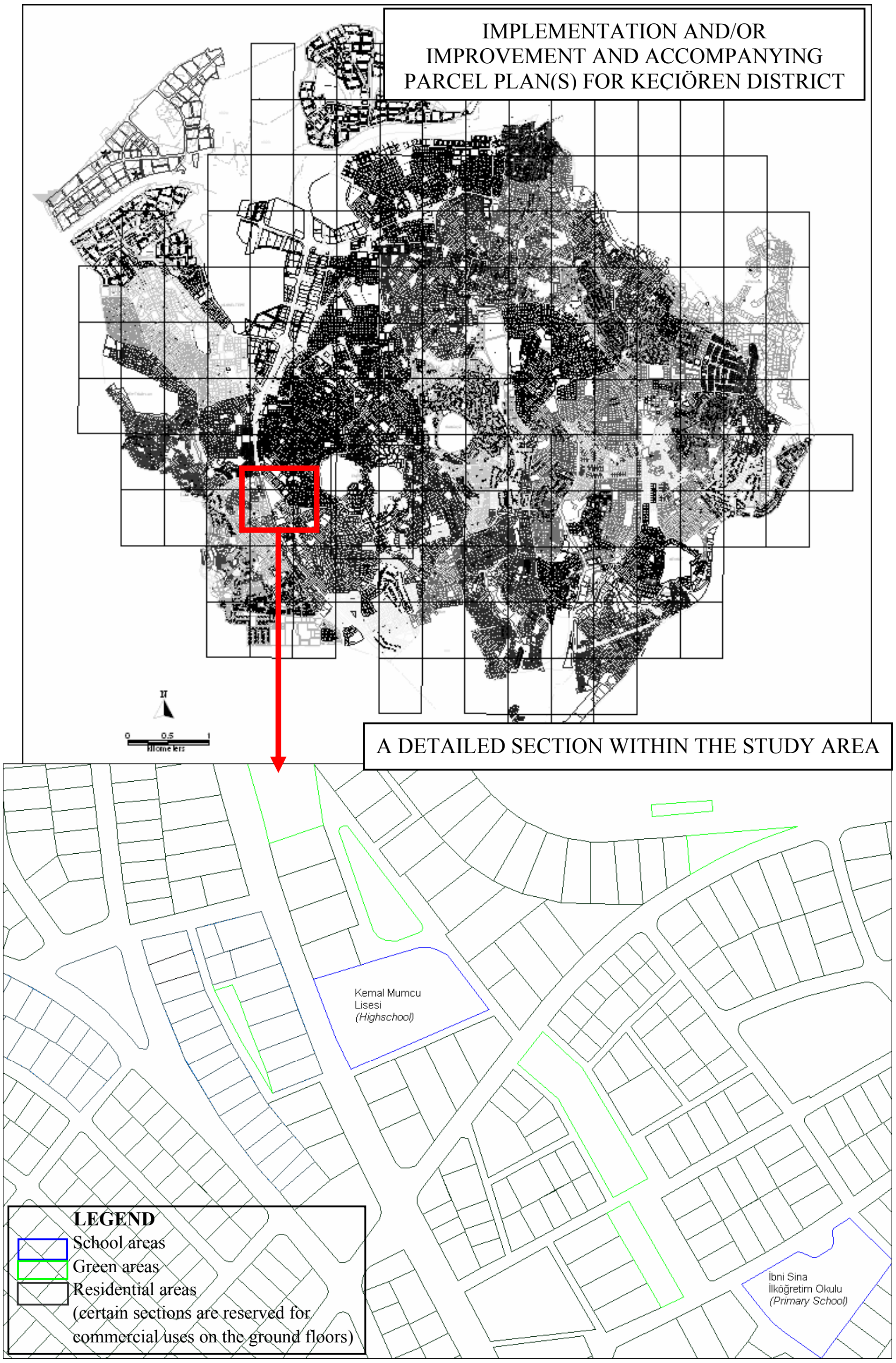

Figure 6.1 Implementation and/or Improvement and accompanying Parcel Plan(s) for Keçiören District and a detailed section within the study area

Note: In the zoomed Figure the unnecessary data and the textual building boundary and density information is not presented for the purposes of clarity.

Source: Keçiören Municipality (Keçiören Belediyesi, İmar ve Yapı Denetim Müdürlüğü)

Figure 6.2 Examples of transformation in the study area

possible. In this regard, in the current planning practice in Turkey, the common use areas like open spaces such as parks and playgrounds, the formation of which could be very effective in the setting up the community and network relations, most of the time are randomly and unluckily placed onto a residual and useless corner of a residential block where that space is not enough for a plot of a proper apartment building (Figure 6.1). Therefore, the present planning system contributes to current elevated occurrences of incidents in the *planned* settlements, and lacks a systematic thinking and thus formation of differentiating levels of public and private spaces. It is far from production of well-defined and differentiated spaces characterized by public, semi-public, semi-private, and private elements.

6.1.2 Critics to and Realities of the Current Transformation of *Squatter* Areas

Certainly, the *squatter* settlements could not provide modern dwelling facilities and the required technical and social infrastructure. However, the model of transformation with Improvement Plans, which in the study area and also in many similar metropolitan areas is mainly carried out by small scale contractors, *yapsatçı* (see Sections 3.1 and 3.2) through demolish-and-rebuild mode and usually result in poor *environmental* qualities (Duyar-Kienast, 2001:23), should have followed some other model or models of transformation. For example, some planning policies for redevelopment could have been adopted so that the original squatter housing is kept in its human-scale and have been transformed into similar density and pattern to prevent alienation and to enable the feeling of belonging to a community.

This could have been achieved by increasing the density to two-three storeys, and combining the floor space, on the average of only two dwelling units with their gardens, resulting in a doubled floor space and doubled-tripled elevation still leaving some garden around the new building which would provide shelter for each of the two residents, and one new dwelling for some other newcomers into the neighbourhood. In this way, the social composition would have changed to a certain degree, but these settlements still would have provided much livable places with higher *environmental* qualities. And with the supply of more social infrastructure, and elaborately defined public-private spaces, including spaces for community interaction, these neighbourhoods would have been model settlements for the remaining regular city of which they become an integral part, and for the settlements to be newly developed.

However, in the social, economic, and political conjuncture of the 1980s, which still prevails, in Turkey, the above mentioned alternative model of transformation does not go beyond an utopia. Because, as mentioned earlier (Chapter 3), in that period there were:

- a governmental attempt for compensating the urban poor, that is, rural migrants living in the *squatter* neighbourhoods, who were severely affected by the consequences of the newly adopted economic policies;
- continuous pressures of the small scale contractors, who were severely blocked (Işık and Pınarcıoğlu, 2002:165-166) and were looking for a way out;
- increasing interests of the society that started to be "consumer" one whereby 'consuming more' and 'owning more' are seen as almost only means to have a higher social status (Erişen, 2003:88,94); and
- the conflicting, separating, and excluding dynamics prevailed in society (Işık and Pınarcıoğlu, 2002:128), which further aggravated by and in turn gave rise to higher levels of segregation and increasing socio-economic polarization among and within different income classes (Erişen, 2003:88; Işık and Pınarcıoğlu, 2002:132-133; Erman and Eken, 2004:2), which is further reinforced by the globalization process.

6.1.3 How New Planning System Should be and Its Relation to Areas to be Newly Planned

The *planning for prevention of crime* in the settlements that is to be newly developed need to take into consideration of all these negativities of the current planning system, and provide means for converting them into positive contexts in the manner mentioned above. In other words, in the first place, the planning of new settlements or neighbourhoods should include the creation of an urban identity and quality which finally would result in generation of “sense of community belonging and safety” as Yuen (2004:5) argues. The construction of the urban fabric should also include the “needs, expectations and life styles of its residents” (Yuen, 2004:5) in creating their well-differentiated levels of public-private spaces with clearly defined functions (Hulme Regenaration Ltd, 1994 in Schneider and Kitchen, 2002:244). The community participation should always be a part of urban development and urban safety related activities for the success in their implementation.

Moreover, this new planning approach should also include urban design component that allow the production of “unique” *environments*, which should establish not only meaningful relationships between the built-up and open spaces but also a meaningful hierarchy of public, semi-public, semi-private and private spaces. Collectively, the careful and elaborative construction of urban setting with its all kinds of integrated land use functions would eventually be a supportive factor in hindering and thus preventing the occurrences of criminal acts. This would be achieved through the improvement of a total living *environment* (Yuen, 2004:6) in terms of physical setting and spatial layouts of the neighbourhoods, which further promotes the production of social networks and community relations within them.

As seen in the common point of all *planning for crime prevention* literature, the effectiveness of an urban planning/design scheme in minimizing the *opportunities* for occurrences of criminal acts in an urban area is directly related to the ability/capacity of that area to reproduce social and community relations *in some respect* similar to those that once was observed in the *early stage gecekondu* (squatter) housing. *In some respect,* because “the active trust” among the people who all know each other in the “informal” settlements, could not be completely reestablished in the new “formal” settlements. The reason is that the formal settlements are characterized by heterogeneity and high-density dwellings and new higher income groups from other parts of the city and decreasing proportion of former *squatter* residents, and that these settlements require the establishment of “the passive trust” prevailing among the people who do not know each other (Giddens, 1992 and Giddens, 1994 in Işık and Pınarcıoğlu, 2002:54-55). A solution lies in

> thinking of new forms of organization that take care of the importance of the passive trust that is supported by the *formal* and include everyone, and at the same time organization that take into consideration the positive strengths originating from the active trust of the *informal*. (Işık and Pınarcıoğlu, 2002:83)[5]

Therefore, the effectiveness of “planning/designing out crime” (Schneider and Kitchen, 2002:280), could be measured to the extent that “space makes difference” (Sayer, 1985) in establishment and development of a sense of community and a sense of belonging to or feeling a part of a community living specifically in that locality. Moreover, it could be measured to the extent that it creates a number of common *place-based opportunity reduction* or *environmental crime prevention strategies* such as “natural surveillance”, “natural access control”, and “territorial reinforcement” (Oc and Tiesdell, 1997:55). Because a feeling of belonging to a community and to feel the trust that prevails in that specific locality accompanied by a certain level of proprietorship and responsibility over the public spaces turn to have reducing effect on the occurrences of criminal activities. Canin (1994) verify this by stating that “When the streets are perceived as a “no man’s land”, they are more inviting to trespassers and criminals.” (Yuen, 2004:7).

In sum, the resolutions for the medium-large scale planning, for which the urban design need to be made compulsory, in prevention/reduction of incidents the followings could be stated. In this respect the spaces to be produced by the plan must:

- provide unique layouts with considerate thinking of *place-based strategies* (such as *Crime Prevention Through Environmental Design, Defensible Space*, etc.);
- give sense of placeness so that its residents and users develop proprietorship and social surveillance over the public spaces;
- allow the functional use of grounds of the buildings and the relationship of buildings to the surrounding area including other buildings and also should be well-defined and differentiated in terms of a systematic of public, semi-public, semi-private, and private elements;
- compose a systematic network of open spaces that would facilitate both the recreational needs and formation of community and social relations, meetings, etc.

- reflect particular and unique physical and social compositions of each individual setting and should enable (re)development of social interactions and networks;
- comprise the participation of the concerned community who will influence the structuring of its housing and/or living/working environment;
- include the data, knowledge and experience of all the key institutions in each locality.

A comparison of these proposed challenges for the new planning system with the problematic of the current medium-large scale planning system in environmental prevention of incidents is presented in Table 6.1.

6.1.4 The Challenges for the Existing Settlements

In the following sections, the focus is turned to what could be done in the *planned* areas of Turkish metropolises, which at the same time would include the whole study area in the future. The discussions made in previous sections should not imply that such social conditions could only be attained by low density, detached, semi-detached housing with courtyards and gardens. In fact, particularly high-density urban redevelopment (transformation of *gecekondu* settlements and the former relatively low density *planned* settlements) in the metropolitan core and periphery (Işık and Pınarcıoğlu, 2002:164-165) through small scale contractors and new high-density developments in the suburbs by large scale companies (Erişen, 2003:108) have been indispensable components of the Turkish urbanization when the 1980s and afterwards are considered.

To exemplify accomplishment of low crime rates in densely populated settlements, Yuen (2004:1) finds that even though 86 % of its population lives in high-rise (6060 persons/km^2) public housing, Singapore enjoys a low crime rate that has a lowest rank at the international level (*The Straits Times*, 31 March 2003). In focusing on "the urban safety challenges and planning possibilities towards making safer cities" she (2004:11) concludes that this was not achieved spontaneously

> but result of a carefully crafted strategy involving investment in the physical environment -upgrading old housing, improving the living environment and constructing a useable past to build up the present basis for planning a distinctive and delightful city. Emphasis is on building "home" places and actively engaging the community in defining urban identity, managing their living areas and preventing crime.

Table 6.1 The problems of and resolutions for the medium-large scale planning system

Theme	Current Planning	Negative reflections in planned developments in inner metropolitan areas	How new planning should be
Creation of unique environments and urban design component including place-based crime prevention design measures	No consideration of unique environments. Urban design -without any place-based consideration- is only carried out for only very special (such as historical areas) and small localities.	No or lost urban identity. Formation of repetitive and monotonous inner metropolitan areas and cities all over the country.	Spaces must be produced with special layouts and design component including considerate thinking of CPTED, Defensible Space, Space Syntax, and SCP strategies. Urban design must be compulsory and essential part of the planning.
Development of sense of placeness, sense of community and establishment of proprietorship over public spaces	No consideration.	Settlements produced give no sense of placeness and of community to its residents. Proprietorship is only limited to the privately owned closed spaces and almost all the time to the dwellings.	Spaces to be produced by the plan should give sense of placeness and of community to its residents and other users so that all of them in time will develop proprietorship and social surveillance over the public spaces that they do not own.
Relationship of buildings with their immediate and farther environments, open-closed space relationships, public-private space definition	No consideration.	Repetitive and monotonous high-density apartment buildings which have no relationship with their environments and stand as independent entities from their surroundings, spaces produced with no definition of differentiating levels of public and private spaces.	Functional use of grounds and the relationship of buildings to the surrounding area that it might share with other buildings should be one of the basic considerations of the planning. The design should enable production of well-defined and differentiated spaces characterized by a systematic of public, semi-public, semi-private, and private space elements.
Common use areas like open spaces such as parks and playgrounds	Almost all the time placed randomly and unluckily onto a residual and useless corner of a residential block where that space is not enough for a plot of a proper apartment building.	Most of the time unsystematic, narrowly thought, and useless bundle of open community spaces.	Design should include elaborate thinking for a systematic network of open spaces that would enable not only satisfaction of recreational needs of the residents, but also establishment of community and social relations, meetings and gatherings via community spaces, meeting points, etc.
Reflection of all current and possible future conditions including residents' socio-economic features	Only limited to some decisive natural inputs or thresholds like geology and topography and to existing cadastral division that would influence the future share from development. Socio-economic aspects most of the time remain only in the research reports when such reports are prepared.	Existing social relations are destroyed. A uniform, unvarying, and undiversified urban spatial structure and life style are imposed to all current and future residents.	The plan/design of a new urban environment should involve unique physical and social compositions of each individual setting. It should enable development or redevelopment of social interactions and networks.
Reflection of communities' needs and expectations, community participation	Almost no consideration. Participation is only limited to collection of complaints of affected residents after finishing and disclosure of the first complete draft plan.	The "complaints" -not the "expectations"- that the residents make focus on rent oriented interests on private ownership such as the ones against public services placed on their property.	The community should influence the structuring of its housing and/or living/working environment through an effective participatory planning process.
Interdisciplinarity and reflection of knowledge and experience of key institutions	Almost no consideration. The reflection of key institutions is only limited to the ones concerning to physical thresholds and infrastructure.	Urban areas produced by an isolated process and thus they are far from realities and solutions for their unique problems.	The planning and design should effectively include the data, knowledge and experience of all the key institutions in each locality.

In the areas, which are to be newly planned for high-density development -and also for low density-, it would be easier to integrate the *environmental design principles for crime prevention* on the condition that a complete change in the urban planning act and regulations is achieved. These acts and regulations must be restructured so that urban design and accompanying *Crime Prevention Through Environmental Design (CPTED), Defensible Space* and/or a part of[6] *Situational Crime Prevention (SCP)* principles become compulsory. Nevertheless, in the areas to be redeveloped (transformed) into high-density settlements through current Improvement Plans, or in the currently high-density *planned* settlements characterized by apartment buildings the implementation of those principles is much more difficult. As stated earlier (Chapter 1), even in the countries like the US and Britain

> the use of defensible space ideas as a major design parameter, has not been a major feature of most house-building in recent times.…where problems of particular types of crime are…tackled by 'retro-fitting' (adapting what already exists); this is by definition a constrained process which probably tends to emphasize target-hardening actions at the level of individual property, simply because these are much easier to carry out than a major revision of the layout of the wider area which might entail a considerable amount of demolition. (Schneider and Kitchen, 2002:274).

Accordingly, in these latter settlements, one of the *Situational Crime Prevention (SCP)* approaches, which is 'target hardening', could be one of the most preferable *environmental* response to prevent incidents and to deter offenders.

These include adoption of certain physical measures to the individual property such as slug rejector device, steering locks, bandit screens, vandal-proofing and tamper-proof seal (Oc and Tiesdell, 1997:59). Such measures could easily be applicable as one of the *Situational Crime Prevention* strategies for "increasing the offenders' effort" in the areas, where high level of incidents take place. In fact, these measures are currently applied. In a recent research performed by Dağ (2004:74-78) focusing on crime problem and public's point of view to the prevention of all kinds of larceny, burglary and theft incidents, 163 (n=163) citizens living in nine of the neighbourhoods under the responsibility of Merkez Polis Station in Keçiören District were surveyed[7]. Two questions of the survey, concerning the above stated measures and the types of these measures revealed the following results: 72,5 % of repliers took individual measures against all kinds of larceny, burglary and theft incidents. For example, 54,4% has changed their doors and door locks (Table 6.2).

Table 6.2 The measures taken against all kinds of kinds of larceny, burglary and theft incidents in nine neighbourhoods of Merkez Police Station in Keçiören District

Measure Taken	**(n)**	**(%)**
I have changed the my door and door locks	80	54,4
I have railed (installation of iron bars) the windows	16	10,9
I have bought a dog	8	5,4
I had a security system made	21	14,3
I have bought a case	6	4,1
“Site” administration* increased the security	8	5,4
I had an insurance made	8	5,4
Total	**147**	**100,0**

(*) For explanation of the word “site” in this context, see Chapter 3.
Source Dağ, 2004:76

Nevertheless, these measures are generally criticized by their possible displacement effect on incidents and their inability in reduction of overall rates (Weisburd, 2002:199). On the other hand, the main means for prevention of incidents in high-density urban developments should involve, minor *physical* interventions that would be reinforcing the increase of *social* networks for both development of feeling of sense of “home”, “community” or in general “place” and proprietorship over public spaces to ensure “social surveillance” (Doeksen, 1997:243,246). Moreover, it should involve the reinforcement of social and community relations so that the community takes part collectively in the activities against criminality and offenders and in improving their physical and social *environment* into high quality livable and safer place. The majority of *environmental criminology* scholars think that current evidence is not enough to support the idea of “planning/designing out crime” (Schneider and Kitchen, 2002:280), “but that place-based responses to crime problems are capable of ‘making a difference’.” (Schneider and Kitchen, 2002:286).

Therefore, the reinforcement of community relations and participation against criminal activities, and collective activities for taking part in improvement of their physical *environment* in a neighbourhood, gain an important and essential role in success of prevention and reduction of crime. In this case, the creation of sense of community and belonging to a place can be supported by social activities and initiatives and by establishment of certain kinds of civil organizations by the members of that specific resident population (Yuen, 2004:7-8).

6.1.5 Community and the Policing

In the high-density apartment developments in Turkey, the changes to the "physical" layout or *environment* with reference to *place-based crime prevention design principles*, which in reality, are not practical, might be compensated by increasing the "social" networks in that settlement. The concern of people for the "others" will increase to the extent that the number of neighbours knowing each other increases and that they are in fine human relations; first for instance within the same apartment building, then the ones in the nearby ones, then in higher levels of aggregation such as the ones living in the same block, then along the same street and finally in the same neighbourhood. With time, this concern would not only turn into development of sense of "home", "community", or in general "place" and proprietorship over the things which they do not directly own such as public spaces, but also feelings and taking necessary actions when those places or their community encounters something odd or something unsafe.

In fact, when an active community participation in keeping its physical and social order takes place consciously in coordination with the local Police Authority, it ends up with a form of urban policing known as "community policing". This is one of the basic policing interventions of *place-based crime prevention approaches*, which has been recently practiced in some of the western countries since 1990s (Schneider and Kitchen, 2002:45,108,122) and which is also being strongly recommended in Turkey and even started in 2006 as a pilot project in 10 big cities (EGM, 2006a). It is hoped that they would not remain as only pilot projects in near future.

This urban policing is based on three main ideas.

1. Since "crime" is a social problem, its resolution should not be attributed to only one institution, which is Police. On the contrary, every individual and every institution should contribute to its solution besides Police. Therefore, its solution is not independent of society and without community participation it could not be resolved;
2. The main responsibility of the Police is not to take retroactive measures against criminal act but to take proactive ones. In other words, the first duty of the Police is to take measures to prevent crimes, and its secondary duty is to perform necessary activities after occurrence of crime, such as; crime scene investigations, finding and apprehending the offenders, etc; and

3. Community policing strategy could be established and continued effectively if an interactive trust is founded and improved in time between the community and the Police (Şimşek, 2004:79-80; İçli, 2004:124-127).

6.1.6 A Model Proposed for Creation of Urban Identity and Image in Community Policing

In the following, concrete activities that the civil society could realize through utilization of current institutions of the neighbourhoods and the activities that the police could carry out within the context of "community policing" are proposed. The former activities involve mostly communities living in apartment housing settlements in creation of urban identity (Yuen, 2004:6), urban image (Newman, 1972:50), and urban variety. The level of aggregation in these activities start from individual and households at the bottom and go through apartment buildings, buildings in the same block, blocks in the same street up to the same neighbourhood. According to the "proposed hierarchical model for creating urban identity and image in community policing" (Figures 6.3 and 6.4), this would take place as collective and organized actions at each level by the coordination of existing institutions like *"Apartment Manager"* at the bottom and *"Muhtar"* at the top and proposed intermediary levels of *"Block Representative"*, who is selected from among the *"Apartment Managers"* of the same block, and *"Street Representatives"* selected from among the *"Block Representatives"* of the same street.

In an urban area, for instance, as a result of successful implementation of the proposed model, when people start to identify themselves with the physical/social features of that community that they live in, this could be seen as the beginning of their development of sense of place or belonging to that community. Consequently, they would be prepared to take actions for its physical/social continuation and betterment, and also would carry out volunteer responsibilities for keeping the community in good spatial and social order and in safety, which would eventually result in reduction and prevention of criminal activities in that area.

This result would be much more effective and sustainable when this spontaneously raised awareness in the community is supported by more conscious and active participation of some other existing institutions such as the local NGOs mentioned earlier (see Section 3.3.1). These small local NGOs, in many squatter settlements were once established right after their residents migrated from the same place and reached to a certain number. Besides their deterioration in

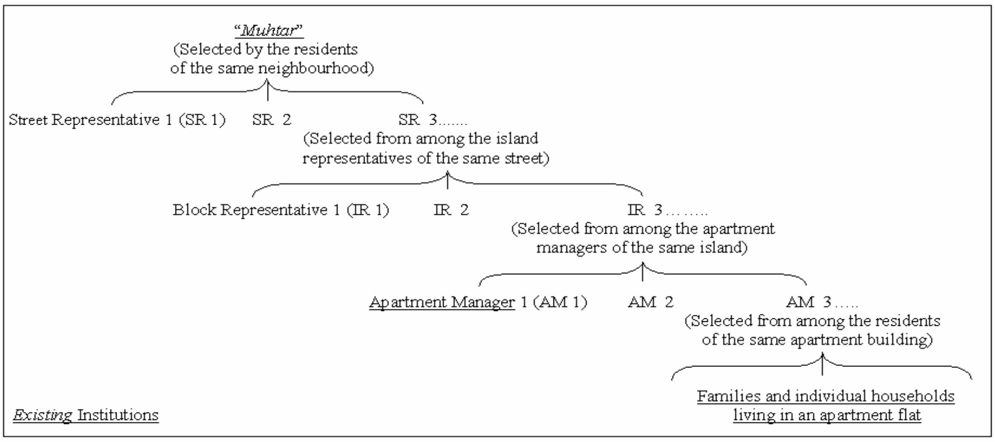

Figure 6.3 Stakeholders in the proposed hierarchical model for creating urban identity and image in community policing by use of existing institutions
Source: Proposed by the Author who is inspired from Yuen (2004)

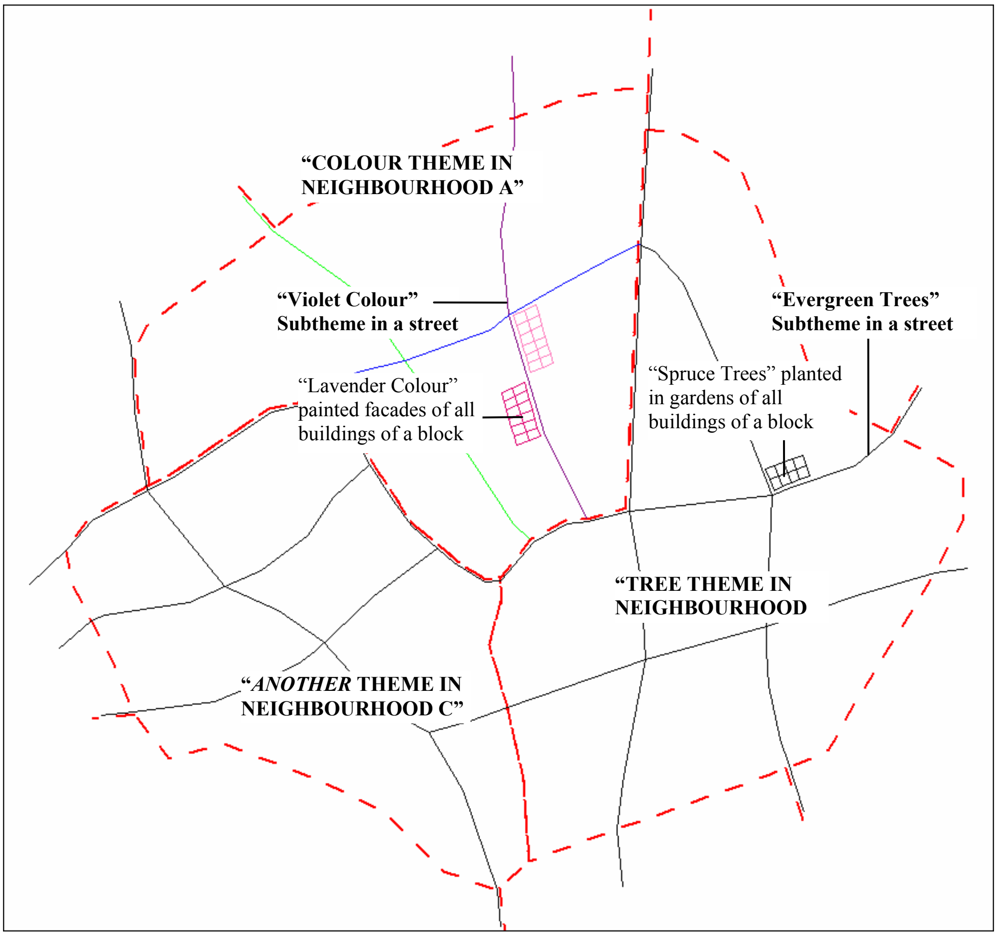

Figure 6.4 Scheme of the proposed hierarchical model for creating urban identity and image in community policing by use of existing institutions
Source: Proposed by the Author who is inspired from Yuen (2004)

time, some of these even became places where the incidents against public morality and incidents against people took place, a case which is very likely to repeat itself in other similar areas of the Metropolis(es). In fact, the responsibilities of the community and the Police Authority coincide at this point for proper functioning of all these local NGOs (societies) (EGM, 2006b).

The deterioration in their functioning, which does not follow their establishment purposes presently, should be stopped by proper implementation of the related regulation. In fact, their current functioning could be returned into their original purpose for them to be utilized in support of the community relations, improvement of *environmental* quality, and development of urban identity and image. For example, monthly neighbourhood meetings could be held with the participation of *Muhtar,* the representatives of the local NGOs, the local Chief Inspector(s) of the related Police Station(s). Such meetings could be very helpful in organizing, discussing and decision taking on for what could be done to increase community relations and to improve the physical *environment* by utilization of the hierarchical model (Figure 6.3 and Figure 6.4). Moreover, this model does not exclude the involvement of the responsible bodies of the upper spatial level(s) such as District and the Metropolis or Province like “District Governor”, “District Mayor”, “District Police Authority”, “Governor”, “Metropolitan Mayor”, and “Provincial Police Authority”.

6.1.7 How New Policing Should be

In establishing and having a functioning ‘community policing’, there are several other activities that the local Police Authority could realize. These could be listed as in the following.

1. First of all, among their own personnel, they could hold training programs on ‘community policing’;
2. Additionally, they can organize a yearly activity throughout the country and declare one day as, for instance, “The Natural Surveillance Day” in order to raise “[p]ublic consciousness that everyone, not just the police force, can do something positive to fight crime” (Yuen, 2004:8);
3. Some of the police officers should be reserved for only community policing whereby these officers need to cooperate with the society to define the problems, and the reasons behind the criminal activities and to take preventive measures (İçli, 2004:125) besides

the remaining personnel who will be supporting them while performing their daily duties in a manner that is compatible with the principles of 'community policing';

4. A Police Station can establish some mobile (temporarily fixed) 'service-control points' that are distributed with respect to where incident hotspots (such as the 5th cluster area) are found. For their functioning these points do not need any closed buildings and any construction activities, and thus, they would not cause any additional financial costs. For instance, only a wireless communication facility, and only small desk would be sufficient. In these points, the responsible police officer not only could distribute brochures and give information to the public for awareness raising on self-help crime prevention (Yuen, 2004:7-8), and also on community policing, but also could serve as an "instant information and contact point" with the police station in case of an occurrence of an incident in order to ensure time minimization for intervention[8]. These 'service-control points' could also be very important to increase the interaction between the community and police and in changing the hard, rigid perception of the police among the public, which is a critical issue to be considered for a successful 'community policing' implementation;
5. Another means of increasing interaction and in this way the trust between the community and police could be the barrier-free performance of patrolling duties. In other words, as it is shown in many researches, the pedestrian patrolling of police officers increases the communication and physical interaction between community and police. In these studies, it is generally concluded that patrolling with cars creates a barrier and prevents direct contact between them. When a citizen sees (a) pedestrian patrolling police officer(s) he/she would feel the officer nearer to himself/herself and even for asking for instance their way or any other questions, not necessarily after the occurrences of criminal acts (Şimşek, 2004:84-85; İçli, 2004:126); and
6. When such patrolling activities are increased in the areas where incidents are concentrated, the existence of police officers would help in deterring the potential offenders, and the residents and pedestrians in those areas would feel themselves safer. For instance, for the study area in the incident hotspots which carry residential, and some or most CBD characteristics (that is, 2nd, 3rd, 4th, 5th and 6th cluster areas in the southern half) and are located only within about 1,5 km radius from the Etlik Police Station (Figure 5.9), the increase of patrolling/control activities would correspond to an area where 73 % of the incidents (the three types together) occurred in the study period.

For the above mentioned activities, the most challenging constraint could be the insufficiencies in the number of officers to be assigned for community policing. However, when the benefits of implementing such policing is started to be observed, the local police authorities will be well aware of the fact that it is not an additional burden on themselves but one of the main activities that they should realize.

6.1.8 Challenges of Planners and Polices in terms of Spatial Interaction

As for the challenges for *spatial interaction* from urban planning and policing aspects, the results of localized analyses of incidents call for an expectation of more frequent incident occurrences in near proximities of each other. For example, for the study area, the incidents tend to cluster, first at a distance up to 115 meters and then at a second distance up to 360 meters in the urban localities and sub-regions of the neighbourhoods. For the urban planning this implies a need for a more considerate and intelligent "planning and design" measures based on *place-based crime prevention* strategies. Similarly, in these localities, the *place-based* strategies elaborated for "police officers" can be implemented simultaneously. Moreover, police officers should be aware of the possibility of repetition of these incidents and be watchful at such sub-regions/clustering areas, and especially at the distances at which these incidents tend to cluster/attract each other.

6.2 Implications for Spatial Analysis for Incidents Differentiated with respect to Their "Types" and "Commitment Types"

In the sections below, urban planning and policing implications and concrete strategies in prevention/reduction of criminal activities that are suggested after the spatial analysis of the incidents differentiated with respect to their "types" and "commitment types" is presented.

6.2.1 How New Planning Legislation Should Be, and the Need for Effective Place-based Crime Prevention Strategies

As one of the main urban planning and policing implications for incident types and commitments, it can be stated that the measures, which would be taken in prevention/reduction of some particular incidents, are also likely to result in prevention/reduction in some other incidents. This likelihood increases as the similarities found in the distribution of incident types and commitments increase. The findings also reinforced the critical tasks of medium-large scale urban planning such that this planning need to include urban design component and participation of the community and key institutions like local Police Authority. In this way, the new planning needs to improve the *environmental* quality and livability of urban spaces and also urban physical conditions that would facilitate the formation of community networks and relations, as listed previously.

The attention should be drawn to the fact that once the planning legislation is integrated with the urban design component, and participation of community and key agencies is made compulsory, the planning/designing process for the settlements to be recently developed would be easier than making new arrangements in the existing urban layout in preventing criminal activities.

Enhancement of such physical and corresponding social relations and community caring and "social surveillance" of the residents are strongly related to sightlines, views and transparency in the built environment (Doeksen, 1997:243). They are also essential bases for a broader set of *place-based* or *environmental* crime prevention strategies to be implemented more effectively. For example, since domestic violences are observed at relatively higher levels in mostly *planned* sections of the study area (see Table 5.9 and Figure 5.15), urban planners should be aware of the fact that there is a high possibility that these incidents will soon be an increasingly widespread feature of urban spaces, which are produced by the current medium-large scale planning practices. With their current approach towards the solution of the problems of urban space, these planning practices are far from reversing at least the negative physical impacts on occurrence of these incidents.

6.2.2 Comparison of New Crime Ecology Implications in the West and in Turkey and Implications for the Study Area

In the following, *new crime ecology* implications for urban planning and policing in western countries (North American and European) and Turkey for more than last twenty years are compared (Table 6.3). Each particular discussion is followed by related implications for the study area.

Table 6.3 Comparison of common place based crime prevention principles/strategies, and their implications for urban planning and policing

<table>
<tr><th colspan="2"></th><th colspan="4">In western countries</th><th>In Turkey</th></tr>
<tr><th colspan="2"></th><th>Jacobs's (61 in 1 and 2) and Hillier's (88 in 2) Perceptions & Main implications</th><th>Newman's (73 in 1 and 2) Basics (Defensible Space)</th><th>Jeffrey's Basics (CPTED Strategies) (3)</th><th>Clarke's (92 in 1;97 in 2) Basics (SCP Techniques)</th><th>Implications in current urban settings</th></tr>
<tr><th colspan="2">Territorial Reinforcement and Target Hardening</th><td rowspan="2">Merits of open society and integration are emphasised, planning and design measures that enable these are welcome while enclosures and territorial marking are not</td><td rowspan="2">Merits of enclosure, merits of segregation, capacity of environment to define zones of territoriality ("boundary definition/territorial marking) and biological meaning of territoriality emphasised, defensible enclaves are supported by excluding "all" strangers without any differentiation, at the most extreme cases ends up with "compound" type of gated communities. Private territories are marked through methods like paving, landscaping, fencing, gating and barricading, which form basic strategies for target hardening at the same time.</td><td>Less emphasis on biological conception of territoriality and argues "Physical design can create or extend a sphere of influence. Users then develop a sense of territorial control while potential offenders, perceiving this control, are discouraged. Promoted by features that define property lines and distinguish private spaces from public spaces using landscape plantings, pavement designs, gateway treatments, and "CPTED" fences. Target hardening is "[a]ccomplished by features that prohibit entry or access: window locks, dead bolts for doors, interior door hinges."</td><td><u>Ex. of Target Hardening:</u>
Slug rejecter device
Steering locks
Bandit screens
Vandal-proofing
Tamper-proof seal</td><td>Most of the time are implemented with perception of Defensible Space, at the extreme point ending up with different level gated communities (ranging from 'enclaves' to 'compounds')</td></tr>
<tr><th colspan="2">(Natural) Access Control</th><td>"A design concept directed primarily at decreasing crime opportunity by denying access to crime targets and creating in offenders a perception of risk. Gained by designing streets,sidewalks, building entrances and neighborhood gateways to clearly indicate public routes and discouraging access to private areas with structural elements."</td><td><u>Ex. of Access Control:</u>
Parking lot barriers
Fenced yards
Entry phones
Locked gates
Id. badges
PIN numbers</td><td>Generally implemented in the form of road enclosures mainly in gated communities and for near environments of certain buildings like the ones for important State Authorities</td></tr>
<tr><th rowspan="3">Surveillance</th><th>Natural</th><td>"Eyes on the street" design principles such as strategically located corner and large front windows, strangers are not only "predatory" but there are also "many many peaceable well-meaning strangers", a certain level of street activity must be ensured during day and night that could be achieved through principles like mixed land use.</td><td>Capacity of design to provide residents to survey on semi-public and non private indoor and outdoor areas. Similar design elements to those of implications of "eyes on the street" principle are suggested.</td><td>"A design concept directed primarily at keeping intruders easily observable. Promoted by features that maximize visibility of people, parking areas and building entrances: doors and windows that look out on to streets and parking areas; pedestrian-friendly sidewalks and streets; front porches; adequate nighttime lighting."</td><td><u>Ex. of Natural Surveillance:</u>
Defensible Space
'Eyes on the street'
Street lighting
Lighting bank interiors
Cab driver id.
Pruning hedges
Neighbourhood watch</td><td>Natural surveillance is no a concern, but linear form of commercial activities ensures a continuous day time street activity and avoidance from completely deserted central places</td></tr>
<tr><th>Formal (Organized)</th><td>Not mentioned</td><td>Not mentioned</td><td>Facilitated not by design but conducted by people who have particular employment to deter or prevent crime like police officers and security guards</td><td><u>Ex. of Formal Surv.:</u>Security guards, police patrols
<u>Ex. of Surv.by Employees:</u>
Park attendants,bus conduc.s</td><td>Private security guards in business, service and commercial sectors since mid 90s</td></tr>
<tr><th>Mechanical</th><td>Not mentioned</td><td>Not mentioned but the use of mechanical or electronic devices are not rejected</td><td>Facilitated by electronic or mechanical devices such as CCTV that could be utilized both in private (residential like gated communities, and commercial like markets) and public places</td><td><u>Ex. of Formal Surv.:</u> Red light cameras, burglar alarms
<u>Ex. of Surv.by Employees:</u>
CCTV Systems</td><td>CCTV is mainly tool for commercial, then service sectors, 'comp.' settlements since mid 1990s</td></tr>
</table>

Sources: (1) Schneider and Kitchen, 2002; (2) Oc and Tiesdell, 1997; (3) CPTED Watch, 2006

6.2.2.1 'Territorial Reinforcement', 'Target Hardening', '(Natural) Access Control', and 'Spatial Segregation vs. Integration'

In western countries the 'territorial reinforcement', 'target hardening' and '(natural) access control' are treated together by an emphasis on 'merits of open society and integration' as urban design measures from *perceptions* of *Jacobs* (1961 in Schneider and Kitchen, 2002 and in Oc and Tiesdell, 1997) and *Hillier* (1988 in Oc and Tiesdell, 1997). However, according to *Newman*'s basics in *Defensible Space* they are dominated by 'merits of enclosure, merits of segregation' through definition of territorial zones or boundary markings (1973 in Schneider and Kitchen, 2002 and Oc and Tiesdell, 1997) (Table 6.3). In most cases, these measures result in what is called as "gated communities", which are almost always seen physically, socially, and most importantly ethically very problematic instrument of highest income social groups in protecting them from criminal activities (Işık and Pınarcıoğlu, 2002:71,143-154) in many metropolises in the developed and developing countries since the start of globalization (see Işık and Pınarcıoğlu, 2002; Peyroux, 2005; Aguilera, 2005).

Unlike Newman, but not as explicit as Jacobs and Hillier, Jeffrey's basics in *Crime Prevention Through Environmental Design* (*CPTED* strategies) (CPTED Watch, 2006) make less emphasis on biological conception of territoriality and thus, on 'territorial reinforcement' and 'target hardening'. Moreover, in *CPTED,* (natural) access control is seen as a design concept for "decreasing crime opportunity by denying access to crime targets and creating in offenders a perception of risk" (CPTED Watch, 2006). With reference to Clarke's basics in *Situational Crime Prevention* (*SCP* Techniques) while some examples of 'target hardening' are given as steering locks and bandit screens, the ones for 'access control' turn to be 'parking lot barriers', 'fenced yards', 'entry phones' and 'locked gates' (1992 in Schneider and Kitchen, 2002; 1997 in Oc and Tiesdell, 1997).

As in the case of 'territorial reinforcement' and accompanied 'boundary marking'; utilization of 'access control' in public space gives rise to effective "privatization" of that space and "exclusion", which results in higher level of counter criticisms on "issues of civil liberties and individual freedoms" when it is implemented in an extreme way (Oc and Tiesdell, 1997:60-61). From this point of view, it is also seen as physically and ethically problematic (see Peyroux, 2005) as 'territorial reinforcement' and as Oc and Tiesdell (1997:61) emphasize "unless checked

- will inevitably result in the erosion of a democratic -democratic referring in this instance to universal accessibility- public realm where all people can mix freely.”.

In Table 6.4, the three overlapping and intervening principles of *new environmental criminological theories*; i.e., ‘natural surveillance’, ‘territorial reinforcement’, and ‘access control’ are presented from the aspect of *CPTED approach.*

Implications of ‘territorial reinforcement’ and ‘target hardening’ in current urban settings in Turkey, most of the time involve their implementations with perception of *Defensible Space* (even though mostly not consciously), which at the extreme point ends up with different levels of gated communities ranging from ‘enclaves’ to ‘compounds’ particularly in the suburban areas. These two groups of extremes lie at the two ends of a continuum as distinguished by Oc and Tiesdell (1997:159). While

> ‘[e]nclaves’ are where the means of segregation is relatively implicit (for example, by income or socio-economic group), passive and symbolic (for example, unmanned gates).…‘Compounds’ are where the means of segregation is explicit, active and physical (manned gates, walls guards, private security guards). (Oc and Tiesdell, 1997:159-160)

In order to ensure privacy and to take ‘target hardening’ measures against criminal activities in the apartment building settlements of the metropolitan areas in Turkey, residents mostly isolate themselves from public space contacts by railing (installation of iron bars), shutters, and curtains on their windows even sometimes during daytime, which prevents surveillance in both directions. These measures constitute additional target hardening strategies also in detached, semi-detached or high-rise dwellings, which most of the time is situated in a gated community (either in the form of ‘enclave’, ‘compound’, or in between). In addition, (natural) access control is generally implemented in the form of road enclosures mainly in gated communities and for near environments of certain buildings like the ones for important State Authorities.

6.2.2.2 ‘Natural’, ‘Formal’, and ‘Mechanical’ Surveillance and ‘Feeder Area’, ‘Density’, ‘Defended Space’, ‘Street Activity’, ‘Lighting’ and ‘Auto park’ Paradoxes

As for different means of ‘surveillance’ in the western countries, *Jacobs’s* (1961 in Schneider and Kitchen, 2002 and Oc and Tiesdell, 1997) and *Hillier’s* (1988 in Oc and Tiesdell, 1997) perceptions, and their main implications are reflected through only the ‘natural’ (natural

Table 6.4 The three overlapping strategies of place-based criminological theories from the aspect of Crime Prevention Through Environmental Design (CPTED) Approach

NATURAL SURVEILLANCE ISSUES	**NATURAL SURVEILLANCE OBJECTIVES**
▪ Does the design allow us to observe?	▪ Design space to facilitate observation by increasing 'visual permeability', i.e. the ability to see what is ahead and around. Measure the need for privacy and/or limited sightlines against the need for personal safety.
▪ Is this level responsive to the needs for observation?	▪ Place vulnerable activities, such as cash handling/child care and other, in places that can be naturally well-monitored. Develop the potential for 'eyes on the street' by strategically aligning windows, work stations and other activity generators towards these areas of 'vulnerable activity'.
▪ Has the need for observation been carried consistently throughout the project?	▪ Take special care to ensure that each phase of the project enhances and complements natural surveillance opportunities created in the design phase. This is particularly critical with respect to the landscape and lighting phases.
NATURAL ACCESS CONTROL ISSUES	**NATURAL ACCESS CONTROL GUIDELINES**
▪ Does the design decrease criminal opportunity by effectively guiding and influencing movement?	▪ Design space to provide people with a sense of direction while giving them some natural indication as to where they are and are not allowed.
▪ Will safety be compromised by limiting access?	▪ Provide a limited number of access routes while allowing users some flexibility in movement.
▪ Does the design develop natural access control opportunities without considering their impact on natural surveillance?	▪ Take special care to ensure that natural access control opportunities enhance and complement natural surveillance objectives.
TERRITORIAL REINFORCEMENT ISSUES	**TERRITORIAL REINFORCEMENT OBJECTIVES**
▪ Does the design act as a catalyst for natural surveillance and access control opportunities?	▪ Enhance the feelings of legitimate ownership by reinforcing existing natural surveillance and natural access control strategies with additional symbolic or social ones. This might include the use of symbolic barriers or signs.
▪ Does the design create ambiguous space?	▪ Minimise the creation of ambiguous spaces (a space is ambiguous when it lacks any sort of clue as to what it is for, and who it is for) Accomplish this by identifying potential 'leftover spaces', for instance those above ground spaces between a building's underground and its property line. Then take some positive action to develop this space so that users of the property take responsibility for it.
▪ Will the design create heavy or unreasonable maintenance demands?	▪ Design space to allow for its continued use and intended purpose. Limit the need for maintenance wherever it affects natural surveillance and access control.

Source: Oc and Tiesdell, 1997:56 (Original source is Peel CPTED Committee (1994)) surveillance) means. These include “eyes on the street” design principles, whereby strangers are not perceived as “predatory”, but as “peaceable” and “well-meaning”. In addition, they consist of principles such as mixed land use to ensure a certain level of ‘street activity’ and ‘peopled places’ during day and night.

One means of achieving this can be the planner’s/designer’s utilization of mixed land-use principles (Schneider and Kitchen, 2002:246) and also urban design principles that facilitates simultaneous pedestrian and car traffic (“woonerf” concept), rather than the separation of the two (“Radburn” principle) (Tranter, 1993 in Doeksen, 1997:245, 248). Such ‘traffic calming strategies’ are applied in a variety of dwelling areas of many Nordic Coutries since 1970s (Doeksen, 1997:245,249). An illustration for the implementation of such traffic calming strategies, ensuring a substantial level of street activity throughout the day time without separation of pedestrian, cyclist, and car traffic in a residential and commercial section of a German city is presented in Figure 6.5.

Figure 6.5 Implementation of traffic calming strategies without separation of pedestrian, cyclist, and car traffic in a residential and commercial section of a German city

Newman's basics in *Defensible Space* suggest that the 'natural surveillance' is the capacity of design to provide residents to survey on semi-public and non private indoor and outdoor areas, and propose similar design elements to those of implications of "eyes on the street" principle like strategically located corner and large front windows (1973 in Schneider and Kitchen, 2002 and Oc and Tiesdell, 1997). Moreover, in *Defensible Space*, while 'mechanical' means of surveillance (mechanical surveillance) is not mentioned, the use of mechanical or electronic devices is not rejected (Schneider and Kitchen, 2002:96).

Similar to the previous three theoreticians, in his *CPTED* Strategies, Jeffrey adopts 'natural surveillance' as a

> design concept directed primarily at keeping intruders easily observable. Promoted by features that maximize visibility of people, parking areas and building entrances: doors and windows that look out on to streets and parking areas; pedestrian-friendly sidewalks and streets; front porches; adequate nighttime lighting. (CPTED Watch, 2006).

Clarke's basics (*SCP* Techniques) suggest examples for 'natural surveillance', which include measures brought by previous principles of '*Defensible Space'*, 'eyes on the street', and measures like 'street lighting' and 'lighting bank interiors' (1992 in Schneider and Kitchen, 2002; 1997 in Oc and Tiesdell, 1997).

'Formal (Organized)' means of surveillance (formal (organized) surveillance) in *CPTED* strategies are facilitated not by design but conducted by people who have particular employment to deter or prevent crime. This also corresponds to one of the highly effective component of the third element in *Routine Activities Theory* (Section 2.2.4). The absence of this third element, which is a guardian/crime suppressor capable of preventing the criminal act, together with presence of the two other elements (a likely/motivated offender and a suitable/desirable target) causes a criminal activity to take place (Cohen and Felson, 1979:589). Its examples in *SCP* include 'formal surveillance' by security guards and police patrols and also 'surveillance by employees' such as park attendants and bus conductors.

In *CPTED*, contrary to 'formal surveillance', 'mechanical surveillance' is facilitated by electronic or mechanical devices such as Closed Circuit Television (CCTV) that could be utilized both in private and public places (CPTED Watch, 2006). Within the context of 'mechanical' surveillance, *SCP* measures like red light cameras and burglar alarms could be counted although they are adopted as means of 'formal surveillance', and CCTV systems despite their inclusion as means of 'surveillance by employees' (Clarke, 1992 in Schneider and Kitchen, 2002; 1997 in Oc and Tiesdell, 1997).

Although the effectiveness of installation of these means for deterring offenders from committing criminal acts and for their apprehending after their commitment still need to be researched more thoroughly and comparatively, it is used frequently in public spaces in some countries like Britain (Schneider and Kitchen, 2002:95) (Figure 6.6) and more frequently in private ventures (ranging from company entries and large shopping malls to small supermarkets) and in 'compound' gated communities in many countries.

Figure 6.6 An example view from a CCTV that can be seen from a local channel broadcast in East London, in Shoreditch, within the context of a neighbourhood program to prevent crime
Source: Spiegel Online, 2006

Another debate on the use of these facilities arises from its cultural and ethical acceptance or rejection especially for their use in public spaces. In between the two kinds of contrasting cultural approaches to such systems, such as Britain and the US, in some countries these devices are adopted for public surveillance and for more security in certain critical public places in privately owned/rented commercial or business enterprises. For example, a considerable portion of the public transport system consisting of different kinds of railways systems such as S-Bahn (suburban railway), U-bahn or Stadtbahn (metro/underground/subway transport) and Strassenbahn (tram system) in Germany are facilitated with CCTV systems in order to increase the security in these systems (Figure 6.7).

As for the implications in current urban settings of different means of ‘surveillance’ in Turkey, it could be stated that while ‘natural surveillance’ is not a particular concern, linear form of commercial and service activities and resultant mixed land uses ensure a continuous day time street activity and avoidance from completely deserted central places. Moreover, while the ‘formal (organized)’ means of surveillance are practiced through private security guards in business, service and commercial sectors since mid 1990s, CCTV, which is used as a means for ‘mechanical’ surveillance, is mainly utilized by commercial and service sectors, and by the ‘compound’ type gated communities since mid 1990s. The period after mid 1990s corresponds to impacts of globalization that resulted in not only emergence of highly diverse business and service sectors but also in the introduction of large commercial and business centers and large shopping malls in inner metropolitan areas and suburban developments as well as nearby ‘gated communities’.

Even though the installation of these devices are increasing at a higher rate in lower-scale shopping centres and even in small supermarkets, their use is mostly limited to public surveillance in privately owned/rented commercial enterprises and in the private territories of the highest income residential areas. It is very likely that this trend will continue and urban residents would not see their installation in public places during at least the next decade. Reasons for such an expectation could be the high value that Turkish people place on their privacy, and the high cost of their installation, maintenance and employee allocation, and the conflicts that would arise for determining the responsible authority for their management.

In the study area and in similar inner metropolitan areas further surveillance might be created by increase of ‘natural surveillance’ and the subsequent increase in feeling safe and attraction by public spaces like streets (Gehl, 1987 in Doeksen, 1997:247; Jacobs, 1961:45 in Oc and Tiesdell, 1997:53). This might be further effective in preventing occurrences of incidents like aggravated battery, simple battery, residential burglary and commercial burglary/theft, theft from auto, and auto theft. For this purpose, a certain level of street activity need to be ensured, both day and night time (Jacobs, 1961:45 in Oc and Tiesdell, 1997:52-53).

Figure 6.7 Examples for CCTV in public spaces such as train stations from a German city
Note: For better visibility the installed systems are encircled

Effective implementation of traffic rules and also active community participation in realization of such design projects as “traffic calming” in carefully planned mixed residential-commercial uses in inner metropolitan areas of Turkey would not only ensure a certain level of street vitality, but also help in creation of sense of belonging and identity that would assist prevention and reduction of criminal acts. As far as the study area is concerned, the cluster area “1”, square of terminal stop of minibuses (Figure 5.7), might be a good starting point, as a pilot project for implementation.

This area contains a large traffic island, squatter housing and mixed land use including mostly apartment housing units with central city functions of commercial and service uses, and it is a place where *Ulus-Ayvalı* minibuses terminate and start their way back to one central business district (CBD) of the Metropolitan Area. Hence, this intersection point is the meeting and distribution point for people whom transport to/from one of the main centres of the Metropolitan Area (i.e., *Ulus*). This square remains in the area of *in-transition* settlement, which started during the 1990s and is about to finish with a high pace, and where most of the apartment buildings are older than 5-6 years. Further, this place is located only about 200 meters away from the intersection point of the three north half neighbourhoods’ boundaries and at the crossroads of the three main roads forming the boundaries and main arteries of these neighbourhoods like *Selim Road, Özlem Road, Mehtap Road*, and *Sarıkamış Street* (Figure 5.7).

As stated above, in many inner metropolitan areas, the current planning system resolves the street activity problem by creation of commercial (activities like shopping, eating and drinking, and leisure time) and business service places mainly in linear form throughout the main roads/and streets in mostly residential areas. In these main roads/streets and sometimes in their secondary arteries these activities are found mainly in ground floors of apartment buildings and they decrease in number in upper floors and in this way completely deserted centers at nights are avoided. This seems to be one of the principles of current planning that deserves to be kept for the new planning system anticipated for prevention and reduction of criminal activities.

However, it is also important to notice that, in this way, the linear placement of commercial activity increases the space within the easy reach of potential offenders; i.e., “feeder area” in line with the *Offenders Search Area Theory* of the Brantinghams (1981b:49-50). They (1981b:49) illustrate how the feeder areas change with respect to the same size area for commercial activity in both circular and strip form as in Figure 6.8. At this point, such a paradox should be viewed as the 'feeder area' dilemma of the planner.

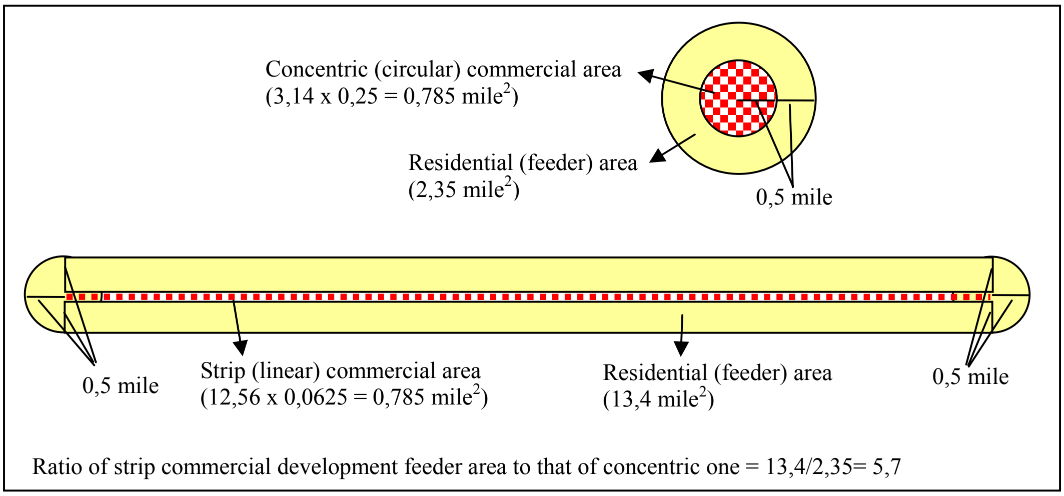

Figure 6.8 Comparison of feeder areas for concentric and strip commercial areas
Note: Drawings are to the scale: 1 cm=1 mile
Source: Adopted from Brantingham and Brantingham (1981b:49-50)

A similar dilemma in trying to create more activities in streets and other public spaces with the aim of achieving more peopled/crowded places for better 'natural surveillance' is called "density paradox" (Harries, 1999). This is directly related to the role of offenders, for which *Defensible Space Theory* is criticized due to its inadequate consideration. It means while busy, crowded, and dense places increase risk of offenders to be seen, they also increase the number of potential offenders and present more opportunities for crime in terms of targets (Wu, 2001:37). In implementing principles of *Defensible Space* it should also be taken into consideration that the Theory is subject to "defended space" and "street activity paradox" (Section 2.2.4). That is, while a well defended space may decrease the likelihood of attacks, robberies or vandalism; it increases possibility for another crime type like incidental thefts from storage places, which is committed since that particular space is secure (Mawby, 1977b in Wu, 2001:37). Similarly, while street activities can mask certain types of crimes like burglaries and motor vehicle thefts, it can encourage other types (Mayhew, 1981 in Schneider and Kitchen, 2002:95) such as pick-pocketing.

All these paradoxes probably explain the most frequent and highest variety of incidents taking place within and between the "4^{th}", "5^{th}" and "6^{th}" clustering areas, collectively composing most crowded, vivid and colorful section of the study area and with its central city (CBD) characteristics, functioning as a sub-centre in the southwest of Keçiören District when a wider metropolitan area is considered.

Moreover, lighting, which is an important design element for 'natural surveillance', presents another dilemma further argued in critics of *Defensible Space.* Lighting not only enables the offenders to be seen, but also allow him/her to see potential targets (Schneider and Kitchen, 2002:96). In addition, as Doeksen (1997:246) argues a well lighted alley or street creates as good opportunity as dark one for criminal acts due to the fact that they attract pedestrians/cyclists to go to "wrong place at the wrong time".

A further discussion arises when the placement of parking areas is concerned. As observed by Doeksen (1997:246)

> [m]any design guidelines suggest direct access from car parks to buildings to avoid the 'dangerous' walk through no-man's land, while others seek to generate more pedestrian traffic by advocating a particular distance between car and home or office….The suggestion of Gehl (1987) for a 'social walk' between car and home to create more street activity can, if the area is badly surveyed, increase opportunities for crime.

According to current planning legislation[9] related to construction of auto parks through "Auto park Regulation", which has been in effect since January 1, 1994[10] replacing a previous one[11], there are two types of parking areas that must be build up in the settlements. First one is "building auto parks"; the second is "regional and general auto parks". The former type of parking is relevant in metropolitan areas similar to the study area. This also corresponds to the first type of design guidelines explained above, but without the underlining concern for not walking through the "no man's land". According to the regulation, the "building auto parks" must be either constructed in a closed or open manner within the building or within the plot that the building to be constructed.

In fact, by means of the first approach, i.e., with parking area setting up inside the building a certain level of safety is ensured by the closed space. Furthermore, with the second approach, the construction of parking within the plot allows 'natural surveillance' of the cars by owner and non-owner home/workplace residents through their front windows also to combat against theft from auto and auto theft incidents in the areas that display similar characteristics to those clusters numbered “2”, “5”, and “6”. However, due to inefficient and ineffective implementation of the regulation and of the controls and penalties by the traffic police officers in all the inner metropolitan areas including *R,* almost all the time streets and pedestrian routes are used as parking, which not only prevents the proper traffic flow, but also safe pedestrian movement (Figures 5.7, 5.8 and 6.9).

Figure 6.9 Use of streets and pedestrian routes as parking in inner metropolitan areas (examples from *R*)

In addition to hindrance to proper traffic flow through occupation of public transportation stops and areas where the parking is prohibited and hindrance to safe and enjoyable pedestrian walk, such parking makes cycling impossible, which has never been considered as a means of transportation in the current planning system even in the areas where the slope allows. In such scheme, residents who are not able to park in front of their own apartment buildings probably park their cars at some distance in the same or a nearby street and afterwards are not able to have a look at or survey them from time to time. This is very likely to create more *opportunities* for offenders of theft from auto and auto theft[12].

Thus far, it must have been apparent that in “planning/designing out crime” (Schneider and Kitchen, 2002:280) urban planners/designers always face paradoxes. Being aware of this fact, they should eliminate these at the best, or at least enable these dilemmas to work in the desired manner through interdisciplinary teamwork and community’s participation in their decision making.

In the areas where these paradoxes result in their negative aspects, in the areas of incident hotspots, and in the areas where incidents are likely to take place; the more frequent patrolling, controlling and appearance of the police officers will possibly lead to prevention/reduction of criminal acts. Such an urban policing strategy should be implemented in the ‘community policing’ framework. The areas for such an intervention, that is, for ‘organized’ or ‘formal’ surveillance means are probably more relevant and critical in the public spaces where this inspection could not be achieved by ‘natural’ surveillance.

This could be well illustrated by the study area clusters (see Appendix G), all of which, as mentioned, remained in either *in transition* (cluster “1”) or *planned* developments (“2” to “6”) (Figures 5.6-5.8). For example, particularly, in prevention of aggravated batteries and simple batteries, more frequent patrolling and appearance of higher number of police officers are essential. This is crucial for the hotpots like “1” and “5” and also to some extend in hotspot “4”, where residential surveillance are physically not in the close contact with the public space incident locations. The relatively longer distances between the dwelling units and incident locations in the hotspots of “1”, “5”, and “4” (e.g., horizontally in hotspot “1” and vertically in hotspot “5”, and both horizontally and vertically in hotspot “4”) are more relevant than the case in the hotspots like “2”, and “6”. In this latter group of clusters the means to achieve ‘natural surveillance’ by the residents is physically more possible due to the spatial nearness of their dwellings to public spaces where incidents take place as compared to former group of hotspot areas.

As far as the study area is concerned, the relatively higher rate of known and/or apprehended offenders of commercial burglary/theft incidents as compared to residential burglary (75 % versus 39 %) (Table 5.19) is likely to result from detection of offenders during their commitments of commercial thefts mostly in the form of shoplifting by the security guard(s) who probably utilized the installed security system established in *Metro Gros Market* (cluster "3"), which witnesses a relatively high ratio of these occurrences[13].

The effectiveness[14] of installation of CCTV system within the commercial centre, *Etlik Ticaret Merkezi*, located in cluster "5", in early 2000s need to be evaluated with an after-2000 comparative research. It is hoped that their use for both deterring the potential offender from his/her commitment and detecting any other who already committed the incident[15], together with an earlier set up 'formal surveillance' system through private security guards in early 1990s will benefit each small shop owner/renter in this commercial centre similar to other shops in collectively administered shopping malls. These malls are being protected in a more regular manner by security guards that are employed, detectors, and CCTV that are installed in their entries, interiors and exits. The examples of collectively administered centres in Ankara can be given as inner metropolitan area shopping malls like Armada or suburban ones like Arcadium. These examples can also be increased to include almost all single constructions of national supermarkets and international hypermarkets franchising. Examples for the former can be counted as "Tansaş" in Turkey, and "Ihrplatz" in Germany; and for the latter as "Real" and "Carrefour".

6.2.3 Challenges of Planners and Polices in terms of Spatial Interaction

Localized analysis of incident distribution at more detailed levels, that is, when incidents are differentiated with respect to their types and commitment types, allowed for more concrete implications for urban planning and policing in terms of *spatial interaction*. As a result, it is implied that *local* clustering found for incidents in general (the three types together) are, in fact, mainly relevant for incidents against property and among them mostly relevant for commercial burglaries/thefts and to a certain degree equally relevant for residential burglaries and thefts from auto. The former commitments -commercial burglaries/thefts- are better to be looked at nearer distances to each other probably than the ones observed for the general trend corresponding to spatial levels such as along the same streets and neighbouring buildings. However, the latter group of commitments -residential burglaries and thefts from auto- whenever show local clustering, they need to be searched at farther distances and probably at about similar distances with the general trend corresponding to spatial levels such as nearby streets and farther blocks. In order to deter criminal activities, which repeat more critically at such distances, the environmental measures can be implemented simultaneously including 'natural surveillance', 'natural access control' and 'territorial reinforcement' principles mainly with *Crime Prevention Through Environmental Design (CPTED)* perception (Table 6.3 and Table 6.4). Moreover, these measures can be accompanied by increased awareness for 'merits of community policing' and 'sense of community' and 'increased level of formal surveillance' through proposed 'service-control points' of the local Police Authority and appearance of higher number of barrier-free patrolling of police officers (Section 6.1.7) as parts of a 'community policing' programme. In addition to these, police officers should be aware of the possibility of repetition of these incidents and be watchful at such sub-regions/clustering areas and at the distances at which these incidents tend to cluster/attract each other.

6.3 Implications for Temporal and Spatio-temporal Analysis of Three Incident Types Together and Differentiated with respect to Their "Types" and "Commitment Types"

Quality of urban life and its livability and sustainability should not only include indicators of level of crime and also fear of crime to the extent that people could make their "*spatial*" choices freely for all their activities like dwelling, working, shopping and entertaining but also to the extent that they can make "*temporal*" choices freely, at the same time. In other words, for an urban resident, his/her ability to realize his/her all living activities whenever as well as wherever he/she likes without any limitations are equally important.

Therefore, the success of creating community social networks, sense of belonging to a place, and proprietorship over the public spaces through urban identity and related community policing and "planning/designing out crime" (Schneider and Kitchen, 2002:280) mentioned previously (Sections 6.1 and 6.2), depend also on inclusion of *temporal* characteristics of incidents.

Particularly, the *new crime ecological approaches* give equal importance to *space* and *time* to explore the reasons for unequal distribution of crimes in *space* and *time*, and state that some targets provide more attractive *spatio-temporal opportunities* for offenders resulting in their victimization.

In the following sections, only additional urban planning and policing implications for the analyses performed in the Section 5.2 are presented. In other words, they are built on and are complementing the implications discussed earlier (Sections 6.1 and 6.2).

6.3.1 Relation to *New Ecology Theories*

As expected, the integration of *temporal* analysis in the distribution of incidents, in the first place, revealed that they display clustering in *time*[16] as they did in *space.* This finding implies that certain periods in *time,* like certain urban *spaces*, provide higher level of *opportunities* for occurrence of criminal activities. In other words, as in *space*, the distribution of incidents in *time* is not random and this randomness cannot be attributed to chance. Moreover, as in *space*, relatively higher number of incidents concentrates in relatively smaller *time* span conforming to existence of hotspots in *time*, like hotspots in *space*. All these observations are compliant with *environmental criminological approaches* including *Routine Activities, Rational Choice and Crime Pattern Theories.*

6.3.2 Opportunities in Time in terms of Urban Activities

When *timely opportunities* that the study period of the year 2000 provides are studied in order to obtain clues in prevention/reduction of criminal activities, several particular patterns were observed. At the first level of analysis, which is with respect to months of the year, the general trend for the three types of incidents together, had peaks during the months of April, June and August. As known, April is a mid-spring month, while June and August compose the early and late months of the summer. In fact, these are the months during which leisure time *routine activities* of people that are carried out mostly indoors and in private spaces during the colder seasons, transferred to outdoors and into public spaces due to warmer weather. Furthermore, towards the end of this period (particularly in August) urban population generally prefer to leave their windows and balconies open due to hot weather especially during nights and to have their summer holidays away from their homes and most probably also away from their cars.

When the main components of such higher frequencies in these months are examined on the basis of the most frequent commitment types against people, it is observed that, when summed, aggravated batteries and simple batteries are mainly observed between April and June corresponding to mid spring-early summer period, as compared to domestic violences, which had no clear monthly pattern.

In order to prevent a group of young and resident offenders from committing their violent acts like aggravated and simple batteries in the open and public spaces during the warmer months of the year; and to prevent older offenders from committing incidents against their own family members at home almost evenly all through the year, the planners/designers need to think in a very innovative way. In addition, they need to obtain their inspiration not only from the residents themselves but also from working together with sociologists, behavioral scientists, architects and also police officers.

It is apparent that the only way for improvement of a community should not only involve improvement of *environmental* quality through physical investments and associated urban renewal programmes. It should also include social improvements. For example, in a large number of German inner city areas such programmes called as “The Socially Integrative City” *(Die Soziale Stadt)* were started in 1999. This programme targeted towards the problematic inner city areas with high level of social disintegration, slums and impoverished neighbourhoods. It “aims at an integrated and holistic strategy, combining physical investments with funding of social work and community development.” (Schmidt-Kallert, 2004:1).

Accordingly, for the former group of above stated offenders, the free provision of finely selected leisure and recreational activities such as artificially covered small football grounds, workshops for folk dances, theatre and for other fine arts like painting for the target spaces and time periods might be some relevant mean for solution. However, for the latter group of offenders the situation is more complicated. Intervention in urban space to reverse at least the negativities of urban structure such as chaos, complexity, air and noise pollution, litter and graffiti, and traffic problems peculiar to ineffective management and maintenance, might contribute to a certain extend in solution of these incidents. Nevertheless, as Schneider and Kitchen (2002:265) discuss “not all types of crimes are equally amenable to amelioration through environmental action…”. They give the example solution to domestic violence problem is “primarily non-environmental in terms of societal action” and different in nature for example from the resolution of a fear of money withdrawal from an ATM at late night time, including “…action in terms of the visibility of its location, the quality of lighting in the immediately surrounding area, and the avoidance of the creation of hiding places".

As for the other main components of the monthly distribution of incidents it is observed that the frequency of residential burglaries and thefts from auto peaked in August. To a certain extent, these two commitment types were also observed close in *space*, as well (see Chapter 5). The concentration of residential burglaries and thefts from auto in August may result from *opportunities* created by preference of residents' leaving the windows and balconies open during nights and going for holiday, thus, leaving their homes and cars unattended.

The commercial burglaries/thefts, which were most frequently observed during May-September, i.e., mid-spring-early-autumn period, display some paralleling to those of aggravated and simple batteries.

For commitments of incidents against property, which almost all the time occurred indoors and in the target itself, like cars, and primarily by the non-resident offenders (Table 5.19), some classical 'target hardening' measures like railing (installation of iron bars) of windows and gates, reinforcement of locks and setting alarm systems may prove to be useful only to a certain extend. However, development of *communal responsibility* and *continuous natural surveillance* by residents accompanied by activities of 'community policing' would probably be more effective means of solution.

The remaining *temporal* analyses for the commitment types are the ones with respect to days of the weeks and three daily time intervals. For the main commitment types, while days of the weeks do not display a clear pattern for domestic violences and commercial burglaries/thefts, they show higher frequency distributions towards the beginning days of the weeks for simple batteries and residential burglaries, and towards weekends and during the weekend days for aggravated batteries and thefts from auto.

Unlike these similarities among pairs of some commitment types of incidents against people and against property; the daily time intervals distribution suggest contrasting *temporal opportunities* for these two incident types. The *routine activity* times and urban *temporal* conditions provide the highest level of *opportunities* for occurrence of incidents against people to be committed during a time span between 18:00 and 00:00. However, those opportunities mostly concentrate between 00:00 and 08:00 for incidents against property. In other words, for incidents against people when daily routines are already over and working family members are at home or outside having more free time until they sleep, and for incidents against property when a great majority of residents are asleep during the night until first hours of the daily routines.

Prevention of incidents on the basis of analyses for different *time* periods cover the same resolutions mentioned previously. However, a broader set of planning and policing implications could be achieved by looking from analytical perspective that compares some periods that are marked by particular socio-cultural behaviours (e.g., benevolence, and fraternity) and incident occurrences. Accordingly, it should be stated that the positive aspects of socio-cultural processes combined with a good level of education and awareness through ‘community policing’ and the resultant communal responsibility would provide sound bases against criminal activities in urban areas. This argument once more proves that prevention of criminal activities require more than what could be done only through physical measures for “planning/designing crime out”.

As for the *spatial* distribution of incidents in monthly *temporal* level, the analyses suggested significantly different incident distributions with respect to months of the year with a pairwise difference of 91% (60 out of 66 comparisons) (see Table 5.23). On the other hand, most of the areas and roads/streets in nearby of which the hotspots are located according to the *kernel estimations* for months of the year (Table 5.25) turned to be *planned* and subsequently *in-transition* development patterns. An additional policing implication concerning the *spatial* and *temporal* analysis could be the use of more effective and efficient allocation of police officers in target spaces during target times. For example, patrolling activity or ‘formal surveillance’ (Section 6.2.2.2) particularly in barrier-free form can be increased and service-control points (Sections 6.1.7) can be set up in the most persistent hotspots which are found in nearby of certain areas and roads/streets. Accordingly, the target months, target areas, and roads/streets in nearby of which hotspots are found are summarized in Table 6.5.

Table 6.5 Priority target periods and target areas and roads/streets in the proximities of which hotspots are found

Priority target times from among months	**Proximities of areas and roads/streets that should be targeted with a priority**
January	*Mehtap Road*
April	
May	*Seval Road*
June	*Kardeşler Cooperative*
August	*Ayvalı Road*
	Metro Gros Market
	Giresun Road
	Gen.Dr.Tevfik Sağlam Road
	Meşeli Street
	Kuyuyazısı Road
	Refik Saydam Road
	Yunus Emre Road

6.3.3 Challenges of Planners and Polices in terms of Space-time Interaction

Although the incidents were found to display significant *local spatial interaction* in terms of clustering, they indicated no *space-time interaction* in terms of either clustering or dispersion when their types are explored together. Nevertheless, when the incidents were distinguished with respect to their types, similar to *local spatial* clustering found among incidents against 'property', a significant *space-time* clustering among these incidents was also observed for all the *time* periods investigated. That is, incidents against property occurred not only in near proximities of each other but they were also close in time over different time periods (i.e., months, weeks, days, and days with three daily time intervals). However, a *space-time* clustering was not found among incidents against 'people' unlike their *local spatial* clustering, which was at least to a certain extent (Figures 5.13 and 5.14). As for incidents against 'people and property', they displayed none of the *space-time interactions* (i.e., neither clustering nor dispersion), as they displayed none of the *spatial interactions* (i.e., neither clustering nor dispersion).

The analysis of the most frequent commitment types of incidents against property revealed that residential burglaries are responsible for the *space-time* clustering in these incidents for all four different *time* periods. This implies that residential burglaries took place both close in space at least up to a certain distance (Figure 5.14) and close in time periods (i.e., during months, weeks, days, and days with three daily time intervals). Accordingly, neither commercial burglaries/thefts nor thefts from auto displayed *space-time* clustering (Table 5.34).

Moreover, while the incidents against people lack *space-time interaction* in terms of clustering or dispersion, a *space-time dispersion* is observed in one of its main components, i.e., among simple battery commitments. This implies that whenever these incidents are close in time they are far apart in space, and whenever they are close in space they are far apart in time for the four time periods. However, no *space-time* interaction is found among aggravated batteries or domestic violences (Table 5.34).

For additional urban planning and policing implications other than the measures mentioned for *spatial* clustering of some incidents, here, for simple batteries it should be stated that the local Police Authority also needs to take into account their *temporal* clustering in their resource allocation, which would be better if programmed in a context of 'community policing' initiative in the study area. Police officers also need to be watchful for the possibility of occurrence of residential burglaries not only in nearby proximities but also their repetition in close periods in terms of months (r=0,079), weeks (r=0,084), days (r=0,080), and days with three daily time intervals (r=0,089) in clustering areas like *Süleymaniye Kültür Merkezi* and the nearby surroundings (i.e., hotspot "2"), *Kasalar Kavşağı* (i.e., hotspot "4"), and near surroundings of the junction of *Gen. Dr. Tevfik Sağlam Road* and *Atadan Road* (i.e., hotspot "6") (Table 5.34). For simple batteries they additionally need to be aware of the fact that whenever these incidents take place in similar localities, they will probably repeat after longer periods of time, and whenever such incidents take place during some time in one place, the officers possibly would expect that another one is taking place at the same or at a similar time but at a place which is not in close proximity for the four time periods (r=-0,061; r=-0,062; r=-0,064; r=-0,064 for months, weeks, days, and days with three daily time intervals, respectively) (Table 5.34).

[1] The resolutions related to these positive spatial and social aspects are discussed below first for the areas to be newly planned in the Section 6.1.3 and for the existing settlements in the Section 6.1.4.

[2] Law numbered 3194, introduced into the planning legislation as a revision to an earlier one dated back to year 1956 and numbered 6785.

[3] Introduced into the planning legislation with the law numbered 2981 and in effect since 1984.

[4] This word is used with its American English meaning which is “a group of buildings with streets on four sides.” (OALD, 1995:115)

[5] This quotation includes the translation made by the author, original text is in Turkish. The emphasis on “formal” and “informal” belongs to the author.

[6] As described in detail in Section 2.2.4, *SCP* has a different scale than the previous opportunity reduction approach, i.e., *CPTED*, and it requires a definition of problematic area and uses additional methods other than planning as well.

[7] Due to many-to-many relationship between the Police Station and neighbourhood boundaries (see Appendix A), the remaining section of one neigbourhood that is partially covered in the study area (as part of Etlik Police Station Zone), is located in Merkez Polis Station Zone.

[8] An analysis carried out to obtain average time between the differences on date-time for incident occurrences and their registration by the police (date-time known by the police) revealed an average of two days time (mean=1,99171) with a standard deviation of about 11 days (standard deviation=11,3266). This analysis was carried out of the 529 incidents data set, which have known “Incident Date”, “Incident Hour”, “Registration Date”, “Registration Hour” information (see Section 4.2.1.1).

[9] Law numbered 3194, introduced into the planning legislation as a revision to an earlier one dated back to 1956 and numbered 6785.

[10] Official Gazette date and number: July 1, 1993 and 21624.

[11] Official Gazette date and number: March 20, 1991 and 20820.

[12] Assessment of such a relationship, i.e., relationship between the victims’ residences and the places of the incidents might be possible if the former data set is compared with incident places.

[13] Out of total of 63 CB/T incidents, and total of 14 TFP / R incidents: 13, and 2 of the respective commitments took place in and near environs of *Metro Gros Market* and the offender(s) of the 12 of these CB/T incidents have been caught by the security guard(s) who probably utilized the installed security system.

[14] Date information for the CCTV and security guards, is obtained from the interviews made in the centre.

[15] The examples for this can be given as the reduction of commercial thefts committed through fraud and thefts from person / robberies, which occur through a face-to-face contact of offenders and the victims (like shop owners and clients), who afterwards could identify the offenders by means of the CCTV records.

[16] The implications for the simultaneous consideration of space and time (i.e., space-time interaction in terms of clustering or dispersion) is discussed in Section 6.3.3.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

This study aimed at exploration of criminal activities in a *spatial* and/or *temporal* context in order to contribute with concrete proposals for suitable strategies for urban planning and policing (*kent planlama ve polisliği*) in crime prevention and reduction by utilization of *new crime ecology (place-based crime) perspective.*

It is the first scientific study in the context of a protocol signed in 2003 between the General Directorate of Security and the Middle East Technical University in developing a study-base for common analytical and strategic researches to prevent/reduce crime in cities. Therefore, its motivation came from an urgent need of an implementing agency in prevention of crime in addition to anticipation for contributing, or at least raising an awareness in the planning authorities on *place-based crime prevention* possibilities, which is lacking at present.

A case study is performed for a group of selected *place* (in terms of *space* and *time*) related incidents (Brantingham and Brantingham, 1981a; Brantingham and Brantingham, 1981b), which are incidents against people, against property, and against people and property, in a study area and for a study period. The study area was selected from within a part of Keçiören District in Ankara Metropolitan Area, which display three different settlement types (*planned*, *early stage gecekondu* (*squatter*), and *in-transition*). It comprised the developed (built-up) sections of all, most or some part of nine neighbourhoods in the Etlik Police Station Zone (EPSZ), and the study period covered a whole year period of 2000.

This study carried out the comparative and systematic *spatial* and/or *temporal* exploration of incidents, their types and commitment types at ‘mezo’-‘micro’ ecological scales in three different development patterns through quantitative means, which is facilitated by the developed loose-coupled (Sui, 1998:653) GIS-based system.

The study was based on the main argument that incidents display differences in the *spatial* and/or *temporal* distribution among the three different development patterns, i.e., *planned*, *early stage gecekondu* (*squatter*), and *in-transition*. In exploration of these differences, it also searched for the validity of *new crime ecology theories* developed in the west (North American and European) and *critical* adaptability of their strategies in Turkey.

The "mezo"-"micro" *spatio-temporal* level study proved to be helpful to obtain implications at the settlement or medium-large scale planning and policing. This study, first, addressed the possibilities of how *new crime ecological theories* and their practical implications could be integrated into medium-large scale urban planning of that locality in a narrow context, and medium-large scale urban planning system (conducted mostly at 1/5000 and 1/1000 scales and in specific circumstances at larger scales like 1/500) in a wider context. Secondly, it contributed with the possibilities of *environmental* measures that could be taken by the local Police Authority in a narrow context, and by the other such authorities responsible in similar inner metropolitan areas and/or responsible at higher level metropolitan regions (District level, Province level, etc.).

In order to achieve the suitable response strategies for planners and polices by means of *new crime ecology* perspective with reference to the main argument of the study; the incidents were explored in two main stages: The first stage involved the *spatial* analysis of the incidents; and the second stage involved the *temporal* and *spatio-temporal* analysis of the incidents. Both levels of these analyses are repeated for the exploration of three incident types together and exploration of incidents when they differentiated with respect to their types and commitment types.

For *spatial* analyses, first, three incident types together were explored for their *general* (*global scale*) *spatial* distribution. Secondly, their *localized* (*local scale*) *spatial* distribution, which corresponds to their *spatial interaction* were explored. Afterwards, the relationship of incident distribution and clustering with respect to urban structure was discussed. In the continuing sections for *spatial* analyses, these three steps are repeated for incident types and commitment types.

With this study, as hypothesized with reference to the main argument, the higher frequency and rates of incidents was observed in mostly *planned* and partially *in-transition* neighbourhoods when the *general spatial* distribution of the three incident types together is explored. Complementarily, the mostly *squatter* and partially *in-transition* neighbourhoods witnessed less frequent and lower rates of incidents. Although carried out from *traditional ecology* perspective, a research in which a central city *squatter* area is compared with a *planned* central city area, suggested similar finding that central city *planned* area witnessed larger number of incidents (Uğur, 1986:45). In the current study, the statistical tests for incident types together confirmed the expectations and revealed that the incidents are not distributed equally among the three development patterns in terms of rates. With further statistical analyses, it is found that the difference among the mean incident rates results from the significant difference between *squatter* and *planned* settlements, and to lesser degree difference between *in-transition* and *planned* settlements.

Similar to above stated finding, and as expected, the statistical tests for point distribution indicated that the incidents are not distributed randomly in *space*, but they have a clustered pattern. This result is in line with the findings of *new ecology* researches stating that the distribution of crime is not random (see e.g., Cohen and Felson, 1979; Cornish and Clarke, 1986; Brantingham and Brantingham, 1981b; Brantingham and Brantingham, 1984; Wu, 2001; Henry and Bryan, 2000; Nelson et al, 1996). In accordance with the main argument, in this pattern, more number of clusters and higher density of incidents are observed in mostly *planned* settlements. Likewise, less number of clusters and relatively regular and lower densities are found in the mostly *squatter* settlements. Further analyses displayed the mean densities of incidents are significantly different among all the three development patterns.

The analyses indicated that the structure of the study area in general was effective in the *general* (*global scale*) distribution of incidents in *space*. Moreover, the analyses for localized (*local scale*) distribution of incidents indicated that the incidents *spatially interact* with each other, i.e., there is a *spatial dependence* among them. It is found that there is an increasing interaction up to 360 m with a prior critical distance at 115 m. These findings suggest similarities to the research by Leitner (1999) who stated both properties, i.e., *global* and *local* scale can be used effectively in exploring the distribution of criminal activities.

The observed clusters of incidents confirmed the relationship of the distribution of incidents with the urban structure. In other words, the point pattern, which was found to be clustered, revealed that some urban areas and respective socio-economic settings create more *environmental opportunities* in *space* as compared to other areas. These *opportunities* in the sub-regions of the neighbourhoods are effective in clustering of larger number of incidents in smaller areas, or in hotspots. As expected, 5 out of 6 clusters (Clusters “2” to “6”) that are identified in the study area remained in the *planned* sections of the southern (mostly *planned*) neighbourhoods. All of these five clusters also remained in an area, which is located within a distance of 1,5 km radius from Etlik Police Station. Only one cluster (“1”) remained in the *in-transition* area located in the northern (mostly *squatter*) neighbourhoods. It is interesting to note that none of the clusters are found in the *squatter* settlements.

These hotspots, which have both similar and/or dissimilar *environmental* features and are mainly located in the *planned* settlements, verify what have been suggested by the *new ecological theories*, (*Routine Activities, Rational Choice, Crime Pattern*) for western cities. For example, for the City of Jackson (Mississippi)

> The picture of a high crime probability site can be described as follows: a site in which the adjacent areas which are easily accessible through a street network…, with a high diversity of land use and a high density of residential and general commercial buildings, particularly retail commercial for eating and drinking. (Wu, 2001:p.xii-xiii)

Similarly, the *planned* settlements in the study area are vulnerable for incident occurrences, mainly in *routine activity spaces* and *times* (Cohen and Felson, 1979). Examples for these can be given as residences, diverse commercial and service workplaces, and places for different kinds of transportation facilities. The low level of neighbourhood relations, high concentration of people with mixed origins and low sense of community also contributes to likelihood of incident occurrences.

On the contrary, it is very probable that in the *early stage gecekondu* settlements, their mostly residential characteristics and homogenous physical and social environment (although with an inferior economic status), the sense of community they experience and their feeling of belonging to a place and being a part of the community have prevented them to be exposed to high incidents rates.

The analyses concerning the relationship that is tried to established between the incident rates and ratio of *squatter* areas to *in transition* areas, and ratio of *planned* areas to *in transition* areas suggested that in the study area, the combined effect of these areal ratios of the neighbourhoods account significantly for 71,6% of the variance in incident rates. Although limitations of this analysis (such as small sample size of n=9) requires a caution for generalization of its results, with the current trend of transformation of *squatter* areas into *planned* settlements through Improvement Plans, it can be stated that there is high probability for *in-transition* and *squatter* settlements to acquire similar *spatial* distribution of incidents that are currently being experienced in the *planned* sections. At least for the study area as a whole, this implies an overall increase in the incident occurrences. Furthermore, the likelihood for increase in incident occurrences in similar inner metropolitan areas should be taken into consideration.

The intensive occurrences of incidents in the *planned* areas suggest the ineffectiveness of the current medium-large scale planning system in the prevention/reduction of criminal activities. There are some aspects that should be adopted from the *early stage gecekondu* settlements. It is a challenging task for the new planning practices to keep the features like high level of neighbourhood relations and high level of sense of community, and to produce spaces where the foreigners are tolerable to end up with a "public realm where all people can mix freely" (Oc and Tiesdell, 1997:61) and behave "without feeling socially embarrassed" (Worpole, 1992:5 in Oc and Tiesdell, 1997:224). Moreover, it needs to welcome heterogeneity with different tenures, socio-economic status groups by designing integrated, mixed, diverse and unique *environments* for all types of land uses facilitated with adequate physical and social infrastructures.

This requires a change in the planning system to integrate urban design principles to promote community spirit and local residents' interaction that would be elaborately developed in accordance with needs and expectations of the changing social, economic, cultural and also demographic composition of each settlement. The new planning system should also enable and, in fact, make compulsory, the participation of each community, which will be living and/or working in or using that particular locality and of the key institutions, which are operating within that locality such as local Police Authority, in solution of their distinct and non-standard problems including criminal activities (Schneider and Kitchen, 2002:288-289). Such planning approach would be less challenging for the settlements to be recently developed than making new arrangements in the currently built-up urban layout in preventing criminal activities.

In this study, concrete activities of the civil society in the context of “community policing” and the activities that police could realize in the same context were presented. According to the “proposed hierarchical model for creating urban identity and image in community policing”, this would take place as collective and organized actions at each of the hierarchical levels by the coordination of existing institutions such as *“Apartment Manager”* at the bottom and *“Muhtar”* at the top and proposed intermediary institutions such as *“Block Representative”*, and *“Street Representative”*.

The descriptive analyses based on the incident types and commitment types revealed that majority of incidents are committed against people as compared to less and least incident occurrences against property and against people and property, respectively. When the neighbourhoods are grouped with respect to their general development patterns such as mostly *squatter* northern settlements, and mostly *planned* southern settlements, the ordering of occurrences of incident types is found to be the same as the study area. However, although the incidents against people display the highest occurrences in both types of settlements, the percentages and the rates of incidents against ‘property’ are predominant in the southern (mostly *planned*) neighbourhoods (mainly in the form of commercial burglaries/thefts and residential burglaries). Moreover, the findings revealed that whenever incidents occur in the mostly *squatter* northern settlements, they are mainly committed against people rather than against property (mainly in the form of aggravated and simple batteries).

Likewise, detailed analysis, in which the three development patterns are differentiated, enabled further elaborations on the occurrences of incident types. For example, although the ordering of the incident types with the highest two percentages are found to be the same for all the three development patterns, the percentage of incidents against people are found to decrease from 90% in *squatter* areas, to 63,9 % in *in-transition* areas, and to 49 % in *planned* areas. Complementarily, the percentages of incidents against property increase from 5 % in *squatter* areas, to 25,8 % in *in-transition* areas, and to 44,1 % in *planned* areas (Table 5.11).

These findings are both in line with the main argument and with the findings of reviewed researches. Although they approached the problem from the *traditional ecology* perspective, they also found peculiarities (Uğur, 1986:56) or quantitative and qualitative (Kaplan, 1980:174) differences of incident distribution between *squatter* and *planned* areas. For example, according to Kaplan (1980:166,174-175), although less in proportion the occurrences of batteries and defamation (incident types against people) are the most frequent incidents (20,3 %) in a *squatter* settlement of Ankara Metropolitan Area whereas in a corresponding *planned* area of higher socio-economic conditions, the most frequent incidents turn to be larcenies (31 %) (incident type against property).

The statistical testing also confirmed these findings, and in line with the main argument, the expectation that the incident types and the three development patterns are not independent of each other in terms of frequencies found to be statistically significant mainly for incidents against 'people' and against 'property'. Similarly, as for the rates of incident types, a significant difference with respect to development patterns is found for incidents against 'property' and against 'people and property'. Further testing indicated that for the incidents against 'property', similar to the general trend of three incident types together, the significant differences are found between both *squatter* and *planned* settlements and between *in-transition* and *planned* settlements. Finally, as for the incidents against 'people and property' the only significant difference is found between *squatter* and *planned* developments.

As expected, for each of the incident types, the statistical tests for point distribution indicated that none of them distributed randomly in *space*, and each type has a clustered pattern. However, the incidents against property display the highest level of clustering as compared to relatively less and least clustering of against people, and against people and property, respectively. This implies relatively homogeneous distribution of the latter types of incidents. Further analyses for point pattern densities suggested significant difference between all pairs of the three development patterns for each of the incident types (all at a level of $p<0,05$) (Table 5.16). Similar to previous finding, the tests for bivariate centrality and dispersion measures of each of the incident types indicated that the distribution in the study area which is distinguished by the three development patterns differ mainly for incidents against people and against property.

The analyses for *localized* (*local scale*) *spatial* distribution of the three incident types and for the first six most frequent commitment types indicated that the *local* clustering found in the general trend of incidents (i.e., when all the incidents are explored together) is in fact, mainly relevant for incidents against property and among them mostly relevant for commercial burglaries/thefts and to a certain degree equally relevant for residential burglaries and thefts from auto. Moreover, significant *local scale* differences are found to exist among all pairs of the incident types. Similarly, as for commitment types, the *local scale* differences are found to exist among all the pairs of commitments except for pairs of thefts from auto-residential burglaries, thefts from auto-domestic violences, and residential burglaries-domestic violences.

When the relationship of distribution and clustering of incident types and commitment types with the urban structure is explored in the mostly *squatter* settlements, it is found that the only exception to relatively homogenous distribution of incidents against people is one clustering of aggravated batteries and simple batteries in their *in-transition* areas. In addition, it was observed that when the incidents against property (particularly in the form of residential burglaries and damages to auto) are committed, most of the time they take place in their *in-transition* sections, which display certain level of physical similarities to those that are found within the *planned* areas.

The analyses on the hotspots in terms of incident types and commitments revealed that the clusters are mainly composed of either one (clusters "1" and "3"), two (clusters "2", "4", "6) or three (cluster "5") incident types. This finding, which provided more evidence for certain areas to attract different offenders for different commitments, verifies one of the main premises of *place-based ecological theories*. In other words, the generally accepted idea of the *new ecological theories* on the existence of differences in motivations (Buettner and Spengler, 2003:7) and different spatial behaviour (Portnov and Rattner, 2003:13) of offenders (such as their *awareness* and *activity spaces*) is supported. Further similarities/dissimilarities in motivations of offenders could also be supported by the mean number of events in incidents, which is either committed as "single event" incidents as for those against property, or committed as "multi-event" incidents as for the remaining incident types. Moreover, a further support of *new ecology* is found by the differences of motivations of resident and non-resident offenders (Buettner and Spengler, 2003:7), who respectively committed incidents against 'people' and against 'property' in general.

By analyzing the incident types and commitment types, the study provided evidence for urban planning and policing that the measures to be taken in prevention/reduction of some particular incident commitments are also likely to result in prevention/reduction in some others. This level of analysis also reinforced the critical tasks of medium-large scale urban planning such that this planning need to include urban design component and participation of the community and key institutions like local Police Authority. In this way, the planning needs to improve the *environmental* quality and livability of urban spaces and also urban physical conditions that would facilitate the formation of community networks and relations.

Improvement of such physical and corresponding social relations, community caring and "social surveillance" of the residents are strongly related to sightlines, views and transparency in the built environment (Doeksen, 1997:243) and are also essential bases for a broader set of *place-based* or *environmental crime prevention strategies* to be implemented more effectively. In this study, detailed *new crime ecological strategies* in prevention/reduction of incidents for urban planning and policing is presented by comparing the implications of *place-based crime prevention strategies* in western countries and Turkey for more than last twenty years, i.e., 'territorial reinforcement', 'target hardening', and '(natural) access control', 'natural', 'formal', and 'mechanical' surveillances, 'spatial segregation' and 'spatial integration'.

It is concluded that against segregating and isolating effects of globalization (such as gated communities); planning should fight for integration, interaction, transparency, permeability, and openness of spaces and communities, with a proper hierarchy for public, semi-public, semi-private, and private spaces. Accordingly, the solution to deter criminal activities should not be searched under gated communities (Yuen, 2004:7). In addition, their displacement effects (Aguilera, 2005:28) should be put forward whenever such proposals are seen as bases for the solution.

In "planning/designing out crime" (Schneider and Kitchen, 2002:280), the resolution of the problem of conflicting physical and social urban spaces, and the resolution of paradoxes that the planners/designers face when they plan/design for deterring criminal incidents should be fed by the support from both the participation of the residents themselves and the interdisciplinarity of planning, which involve essentially teamwork with sociologists, behavioral scientists, architects and certainly with police officers. These paradoxes include: 'feeder area' (Brantingham and Brantingham (1981b); 'density' (Harries, 1999); 'defended space'; 'street activity' (Wu, 2001:37); 'lighting' (Schneider and Kitchen, 2002:96); and 'auto park' (Doeksen, 1997:246).

In cases of ‘feeder area’ and ‘autopark’ paradoxes the locational characteristics of respective central city functions and parking facilities give rise to dilemma of increase or decrease of potential offenders and *opportunities* for incident occurrences. For example, while linear commercial activities prevents from night-deserted central areas, they provide almost six times larger area for potential offenders, which is also called as ‘feeder area’ (Brantingham and Brantingham, 1981b:49-50). In the case of other paradoxes the existence or non-existence of the related conditions gives rise to dilemmas either in terms of decreasing or increasing *opportunities* for incidents and a change in their types.

In resolution of these, the interdisciplinary teamwork requires the police authorities to undertake an essential responsibility similar to the planner/designers themselves, which is being open in sharing data. This implies an effective increase in their ability to share incident data to the extent that it would not harm the civil liberties. For example, in revising an existing plan of a settlement; even though it would be in aggregate, the information coming from Police Station or Stations in that locality might be critical. The information might be on the issues such as which type of criminal activities have been common during the last ten years; in which places the offenders are used to be non-residents or residents as in domestic violences; which group of people in which places become the victims of violent incidents including homicide, different levels of battery and the like; whether residential burglaries are more common than commercial burglaries/thefts and where they concentrate. Furthermore, the advises of the local Police Authority on proposing places for social, commercial, and similar facilities and the residential densities would benefit the planners/designers much in their actions to “plan/design out crime”.

For this purpose, there are essential activities that the local Police Authorities need to carry out. First, setting and maintaining a continuously up-to-date, complete database system that involves data on both spatial and related tabular properties of incidents should be among their primary tasks. In this study, example of achieving such a database system; and the means of achieving such a system are presented; and a software (“Event Notebook Program”) is developed. The software aims for the incident data management (entry, correction, etc.) in the designed loose-coupled GIS-based system.

Such database management systems are better to be set up and maintained in each Police Station in a standard manner and coordinated by a central database management authority. The Provincial Directorate of each province could be responsible at the first level and General Directorate of Security could be responsible at the national level. Such a system, at the local level, also requires training of the officers that would be responsible for data entry and update of these databases.

Second, at the minimum at the District level, the Police Authority should either employ professionals or train their own interested officers for spatial and analytical analysis and interpretation of these data in such a way that it would help to resolve the related questions that would be addressed by the local Planning Authority.

The analyses, which is performed for the *general* (*global scale*) *temporal* distribution of incident types together and for each of the three types of incidents, revealed that the incidents in aggregate and each type of incidents are also clustered in *time* as they were in *space*. In other words, similar to heterogeneity of the study area, which offered differentiating levels of *spatial opportunities* for occurrences of criminal activities, the study period displayed differentiating *temporal opportunities*. The observations related to *temporal* and *spatio-temporal* distributions were found to be compliant with studies that are based on *crime place theories*. For example, similar to findings of Nelson et al (1996) and Henry and Bryan (2000) the incidents occur in *routine activity space* and *times*, and are based on *rational choice* of offenders where and when less surveillance and more ability to escape exist.

Most strikingly, occurrences of the three types of incidents together, peaked in months of April, June and August, and during the weeks in these months. April is a mid-spring month, and June and August are the early and late summer months. During these periods, leisure time *routine activities* of people move from dwellings and indoors to outdoors and into public spaces. In addition, towards the end of these periods (particularly in August) urban population generally prefer to leave their windows and balconies open due to hot weather especially during nights and/or to have their summer holidays away from their homes and most probably also away from their cars.

These create opportunities mainly for residential burglaries and thefts from auto, which concentrate in August. While aggravated and simple batteries were mostly committed between April and June by mostly young resident population outdoors, the reverse is true for domestic violences, which were committed by mostly old resident population indoors or in dwellings. In prevention and reduction of these incidents while measures other than *environmental* concern such as *social* projects (Schmidt-Kallert, 2004:3-10) are essential, the former measures can accompany provision of free (without any fee) leisure and recreational activities for sports (e.g., artificially covered small football grounds) and arts (e.g., painting, and folk dancing) in the target *spaces* and *times*. For the incidents against property, which are mainly committed by non-residential offenders, such as residential burglaries and thefts from auto while some classical 'target hardening' may prove to be useful to a certain extent, development of *communal responsibility* and *continuous natural surveillance* by the residents within 'community policing' context, would probably be more effective solutions.

The most frequent commitment types are found display relatively no clear pattern for their distribution during the days of the weeks of the year. However, an obviously opposite distribution was found between the most frequent incident commitments against people (aggravated batteries, simple batteries, and domestic violences) and against property (residential burglaries, commercial burglaries/thefts, and thefts from auto) for the three daily time intervals of the year. In other words, the two groups of incident commitments were found to occur in reverse *routine activity* periods and *temporal* conditions. That is, the commitments against people have an increasing frequency between 00:00-08:00; between 08:00-18:00, and between 18:00-00:00 while commitments against property have a decreasing frequency between the same periods. These periods respectively correspond the *time* between the first hours when people are asleep during the night and first hours of the daily routines; between start and end of the daily routine; and between the end of daily routines and the first hours when people are asleep during the night.

In this study it is also observed that certain periods, e.g., religiously holy periods, have timely coincidence with relatively lower frequencies of the three incident types together with respect to months. Similarly, relatively low frequencies of the most frequent commitment types are observed cumulatively for all the Fridays throughout the year. Although this requires further research for statistical significance testing, the possibility of sound bases against criminal activities in urban areas should not be undermined when the positive aspects of socio-cultural processes are combined with a good level of education and awareness through ‘community policing’ activities and resultant communal responsibility. This fact once more proves that prevention of criminal activities require more than what could be done only through physical measures for “planning/designing crime out” (Schneider and Kitchen, 2002:280).

The exploration of general *spatial* (*global scale*) distribution of the three types of incidents together in months of the year, revealed differences for both the places as well as the amounts and densities of hotspots. However, in general, with these analyses it is found that incidents occur persistently in *planned* and *in-transition* settlements and it became possible to identify target *spaces* and target *times* for more effective and efficient allocation of policing resources. For instance, patrolling activity or ‘formal surveillance’ particularly in barrier-free form can be increased and service/control points that are proposed with this study can be set up in these targets. An example target *time* involves all the months except for November and target *space* involves the near proximities of one the main arteries in the study area, i.e., *Gen. Dr. Tevfik Sağlam Road*. Further analyses enabled more elaborate comparison of incident patterns in different months than by simple mapping. For example, a detailed statistical evaluation between the *spatial* distributions for each pair of months indicated 91% of the pairs are different. In addition, it is also observed that the frequencies of incidents against ‘people’ and against ‘property’ are higher in the *planned* sections of the study area throughout the twelve months of the year 2000. The statistical testing suggested no significant differences among the *spatial* distribution of these two incident types with respect to monthly *time* periods.

As for *local scale* analyses, the simultaneous treatment of *space* and *time* variables in the study, revealed no *space-time interaction* among the incident group of three types together (in the form of neither clustering nor dispersion) unlike significant *spatial interaction* in the form of clustering. However, at the more detailed level of analysis, with respect to each of the three types of incidents, a significant *space-time* clustering was found among incidents against ‘property’ for all the *time* periods investigated. In other words, they occurred not only in near proximities of each other but they were also close in time (i.e., repeating in subsequent periods) over time periods of months, weeks, days, and days with three daily time intervals. Moreover, none of the either form of interactions was found to exist among incidents against ‘people’ and against ‘people and property’. The analysis at the most frequent commitment type level suggested that residential burglaries were responsible for the *space-time clustering* in incidents against property for the four different *time* periods. The lack of *space-time interaction* (neither in terms of clustering nor dispersion) in incidents against 'people' were found to be accompanied by a *space-time* dispersion in one of its main commitments, which are simple batteries for the four different *time* periods.

For simple batteries it should be stated that the local Police Authority also needs to take into account their *temporal* clustering in their resource allocation, which would be better if programmed in a context of 'community policing' initiative. Furthermore, police officers also need to be watchful for the possibility of occurrence of residential burglaries not only in nearby proximities but also their repetition in close periods (i.e., repeating in subsequent periods) over the four different *time* periods in their particular hotspots. They additionally need to be aware of the fact that whenever simple batteries incidents take place in similar localities, they will probably repeat after longer periods of time; and whenever such incidents take place during some time in one place, the officers possibly would expect that another one is taking place at the same or at a close time at some other place that is far apart.

Further research should include the data that were unavailable in this study. For instance, they should focus on other *environmental* aspects such as building quality, the existence of incivilities like uncollected trash, broken windows and graffiti. In addition, the inspection of *spatio-temporal* distribution of incidents from *traditional crime ecology* aspect that requires socio-economic variables such as income and education to be added into the analysis; and a comparison with the one from *new crime ecology* aspect would probably enhance the findings of this study. Moreover, the inclusion of the analysis that compares the observed *local scale* spatial distributions of incidents not only with the Complete Spatial Randomness (CSR) but also with various baseline characteristics like population distribution or the distribution of employment (Levine and Associates, 2004:5.25) would result in improvement of the conclusions to be drawn from the analysis.

The new researches need also utilize the available but not processed data due to time limitations. For example, the inclusion of victim data and a comparative study on the offenders' home base and incident locations would lead to further conclusions pertaining to spatial distribution of incidents and resultant planning and policing implications.

Besides these, other than the current 'mezo-micro' level *ecological* analysis, a future 'macro' level *ecological* analysis such as at the inter city and/or inter regional spatial level(s) and at least a within and/or between decade(s) temporal level(s) with utilization of relevant macro scale variables such as level of urbanization and migration, form some other research questions to be addressed.

Crime is here to stay, and by far it has been obvious that it could not be deterred by only practices of laws on punishment of offenders and by the judicial system. The problem is much more complicated and there are many other aspects (e.g., social, economic, cultural, behavioural, etc.) to be taken into consideration for its solution. By focusing on reduction of *opportunities* for crime occurrences through *place-based crime prevention* principles and its accompanying policing strategies, this study addressed only one part the problem for a high quality of living in safer *spaces* and *times*, without any limits to urban residents in their choices both in *space* and *time* for all their living activities.

REFERENCES

ACC, Ankara Chamber of Commerce (1998) *Ankara: From the Past to the Present.* Ankara.

Aday, Jr. D. P. (2001) *Crime, Definition of.* In: Bryant, C.D. (chief ed.), Luckenbill, D. and Pek, D. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume II: Crime and Juvenile Delinquency. USA: Brunner-Routledge, Taylor and Francis Group, 117-121.

AEM, Ankara Emniyet Müdürlüğü (2003) http://www.ankaraemniyet.gov.tr/html/birimlerimiz/asayis/metro.html accessed on October 2, 2003.

Aguilera, A. V. (2005) *City of Fear: The Social Control of Urban Space in Latin America.* Trialog 87, A Journal for Planning and Building in the Third World Vol.4:25-30.

AİM, Ankara İmar Müdürlüğü (1954) *The City of Ankara*. Ankara: AİM.

AİM, Ankara İmar Müdürlüğü (1955) *Specifications and Program of the International Competition to Arrange the Development Plan of the City of Ankara.* Ankara: AİM.

Akers, R.L. (2000) *Criminological Theories.* (third edi.) Los Angeles: Roxbury.

Akpınar, E. (2005) *Using Geographic Information Systems in Analysing the Pattern of Crime Incidents and the Relationship Between Landuse and Incidents.* MS Thesis in the Graduate School of Natural and Applied Sciences, Department of Geodetic and Geographic Information Systems, METU, Ankara.

Aksoy, H. (2002) *The Geographic Information System of Bursa Police Department.* In: International Symposium on GIS, 23-26 September 2002, Istanbul, Türkiye.

Aksoy, H. (2004) *Personal Interview with.* Police Lieutenant at Bursa Police Department (Bursa Emniyet Müdürlüğü, Bilgi İşlem Şube Müdürlüğü).

Aktepe, B. (2004) *Personal Interview with.* Head of Department of Information Technology at Police Intelligence Headquarters, General Directorate of Security (Emniyet Genel Müdürlüğü İstihbarat Daire Başkanlığı Bilgi İşlem Şube Müdürü).

ALFABİM, Alfabim Bilgisayar Sistemleri Yazılım-Donanım-İşletim San.Tic.A.Ş. (2003) *Emniyet Müdürlükleri Teknolojiye Adaptasyon Projeleri tanıtım kitapçığı.*

Alpdemir, E. A. (2006) *1999-2004 yılları arasında Eskişehir'de işlenen asayiş suçlarına ilişkin suç haritalarının coğrafi bilgi sistemleri yardımıyla oluşturulması.* Anadolu Üniversitesi, Fen Bilimleri Enstitüsü, Uzaktan Algılama ve CBS Anabilim Dalı Y.L. Tezi. Eskişehir.

Alston, J.D. (1994) *The Serial Rapist's Spatial Pattern of Target Selection*. MA Thesis submitted to Simon Fraser University (Canada).
http://wwwlib.umi.com/dissertations/fullcit/MM01030 accessed on March 4, 2002.

Altaban, Ö. (1987) *Kamu Yapıları Yer Seçim Süreçleri.* İçinde: Ankara Büyükşehir Belediyesi, EGO Genel Müdürlüğü. Ankara: 1985'den 2015'e. Orta Doğu Teknik Üniversitesi, Şehir ve Bölge Çalışma Grubu: İlhan Tekeli, Özcan Altaban, Murat Güvenç, Ali Türel, Baykan Günay ve Raci Bademli. Ankara:Ajans İletim.

Altındağ Belediyesi (2007*) Gültepe (Çinçin) Toplu Konut Projesi.* http://www.altindag-bld.gov.tr/ALTINdag.asp?Belediye=FaaliyetveProjeDetayla&ilgiNo=17 accessed on October 15, 2007.

AMANPB, Ankara Metropoliten Alan Nazım Plan Bürosu (1977a) *Ankara: Kentsel Servisler ve Çevre Standartları.* Yayın no.5 Ankara: AMANPB Yayınları.

Anderson, R. L. (2001) *The Relation of Demographic and Academic Factors to Office Referrals for Aggressive Behavior.* Ph.D. Thesis submitted to University of Houston.
http://wwwlib.umi.com/dissertations/fullcit/3004073 accessed on February 7, 2002.

Ankara Bülteni (1990) *Ankara Büyükşehir Belediyesi Ankara Bülteni.* No.7.

Ankara Kent Planı (2001-2002) Hazırlayan: Harita Mühendisi S. Çelik

Anselin, L. (1995) *Local indicators of spatial association-LISA.* Geographical Analysis 27, No. 2 (April):93-115.

Anselin, L., Cohen, J., Cook, D., Gorr, W. and Tita, G. (2000) *Spatial Analysis of Crime.* http://www.ncjrs.org/criminal_justice2000/vol_4/04e.pdf accessed on March 10, 2002.

Anstey, M. C. (1998) *Spatial and Structural Determinants of Residential Burglary Rates in Kitchener-Waterloo (Ontario).* MA Thesis submitted to Wilfrid Laurier University (Canada). http://wwwlib.umi.com/dissertations/fullcit/MQ24372 accessed on March 4, 2002.

Aronoff, S. (1991) *Geographic Information systems: A Management Perspective.* Ottawa, Canada: WLD Publications. (G70.2 A76)

AWSW LIS, Ankara Water and Sewage Works Land Information System (2004) Municipality of Greater Ankara. (Ankara Büyükşehir Belediyesi ASKİ Kent Bilgi Sistemi)

Bademli, R. (1987) *Ankara'da Kent Planlama Deneyi ve Ulaşılan Sonuçlar.* İçinde: Ankara Büyükşehir Belediyesi, EGO Genel Müdürlüğü. Ankara: 1985'den 2015'e. Orta Doğu Teknik Üniversitesi, Şehir ve Bölge Çalışma Grubu: İlhan Tekeli, Özcan Altaban, Murat Güvenç, Ali Türel, Baykan Günay ve Raci Bademli. Ankara:Ajans İletim.

Bailey, T. C. and Gatrell, A.C. (1995) *Interactive Spatial Data Analysis*. Burnt Mill, Essex, England: Longman Scientific and Technical.

Bailey, T. C. and Gatrell, A.C. (1996) *Interactive Spatial Data Analysis*. (sec. edi.) Harlow, England: Longman Group Limited.

Bachi, R. (1957) *Statistical Analysis of Geographical Series*. Central Bureau of Statistics, Kaplan School, Jerusalem: Hebrew University.

Balkwell, J. W. (2001) Criminology Research Methods, Quantitative. In: Bryant, C.D. (chief ed.), Luckenbill, D. and Pek, D. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume II: Crime and Juvenile Delinquency. USA: Brunner-Routledge, Taylor and Francis Group, 183-187.

Barlett, M. S. (1948) *Determination of Plant Densities*. Nature, 162:621-624.

Barnard, G. A. (1963) *Comment on 'The Spectral Analysis of Point Processes' by M. S. Bartlett.* Journal of the Royal Statistical Society, Series B, 25, 294.

BEM, Bursa Emniyet Müdürlüğü (2003a) Bilgi İşlem Şube Müdürlüğü, *Bursa Emniyet Müdürlüğü Teknolojik Adaptasyon Projesi Broşürü.*

BEM, Bursa Emniyet Müdürlüğü (2003b) *BEMTAP-FORGIS Projesi-Suç Veri Tabanı ile Kent Coğrafi Bilgi Sistemi Ilişkilendirilmesi Yapılarak Suç Haritalarının Oluşturulması*. http://www.bursapolis.gov.tr/projeler/FORGIS.HTM accessed on September 30, 2003.

Besag, J. and Newell J. (1991) *The detection of clusters in rare diseases.* Journal of the Royal Statistic Society A, 154, Part I:143-155.

Bilgin, İ. (1998) *Modernleşmenin ve Toplumsal Hareketliliğin Yörüngesinde Cumhuriyet'in İmarı.* İçinde: Sey, Y. (ed.) 75 Yılda Değişen Kent ve Mimarlık. İstanbul: Türkiye İş Bankası ve Tarih Vakfı Ortak Yayını, 255-272.

Boba, R. (2001) *Introductory Guide to Crime Analysis and Mapping-Report to Community Oriented Policing Services.* http://www.usdoj.gov/cops/pdf/cp_resources/crime_mapping_newsIntroductory%20Guide%to%20Crime%20Analysis%20and%20Mapping.pdf accessed on February 9, 2002.

Brantingham, P. J. and Brantingham P. L. (1981a) *Introduction: The Dimensions of Crime.* In: P.J. Brantingham and P.L. Brantingham (eds.), Environmental Criminology. Beverly Hills, CA: Sage Publications, 7-26.

Brantingham, P. L. and Brantingham, P. J. (1981b) *Notes on the Geometry of Crime.* In: P.J. Brantingham and P.L. Brantingham (eds.), Environmental Criminology. Beverly Hills, CA: Sage Publications, 27-54.

Brantingham, P. J. and Brantingham, P. L. (1984) *Patterns in Crime.* New York, NY: Macmillan.

Brantingham, P. L. and Brantingham, P. J. (1993) *Environment, Routine and Situation: Toward a Pattern and Rational Choice.* Advances in Criminological Theory, Vol. 5. New Brunswick, NJ: Transaction Publications.

Brantingham, P. L. and Brantingham, P. J. (1998) *Mapping crime for analytic purposes: location quotients, counts and rates.* In: Weisburd, D. and McEven, T. (eds.), Crime Mapping and Crime Prevention. Crime Prevention Studies. Vol 8. Monsey, New York: Criminal Justice Press, 263-288.

Brantingham, P. L., Rondeau, M. B. and Brantingham, P. J. (1997) *The Value of Environmental Criminology for the Design Professions of Architecture, Landscape Architecture and Planning,* Draft Paper, Second Annual International Crime Prevention Through Environmental Design Conference, Orlando, FL: ICA.

BTİNSAN (2003) *Türkiye'nin Bilişim ve İnsan Kaynakları adlı Haber Sitesi, Mobil Trafik Bilgi Sistemi Projesi Hizmete Girdi* başlıklı ve 16 Haziran 2003 tarihli haber. http://www.btinsan.com/127/71.asp accessed on October 4, 2003.

Buettner, T. and Spengler, H. (2003) *Local Determinants of Crime: Distinguishing Between Resident and Non-resident Offenders.* In: 43rd Congress of the European Regional Science Association, 27-30 August 2003, Finland.

Bursik, R. (1988) *Social Disorganization and Theories of Crime and Delinquency: Problems and Prospects.* Criminology 26(4): 519-551.

Canin, B. (1994) Mastering Crime in Your Planned Community. Paper presented to Urban Land Institute. October.

Canter, P.R. (1998) *Geographic information systems and crime analysis in Baltimore County, Maryland.* In: Weisburd, D. and McEven, T. (eds.), Crime Mapping and Crime Prevention. Crime Prevention Studies. Vol 8. Monsey, New York: Criminal Justice Press, 157-190.

Canter, D. and Larkin, P. (1993) *The Environmental Range of Serial Rapists*. Journal of Environmental Psychology, 13(1):63-69.

Carson, R., Doeksen, H., Doyle, J., Duffell, S., McLauchlan, J. and Shannon, K. (1994) *The garden city a safe city: reducing crime through environmental planning and design.* Christchurch Safer Community Council, New Zealand, 34 pp.

Cengizkan, A. (2000) *Discursive Formations in Turkish Residential Architecture: Ankara; 1948-1962.* PhD Thesis in the Graduate School of Natural and Applied Sciences, Department of Architecture, METU, Ankara.

Chaiken, J. M., Lawless, M. W. and Stevenson, K. A. (1974) *The Impact of Police Activity on Crime: Robberies on the New York City Subway System.* Report no.R-1424-NYC. Santa Monica, CA:RAND.

Chen, D. and Getis, A. (1998) *Point Pattern Analysis.* http://www.povertymap.net/publications/doc/rome_2002/John%20Weeks/Point%20Pattern%20Analysis.htm accessed on February 11, 2004.

Clark, G.A. (2001) *Social Disorganization Theory*. In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 370-373.

Clark, P. J. and Evans, F. C. (1954) *Distance to nearest neighbor as a measure of spatial relationships in populations.* Ecology, 35:445-453.

Clarke, R. V. (1980*) Situational Crime Prevention: Theory and Practice,* British Journal of Criminology, 20:137-147.

Clarke, R. V. (1989) *Theoretical Background to Crime Prevention Through Environmental Design, and Situational Prevention.* Conference on Designing Out Crime: Crime Prevention Through Environmental Design, 16 June 1989-Sydney. http://www.aic.gov.au/conferences/cpted/clarke.pdf accessed on May 6, 2002.

Clarke, R. V. (1992) (ed.) *Situational Crime Prevention: Successful Case Studies.* Albany, NY: Harrow and Heston.

Clarke, R. V. (1997) (ed.) *Situational Crime Prevention: Successful Case Studies.* (sec. edi.) Albany, NY: Harrow and Heston.

Clarke, R. V. and Weisburd, D. (1990) *On the distribution of deviance.* In: D. M. Gottfredson and R. V. Clarke (eds.), Policy and Theory in Criminal Justice. Aldershot, UK: Avebury.

Clarke, R. V. and Weisburd, D. (1994) *Diffusion of Crime Control Benefits: Observations on the Reverse of Displacement.* Crime Prevention Studies 2:165-184.

Clinard, M. B. and Meier, R. F. (1998) *Sociology of Deviant Behavior.* (tenth edi.) Fort Worth, TX: Harcourt Brace.

Clontz, K. A. (1995) *Residential and Commercial Burglaries: An Empirical Test of Crime Prevention Through Environmental Design (Defensible Space).* Ph.D. Thesis submitted to the Florida State University. http://wwwlib.umi.com/dissertations/fullcit/9526744 accessed on March 4, 2002.

Cloward, R.A. and Ohlin, L.E. (1960) Delinquency and Opportunity. IL: Free Press.

CMN, *Crime Mapping News.* Winter (2002). www.ojp.usdoj.gov/cops/pdf/cp_resources/crime_mapping_news/Vol4Issue1.pdf accessed on February 9, 2002.

Cockerham, W. C. (1989) *Sociology of Mental Disorder.* (sec. edi.) Englewood Clifs, NJ: Prentice-Hall.

Cohen, J. (1988) *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ: Erlbaum.

Cohen, L. E. and Felson, M. (1979) *Social Change and Crime Rate Trends: A Routine Activity Approach.* American Sociological Review. Vol. 44 August:588-608.

Cole, R. D. (2002) *An Examination of Washington, D.C.'s Juvenile Curfew Act of 1995: A Single-system Approach.* Ph.D. Thesis submitted to University of Maryland, Baltimore. http://wwwlib.umi.com/dissertations/fullcit/3048464 accessed on March 2, 2002.

COPS, U.S. Department of Justice-Office of Community Oriented Policing Services (2000) *Geocoding in Law Enforcement.* http://www.cops.usdoj.gov/files/ric/CDROMs/TechDocs/CrimeMapping/GeocodingLawEnforcementFinalReport.pdf accessed on September 20, 2007.

Cornish, D. B. and Clarke, R. V. (1986) *The Reasoning Criminal: Rational Choice Perspectives on Offending.* New York: Springer-Verlag.

CPTED Watch, Crime Prevention through Environmental Design (2006) http://www.cpted-watch.com/ accessed on June 29, 2006.

Cressie, N. (1991) *Statistics for Spatial Data.* New York: J. Wiley and Sons, Inc.

Crews, G.A. (2001) *Epidemilogy of Deviance.* In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 143-147.

Crews, G.A. Montgomery, Jr. R.H. and Garris, W.R. (1996) *Faces of Violence in America.* NeedhamHeights, MA: Simon and Schuster.

Cromley, R. G. (1992). *Digital Cartography*. Englewood Cliffs, NJ: Prentice Hall.

Crowe, T. (1991) *Crime Prevention Through Environmental Design.* Boston, MA: Butterworth-Heinemann.

Crowe, T. (2000) *Crime Prevention Through Environmental Design.* (sec. edi.) Boston, MA: Butterworth-Heinemann.

Curtis, J. T. and McIntosh, R. P. (1950) *The Interrelations of Certain Analytic and Synthetic Phytosociological Characters.* Ecology, 31:434-455.

CYMRU, National Grid for Learning Cymru (2006) http://www.gcad-cymru.org.uk/vtc/20030127/Geography/Keystage3/Settlement/LandusemodelsCa/Burgesscirclemo/ accessed on February 19, 2006.

Dağ, H. (2002) *Personal Interview with.* Police Captain at Department of Research-Development, Research Planning and Coordination Headquarter, General Directorate of Security (Emniyet Genel Müdürlüğü APK Daire Başkanlığı Ar-Ge Şube Müdürlüğü).

Dağ, H. (2004) *Suç Problemi Ve Hırsızlık Suçlarının Önlemesine Halkın Bakışı.* Polis Dergisi, Yıl:10 Sayı 42:74-78.

Dağ, H. (2005) *Personal Interview with.* Police Major at Department of Research-Development, Research Planning and Coordination Headquarter, General Directorate of Security (Emniyet Genel Müdürlüğü APK Daire Başkanlığı Ar-Ge Şube Müdürlüğü).

Dalton, J. (2003) *The Production and Deployment of a Geospatial Repository for Analysis and Safety Planning.* In: Third European Academy of Forensic Science Meeting, İstanbul, Türkiye, September 22-27, 2003, Forensic Science International Vol.136/Suppl.1:12-13.

Davison, E. L. and Smith, W.R. (2002) *The Relationship Between Crime and Urban Location in Raleigh, North Carolina.* http://www.ncsociology.org/beth9.htm accessed on March 8, 2002.

Diggle, P. J. (1983) *Statistical analysis of spatial point patterns.* London: Academic Press.

Diggle, P. J., Chetwynd, A. G. Häggkvist, R. and Morris, S. E. (1995) *Second-order analysis of space-time clustering.* Statistical Methods in Medical Research Vol.4:124-136.

Doeksen, H. (1997) *Reducing crime and fear of crime by reclaiming New Zealand's suburban street.* Landscape and Urban Planning Vol.39:243-252.

Drakakis, D. (1990) *Urban Growth in the Third World.* In: Drakakis, D., The Third World City (reprint), Newyork:Routledge.

Dumanovsky, T. (1999) *Crime in Poor Places: Examining the Neighbourhood Context of NYC's Public Housing Projects.* Ph.D. Thesis submitted to New York University.
http://wwwlib.umi.com/dissertations/fullcit/9945271 accessed on March 4, 2002.

Dunham, R. G. and Wilson, G. (2001) *Integrated Theories of Crime and Deviance*. In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 186-190.

Durkheim, E. [1895] 1938. *The Rules of Sociological Method.* edited by G.E.G.Catlin. Glencoe, IL:The Free Press.

Duyar-Kienast, U. (2001) *Aspects of the Formation of gecekondu in Turkey: A Case Study from Ankara.* Trialog 70, A Journal for Planning and Building in the Third World Vol.3:23-29.

Düzgün, H.Ş. and Erdoğan, A. (2003) *A Methodology for Mapping and Spatial Analysis of Auto Theft and Theft From Auto Incidents in the City of Konya.* In: Third European Academy of Forensic Science Meeting, İstanbul, Türkiye, September 22-27, 2003, Forensic Science International Vol.136/Suppl.1:15-16.

Dwass, M. (1957) *Modified randomization tests for nonparametric hypotheses.* Annals of Mathematical Statistics, 28:181-187.

Ebdon, D. (1988) *Statistics in Geography* (sec. edi. with corrections). Oxford :Blackwell.

Eck, J. E. (1998) *What do those dots mean? mapping theories with data.* In: Weisburd, D. and McEven, T. (eds.), Crime Mapping and Crime Prevention. Crime Prevention Studies. Vol 8. Monsey, New York: Criminal Justice Press, 379-406.

Eck, J. E. and Weisburd D. (1995). *Crime places in crime theory*. In: J. Eck and D. Weisburd (eds.), Crime and Place. Crime Prevention Studies, Vol 4. Monsey, NY: Criminal Justice Press, 1-34.

ECRI (2004) *What is Geographic Profiling?* http://www.geographicprofiling.com/geopro/index.html accessed on March 7, 2004.

EGM, Emniyet Genel Müdürlüğü (2006a) Haftalık Basın toplantısı konuşmaları: Toplum Destekli Polislik. http://www.egm.gov.tr/basin.haftalik.01hafta2006.asp accessed on October 14, 2006.

EGM, Emniyet Genel Müdürlüğü (2006b) *İçişleri Bakanlığı, İller İdaresi Genel Müdürlüğü Dernekler Daire Başkanlığı Merkez ve Taşra Teşkilatı Kuruluş, Görev, Çalışma ve Denetim Usul ve Esaslarına Dair Yönetmelik.* http://www.egm.gov.tr/hizmet.dernek.yonetmelik.asp accessed on October 14, 2006.

EIRD, United Nations International Strategy for Disaster Reduction, Latin America and the Caribbean (2006) http://www.eird.org/eng/revista/No1_2001/pagina14.htm accessed on October 28, 2006.

Ekblom, P. (1988) *Getting the Best out of Crime Analysis.* Crime Prevention Unit Paper No.10, Home Office, London.

Erişen, O. (2003) *Suburbanization in Türkiye within the Process of Integration to Global Development and a New Life-Style Settlement.* PhD Thesis in the Graduate School of Natural and Applied Sciences, Department of City and Regional Planning, METU, Ankara.

Ergun, N., Giritlioğlu, C. and Yirmibeşoğlu, F. (2003) *Social Change and Criminality in Istanbul.* In: 43rd Congress of the European Regional Science Association, 27-30 August 2003, Finland.

Erkut, G., Ocakçı, M. and Ünlü, A. (2001) Evaluation of Crime Profile in Istanbul Metropolitan Area. Trialog 70, A Journal for Planning and Building in the Third World Vol.3:30-33.

Erman, T. (2001) *The politics of gecekondu (squatter) studies in Turkey: The changing representations of rural migrants in the academic discourse.* Urban Studies 38(7):983-1002.

Erman, T. and Eken, A. (2004) *The "Other of the Other" and "unregulated territories" in the urban periphery: gecekondu violence in the 2000s with a focus on the Esenler Case, İstanbul.* Cities. Vol 21, Iss 1:57-68 (html:1-16).

Etöz, Z. (2000) *Varoş: Bir istila, bir tehdit.* Birikim, 132:49-53.

Fanek, M. F. (1997) *The Use of Space Syntax Methodology in Predicting the Distribution of Crime in Urban Environments.* PhD Thesis submitted to Texas Tech University. http://wwwlib.umi.com/dissertations/fullcit/9736893 accessed on March 4, 2002.

Farooq, A. (1999) *Social and Spatial Implications of Community-Based Residential Environments on Crime in Urban Settings.* PhD Thesis submitted to Georgia Institute of Technology. http://wwwlib.umi.com/dissertations/fullcit/9966947 accessed on March 4, 2002.

Fisher, B. and Nasar, J. L. (1995) *Fear spots in relation to microlevel cues: Exploring the overlooked.* Journal of Research in Crime and Delinquency, 32:214-239.

Franck, K. A. and Mostoller, M. (1995) *From courts to open spaces to streets: changes in the site design of US public housing.* Journal of Architectural and Planning Research, 12(3):186-220.

Fritz, N. J. (2001) *Environmental Criminology Theory.* In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), *Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues*. USA: Brunner-Routledge, Taylor and Francis Group, 141-142.

Furfey, P. H. (1927) *A note on Lefever 's 'Standard deviational ellipse*. American Journal of Sociology. XXIII, 94-98.

Gatrell, A. C. Bailey, T. C., Diggle, P. J. and Rowlingson, B. S. (1996) *Spatial Point Pattern Analysis and its Application in Geographical Epidemiology*. Trans. Inst. Br. Geogr. 21:256–274.

GDS, General Directorate of Security (2000) *Archive Data.*

Gehl, J. (1987) *Life Between Buildings: Using Public Space.* New York:Van Nostrand-Reinhold, 202 pp.

Gehl, R. D. (2000) *Applying Computer Mapping Technology to the Victoria Police Department (British Columbia).* MA Thesis submitted to Royal Roads University (Canada). http://wwwlib.umi.com/dissertations/fullcit/MQ49176 accessed on February 7, 2002.

Giddens, A. (1992) *The Consequences of Modernity.* , Stanford: Polity Press.

Giddens, A. (1994) *Living in a post-traditional society.* In: Beck, U. (ed.) Reflexive Modernization. Cambridge: Polity Press, 66-110.

Gilbert, A. (1994) *Third World Cities: Poverty, Employment, Gender Roles and the Environment During a Time of Restructuring.* Urban Studies, Vol. 31, No.4-5:605-633.

Gilbert, A. and Gugler, J. (1989) *Housing the Urban Poor.* In: Gilbert, A. and Gugler, J. (eds.) Cities, Poverty and Development: Urbanization in the Third World. (reprint), London: Oxford University Press, 81-115.

Glaser, B.G. and Strauss, A.L. (1968) *The Discovery of Grounded Theory: strategies for qualitative research.* London, UK: Weidenfeld and Nicolson.

Glaser, D. (1970) *Introduction to Part II: The Distribution of City Crime.* In: Glaser, D. (ed.) Crime in the City. New York: Harper and Row Publishers.

Glaeser, E.L., Sacerdote, B. and Scheinkman, J.A. (1996) *Crime and Social Interactions.* Quarterly Journal of Economics, Vol 111, Iss 2: 507-548.

Glyde, J. (1856) *Localities of crime in Suffolk.* Journal of the Statistical Society of London 19: 102-106.

Goldstein, H. (1990) *Problem-Oriented Policing.* New York, NY: McGraw-Hill.

Goode, E.1997. Deviant Behavior. 5 thed. Upper Saddle River, NJ: Prentice Hall.

Görgülü, E. (2006) *Müdüre tabanca öğretmene bıçak öğrenciye esrar* başlıklı ve 04.05.2006 tarihli Hürriyet Gazetesi haberi. http://hurarsiv.hurriyet.com.tr/goster/haber.aspx?id=4358153 accessed on October 27, 2006.

Grant, S. E. (2002) *An Analysis of Community Block Clubs as a Vehicle of Social Capital: Using E-911 Statistics (New York).* PhD Thesis submitted to State University of New York at Buffalo. http://wwwlib.umi.com/dissertations/fullcit/3063253 accessed on March 2, 2002.

Greig-Smith, P. (1964) *Quantitative Plant Ecology*. (sec. edi.) London: Butterworth.

Grescoe, T. (1996) *Murder He Mapped.* In Canadian Geographic, Sep/Oct.

Guerry, A. M. (1833) *Essai sur la statistique morale de la France.* Paris: Crochard.

Gül, H. N. (2002) *Hırsızlık Suçlarının Aydınlatılmasında Coğrafi Bilgi Sistemleri: Bursa İli Pilot Uygulaması.* İstanbul Üniversitesi, Adli Tıp Enstitüsü, Fen Bilimleri Anabilim Dalı Y.L. Tezi. İstanbul.

Gürbüz, H., Demirer, A. O. and Yıldırım, Ö. (1999) *Ankara Metropolitan Alan'ın Sayısal Fotogrametrik Haritalarının Yapımı Projesi.* İçinde: Yomralıoğlu, T. (ed.) Yerel Yönetimlerde Kent Bilgi Sistemi Uygulamaları Sempozyum Bildirileri. 13-15 Ekim 1999, Trabzon: Karadeniz Teknik Üniversitesi Matbaası, 99-111.

Gürel, D. (2006) *Taksicilerin Çinçin Korkusu* başlıklı ve 16.10.2006 tarihli Hürriyet Gazetesi haberi.http://hurarsiv.hurriyet.com.tr/goster/haber.aspx?id=5263427&tarih=2006-10-16 accessed on October 27, 2006.

HABITAT (2006) *Safer Cities Programme.* http://www.unhabitat.org/programmes/safercities/approach.asp accessed on March 17, 2006.

Hair, Jr. J. F., Anderson, R. E., Tatham, R. L. and Black, W. C. (1998) *Multivariate Data Analysis.* (fifth edi.) Upper Saddle River, NJ: Prentice Hall.

Harries, K. (1999) *Mapping Crime: Principle and Practice.* http://www.ncjrs.org/html/nij/mapping/ch1_14.html accessed on March 3, 2002.

Henry, L. M. and Bryan, B. A. (2000) *Visualizing the Spatio-Temporal Patterns of Motor Vehicle Theft in Adelaide, South Australia.* In: Conference on Crime Mapping: Adding Value to Crime Prevention and Control, 21-22 September 2000-Adelaide. http://www.aic.gov.au/conferences/mapping/henry.pdf accessed on February 16, 2003.

Henslin, J. M. (1999) *Sociology: A Down-To-Earth Approach.* (fourth edi.) Boston: Allyn and Bacon.

Herbert, D.T. (1982) *The Geography of Urban Crime*. New York, NY: Longman Group Ltd.

Hesseling, R. B. P. (1992) *Using Data on Offender Mobility in Ecological Research.* Journal of Quantitative Criminology 8(1):95-112.

Hillier, B. (1973) *In Defence of Space.* RIBA Journal, November:539-544.

Hillier, B. (1977) *A State of Mind.* RIBA Journal, May:202.

Hillier, B. (1988) *Against Enclosure.* In: Teymur, N. and Wooley, T. (eds.), Re-humanizing Housing, London: Butterworths,63-88.

Hillier, B. (1996) *Space is the Machine: A Configurational Theory of Architecture.* New York: Cambridge University Press.

Hillier, B. and Hanson, J. (1984) *The Social Logic of Space.* Cambridge: Cambridge University. (NA2765 H56)

Hillier, B., Hanson, J., Peponis, J., Hudson, J. and Burdett, R. (1983) *Space Syntax: A Different Urban Perspective.* The Architects' Journal, 30 November, Number 48, Vol. 178:47-64.

Hirschfield, A., Brown, P. and Todd, P. (1995) *GIS and the Analysis of Spatially Referenced Crime Data: Experiences in Merseyside, UK.* International Journal of Geographical Information Systems, 9:191-210.

Howard, M. R. (1999) *Crime Prevention Through Environmental Design: An Investigation of the Effect of Modular Lotting on Property Crime.* MLA Thesis submitted to University of Guelph (Canada). http://wwwlib.umi.com/dissertations/fullcit/MQ43175 accessed on March 4, 2002.

Hulme Regenaration Ltd (1994) *Rebuilding the City: A Guide to Development in Hulme.* Manchester: Manchester City Council.

Işık, M. and Koşak, M. (2002) *Bursa Traffic Accidents Inspection and Evaluation Project (BUTKID Project).* In: International Symposium on GIS, 23-26 September 2002, Istanbul, Türkiye.

Işık, O. (1996) *1980 Sonrasında Türkiye'de Kent ve Kentleşme.* İçinde: Cumhuriyet Dönemi Ansiklopedisi. İstanbul: İletişim Yayınları, Vol. 13:782-801.

Işık, O. ve Pınarcıoğlu, M. M. (2002) *Nöbetleşe Yoksulluk: Sultanbeyli Örneği.* (ikinci baskı) Araştırma İnceleme Dizisi, 114, İstanbul: İletişim Yayınları.

İçli, T. G. (2004) *Toplum Destekli Polislik Amaçları ve Etkinliği*. Polis Dergisi, Yıl:10 Sayı 42:124-127.

İİB, İmar İskan Bakanlığı (1973) *50 Yılda İmar ve Yerleşme: 1923-1973.* Ankara.

Jacobs, J. (1961/1984) *The Death and Life of Great American Cities: The Failure of Town Planning.* London: Peregrine Books in association with Jonathan Cape.

Jeffrey, C. R. (1971) *Crime Prevention Through Environmental Design.* Beverly Hills, CA: Sage Publications.

Jeffrey, C. R. (1977) *Crime Prevention Through Environmental Design.* (sec. edi.) Beverly Hills, CA: Sage Publications.

Jensen, G. (2001a) *Deviance, Definition of.* In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 88-92.

Jensen, G. (2001b) *Etiology of Deviance.* In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 153-157.

Jones, E. (1970) *Towns and Cities.* (sec. edi.), London: Oxford University Press.

Kanji, G. K. (1993) *100 S tatistical Tests*. Thousand Oaks, CA: Sage Publications.

Kaplan, E. A. (1980) *Kentleşen Toplumda Suçluluk Sorunu ve Polis Örgütü.* TODAİE Kamu Yönetimi Lisansüstü Uzmanlık Programı Tezi. Ankara.

Kendall, D. (1998) *Social Problems in a Diverse Society.* Boston, MA: Allyn and Bacon.

Kennedy, L. (2002) *A Brief Overview of the Project (for Edmonton Police Service-EPS).* http://www.ualberta.ca/~crimgrp/Bovrview.htm, accessed on March 10, 2002.

Kıray, M. B. (1992) *Modern Şehirlerin Gelişmesi ve Türkiye'ye Has Bazı Eğilimler.* İçinde: Toplum Bilim Yazıları, No.7, 265-273, Ankara: G.Ü. Yayınları.

Kinney, J. B. (1999) *A Spatial Analysis of Calls for Police Service and Bar Locations in Downtown Vancouver (British Columbia).* MA Thesis submitted to Simon Fraser University (Canada). http://wwwlib.umi.com/dissertations/fullcit/MQ51378 accessed on March 4, 2002.

Knox, E. G. (1963) *Detection of low intensity epidemicity: application in cleft lip and palate.* British Journal of Preventive and Social Medicine, 17:121-127.

Knox, G. (1984) *Epidemiology of Childhood Leukaemia in Northumberland and Durham.* British Journal of Preventative and Social Medicine, 18:17-24.

Knox, E. G. (1988) *Detection of clusters.* In: Elliott, P. (ed.) Methodology of Enquiries into Disease Clustering, London: London School of Hygiene and Tropical Medicine.

Knox, P. (1987) *Urban Social Geography: An Introduction.* (sec. edi.), London: Longman.

Lea, J. (1997) *Post-Fordism and Criminality.* In: Jewson, N. and MacGregor, S. (eds.) Transforming cities: contested governance and new spatial divisions, London: Routledge. (HT133 T74)

Lee, C.M. and Culhane D.P. (1998) *A Perimeter-Based Clustering Index for Measuring Spatial Segregation-A Cognitive GIS Approach.* Environment and Planning B-Planning and Design, Vol 25, Iss 3: 327-343.

Leitner, M. (1999) *First and Second Order Properties of Spatial Point Patterns: The Application of Crime Data from Baton Rouge, LA.* In: 4th International Conference on GeoComputation, 25-28 July 1999, Virgina.
http://www.geovista.psu.edu/sites/geocomp99/files/geocomp99_program.pdf, accessed on June 6, 2002.

Levine, N. and Associates. (1999). *CrimeStat: A Spatial Statistics Program for the Analysis of Crime Incident Locations.* http://www.geovista.psu.edu/sites/geocomp99/Gc99/105/gc_105.pdf accessed on May 26, 2002.

Levine, N. and Associates (2002) *CrimeStat II: A Spatial Statistics Program for the Analysis of Crime Incident Locations (version 2.0).* Houston, TX and the National Institute of Justice, Washington, DC.

Levine, N. and Associates (2004) *CrimeStat III: A Spatial Statistics Program for the Analysis of Crime Incident Locations (version 3.0).* Houston, TX, and the National Institute of Justice, Washington, DC.

Li, J. and Rainwater, J. (2002) *The Real Picture of Land-Use Density and Crime: A GIS Application.* http://www.esri.com/library/userconf/proc00/professional/papers/PAP508/p508.htm accessed on March 9, 2002.

Loukaitou-Sideris, A., Liggett, R. Iseki, H. and Thurlow, W. (2004) *Measuring the Effects of Built Environment on Bus Stop Crime.* Department of Urban Planning, UCLA School of Public Policy and Social Research. http://www.uctc.net/papers/419.pdf accessed on March 20, 2004.

Mack, J. (1964) *Full-time miscreants, delinquent neighborhoods and criminal networks.* British Journal of Sociology, 15:38-53.

Mangin, W. (1980) *Squatter Settlements.* In: Press, I. (ed.) Urban Place and Process: Readings in the Anthroplogy of Cities, New York: Macmillan.

Mantel, N. (1967) *The detection of disease clustering and a generalized regression approach.* Cancer Research, 27:209-220.

Mantel, N. and Bailar, J. C. (1970) *A class of permutational and multinomial test arising in epidemiological research.* Biometrics, 26:687-700.

MAPINFO (2001) *MapInfo User Help. MapInfo Professional 6.5.* Copyright 1985-2001, MapInfo Corp.

Mason, B. (1996) *New Software Targets Serial Criminals.* Simon Fraser University News (June 6, 1996). http://www.sfu.ca/mediapr/Releases/News/1996/june96/rossmo.html accessed on February 8, 2004.

Mathéy, K. (2005) *Reduction of Urban Violence trough Neighbourhood Improvement: A Strategy for Khayelitsha Township in Cape Town, South Africa.* Trialog 87, A Journal for Planning and Building in the Third World Vol.4:17-24.

Mawby, R. I. (1977b) *Defensible space: a theoretical and empirical appraisal.* Urban Studies 14:169-179.

Mayhew, P. (1981) *Crime in Public View: Surveillance and Crime Prevention*. In: Brantingham, P.J. and Brantingham, P.L. (eds.), Environmental Criminology. Beverly Hills, CA: Sage Publications, 119-134.

McElrath, D. (1980) *The New Urbanization.* In: Press, I. (ed.) Urban Place and Process: Readings in the Anthropology of Cities, New York: Macmillan.

McNulty, T.L. (2001) *Social Ecology Theory.* In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 374-377.

Merriam-Webster, Merriam-Webster's Dictionary of Law (1996) Merriam-Webster, Inc. http://dictionary.reference.com/search?db=mwlaw&q=battery accessed on June 6, 2006.

Merton, R.K. (1938) Social structure and anomie. American Sociological Review 3: 216-230.

Miethe, T. D. (1991) *Citizen Based Crime Control Activity and Victimization Risks: An Examination of Displacement and Free-Rider Effects.* Criminology, 29:419-440.

Miethe, T. D. (2001) *Ecology of Crime.* In: Bryant, C.D. (chief ed.), Luckenbill, D. and Pek, D. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume II: Crime and Juvenile Delinquency. USA: Brunner-Routledge, Taylor and Francis Group, 203-205.

Nasar, J. L. and Fisher, B. (1993) *'Hot spots' of fear and crime: A multi-method investigation.* Journal of Environmental Psychology, 13:187-206.

Neft, D. S. (1962) *Statistical Analysis for Areal Distributions*. Ph.D. dissertation, New York : Columbia University.

Nelson, A.L., Bromley, R.D.F. and Thomas, C.J. (1996) *The Geography of Shoplifting in a British City: Evidence from Cardiff.* Geoforum 27(3):409-423.

Newman, O. (1971) *Architectural Design for Crime Prevention.* National Institute of Law Enforcement and Criminal Justice, Washington, DC: Law Enforcement Assistance Administration.

Newman, O. (1972) *Defensible Space: People and Design in the Violent City.* London: Architectural Press and New York, NY: McGraw-Hill and Macmillan. (HV7431 N551)

Newman, O. (1973) *Defensible Space: People and Design in the Violent City.* (sec. edi.) London: Architectural Press.

Nieto, M. (1997) *Public Video Surveillance: Is It An Effective Crime Prevention Tool?* California Research Bureau, Paper 97-005, at http://www.library.ca.gar/CRB/97/05/.

Oc, T. and Tiesdell, S. (eds.) (1997). *Safer City Centres: Reviving the Public Realm.* London: Paul Chapman. (HT178 G7 S24)

OALD, Oxford Advanced Learner's Dictionary (1995) Oxford, UK: Oxford University Press.

OED, Oxford English Dictionary (1987) Oxford, UK: Clarendon.

Osmay, S. and Duruöz, C. N. (1995) (comp.) *Urban Sociology and Urbanization Selected Readings.* Ankara: METU Faculty of Architecture Offset Printing Studio.

Öncü, A. (1997b) *The Myth of the Ideal Home: Travels Across Cultural Borders to Istanbul*. In: Öncü, A. and Weyland, P. (eds.) Space, Power and Culture. Zed Publications, 56-72.

Pallant, J. (2001) *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows (Versions 10.0 and 11.0).* Open University Press.

Park, M. (2000) *Relationships between Crime and Tourism Development: A Comparative Study of Rural Colorado Communities.* PhD Thesis submitted to Texas A&M University. http://wwwlib.umi.com/dissertations/fullcit/9994310 accessed on February 7, 2002.

Park, R. E. (1969/1916) *The City: Suggestion for Investigation of Human Behavior in the Urban Environment.* In R. Sennet (ed.), Classic Essays on the Culture of Cities. (reprint), New York: Appleton-Century-Crofts.

Park, R.E., Burgess, E.W., and MacKenzie, R.D. (1925/1928) *The City.* Chicago, IL: University of Chicago Press.

Pawson, E. (1987) *The social production of urban space.* New Zealand Geographer 43(3):123-129.

Peel CPTED Committee (1994) *Crime Prevention Through Environmental Design Principles.* Peel, Ontario: Region of Peel/City of Brampton/Corporation of the Town of Caledon; Mississauga/Peel Regional Police/Ontairo Provincial Police.

Peet, R. (1975) *The geography of crime: a political critique*. Professional Geographer 27:277-280.

Pelkey, W. L. (1990) *An Investigation into the Spatial Randomness of Crime Series.* PhD Thesis submitted to University of Northern Colorado. http://wwwlib.umi.com/dissertations/fullcit/9029138 accessed on March 4, 2002.

Peyroux, E. (2005) "*Sorting society through gates" A controversial form of crime prevention in post-apartheid Johannesburg.* Trialog 87, A Journal for Planning and Building in the Third World Vol.4:31-35.

Phelan, G. F. (1977b) *Testing architecturally defensible design: burglars perceive cues of residential vulnerability.* Atlanta, GA: Paper presented at the meeting of the American Society of Criminology.

Phillips, J. A. (1998) *Crime and Migration: Three Essays Examining Causes and Consequences of Two Urban Social Challenges.* PhD Thesis submitted to University of Pennsylvania. http://wwwlib.umi.com/dissertations/fullcit/9913511 accessed on March 4, 2002.

Portnov, B.A. and Rattner, A. (2003) *Spatial Patterns of Crime in Israel: Investigating the Effects of Inter-Urban Inequality and Proximity.* In: 43rd Congress of the European Regional Science Association, 27-30 August 2003, Finland.

Pruitt, M. V. (1995) *Economic Deprivation, Racial Inequality, Urban Underclass, and Crime: An Examination of the Effects of Structural Covariates on Race-and Age- Specific Arrest Rates for Homicide, Robbery, and Burglary.* PhD Thesis submitted to North Caroline State University. http://wwwlib.umi.com/dissertations/fullcit/9606343 accessed on March 4, 2002.

Quetelet, A. [1831] (1984) *Research on the Propensity for Crime at Different Ages.* Translated by Sawyer F. Sylveski. Cincinnati, OH: Anderson.

Quimet, M. (2000). *Aggregation bias in ecological research: How social disorganization and criminal opportunities shape the spatial distribution of juvenile delinquency in Montreal*. Canadian Journal of Criminology 42(2), 135-156.

Ratcliffe, J. H. (2001) *Residential Burglars and Urban Barriers: A Quantitative Spatial Study of the Impact of Canberra's Unique Geography on Residential Burglary Offenders.* Final Report for the Criminology Research Council Grant, CRC 17/00-01.

Repetto, T. A. (1976) *Crime Prevention and the Displacement Phenomenon.* Crime and Delinquency, 22:166-177.

Ripley, B. D. (1976) *The second-order analysis of stationary point processes.* Journal of Applied Probability, 13:255-66.

Ripley, B. D. (1981) *Spatial Statistics*. New York: John Wiley and Sons.

Robinson, D. M. (2001) *Routine Activity Theory: The Commentator's Perspective*. In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 335-339.

Robison, S. M. (1936) *Can Delinquency Be Measured?* New York: Colombia University Press.

Rossmo, D. K. (1995) *Geographic profiling: Target Patterns of Serial Murderers.* PhD Thesis submitted to Simon Fraser University (Canada).
http://wwwlib.umi.com/dissertations/fullcit/NN17083 accessed on March 4, 2002.

Sacerdote, B. I. (1997) *Essays in Applied Microeconomics: The Lottery Winner Survey, Crime and Social Interactions, and Why is There More Crime in Cities?* PhD Thesis submitted to Harvard University. http://wwwlib.umi.com/dissertations/fullcit/9721692 accessed on March 4, 2002.

Sampson, R. J. (1995) *The Community*. In: Wilson, J. Q. and Petersilia, J. (eds.) Crime. San Francisco:ICS Press.

Sayer, A. (1985) *The Difference that Space Makes*. In: Gregory, D. and Urry, J. (eds.) Social Relations and Spatial Structures. London: Macmillan.

Sayın, F. (1998) *1993-1997 Yılları Arasında İstanbul'da Meydana Gelen Gasp Olaylarının Sosyo-Ekonomik Analizi.* Marmara Üniversitesi, Orta Doğu ve İslam Ülkeleri Enstitüsü, İktisat Anabilim Dalı Y.L. Tezi. İstanbul.

Scherdin, M. J. (1986) *The Halo Effect: Psychological Deterrence of Electronic Security Systems.* Information Technology and Libraries 5:232-235.

Schmidt-Kallert, E. (2004) *The Integration of Minorities in Deprived Neighbourhoods in Germany-Some Lessons from the Programme "The Socially Integrative City".* In: Bohnet, A. and Höher, M. (eds.) The Role of Minorities in the Development Process. Gießen.

Schneider, R.H. and Kitchen, T. (2002) *Planning for Crime Prevention: A Transatlantic Perspective.* London, USA, Canada: Routledge, Tylor and Francis Group.

Schumacher B.J. and Leitner M. (1999) *Spatial Crime Displacement Resulting from Large-Scale urban Renewal Programs in the City of Baltimore, MD: A GIS Modelling Approach,* In: 4th International Conference on GeoComputation, Mary Washington Coll., Fredericksburg, Virgina. http://www.geovista.psu.edu/sites/geocomp99/Gc99/047/gc_047.htm accessed on May 23, 2002.
Schwab, W. A. (1992) *Theories of the City.* In: The Sociology, New York: Prentice Hall, 1-34.

Shaw, C. R. and McKay, H. D. (1942) (rev. edi. 1969) *Juvenile Delinquency and Urban Areas.* Chicago, IL: University of Chicago Press.

Sherman, L. W. (1990) *Police Crackdowns: Initial and Residual Deterrence.* In: Tonry, M. and Morris, N. (eds.), Crime and Justice: A Review of Research. Chicago, IL: University of Chicago Press.

Sherman, L. W., Gartin, P. R., and Buerger, M. E. (1989) *Hot Spots of Predatory Crime: Routine Activities and the Criminology of Place.* Criminology 27(1):24-56.

SIS, State Institute of Statistics, Prime Ministry of Republic of Türkiye (2001) *2000 Census of Population, Social and Economic Characteristics of Population: Ankara.* Ankara: SIS Printing Division.

SIS, State Institute of Statistics, Prime Ministry of Republic of Türkiye (2002) *Judicial Statistics 2000.* Ankara: SIS Printing Division. (DİE, Başbakanlık Devlet İstatistik Enstitüsü (2002) *Adalet İstatistikleri.* Ankara: DİE Yayınları.)

SIS, State Institute of Statistics, Prime Ministry of Republic of Türkiye (2003) *2000 Census of Population, Social and Economic Characteristics of Population: Türkiye.* Ankara: SIS Printing Division.

Southworth, M. and Owens, P. M. (1993) *The evolving metropolis: studies of community, neighbourhood and street form at the urban edge.* J. Am. Plan. Assoc. 59(3):271-287.

Spiegel Online (2006) News dated May 15, 2006 and with heading *Tuning into CCTV, East London Meets Orwell.* http://service.spiegel.de/cache/international/0,1518,416209,00.html accessed on May 15, 2006.

SPSS (2005) *SPSS User Help. SPSS 13.0 for Windows Evaluation Version.* Copyright 1989-2004, SPSS Inc.

Stangeland, P. (2003) *Catching a Serial Rapist: Hits and Pitfalls in Criminal Profiling*. In: Third European Academy of Forensic Science Meeting, İstanbul, Türkiye, September 22-27, 2003, Forensic Science International Vol.136/Suppl.1:14-15.

Stevens, J. (1986) *Applied Multivariate Statistics for the Social Sciences.* New Jersey: Lawrence Erlbaum Associates. (M 26638)

Stevens, J. (1996) *Applied Multivariate Statistics for the Social Sciences.* (third edi.) Mahway, New Jersey: Lawrence Erlbaum.

Stren, R. and McCarney, P. (1992) *Urban Research in the Developing World: Towards an Agenda for the 1990s.* Centre for Urban and Community Studies, Major Report No.26, University of Toronto.

Sui, D.Z. (1998) *GIS-Based Urban Modelling: Practices, Problems, and Prospects.* International Journal of GIS, Vol.12, No.7, 651-671.

Suresh, G. (2000) *Spatial Analysis of Crime: Aggravated Assault, Homicide, and Rape Patterns in the City of Louisville (1989-1998) (Kentucky).* PhD Thesis submitted to University of Louisville. http://wwwlib.umi.com/dissertations/fullcit/3000481 accessed on February 7, 2002.

Sutherland, E. H. (1940) *White collar criminality*. American Sociological Review. 5: 1-12.

Sümengen, E. (2005) *Personal Interview with.* Urban Planner at Keçiören Municipality (Keçiören Belediyesi, İmar ve Yapı Denetim Müdürlüğü).

Sweet, S. P. (1996) *A Study of the Effects of Public Transportation on Crime: From the Metro to the Mall.* PhD Thesis submitted to University of Maryland College Park. http://wwwlib.umi.com/dissertations/fullcit/9707669 accessed on March 4, 2002.

SYSTAT (1996) *Systat 6.0 for Windows: Statistics*. Chicago, IL: SPSS, Inc.

Şahin, E. (2005) *Personal Interview with.* Police Chief at Research Planning and Coordination Headquarter, General Directorate of Security (1. Sınıf Emniyet Müdürü, Emniyet Genel Müdürlüğü APK Daire Başkanlığı).

Şener, M. (1994) *Büyük Kentlerin Gecekondu Bölgelerindeki Sosyo-Ekonomik Yapının Suç Olgusuna Etkileri (İzmir Büyükkent Belediyesi Yönetimi Alanında Konak İlçesi İçin Bir Yaklaşım.* Dokuz Eylül Üni., Sos. Bil. Ens., Kamu Yönetimi Anabilim Dalı Y.L. Tezi. İzmir.

Şenyapılı, T. (1982) *Economic Change and the gecekondu family.* In: Kağıtçıbaşı, C. (ed.), Sex Roles, Family and Community in Turkey, Bloomington: Indiana University Press, 237-248.

Şenyapılı, T. (1983) *Ankara Kentinde Gecekondu Gelişimi (1923-1960).* Ankara: Kent Koop. Yayınları.

Şenyapılı, T. (1995) *Name of the Problem is not Gecekondu*, to be published in Utrecht University.

Şimşek, H. (2004) *İngiltere ve Amerika Deneyimleri Işığında Toplum Destekli Polisliğin Felsefesi ve Uygulaması ve Türkiye için Öneriler*. Polis Dergisi, Yıl:10 Sayı 42:79-90.

Tabachnick, B.G. and Fidell, L.S. (1983) *Using Multivariate Statistics.* New York: Harper and Row Publishers. (M 21070)

Tabachnick, B.G. and Fidell, L.S. (1996) *Using Multivariate Statistics.* (third edi.) New York: HarperCollins.

Taç, M. (2003) Haber Sitesi, *MOBESE: Bir Emniyet Klasiği* başlıklı ve 09.08.2003 tarihli haber. http://www.muharremtac.com/default.asp?konuno=214 accessed on October 4, 2003.

Tankut, G. (1984) *Jansen Planı Uygulama Sorunları ve Cumhuriyet Bürokrasisinin Kent Planlama Yaklaşımı.* İçinde: Yavuz, E. ve Uğurel, Ü. N. (eds.) Tarih İçinde Ankara. Ankara: ODTÜ, Mimarlık Fakültesi Yayını, 301-319.

Tankut, G. (1993) *Bir Başkentin İmarı Ankara:1929-1939.* İstanbul: Anahtar Yayınları. (HT169 T92 A58).

Tekeli, İ. (1978) *Cumhuriyet Döneminde (1923-1973) Türkiye'de Belediyeciliğin Evrimi.* İçinde: Tekeli, İ. ve Ortaylı, İ. (Turgay Türkcan ed.) Türkiye'de Belediyeciliğin Evrimi. Ankara: Türk İdareciler Derneği Yayını, 27-297.

Tekeli, İ. (1982) *Başkent Ankara'nın Öyküsü.* İçinde: Tekeli, İ. (ed.) Türkiye'de Kentleşme Yazıları. Ankara: Turhan Kitabevi Yayınları, 68-76.

Tekeli, İ. (1987/1991) *Türkiye'de Küçük Sermayenin Spekületif Kentinden Büyük Sermayenin Spekülatif Kentine Bir Geçiş mi Yaşanıyor.* İçinde: Kent Planlaması Konuşmaları. Ankara: TMMOB Mimarlar Odası Yayını, 166-169.

Tekeli, İ. (1998) *Türkiye'de Cumhuriyet Döneminde Kentsel Gelişme ve Kent Planlaması.* İçinde: Sey, Y. (ed.) 75 Yılda Değişen Kent ve Mimarlık. İstanbul: Türkiye İş Bankası ve Tarih Vakfı Ortak Yayını, 1-24.

Tekeli, İ. (1999) *Bir Modernleşme Projesi Olarak Türkiye'de Kent Planlaması.* İçinde: Bozdoğan, S. ve Kasaba, R. (eds.) Tercüme: Elhüseyni, N. Türkiye'de Modernleşme ve Ulusal Kimlik, İstanbul: Tarih Vakfı Yurt Yayınları.

Topçu, M. (2004) *Spatial Variation of Apartment Housing in Ankara.* MS Thesis in the Graduate School of Natural and Applied Sciences, Department of City and Regional Planning, Urban Design, METU, Ankara.

Tranter, P. J. (1993) Children's mobility in Canberra: confinement or independence? Monograph Series 7, Department of Geography and Oceanography, University of New South Wales, 157 pp.

Türel, A. (1987) *Ankara'da Konut Yapım Süreçleri.* İçinde: Ankara Büyükşehir Belediyesi, EGO Genel Müdürlüğü. Ankara: 1985'den 2015'e. Orta Doğu Teknik Üniversitesi, Şehir ve Bölge Çalışma Grubu: İlhan Tekeli, Özcan Altaban, Murat Güvenç, Ali Türel, Baykan Günay ve Raci Bademli. Ankara:Ajans İletim.

Uğur, N. (1986) *Gecekondularda Suç ve Suçluluk (Ankara Örneği).* Gazi Üniversitesi, Sosyal Bilimler Enstitüsü, Master Programı Y.L. Tezi. Ankara.

UMI, University Microfilms (2002) Abstract for PhD Thesis by Farooq, A., 1999, *Social and Spatial Implications of Community-Based Residential Environments on Crime in Urban Settings* submitted to Georgia Institute of Technology.
http://wwwlib.umi.com/dissertations/fullcit/9966947 accessed on March 4, 2002.

Upton, G. J. G. and Fingleton, B. (1985) *Spatial Data Analysis by Example, Volume I: Point Pattern and Quantitative Data.* Chichester, New York, Brisbane, Toronto, Singapore: John Wiley and Sons Ltd. (QA278.2.U68 1985)

Ünlü, A., Alkışer, Y. ve Edgü, E. (2000) Fiziksel ve Sosyokültürel Değişim Bağlamında Beyoğlu'nda Suç Olgusunun Değerlendirilmesi. İstanbul Teknik Üniversitesi Araştırma Fonu, Proje no:1094.

Ürger, A. M. (2004) *Apartment Block as the Object of the Generic City: Ankara.* MA Thesis in the Graduate School of Natural and Applied Sciences, Department of Architecture, METU, Ankara.

Vanderschueren, F. (2000) *Prevention of urban crime. Safer Cities Programme. Background document.* UNCHS (Habitat) http://www.unhabitat.org/downloads/docs/1847_44357_SCProgramEng2.pdf accessed on September 22, 2007

Veenendaal, B. and Houweling, T. (2000) *Gut Feelings, Crime Data and GIS*. In: Conference on Crime Mapping: Adding Value to Crime Prevention and Control, 21-22 September 2000-Adelaide. http://www.aic.gov.au/conferences/mapping/houweling.pdf accessed on June 6, 2002.

Venables, W. N. and Ripley, B.D. (1997) *Modern Applied Statistics with S-Plus.* (sec. edi.) New York: Springer-Verlag.

Walford, N. (1995) *Geographical Data Analysis*. England: John Wiley and Sons Ltd.

Weisburd, D. (2002) *From Criminals to Criminal Contexts: Reorienting Crime Prevention Research and Policy.* In: Waring, E. and Weisburd, D. (eds.), Crime and Social Organization. Advances in Criminological Theory. Vol 10. New Brunswick and London: Transaction Publishers, 197-216.

Weisburd, D. and Green, L. (1994) *Defining the Drug Market: The Case of the Jersey City DMA System.* In: MacKenzie, D. L. and Uchida, C. D. (eds.), Drugs and Crime: Evaluating Public Policy Initiatives. Newbury Park, PA:Sage Publications.

Weisburd, D. and McEwen, T. (1998) *Introduction: crime mapping and crime prevention.* In: Weisburd, D. and McEven, T. (eds.), *Crime Mapping and Crime Prevention*. Crime Prevention Studies. Vol 8. Monsey, New York: Criminal Justice Press, 1-23.

Weisburd, D., Maher, L. and Sherman, L. (1992) *Contrasting Crime General and Crime Specific Theory: The Case of Hot-Spots of Crime.* Advances in Criminological Theory, 4:45-70.

Whitt, H. P. (2001) *The Moral Statisticians.* In: Bryant, C.D. (chief ed.), Adler, P.A., Adler, P., and Jay, C. (assoc. eds.), Encyclopedia of Criminology and Deviant Behavior, Volume I: Historical, Conceptual, and Theoretical Issues. USA: Brunner-Routledge, Taylor and Francis Group, 229-232.

Wiles, P. 1976. The Sociology of Crime and Delinquency in Britain. London, UK: Martin Robertson.

Williamson, D., McLafferty, S., Goldsmith, V., Mollenkopf, J. and McGuire, P. (1999) *A Better Method to Smooth Crime Incident Data.*http://www.esri.com/news/arcuser/0199/crimedata.html accessed on Februay 2, 2002.

Wilson, J. Q. and Kelling, G. L. (1982) *Broken Windows.* The Atlantic Monthly, 211, March: 29-38.

Worpole, K. (1992) *Towns for People: Transforming Urban Life*. Buckingham: Open University Press.

Wu, T. (2001) *Analysing Crime Spatial Patterns Using Remote Sensing and Geographical Information System Technologies: Investigating the Urban Opportunity Structure Model of Jackson, Mississippi.* Ph.D. Thesis submitted to Lousiana State University and Agricultural and Mechanical College.

Yavuz, Y. (1984) *1923-1928 Ankara'sında Konut Sorunu ve Konut Gelişmesi.* İçinde: Yavuz, E. ve Uğurel, Ü. N. (eds.) Tarih İçinde Ankara. Ankara: ODTÜ, Mimarlık Fakültesi Yayını, 235-256.

Yıldıral, Z. ve Nebi, M. (2003) Nethaber adlı haber sitesi, *Diyarbakır'da suç oranını azaltan teknoloji, İstanbul'a getiriliyor* başlıklı ve 08 Eylül 2003 tarihli Zaman gazetesi haberi. http://www.nethaber.com/haber/haberler/0,1082,96976_3,00.html accessed on October 4, 2003.

Yıldırım, D. (2004) *Design Problems of AOÇ as a Public Property.* MS Thesis in the Graduate School of Natural and Applied Sciences, Department of City and Regional Planning, Urban Design, METU, Ankara.

Yön, H. (2003) Impact of Crime Mapping on the Crime Analysis Approach of the Ankara Polis Department. In: Third European Academy of Forensic Science Meeting, İstanbul, Türkiye, September 22-27, 2003, Forensic Science International Vol.136/Suppl.1: 12.

Young, L. E. (1992) *Patterns of Victimization in Rape (Rape Patterns).* PhD Thesis submitted to the University of Texas at Austin.
http://wwwlib.umi.com/dissertations/fullcit/9225777 accessed on March 4, 2002.

Yuen, B. (2004) *Safety and Dwelling in Singapore. Cities.* Vol 21, Iss 1: 19-28 (html:1-16).

Zürcher, E. J. (1995) Modernleşen Türkiye'nin Tarihi. (üçüncü baskı) Tarih Politika Dizisi, 7, İstanbul: İletişim Yayınları.

APPENDIX A

STUDY AREA SELECTION PROCESS

As for the year 2000 (study period), there are 8 metropolitan districts that totally constituting 396 neighbourhoods (AWSW LIS, 2004) and a population of 3 203 362 (SIS, 2001). Furthermore, there are totally 49 Police Stations and 48[1] Police Station Zones (AWSW LIS, 2004), which form the boundaries of the responsibility areas of the Stations. A comparison can be made for these properties of the Metropolitan Area by means of Table A.1.

Table A.1 Urban population, area, and number of police stations of the districts in Ankara Metropolitan Area

Districts	**Total urban population (1)**	**Total Area (km^2) (2)**	**Number of Police Stations and their zones (2)**
Altındağ	400 023	50,38	11
Çankaya	758 490	146,55	10
Etimesgut	169 615	88,56	2
Gölbaşı	35 308	12,15	1
Keçiören	625 167	49,30	7
Mamak	412 771	63,70	9
Sincan	267 879	23,90	2
Yenimahalle	534 109	113,32	7
Total	3 203 362	547,86	49

Source: (1) SIS, 2001
(2) AWSW LIS, 2004

The study mainly argues the differences in the *spatial* and/or *temporal* distribution of incidents among different settlement types, i.e., *planned*, *early stage gecekondu* (*squatter*), and *in-transition*. For this reason, the first intention, which was agreed upon with the police officers, was to choose the Study Area such that it would cover three neighbourhoods from among one of the eight metropolitan districts, each of which display one of the three development patterns. Afterwards, further discussions with the police officers, this preliminary idea was developed to cover nine neighbourhoods in groups of three neighbourhoods, each group to be chosen from among one of the eight metropolitan districts for a better and unbiased representation.

On the other hand, there were some priorities of police officers in order not to encounter any problems during the data entry such that each of the three neighbourhood groups would be chosen in a way that they would be entirely covered in one Police Station Zone as much as possible. In this way, it could have been possible to enter the incident and related data for nine

[1] The excess of one Police Station is due to an additional one in one Police Station Zone, which is located in the intercity bus terminal complex, and responsible for that place, and by coincident it falls within the responsibility area of the Bahçelievler Police Station.

neigbourhoods by obtaining data from only three Police Stations. That is, it was emphasized that each of the neighbourhoods in each of the three Police Station Zones should not have been divided between two or more Police Station Zones.

Nevertheless, it is known that Police Station Zones are determined by protocols between Police Stations and they may cover one or more neighbourhoods partially and/or completely. Thus, the relationship between Police Station Zones and neighbourhood boundaries is many-to-many. Afterwards, some field study was carried out and some Police Stations that would cover the most suitable features of the set criteria were visited. This search resulted in finding one district with one of the neighbourhood in one Police Station Zone, which is separate from the other Zone involving two adjacent neighbourhoods; a second district in which one Police Station involve one separate and two adjacent neighbourhoods; and a third district in which all the three neighbourhoods located separately in three different Police Station Zones, two of which are problematic due to being divided into two parts by the Zone boundaries. Therefore, the last district was planned to be changed later on.

As it is seen, even if these neighborhoods and the responsible Police Station Zones would have been selected by such a process, it would have been based on a non-probabilistic sampling method by “convenience” approach and would not have been based on a probabilistic “random” sampling approach. To compensate this non-probabilistic method it was planned to prepare a “sampling frame” or “sampling list” with respect to criteria which define the development pattern categorization of all neighbourhoods. These criteria were thought to be: Socio-economic, and physical (spatial) features, in addition to plan situations of the neighbourhoods. In this way, it would have been possible to place and see where these “convenience” selections stand in such a sampling framework. However, the preparation of such frames or lists would have required an additional research time period and more than this it could have been subject of another research by itself. As a result, in order to overcome the difficulties of sampling problem, problem of incident and data entry by several different Police Stations and the spatial non-continuity of these selected neighbourhoods, the following final decision on the reasoning behind the selection of study area (*R*) was made.

One Police Station Zone was chosen such that it comprised urban sections where a group of spatially continuous and adjacent neighbourhoods which have experienced, and is currently experiencing all the three different development patterns. In this way, even though a generalization to all the Metropolitan Area is not possible, at least it will be possible to explore, explain, and extract planning and policing implications from the *spatio-temporal* distribution of the selected incident types in a spatially continuous and consistent -in terms of incident and related data coming from one source- neighbourhoods within a part of the Metropolitan Area, which display typical urban development patterns peculiar to big cities in Turkey.

APPENDIX B

FIELDS OF "EVENT NOTEBOOK"

Table B.1 Fields of "Event Notebook" (*)

Suçun	Numarası			
	Çeşidi			
	Yeri			
	Tarih ve Saati			
	Maddi Zarar			
Mağdur ve Şika-yetçiler		Adı ve Soyadı		
		Baba Adı		
		Doğum Yeri ve Tarihi		
		İş ve ikametgah adresi		
Suçluların	Adı ve Soyadı			
	Baba Adı			
	Ana Adı			
	Doğum Yeri ve Tarihi			
	Uyruğu			
	Nüfusa Kayıtlı olduğu yer	İl		
		İlçe		
		Bucağı		
		Köy veya Mahalle		
	İşi			
	İş ve ikametgah adresi			
	Suç Delilleri			
	Yakalanıp Yakalan-madığı	Yakalandı		
		Firar		
		Meçhul		
Yapılan İşlemler	Hazırlık evrakının	Sevk Tarihi		
		Numarası		
	Sevk Şekli	Suç Üstü		
		Mevcutlu		
		Gn.Hük.lere Göre		
	Birlikte Gönderilen Deliller			
	Gönderildiği Yer			
	Sonuç			

(*) Started to be utilized in its more sophisticated form since 1993 for standard and regular registration of the incidents known to police

Source: Etlik Police Station, 2000

APPENDIX C

EXPLANATIONS, FORMATTING, AND CORRECTIONS CONCERNING SOME FIELDS IN THE REVIZED "INCIDENT TABLE"

The number of incidents data entered from "Event Notebook"s of Etlik Police Station in the year 2000 is 1139. Once all these data were entered, initial corrections were made for all the incidents by controlling the "Event Notebook"s and "Event Report"s prepared for each incident. The incidents, which have problems in their field values, were given priority in this correction.

While values of "Incident Date", and "Incident Hour" were controlled and corrected, values for newly added fields of "Registration Date", and "Registration Hour" were entered.

In formatting and/or correction of the field of "Against What", Felonies (all 11 parts) and Misdemeanours (all 4 parts) in Turkish Criminal Code (TCC[2]) and Special Codes were used. With respect to this, it was observed that all "single event" incidents[3] were committed against "Special Codes" given in the 2nd section of Table C.1, and all the categories given in the 1st section of this Table except for categories of "Felonies on Informatics" and "Misdemeanours Against Property Rights". As for "multi event" incidents[4], it is seen that they were committed against different combinations of main parts of Felonies, Misdemeanours, and Special Codes (3rd Section in Table C.1). The incidents, for which none of these categorizations is possible, were placed into the "Other" category (4th Section in Table 1). This category is added to "Against What" field for only the "Lost Person" and "Lost/Found Gun" incidents. For all these purposes, first, necessary additions were made into the incident type list in accordance with TCC and Special Codes.

Moreover, in the context of Table C.1, during the formatting and/or correction of incidents for their values in the "Against What" field, some incidents were not assigned into the categories that they must have been put into, instead, they were given the category of "Against People". These incidents are seen in Table C.2.

Similar to "Registration Date" and "Registration Hour", another field which was required to be added after the finalization of data entry was "…Detail". This field was used to store standard detail information on "…Commitment Type" for each "single event" incidents and/or each event in "multi event" incidents.

In the following the category assignments and/or assumptions used for transforming the entered values of "…Incident Type" and "….Commitment Type" fields in order them to be complied with the TCC and Special Codes categories and for leaving them as they are if they were already

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[2] The previous, not the current TCC, is meant throughout the whole study.
[3] Incidents in which only one event took place.
[4] Incidents in which more than one event took place.

Table C.1 The obtaining of values in the "Against What" Field (1)

1st Section		
Felonies (TCC)	***Misdemeanors (TCC)***	***"Against What" Field***
1st Part - Felonies against the State		*The State*
2nd Part - Felonies against liberty		*Liberty*
3rd Part - Felonies against government administration		*Government Administration*
4th Part - Felonies against judicial administration		*Judicial Administration*
5th Part - Felonies against public order	1st Part - Misdemeanors against public order	*Public Order*
6th Part - Felonies against public confidence		*Public Confidence*
7th Part - Felonies against public welfare	2nd Part - Misdemeanors against public welfare	*Public Welfare*
8th Part - Felonies against public decency and family order		*Public Decency and Family Order*
9th Part - Felonies against individuals (*)		***People***
10th Part - Felonies against property		***Property***
11th Part - Felonies on informatics		On Informatics
	3rd Part - Misdemeanors against public morality	*Public Morality*
	4th Part - Misdemeanors against property rights	Property Rights
2nd Section		
Special Codes	*Special Codes*	
3rd Section		
Felonies, Misdemeanors (TCC)-Special Codes Combinations	*Government Administration and Public Morality*	
	Government Administration and Public Confidence	
	Government Administration and Property	
	Government Administration and People	
	Government Administration, People, and Public Morality	
	Public Decency and Family Order and Property	
	Public Decency and Family Order and People	
	Liberty, and Public Morality	
	Liberty and People	
	Public Decency and Family Order and Liberty	
	Liberty, People, and Property	
	Liberty, and Public Confidence	
	Property, and Public Welfare	
	People, and Public Morality	
	People and Property	
	People, Property, and Public Morality	
	People, Property, and Public Confidence	
	People, Property, and Special Codes	
4th Section		
Unclassified	*Other*	

(1) The italic articles show the values of "Against What" for 1139 incidents, bold and italic articles show the values of "Against What" for the incidents which are selected for geocoding and spatio-temporal and detailed analyses.
(*) To comply with the literature, the translation of "people" would be used in the remaining of the study.
Source (for translation): SIS, 2002

Table C.2 Incidents put into "Against People" category even though they are in other categories of TCC

Original Data	Category in accordance with TCC: **Incident Type**	Category in accordance with TCC:**Commitment Type**	**Detail**	Category in accordance with TCC: **Against What**	Used Category: **Against What**
Sexual Abuse by Telephone and Letter	Obscenity Felonies	Obscene Acts	Sexual Abuse by Telephone and Letter	Felonies Against Public Decency and Family Order	People
Abuse by Telephone	Obscenity Felonies	Obscene Acts	Abuse by Telephone	Felonies Against Public Decency and Family Order	People
Sexual Abuse	Obscenity Felonies	Obscene Acts	Sexual Abuse	Felonies Against Public Decency and Family Order	People
Blank Shot Display	Firearms and Non-firearms Felonies	Weapon Display	Blank Shot	Felonies Against Governm. Administration	People
Claim for Pistol Display	Firearms and Non-firearms Felonies	Weapon Display	Pistol	Felonies Against Governm. Administration	People
Pistol Display	Firearms and Non-firearms Felonies	Weapon Display	Pistol	Felonies Against Governm. Administration	People
Knife Display	Firearms and Non-firearms Felonies	Weapon Display	Knife	Felonies Against Governm. Administration	People
Claim for Pistol and Knife Display	Firearms and Non-firearms Felonies	Weapon Display	Pistol and Knife	Felonies Against Governm. Administration	People
Pistol Display	Firearms and Non-firearms Felonies	Weapon Display	Shotgun	Felonies Against Governm. Administration	People
Pistol Display	Firearms and Non-firearms Felonies	Weapon Display		Felonies Against Governm. Administration	People

complied with those categories are explained. First, the incidents that are defined as "Opposition to…" are arranged as in Table C.3.

In the context of incidents registered as "Attempt for ….", since the "Attempt for Suicide" is a quite frequent case, this value was added as a separate "…Commitment Type" under "Death, Homicide Incidents" in the incident type list prepared in accordance with TCC. However, "Attempt for…" explanation were removed from the main category for the incidents like "Attempt of ….Burglary", which were too few in number. The reason for this is that such incidents turn to be registered with an explanation of the caught of offenders as "red-handed" in the "Event Report"s. Therefore, the term "Attempt for…" makes no further contribution to the definition of the incident, and it does not invalidate the happening of the incident. Hence, this additional information was transferred to the "Notes" field and values of "…Incident Type" and "….Commitment Type" fields were arranged in this way. In other words, within these fields incidents defined as "Attempt for …." do not exist except for "Attempt for Suicide" incident records in "…Commitment Type" field.

Similarly; incidents that are entered into the "Event Notebook"s as "Claim for …." did not provide any criterion for the happening of the incident. After realizing the information that this explanation was only entered in the cases for which the police officers thought the incidents did not really happen due to lack of required proof/proves and witness/witnesses, and due to too few encountering of such incidents and in order to eliminate complexity, this explanation was transferred to the "Notes" field, as well.

Table C.3 Formatting and/or correction of "Opposition to …" Incidents

Original Data	Category in accordance with TCC/Special Codes: **Incident Type**	Category in accordance with TCC/Special Codes: **Commitment Type**
Opposition to Special Law Numbered 2860	Opposition to Other Laws	Opposition to Aid Collection Law
Opposition to Special Law Numbered 2908	Opposition to Other Laws	Opposition to Law of Associations
Opposition to 526th Article of TCC	Disobedience to Orders Issued by Competent Authorities	Disobedience to Orders Issued by Competent Authorities
Opposition to Special Law Numbered 6136 (1)	Firearms and Non-firearms Felonies	Carrying firearms and bullets
Opposition to Special Law Numbered 6136	Firearms and Non-firearms Felonies	Keeping firearms and bullets
Opposition to Special Law Numbered 4320 (2)	Maltreatment of Members of One's Family	Maltreatment of Members of One's Family (Domestic Violence)

(1) Firearms Law *(Ateşli Silahlar ve Bıçaklar ile Diğer Aletler Hakkında Kanun)*
(2) Law of Protection of Family *(Ailenin Korunmasına Dair Kanun)*

In addition, transference of these explanations, namely "Attempt for…", and "Claim for…", to the "Notes" field and lacking them in the "….Commitment Type" fields were also based on the reason that the TCC had no categories of incidents defined as such.

When read from "Event Report"s, it is understood that a record was entered in "Fraud" category in the "Event Notebook"s even though it is a "Bribery-Receiving Bribe" incident. Moreover, after evaluating "Event Report"s, two data entered as "Kidnapping" were not put into the category of "Plundering, Highway Robbery, and Kidnapping (For Ransom)", which could also be found in incident list of TCC, but they were put into the category of "Felonies Against Liberty-Felonies Against Personal Liberty" of TCC, where such different purpose kidnapping incidents are referred. As a result, these data were corrected as seen in Table C.4.

Table C.4 Formatting and/or correction of "Fraud" and "Kidnapping" Incidents

Original Data	The found real category in accordance with TCC: **Incident Type**	The found real category in accordance with TCC: **Commitment Type**	*Detail*
	Bribery	Receiving Bribe	
Kidnapping	Felonies Against Liberty	Felonies Against Personal Liberty	Kidnapping
Claim for Kidnapping by Knife Display	Felonies Against Liberty	Felonies Against Personal Liberty	Kidnapping by Knife Display

For the incidents entered in "Threat" category in the "Event Notebook"s, and for majority of cases where the value on "…Commitment Type" was not clear, this value was entered or corrected as "Ordinary Threat". As for cases entered as "Threatening by Death"; "Commanding, Forcing, Restricting Threat" category was used. Category of two incidents entered as "Knife

Display” was corrected as “Threatening Using Knife”, when they were exasmined in the “Event Report”s. According to these; all “Threat” incidents were corrected as given in Table C.5.

Table C.5 Formatting and/or correction of “Threat” Incidents

Original Data	Category in accordance with TCC: **Incident Type**	Category in accordance with TCC: **Commitment Type**	*Detail*
(By Death) Threatening	Stalking	Commanding, Forcing, Restricting Stalking (Forcible Stalking)	***By Death***
Claim for (By Death) Threatening	Stalking	Commanding, Forcing, Restricting Stalking (Forcible Stalking)	***By Death***
(Using Knife) Threatening	Stalking	Commanding, Forcing, Restricting Stalking (Forcible Stalking)	Using Knife
Knife Display	Stalking	Commanding, Forcing, Restricting Stalking (Forcible Stalking)	Using Knife
Threatening	Stalking	Commanding, Forcing, Restricting Stalking (Forcible Stalking)	By Death Using Shotgun
Threatening	Stalking	Commanding, Forcing, Restricting Stalking (Forcible Stalking)	
Claim for Threatening	Stalking	Commanding, Forcing, Restricting Stalking (Forcible Stalking)	
Mutual Threatening	Stalking	Plain Stalking	Mutual
Threatening	Stalking	Plain Stalking	

The sequence of the individual events, which took place in a “multi event” incident was evaluated in the context of TCC and with interpretations based on reasoning, the sequencing was made so that they start from the heaviest and end with the lightest one, as much as possible. Nevertheless, in cases where these events happened both “Against People” and “Against Property”; priority in sequencing was given to the “Against People” one(s) without looking at the degree of its (their) punishment. The results obtained in this way, turned to be not much different from the data as they were first entered by the police officers.

APPENDIX D

SAMPLE FORM FOR CENSUS GEOGRAPHY DATA OBTAINED FROM SIS

T.C.
BAŞBAKANLIK
DEVLET İSTATİSTİK ENSTİTÜSÜ
BAŞKANLIĞI

2000
BİNALAR CETVELİ
(Belediye Teşkilatı Bulunan Yerlere Ait)

FORM NÜFUS 1
(Numaralama yönetmeliği madde 39)

Sayfa No: 1

İl adı: ANKARA

İlçe adı: GÖLBAŞI

Bucak adı: ....

Köy adı: ....

Mahalle adı: SEYMENLER

	İlk Numarası	Son Numarası
Cadde veya sokağın tek numaralı tarafı	....	....
Cadde veya sokağın çift numaralı tarafı	....	....
Küme ise	1	15

BİLGİSİ DOLDURULAN YER MEYDAN, BULVAR, CADDE, SOKAK VEYA KÜMEDEN HANGİSİ İSE AŞAĞIDA KARŞILIK GELEN TÜRÜ ŞIKLARINDAN BİRİNİ İŞARETLEYİNİZ, ADINI YAZINIZ VE GELİŞMİŞLİK DURUMUNU İŞARETLEYİNİZ

TÜRÜ : MEYDAN ☐ BULVAR ☐ CADDE ☐ SOKAK ☐ KÜME ☒

MEYDAN, BULVAR, CADDE, SOKAK VEYA KÜME ADI (CADDESİ, CD., SOKAĞI, SK., KÜMESİ VB. UZANTILAR YAZMAYINIZ)

ÖREN SERPMELERİ

GELİŞMİŞLİK DURUMU : GELİŞMİŞ ☐ ORTA GELİŞMİŞ ☒ GELİŞMEMİŞ ☐

YUKARIDA KAYDETTİĞİNİZ YER BAĞIMSIZ TANIMLANAMIYORSA, BAĞLI OLDUĞU BİRİMİN ADINI YAZINIZ VE TÜRÜNÜ İŞARETLEYİNİZ

CEMAL GÜRSEL

TÜRÜ : MEYDAN ☐ BULVAR ☐ CADDE ☒ SOKAK ☐

SIRA NO	BİNANIN		NUMARALI YERİN				BİNANIN BAŞKA CADDE veya SOKAĞA AÇILAN KAPISI VAR İSE		DÜŞÜNCELER VEYA AÇIKLAMALAR
			NİTELİĞİ	KULLANIŞ AMACI		NİTELİK KODU			
	Numarası, kapı numarası (Arsa ise tahsis no)	İç kapı numarası (Dış kapıya bağlı)	Kullanış amacını açıkça yazınız. Örneğin; konut, ayakkabı imalathanesi, toptan veya perakende ticaret, avukat yazıhanesi, bakkal, kasap, berber, resmi daire, cami, hastane, samanlık, ahır, depo, garaj, arsa vb. Boş yerler için, boş konut veya boş işyeri yazınız.	Konut ise; içinde devamlı ikamet eden kişi sayısını yazınız.	Ticaret, hizmet, imalat işyeri ve benzeri ise çalışan sayısını yazınız.	1. Konut 2. Özel işyeri 3. Kamu işyeri 4. İnşaat 5. Arsa 6. Diğer	Meydan, Bulvar, Cadde veya Sokağın Adını Yazınız.	Kapı No.	
	1	2	3	4	5	6	7	8	9
1	1		KONUT	6		1			
2	2		KONUT	4		1			
3	3		KONUT	8		1			
4	4		KONUT	6		1			
5	5	1	KONUT	5		1			
6	5	2	KONUT	6		1			
7	5	3	KONUT	5		1			
8	5	4	KONUT	5		1			
9	6		KONUT	7		1			
10	7		KONUT	7		1			
11	8		KONUT	3		1			
12	9		KONUT	4		1			
13	10		KONUT	4		1			
14	11		KONUT	5		1			
15	12		KONUT	5		1			
16	13		KONUT	2		1			
17	14		KONUT	3		1			
18	15		KONUT	6		1			
19									
20									

Figure D.1 Front page of sample form for Census Geography Data obtained from SIS

T.C.
BAŞBAKANLIK
DEVLET İSTATİSTİK ENSTİTÜSÜ
BAŞKANLIĞI

2000
BİNALAR CETVELİ
(Belediye Teşkilatı Bulunan Yerlere Ait)

FORM NÜFUS 1
(Numaralama yönetmeliği madde 39)

Sayfa No: ....

İl adı: ....

İlçe adı: ....

Bucak adı: ....

Köy adı: ....

Mahalle adı: ....

	İlk Numarası	Son Numarası
Cadde veya sokağın tek numaralı tarafı	....	....
Cadde veya sokağın çift numaralı tarafı	....	....
Küme ise	....	....

BİLGİSİ DOLDURULAN YER MEYDAN, BULVAR, CADDE, SOKAK VEYA KÜMEDEN HANGİSİ İSE AŞAĞIDA KARŞILIK GELEN TÜRÜ ŞIKLARINDAN BİRİNİ İŞARETLEYİNİZ, ADINI YAZINIZ VE GELİŞMİŞLİK DURUMUNU İŞARETLEYİNİZ

TÜRÜ : MEYDAN ☐ BULVAR ☐ CADDE ☐ SOKAK ☐ KÜME ☐

MEYDAN, BULVAR, CADDE, SOKAK VEYA KÜME ADI (CADDESİ, CD., SOKAĞI, SK., KÜMESİ VB. UZANTILAR YAZMAYINIZ)

....

GELİŞMİŞLİK DURUMU : GELİŞMİŞ ☐ ORTA GELİŞMİŞ ☐ GELİŞMEMİŞ ☐

YUKARIDA KAYDETTİĞİNİZ YER BAĞIMSIZ TANIMLANAMIYORSA, BAĞLI OLDUĞU BİRİMİN ADINI YAZINIZ VE TÜRÜNÜ İŞARETLEYİNİZ

....

TÜRÜ : MEYDAN ☐ BULVAR ☐ CADDE ☐ SOKAK ☐

SIRA NO	BİNANIN		NUMARALI YERİN				BİNANIN BAŞKA CADDE veya SOKAĞA AÇILAN KAPISI VAR İSE		DÜŞÜNCELER VEYA AÇIKLAMALAR
			NİTELİĞİ	KULLANIŞ AMACI		NİTELİK KODU			
	Numarası, harfli numarası (Arsa ise tahmini no)	İç kapı numarası (Dış kapıya bağlı)	Kullanış amacını açıkça yazınız. Örneğin; konut, ayakkabı imalathanesi, toptan veya perakende tuhafiye ticareti, avukat yazıhanesi, bakkal, kasap, berber, resmi daire, cami, hastane, samanlık, ahır, depo, garaj, arsa vb. Boş yerler için, boş konut veya boş işyeri yazınız	Konut ise; içinde devamlı ikamet eden kişi sayısını yazınız	Ticaret, hizmet, imalat işyeri ve benzeri ise çalışan sayısını yazınız	1. Konut 2. Özel işyeri 3. Kamu işyeri 4. İnşaat 5. Arsa 6. Diğer	Meydan, Bulvar, Cadde veya Sokağın Adını Yazınız	Kapı No	
	1	2	3	4	5	6	7	8	9
1									
2									
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Figure D.2 Back page of sample form for Census Geography Data obtained from SIS

APPENDIX E

EXPLANATIONS CONCERNING THE UTILIZED METHODS

1. The Computation of the Rate Variable for 560 Roads/Streets in the Study Area

In order to obtain rate values in the study area, first, the computation for each of the development pattern areas (all different sections delineated in *R*) was considered. The computation of the denominator in finding the rates for each of these areas, which is the number of residents, required that the attributes of updated the roads/streets centerline map objects (such as number of housing units) to be divided and assigned to each of the area for the portion that they intersect. Because, although the centerline map has linear features, it represent the physical or environmental characteristics of the study area, *R*, without any gap since the linear features bear variables for a certain area around themselves.

On the other hand, such division would have required additional process on the attributes of updated roads/streets centerline map objects, which would possibly downgrade the quality and consistency of data. Moreover, in this case, *n* would have been 29. Therefore, instead, another approach was followed in computation of the denominator and thus, the rate. In this approach, first, the 565 updated roads/streets centerline map objects were assigned with an additional variable (attribute) of one of the three development pattern categories with respect to within which delineated area in *R* they were located. The centerline map objects, which are located on the boundaries of *R* or on the boundaries of the delineated areas were corrected to be in the appropriate area. In doing these, only few measurement errors came into scene, but this amount remained much less compared to the ones that would have occurred if the other approach were chosen (when *n* were to be 29). The size and amount of these few inaccuracies are presented in Figure E.1.

Afterwards, the denominator for each of the roads/streets centerline map objects was found by multiplying their number of residential units ("*iskan*" variable) by the household size for each different neighbourhood that they located inside. When the streets/roads or their segments did not contain any residential units, the number of workplaces ("*isyeri*" variable) was used. Out of total *n*=565 cases, 552 contained residential units with other land uses, and 8 did not contain any residential units but workplaces (either private or state) with other land uses, and 5 contained neither residential units or workplaces but one or more of other land use types. Accordingly, the *n* turned to be 560 in the one-way ANOVA analysis, and not 565. Consequently, the rate values, which were found by dividing the incident counts to the found denominators, and finally multiplied by 1000, were entered into the analysis. For the rates having a zero value per 1000 population, it was assumed to be 0,0001 per 1000 population in order to have a positive value of the dependent variable in further analyses (Only 185 of the linear objects witnessed occurrence of at least one incident out a total of 529. In other words, it was found that the 529 incidents (against people, property, and people and property) occurred in 185 different roads/streets or in their segments, which comprise only about 33% of the analyzed linear features (565)) (Figure E.2).

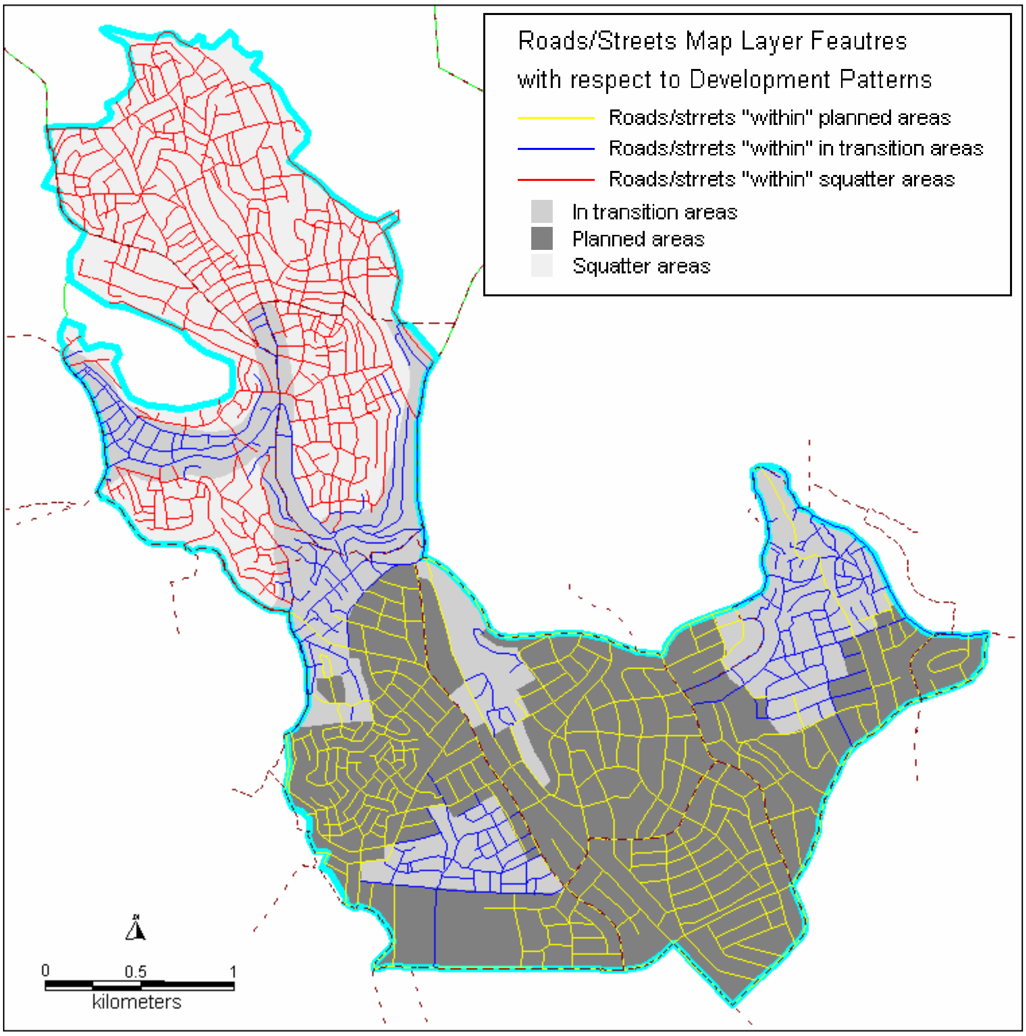

Figure E.1 Distribution of roads/streets map in different development patterns after a "within" spatial analysis
Note: The incidents belonging to set of geocoding for 529 points is used in this analysis.

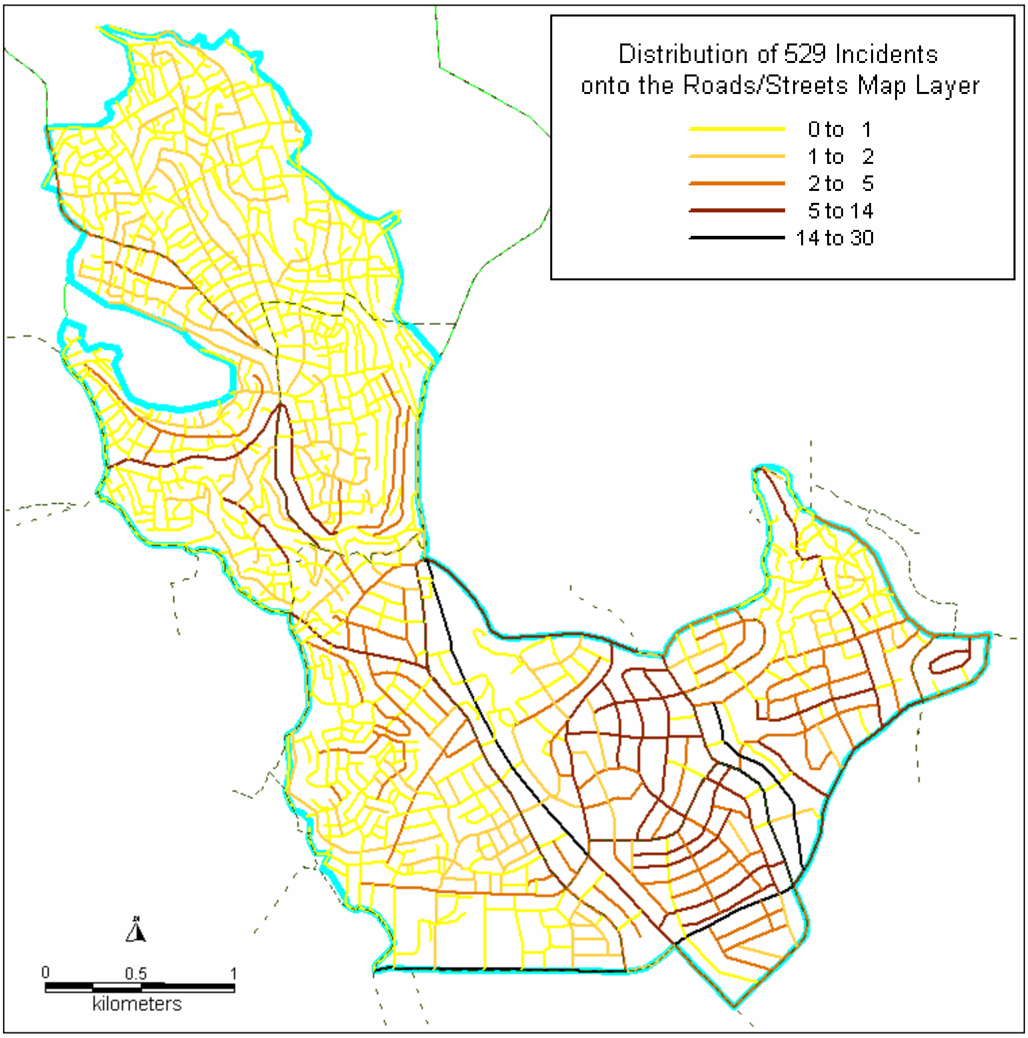

Figure E.2 Frequency mapping of 529 incidents on the updated roads/streets of the study area

2. Quadrat Method

Global scale properties display the extent to which overall incidents point pattern deviate from spatial randomness (Anselin et al, 2000:230). The exploration techniques for point pattern at this scale cover mainly the analysis of measure of variation in the expected value (mean) of the spatial process (Bailey and Gatrell, 1996:32) denoted by λ.

The *quadrat method*, which is a *global scale* point pattern analysis, is simply based on finding an intensity measure by summarizing the spatial pattern via partitioning the study area into equal grids or quadrats. It is one of the most basic methods of converting the discrete point data into a continuous density surface representation by means of frequency count in each quadrat and dividing it by its area. The problems with this method are that the relative locations of points are not considered within a quadrat, and the choice of the size of the quadrats. To overcome this problem and to get a spatially smoother estimate of the intensity a 'moving window' is used. Moving window approach requires a suitable size window that is moved on point centres of every fine grid to estimate the intensity from the event count per unit area of window. Nevertheless, in addition to no consideration of relative locations of events, there is still another difficulty of deciding what size of window will be used (Bailey and Gatrell, 1996:84).

In the study area, by means of Quadrat Method it was investigated whether the general trend in the mean value of the incidents distribution follows a homogeneous Poisson distribution or complete spatial randomness (CSR). CSR or Poisson process assumes equal λ (mean) all over the *R*; furthermore, it also assumes that the s^2 (variance) is equal to λ (Walford, 1995:174,355). Therefore, the test of whether the point process is random and $\lambda = s^2$ and λ is the same all over the *R,* is the same as stating $\lambda_{sq} = \lambda_{itr} = \lambda_{pl}$. This assessment was made by Quadrat Method to find whether the observed point distribution is regular, clustered or random (Bailey and Gatrell, 1996:96). In the analysis a Chi-square test statistic computed from Variance-Mean Ratio was utilized. As Walford (1995:355-356) describe

> [w]hen the test is applied to a particular sample of observations, the numbers of points and grid squares are fixed, consequently the mean (λ) will be constant irrespective of whether the points are clustered, random or dispersed. It is therefore differences in the variance that indicate the nature of the point pattern. If the VMR is significantly greater than 1.0, then clustering of the points is indicated, whereas a value lower than 1.0 denotes dispersal or regularity. The null hypothesis can be tested by converting the sample ratio into either a *t* or χ^2 test statistic…. calculated as VMR multiplied by the degrees of freedom, which is expressed...as: $\chi^2 = (k-1)\frac{s^2}{\lambda}$

In order to obtain the optimal quadrat size, various suggestions are made considering the mean count per quadrat, and the percentage of zero count quadrats (Upton and Fingleton, 1985:31). Some of these proposals are summarized as in Table E.1.

Table E.1 Proposals on finding optimum quadrat size

Mean count per quadrat	**% of quadrats with zero counts**	**Researchers**
1,6	20%	Barlett, 1948
1,0	40%	Greig-Smith, 1964
4,0	2%	Curtis and McIntosh, 1950

Source: Based on explanations of Upton and Fingleton, 1985:31

In the study different size quadrats were tried (Figure E.3) in order to achieve the suggested mean and percentage of zero count quadrats as much as possible in *R*. However, the distribution of the 500 incidents in quadrats of 100m, 200m, 300m and 400m sizes did reveal different results, in which mean density value increases as the size of gris increases (Table E.2). However, this did not invalidate the testing because it is highly probable that the "optimum" quadrat size would have not been achieved, no matter to which number the trials are increased. Accordingly, as a solution to improve the reliability of the test results, testing was applied for all the different size quadrats designed for *R.*

There are several indexes, which can be converted into relevant test statistics against which the evaluation of the randomness of point distribution is made. Among these, two basic these indexes are called *Index of Dispersion (ID)* and *Index of Cluster Size (ICS).* The former index equals to VMR, and the latter one is obtained by subtraction of 1 from the ID (Bailey and Gatrell, 1996:97). In the study, these indexes were evaluated for randomness if they are equal, bigger or smaller than specific values (Table E.3).

The significant clustering at all scales of grid units, where the mean intensity in *R* was not constant, suggested that the spatial distribution of the incidents had significantly differentiating intensities within *R*, which is characterized by different development patterns.

3. Kernel Estimation

Kernel estimation, which is another *global scale* point pattern analysis, improves the *quadrat method* by eliminating its main shorthcomings. This method takes into account the relative locations of the events. It is also known as *kernel smoothing* because it provides a smoother continuous density map (Williamson et al, 1999). This explorative analysis still has the shortcoming of appropriate bandwidth size (τ) selection; that is, the radius of the circular 3D floating function in which the smoothing is done (Bailey and Gatrell, 1996:85-87). To overcome this *fixed bandwidth* problem and improve the *kernel estimation*, where λ is assumed to be constant all over the study area (Walford, 1995:174), *adaptive kernel estimation*, which is obtained by different values of τ at each observed event in study area, has been devised (Bailey and Gatrell, 1996:87) by using variable density λ. Significance testing of *kernel density estimates* is complicated and currently researchers experiment by focusing on simulating surfaces under spatial randomness assumptions (Levine and Associates, 2002:324,310).

In performing Kernel Estimation in the study area, different trials were carried out with different bandwidths for the incidents belonging to set of 500 points (Figure E.4). These trials operate on two different functions[5] that both use different minimum number of samples in their *adaptive kernel*[6] calculations.

[5] All these statistics are computed by the calculated in CrimeStat ® Software and densitites mapped with classes obtained by natural break algorithm in MapInfo ® GIS.

[6] Although fixed bandwidth kernel estimation could have been obtained by the CrimeStat ® Software, adaptive one is preferred in order to achieve consistency in the statistical precision, the degree of which depends on the sample size of the bandwidth interval (Levine and Associates, 2002:315).

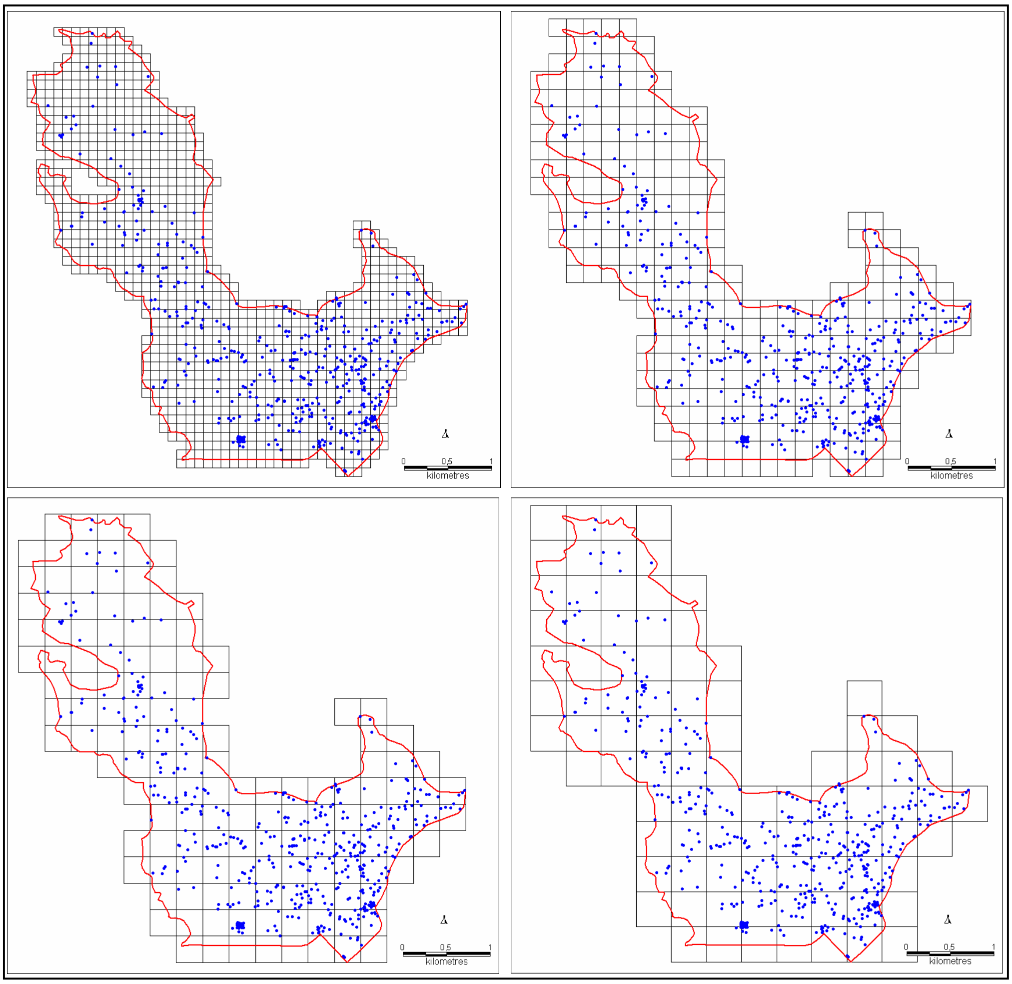

Figure E.3 Different size quadrats designed for the study area

Table E.2 Different size spatial quadrats designed for the study area

Size of on side of the quadrats	**Number of quadrats (N)**	**Number of empty quadrats**	**Mean count per quadrat**	**Percentage of quadrats with zero counts**
100 m	1101	793	0,45	72%
200 m	312	144	1,60	46%
300 m	144	45	3,47	31%
400 m	90	25	5,56	28%

Table E.3 Two of the indexes by which the quadrat results are evaluated

Index	Value	Index	Value	Evaluation
	1		0	Randomness
ID	< 1	ICS	< 0	Dispersion or regularity
	> 1		> 0	Clustering

Source: Prepared from explanations of Bailey and Gatrell, 1996:97

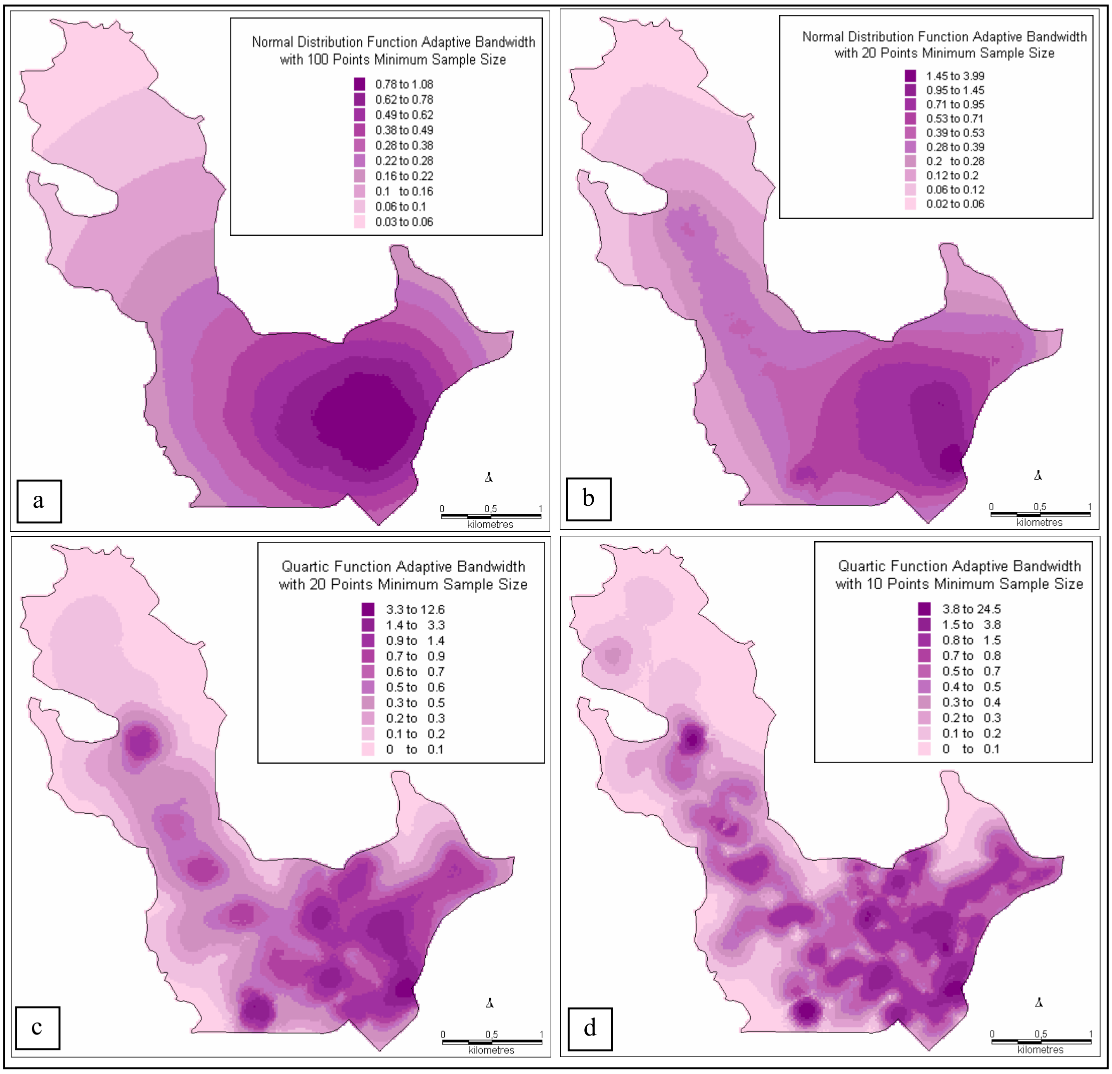

Figure E.4 Results of the *adaptive kernel estimation*
Note: The incidents belonging to set of geocoding for 500 points with units of incidents per hectare

One of the two functions used in the analysis is normal distribution function

$$g(x_j) = \sum \left\{ [W_i * I_i] * \frac{1}{h^2 * 2\pi} * e^{-\left[\frac{dij^2}{2*h^2}\right]} \right\}$$

where d_{ij} is the distance between an incident location and any reference point in the region, h is the standard deviation of the normal distribution (the bandwith), W_i is a weight at the point location and I_i is an intensity at the point location. This function extends to infinity in all direction and, thus will be applied to any location in the region. (Levine and Associates, 2002:303).

The other one is quartic function, which

is applied to a limited area around each incident point defined by the radius, h. It falls off gradually with distance until the radius is reached. Its functional form is:

I. Outside the specified radius, h: $g(x_j) = 0$ (8.2)

II. Within the specified radius, h: $g(x_j) = \sum \left\{ [W_i * I_i] * \left[\frac{3}{h^2 * \pi} \right] * \left[1 - \frac{d_{ij}^2}{h^2} \right]^2 \right\}$ (8.3)

where d_{ij} is the distance between an incident location and any reference point in the region, h is the radius of the search area (the bandwidth), W_i is a weight at the point location and I_i is an intensity at the point location." (Levine and Associates, 2002:308)

Among the resultant outputs, the ones computed by normal distribution functions (Figures E.3a and E.3b) gave smoother intensity estimates which differs from the other functions (here only the quartic one is used) by weighing all points in *R,* and not weighing within a circumscribed circle around grid cell. The other three distributions are called triangular, negative exponential, and uniform. Except for the uniform function all these functions (quartic, triangular, negative exponential) weigh near points more highly than the distant ones (Levine and Associates, 2002:309).

The variation in the normal distribution increased when the minimum number of points within the *adaptive kernel* is decreased from 100 to 20 (Figure E.4a and Figure E.4b, respectively). Similarly, when the minimum number of points within the *adaptive kernel* is decreased from 20 to 10 as in the quartic function results (Figure E.4c and Figure E.4b, respectively), the *kernel estimate* gave more spiky appearance in the intensity. The intensity estimate result obtained by quartic function and 20 minimum number of points (Figure E.4c) is chosen for further interpretation and analyses, because it is observed as the most suitable in order to capture the *global* trend in the spatial process by not loosing variability as in the too much smoothed results obtained by the normal distribution function (Figures E.4a and E.4b) and not to be lost in the too much spiky appearance of the point pattern intensity with smaller number of points (10) quartic function (Figure E.4d).

The edge effects (biases), which mainly occur as spikes at the edge of the reference grid, which is defined as the rectangular area drawn by the lower left and upper right coordinates of the *R,* and thus outside of *R,* was eliminated by trimming the reference grid outside of *R* (Levine and Associates, 2002:324,340) (Figure E.4).

For one-way ANOVA to be performed on the Kernel results to assess differences between the three development patterns for each of the incident types, the parameters of the Kernel required to be the same with respect to different incident types. Therefore, quartic function with *fixed bandwidth kernel estimation* was carried out for each of the three point distributions. The bandwidth choice was made after a trial-error process and resulted in 500 m bandwidth, which allowed a common detail or variation in visualizing the *global* trends for each data set.

Moreover, for these one-way ANOVA analyses, a variable was added into the *kernel density estimation* reference grids for each of the three incidents GIS layers and populated with data from the "Development Pattern in 2000" variable in the *situation* region GIS layer by means of a "within" spatial querying such that the centroids of the reference grid lie within the *situation* layer's entities (Figure E.5). Second, these three different density GIS layers with the additional variable fields are combined in one tabular data set[7].

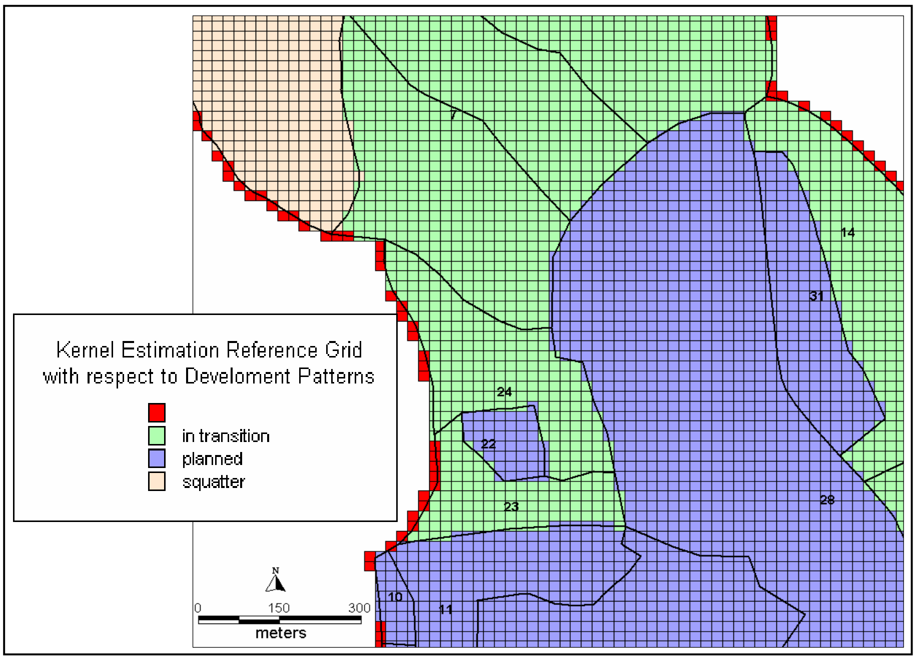

Figure E.5 Assignment of development pattern related values into kernel intensity estimate reference grid

4. Nearest Neighbour Index

Local scale properties measure the correlation or the *spatial dependence* (*interaction*) in the point pattern (Bailey and Gatrell, 1996:32; Gatrell et al, 1996:264). They "refer to sub-regional patterns or 'neighborhood' patterns within the overall distribution." (Levine and Associates, 2004:5.1). One of the most frequently used distance statistics in assessing the existence of *local*

[7] These analyses are performed by using MS Excel ® on the results found by the CrimeStat ® Software.

interactions is *Nearest Neighbour Index (NNI)*[8] (Anselin et al, 2000:229) was utilized in the study. If the *NNI*, which is found by division of observed mean *Nearest Neighbour Distance (NND)* of the incident points by their expected (mean) *NND* under *Complete Spatial Randomness (CSR)*, has a value of 1, it represents the equality of observed mean *NND*, which is found by computation and addition of the distance between each point and its nearest neighbour and averaging by the number of points to the expected *NND* under spatial randomness (mean random *NND*)[9] (Levine and Associates, 2004:5.1,5.3). For the incidents belonging to set of geocoding for 500 points (n=500), with direct measurement the respective observed and expected nearest neighbour distances found to be 56,71 m and 68,91 m, which resulted in a *NNI* of 0,8229[10] and being smaller than 1 it suggested *local* clustering.

The significance testing of *Nearest Neighbour Index (NNI)* is performed by a *z* test proposed by Clark and Evans (1954 in Levine and Associates, 2004:5.4), whisc is represented as "$Z = (d(NN) - d(ran)) / SE_{d(ran)}$, where the standard error of the mean random distance is approximately given by $Z \approx \frac{0{,}26136}{\sqrt{N^2 / A}}$ with A being the area of region and N the number of points." (Levine and Associates, 2004:5.4). In this analysis, the found standard error and *z* test statistic are 1,61 m and -7,5763, respectively and the test statistic *z*, is significant at *p*=0,0001 both for one and two tail tests. The order of significant *local clustering* (in terms of *NNI*) for the two incident types which displayed highest clustering for incidents against property, and moderate clustering clustering for incidents against people, was also reflected in their respective commitment types (Table E.4).

The comparison of the results for *K-order Nearest Neighbour Indexes* for the incidents belonging to set of geocoding for 500 points with no edge corrections with the ones edge correction was made, which displayed almost no differences in between, are presented in Figures E.6-E.9.

---

[8] "[D]eveloped by two botanists in the 1950s (Clark and Evans, 1954), primarily for field work, but it has been used in many different fields for a wide variety of problems (Cressie, 1991)." (Levine and Associates, 2004:5.1).

[9] Mean NNd is "$d(NN) = \sum_{i=1}^{N} [Min(d_{ij}) / N]$ where Min(d_{ij}) is the distance between each point and its nearest neighbor and N is the number of points in the distribution." (Levine and Associates, 2004:5.3) and mean random NND is "$d(ran) = 0{,}5\sqrt{A/N}$ where A is the area of the region and N is the number of incidents." (Levine and Associates, 2004:5.3).

[10] Although the rectangular and circular edge corrected analyses were performed to obtain the *NNI,* due to the shape of the study area, it is thought that the found value would be more distorted by using either corrections than the one without any correction and they were not utilized for interpretation (Levine and Associates, 2004:5.13,5.34).

Table E.4 Summary of z test results for the 1st NNI for the most frequent six commitments

Commitment Type	n (*)	1st NNI (Size of R=9,4971 km^2)	z statistic for the 1st NNI	Standard error (m)	p value (one tail test)	p value (two tail test)
CB/T	63	0.5646	-6.6111	12.78	0.0001	0.0001
TFA	30	0.7708	-2.4020	26.85	0.01	0.05
RB	55	0.8189	-2.5691	14.64	0.01	0.05
AB	64	1.0412	0.6313	12.59	n.s.	n.s.
SB	103	0.9887	-0.2191	7.82	n.s.	n.s.
DV	87	0.9672	-0.5846	9.26	n.s.	n.s.

(*) The incidents belonging to set of geocoding for 500 points is used in this analysis. See ***Endnote 1****.*

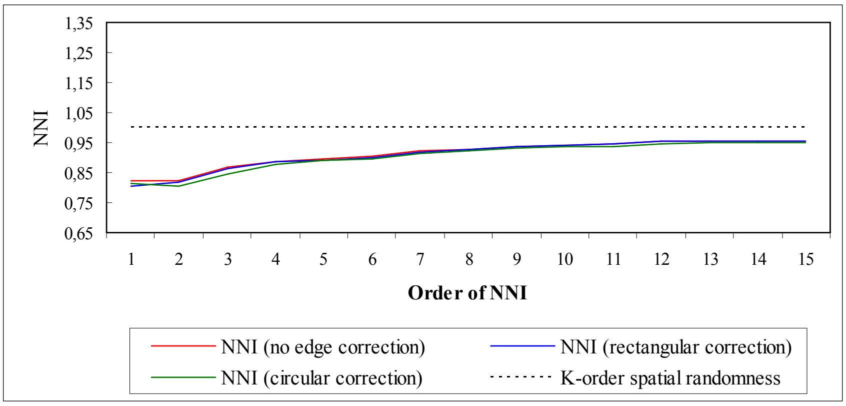

Figure E.6 Plots of *nearest neighbour indexes* up to 15th order versus their orders for the three types of incidents together with no edge correction, and with rectangular and circular corrections

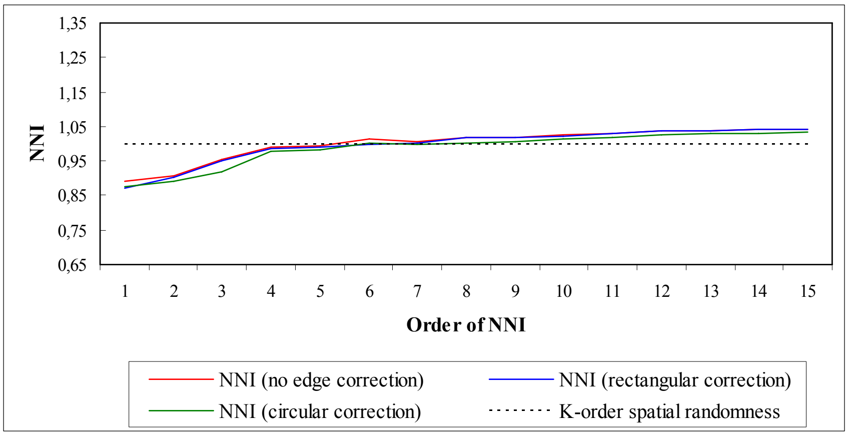

Figure E.7 Plots of *nearest neighbour indexes* up to 15th order versus their orders for incidents against people with no edge correction, and with rectangular and circular corrections

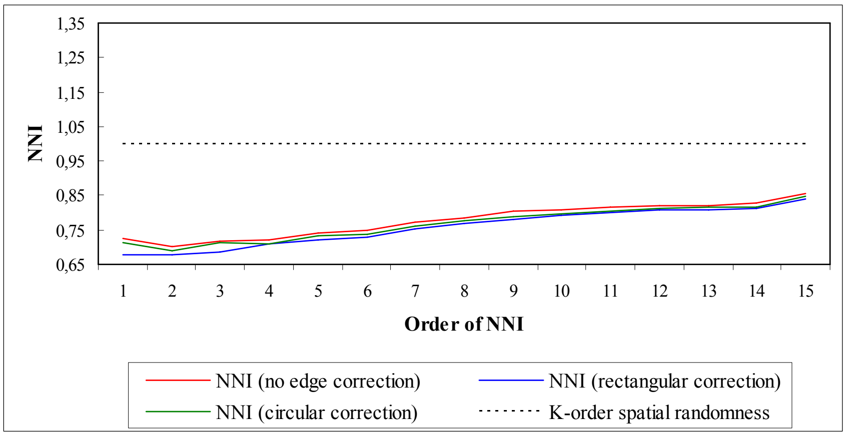

Figure E.8 Plots of *nearest neighbour indexes* up to 15th order versus their orders for incidents against property with no edge correction, and with rectangular and circular corrections

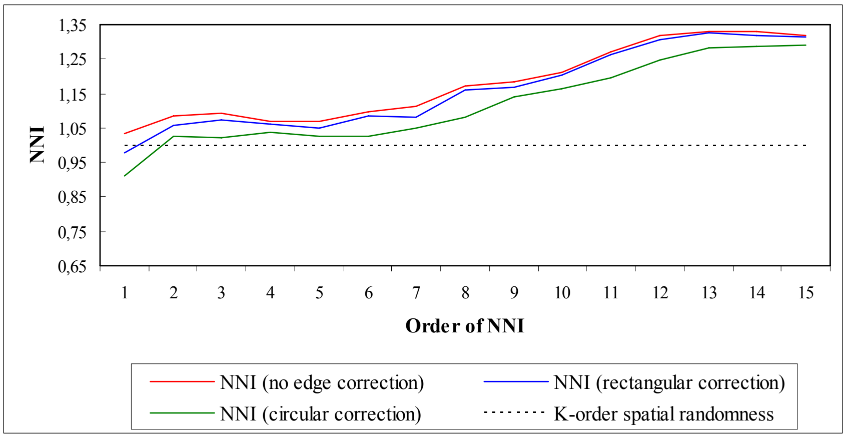

Figure E.9 Plots of *nearest neighbour indexes* up to 15th order versus their orders for incidents against people and property with no edge correction, and with rectangular and circular corrections

5. K Function

In the case of existence of significant spatial dependence (Gatrell et al, 1996:259) among the incidents at the *local scale* or within the sub-regions in *R*, the distances at which this dependence takes place is assessed by *K Function (Ripley's K)* statistic. This method requires large number of sample size (e.g. hundreds) to give precise analysis results (Levine and Associates, 2004:5.33). This function "is an index of non-randomness for different scale values (Ripley, 1976; Ripley, 1981; Bailey and Gattrell, 1995; Venables and Ripley, 1997)….providing a test of randomness for every distance" (Levine and Associates, 2004:5.20).

> [T]he expected number of points within distance, t_s, is
>
> $$E(\#\text{ under csr}) = \frac{N}{A}\pi(t_s)^2$$
>
> ….Under unconstrained conditions, K is defined as
>
> $$K(t_s) = \frac{A}{N^2}\sum_i\sum_{i \neq j} I(t_{ij})$$
>
> where $I(t_{ij})$ is the number of other points, j, found within distance, t_s, summed over all points, i. That is, a circle of radius, t_s, is placed over each point, i. Then, the number of other points, j, within the circle is counted. The circle is moved to the next i and the process is repeated. Thus, the double summation points to the count of all j's for each i, over all i's. Note, the count does *not* include itself, only other points.
>
> After this process is completed, the radius of the circle is increased, and the entire process is repeated. Typically, the radii of circles are increased in small increments so that there are 50-100 intervals by which the statistic can be counted." (Levine and Associates, 2004:5.22-5.23).

In practice, it is converted into a square root function called as *L Function*[11], and this is used for interpretation of second order clustering for only short distances. This function is interpreted by plotting its values versus t_s (distance from an arbitrary point) and by comparing to *Complete Spatial Randomness* (*CSR*), computed as $\pi(t_s)^2$, which is represented as a horizontal line corresponding *L=0* (Levine and Associates, 2004:5.23). Therefore, for this Function's interpretation, it is needed to differentiate between positive peaks and negative troughs to see within which distances of t_s from an event spatial concentrations (attractions) and dispersions (repulsions) occur, respectively (Bailey and Gatrell, 1996:94-95).

Since sampling distribution of $L(t_s)$ is not known, its observed values is tested[12] against spatial randomness by performing a Monte Carlo simulation, which utilizes randomly assigned points in *R* defined as a rectangle formed by minimum and maximum bounding points and rescaled so that it covers the same size as the *R* itself. It is important to note that there are critics for comparison against the spatial randomness for most of the social distributions like crime incidents due to its irrelevance and there is a tendency to use a baseline population such as distribution of population and employment (Levine and Associates, 2004:5.23,5.25).

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[11] $L(t_s) = (\sqrt{K(t_s)/\pi}) - t_s$ (Levine and Associates, 2004:5.23)

[12] For the respective statistic (L-Function) "since there is not a formal test of significance, the comparison with an envelope produced from a number of simulations provides only approximate confidence about whether the distribution differ s from chance or not. That is, one cannot say that the likelihood of obtaining this result by chance is less than 5%, for example." (Levine and Associates, 2004:5.42).

By taking into account all the events and applying to all distances in assessing the local effects, *K Function* (which later on converted to *L Function*) is different from the *Nearest Neighbour Index (NNI) Method.* However, similar to edge effects on that method, *L Function* is also prone to such effects and also similar to that method, unless the *R* have a rectangle or circle like shape rectangular and circular corrections may distort *L Function*'s interpretation even more. Therefore, the use of edge corrections should be done cautiously (Levine and Associates, 2004:5.26,5.34). Another attention in interpretation of *L Function* should be paid to the influence of first order effects. As Gatrell et al (1996:264) point out

> if we estimate a *K* function in a situation where there are large-scale first-order effects -in other words, where intensity varies greatly across the study region- then any spatial dependence indicated by the estimated *K* function could be due more to these first-order effects rather than to interaction between the events themselves.

This is the reason, as argued by Levine and Associates (2004:5.33), "why it is generally wise to use the K statistic for short distance ranges and not for larger distance separations.".

In the study, for the three types incidents together belonging to set of geocoding for 500 points, the plot of *L* values versus the distance bin (t_s) up to 1000m[13] by conducting 1000 simulations with no edge correction was utilized. Although the rectangular and circular edge corrected analyses were performed to obtain the *L Function,* due to the shape of the study area, it is thought that the estimated value would be more distorted by using either corrections than the one without any correction and they were not utilized for interpretation (Levine and Associates, 2004:5.13,5.34). The edge corrected results are presented in Figures E.10 and E.11 and their comparison with the one without edge correction is seen in Figure E.12.

The likelihood of the difference of the observed distribution from random or chance pattern (i.e., clustering of incidents) is determined if the $L(t_s)$ value is always above the maximum random simulation envelope (Levine and Associates, 2004:5.23).

6. One-way Repeated Measures ANOVA and Paired t Tests on the Results of K-order Nearest Neighbour Indexes

One-way repeated measures ANOVA requires three assumptions to be met on the univariate level and required two assumptions to be met on the multivariate level, which are independence of measurement, normality and sphericity; and independence of measurements and normality, respectively (Stevens, 1986:412; Pallant, 2001:198).

In the study, in testing for the differences in the means of the *Nearest Neighbour Indexes* up to 15th order for each incident type, the first of these assumptions assumed to be met. Nevertheless, since the sample size was small with n=15, the second one, normality assumption, required a

[13] This analysis is performed by CrimeStat ® Software. In CrimeStat III ®, "the distance is set at one-third the side of a square defined by the area (SQRT [A]/3).". (Levine and Associates, 2004:5.23).

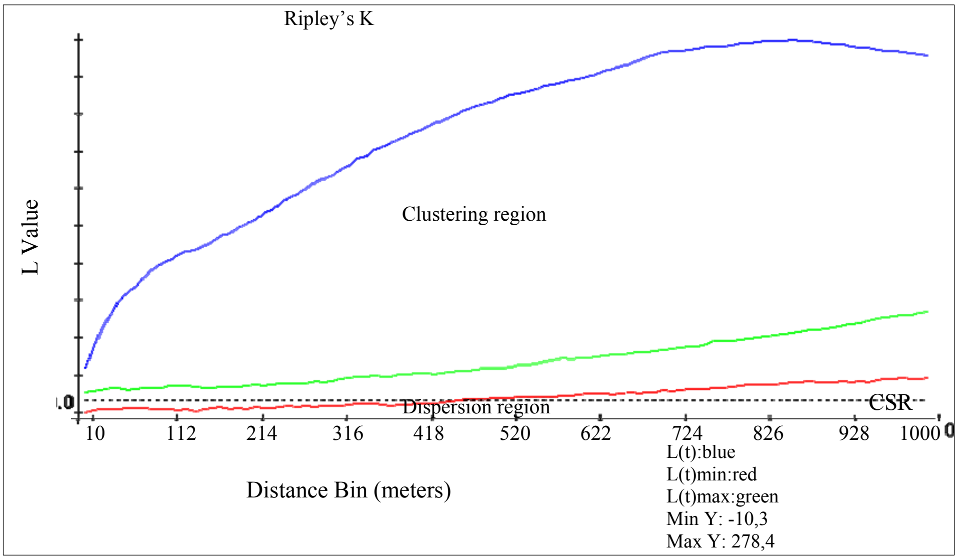

Figure E.10 Plot of L value versus distance bin with rectangular correction
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. Moreover, the analysis is carried out with 1000 simulations.

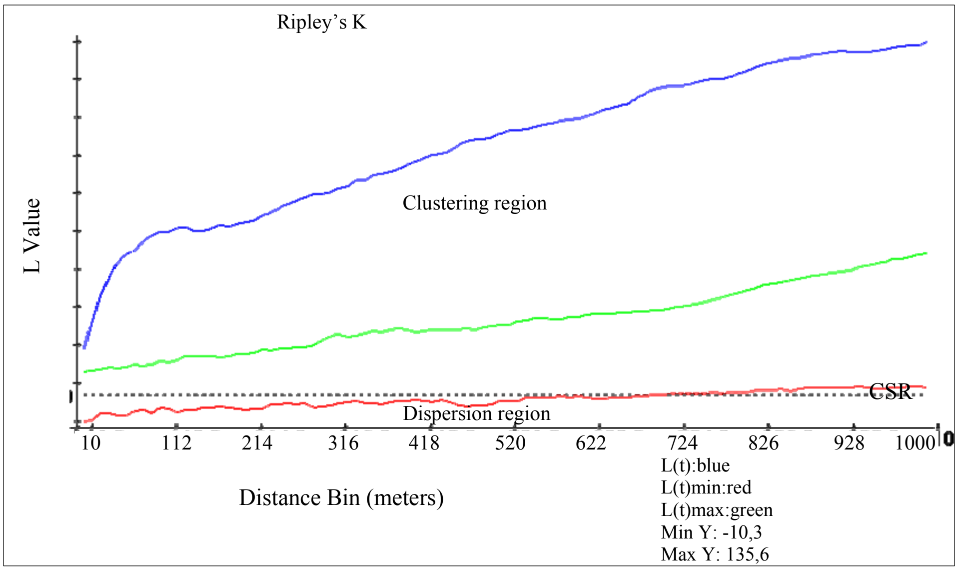

Figure E.11 Plot of L value versus distance bin with circular correction
Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. Moreover, the analysis is carried out with 1000 simulations.

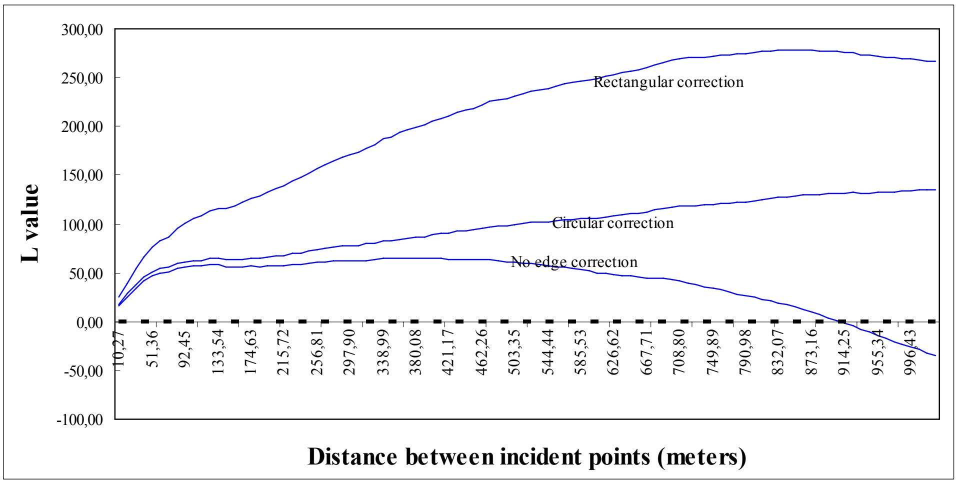

Figure E.12 Plots of L value versus distance bin for the three types of incidents together with no edge correction, and with rectangular and circular corrections

Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. Moreover, the analysis is carried out with 1000 simulations.

separate evaluation to meet[14] the criteria for each 15-order *NNI* distribution. Finally, since the third assumption, sphericity, found to be not met (with Mauchly's W statistic being significant at p<0,0005 level) as one of the results of the ANOVA, the multivariate test results were further evaluated (Pallant, 2001:198).

These results for comparison of the same *NNI* order with respect to the three different incident types revealed significant Wilks' Lambda statistic, which is 0,006 at p<0,0005 with an eta sq value of 0,994 indicating a considerably large effect (Cohen, 1988 in Pallant, 2001:199). That is, a substantial effect is found with a significant difference in the *spatial interaction* in terms of the means of the up to 15th order nearest neighbour indexes of incidents against people, property, and people and property (i.e., $\mu_{NNIiapr} \neq \mu_{NNIiapp} \neq \mu_{NNIiape}$).

The significant difference found by the one-way repeated measures ANOVA among the three types of incidents found to be resulted from the differences among each of the three pairs of incidents after conducting a paired t test analysis for each pair. This analyses were evaluated on the basis of a p value which was set at 0,016 following the Bonferroni adjustment by dividing 0,05 with the number of pairs compared (Stevens, 1986:423), which is 3 (i.e., $\mu_{NNIiapr} < \mu_{NNIiape} < \mu_{NNIiapp}$ with respective means and standard deviations or 0,78; 1,00; 1,18 and 0,048; 0,047; 0,11).

[14] For this purpose, the Skewness statistic, S, was computed for each distribution and whether it is significantly different from zero, which indicates normality, is tested by means of a z statistic, which would show non-normality with values larger than ±2,58 at 0,01 level (Tabachnick and Fidell, 1983:79). The respective S values for incidents against people, property, and people and property; which are -1,052 , -1,474 , -0,136, with a standard error of 0,58, were found to be significantly (p=0,01) indicating normality.

Similar to the analyses for incident types, in order to assess whether the differences in the means of the nearest neighbour indexes up to 15^{th} order for each of the most frequent commitment types are significant, one-way repeated measures ANOVA was conducted. Likewise, the first assumption; independence of measurements, was assumed to be met. Moreover, due to small sample size (n=15), the second requirement, normality were again assessed by a separate *z* statistic to determine if the skewness of each distribution is significantly indicating the required distribution (Tabachnick and Fidell, 1983:79). The results were found to meet this criterion[15]. Also as in the previous findings, the third assumption, sphericity, was found not to be met (with Mauchly's W statistic being significant at $p<0{,}0005$ level) as one of the results of the ANOVA, the multivariate test results were evaluated (Pallant, 2001:198). Accordingly, like previous findings the results for comparison of the same *Nearest Neighbour Index (NNI)* order with respect to the six different commitment types revealed significant Wilks' Lambda statistic, which is 0,008 with $p<0{,}0005$ and with an eta squared value of 0,992 indicating a substantial effect (Cohen, 1988 in Pallant, 2001:199) in differentiating commitment types.

On the other hand, unlike previous paired *t* test comparisons between the incident types which had resulted in differences in all the pairs; the paired *t* test results again based on Bonferroni adjustment at a set *p* level of 0,003 (found by 0,05 divided by the number of pairs compared, which is 15) resulted in similarity of three compared pairs.

In other words, the *K-order Nearest Neighbour Indexes*' means comparison among the pairs of the most frequent commitments resulted in significant differences in between all the pairs at 0,001 level, except for pairs of TFA-RB, TFA-DV, and RB-DV.

In other words, the found pattern suggested a highest level of *local* clustering for CB/T followed by a decreasing level of clustering and increasing level of dispersion with statistically equal *NNI* means for RB, TFA, and DV, which are followed by higher and highest dispersed *NNI* mean distributions of SB and AB ($\mu_{NNI.CB/T} < \mu_{NNI.RB} = \mu_{NNI.TFA} = \mu_{NNI.DV} < \mu_{NNI.SB} < \mu_{NNI.AB}$). The respective means and standard deviations are given in Table E.5.

Table E.5 Means and standard deviations of 15-order nearest neighbour indexes for the most frequent six commitments belonging to set of geocoding for 500 points

Commitment Type	Mean	Standard Deviation
CB/T	0,74	0,13
RB	0,97	0,10
TFA	0,98	0,09
DV	1,02	0,03
SB	1,07	0,07
AB	1,16	0,06

[15] The respective S (skewness) values for CB/T, TFA, RB, AB, SB and DV are 0,176 , -1,450 , -0,882 , -0,466 , -0,118 and -0,760 and their standard errors are 0,58.

7. Knox and Mantel Indexes

Similar to development of statistics concerning the *spatial interaction in point distributions* mainly in the field of Botanics (Clark and Evans, 1954 in Levine and Associates, 2004:5.1) but their use also in many other fields of research (Cressie, 1991 in Levine and Associates, 2004:5.1) including crime pattern analysis, the main research area on *space-time interactions in point distributions*

> has been developed mostly in the field of epidemiology (Knox, 1963, 1988; Mantel, 1967; Mantel and Bailar, 1970; Besag and Newell, 1991)…. However, most of these techniques are applicable to crime analysis…as well. (Levine and Associates, 2004:9.1)

One of the earliest studies on *space-time interaction* was performed by Knox (Knox, 1963 and Knox, 1984 in Diggle et al, 1995:124) who developed *Knox Index*, which as Levine and Associates (2004:9.4-9.5) explain

> is a simple comparison of the relationship between incidents in terms of distance (space) and time (Knox, 1963; 1964). That is, each individual pair is compared in terms of distance and in terms of time interval. ….The distance between points is divided into two groups - Close in distance and Not close in distance, and the time interval between points is also divided into two groups - Close in time and Not close in time. ….A simple 2x2 table is produced that compares closeness in distance with closeness in time. ….The actual number of pairs that falls into each of the four cells are then compared to the expected number if there was no relationship between closeness in distance and closeness in time. ….with a Chi-square statistic

The problem of interdependency between observations, which cause the usual significance tests to be inappropriate for assessing the observed chi-square, can be handled by performing "Monte Carlo simulation of the chi-square value for the *Knox Index* under spatial randomness (Dwass, 1957; Barnard, 1963)" (Levine and Associates, 2004:9.5).

The main drawback of this index is the user specification of the thresholds for closeness of distance and time, which results in multiple performing of the test using different intervals for space (distance) and time (Gatrell et al, 1996:266; Bailey and Gatrell, 1996:123). As an extension to *Knox Index, Mantel Index,* which was developed by Mantel (Bailey and Gatrell, 1996:123), resolves some of its problems (Levine and Associates, 2004:9.8). It utilizes continuous or numerical values instead of categorical ones in spatial and temporal separation (Gatrell et al, 1996:266; Bailey and Gatrell, 1996:123).

> [I]t is a correlation between distance and time interval for pairs of incidents (Mantel, 1967)…..based on a simple cross-product of two interval variables (e.g., distance and time interval):
>
> $$T = \sum_{i=1}^{N}\sum_{j=1}^{N}(X_{ij} - MeanX) * (Y_{ij} - MeanY) \qquad (9.2)$$
>
> where X_{ij} is a n index of similarity between two observations, i and j, for one variable (e.g., distance) while Y_{ij} is an index of similarity between the same two observations, i and j, for another variable (e.g., time interval).
>
> The cross-product is then normalized by dividing each deviation by its standard deviation:
>
> $$r = \frac{1}{N-1}\sum_{i=1}^{N}\sum_{j=1}^{N}(X_{ij} - MeanX)/S_x * (Y_{ij} - MeanY)/S_y \qquad (9.3a)$$

$$= \sum_{i=1}^{N}\sum_{j=1}^{N} Z_x * Z_y /(-1) \qquad (9.3b)$$

where X_{ij} and Y_{ij} are the original variables for comparing two observations, i and j, and Z_x and Z_y are the normalized variables. (Levine and Associates, 2004:9.8-9.9).

8. Spatial and Temporal Analysis of Crime (STAC) Routine

STAC Routine (in *CrimeStat*), which was first developed by the Illinois Criminal Justice Information Authority in 1989,

> searches for and identifies the densest clusters of incidents based on the scatter of points on the map. The STAC Hot Spot Area routine creates areal units from point data. It identifies the major concentrations of points for a given distribution. It then represents each dense area by either a standard deviational ellipse or a convex hull, or both….STAC is not constrained by artificial or political boundaries, such as police beats or census tracts. ….In contrast, STAC Hot Spot Areas are based on the actual clusters of events or places on the map. (Levine and Associates, 2004:7.1,7.3)

In the study the trials with the STAC Routine were carried out for different search radius and minimum number of points per cluster for 500 incident points (Figure E.13). Being on or in the very near surroundings of the previously defined 6 clustering areas, this analysis only give an additional clustering area in about mid distance between the ones numbered "2" and "6". However, having almost no peculiarity and no distinguishing environmental characteristics (land use, etc.) for this clustering area as compared to the main hotspots observed in *R* ("1" to "6"), it is not separately elaborated in the study.

9. Bivariate Statistics

Measures of Centrality

> Mean Centre….is the mean of the X and Y coordinates….and….formula for the mean center is:
>
> $$\overline{X} = \sum_{i=1}^{N} \frac{X_i}{N} \qquad \overline{Y} = \sum_{i=1}^{N} \frac{Y_i}{N} \cdots$$
>
> where X_i and Y_i are the coordinates of individual locations and N is the total number of points. .... The median center is the intersection between the median of the X coordinate and the median of the Y coordinate. (Levine and Associates, 2002:109,112,114).

Measures of Dispersion

Standard deviation of X and Y coordinates calculated by the following formulas and provides with in fact two separate statistics and not a single one, dispersion in X and dispersion in Y, and it is measured in the coordinate system units.

$$S_X = SQRT\left[\sum_{i=1}^{N} \frac{(X_i - \overline{X})^2}{N-1}\right] \text{ and } S_Y = SQRT\left[\sum_{i=1}^{N} \frac{(Y_i - \overline{Y})^2}{N-1}\right]$$

Standard distance deviation overcomes the problems of Standard deviation of X and Y coordinates and it is a measure of standard deviation of the distance of each point from the mean centre and its unit is the units by which the measurement is made. It is a two dimensional equivalent of a standard deviation and calculated by the formula:

$$S_{XY} = SQRT\left[\sum_{i=1}^{N} \left\{\frac{(d_{iMC})^2}{N-2}\right\}\right]$$ (Levine and Associates, 2002:123).

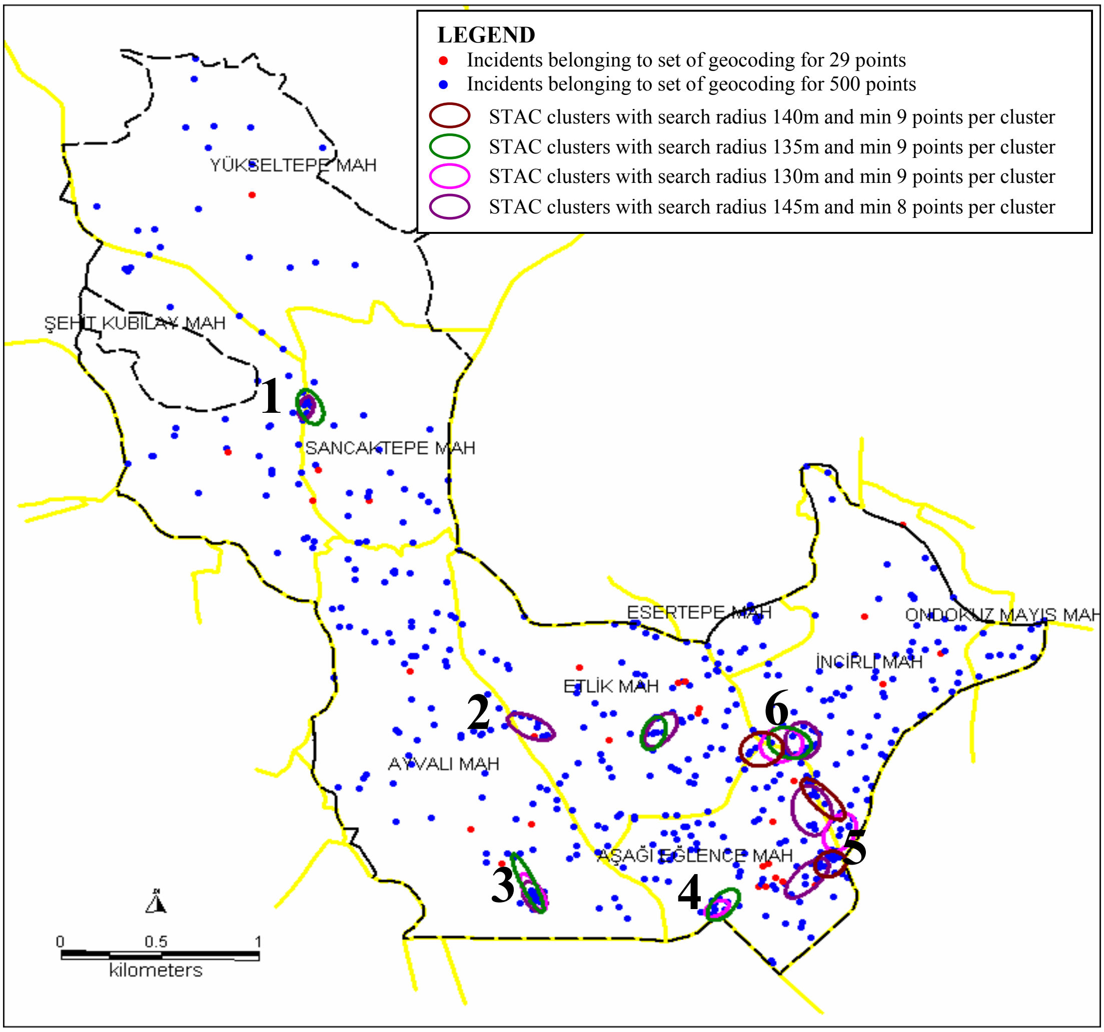

Figure E.13 Results of different parameter STAC routines

Note: The incidents belonging to set of geocoding for 500 points is used in this analysis. Moreover, the analysis is carried out with 100 simulations.

Standard deviational ellipses: A statistics is devised to give dispersion in two dimensions since in two dimensions distributions are frequently skewed in one direction or another (Ebdon, 1988 and Cromley, 1992 in Levine and Associates, 2002:125). It is derived from the bivariate distribution (Furfey, 1927; Neft, 1962; Bachhi, 1957 in Levine and Associates, 2002:125) and is defined as:

Bivarite distribution $= SQRT \frac{[\sigma_x^2 + \sigma_y^2]}{2}$ The two standard deviations (in X and Y directions) are orthogonal to each other and define an ellipse. Ebdon (1988 in Levine and Associates, 2002:125) rotates these axes so that the sum of squares of distances between points and axes are minimized.

Formulas for these statistics are:

1. The y axis is rotated clockwise through an angle θ, where

$$\theta = ARCTAN\left\{\left(\sum\left(X_i - \overline{X}\right)^2 - \sum\left(Y_i - \overline{Y}\right)^2\right) + \left[\left(\sum\left(X_i - \overline{X}\right)^2 - \sum\left(Y_i - \overline{Y}\right)^2\right)^2 + 4\left(\sum\left(X_i - \overline{X}\right)\left(Y_i - \overline{Y}\right)\right)^2\right]^{1/2}\right\} / \left(2\sum\left(X_i - \overline{X}\right)\left(Y_i - \overline{Y}\right)\right)$$

where all summations are for i=1 to N (Ebdon,1988 in Levine and Associates, 2002:125)

2. Two standard deviations are calculated, one along the transposed X-axis and one along the transposed Y-axis.

$$S_x = SQRT(2)\left\{\sum_{i=1}^{N}\left[\left(X_i - \overline{X}\right)Cos\theta - \left(Y_i - \overline{Y}\right)Sin\theta\right]^2 / (N-2)\right\}^{1/2}$$

$$S_y = SQRT(2)\left\{\sum_{i=1}^{N}\left[\left(X_i - \overline{X}\right)Sin\theta - \left(Y_i - \overline{Y}\right)Cos\theta\right]^2 / (N-2)\right\}^{1/2}$$

where N is the number of points.

3. The x axis and Y axis of the ellipse are defiend by $Length_x = 2S_x$ and $Length_y = 2S_y$ (Levine and Associates, 2002:125,127).

APPENDIX F

SOCIAL, PHYSICAL STRUCTURES, AND DIFFERENT DESCRIPTIVE MEASURES OF INCIDENTS IN THE NEIGHBOURHOODS

Table F.1 Summary of social and physical structures and of different descriptive measures of incidents in the neighbourhoods

	Neighbourhoods	**Area of urban settlement covered in *R* (ha)**	**Development Pattern (2000)**	**Area of Physical characteristics in 2000**	**Population (2000)**	**Density (Pop./Urban Settlement Area)**	**Development Level * (2000)**	**Household Size ** (2000)**	**Water-Discharge Users (2000)**	**Number of Schools**	**Number of Mosques**	**Incident Frequency (2000)**	**Incident Rate: Freq. per 10000 pop. (2000)**	**Incident Type**	**Frequency (2000)**	**Rate: Freq. per 10000 pop. (2000)**	**LQC**
Mostly *squatter* (~3/4) and partially *in transition* (~1/4)	Yükseltepe	164,51	Squat. In-tra.	162,07 2,44	12218	74,27	0,01	5.61	2176	1	8	18	14,73	Peop: Prop: Pe&Pr:	16 0 2	13,10 0,00 1,64	1,60 0,00 1,43
	Şehit Kubilay	119,94	Squat. In-tra.	77,59 42,35	13847 (1)	115,45	0,01	5.86	2362	2	5	37	26,72	Peop: Prop: Pe&Pr:	30 5 2	21,67 3,61 1,44	1,46 0,37 0,70
	Sancaktepe	91,54	Squat. In-tra.	57,95 33,59	8613	94,09	0,02	5.84	1475	2	5	29	33,67	Peop: Prop: Pe&Pr:	16 10 3	18,58 11,61 3,48	1,00 0,94 1,33
Mostly *planned* (~3/4) and partially *in transition* (~1/4)	Ayvalı	210,08	Plann. In-tra.	148,76 61,32	32209 (2)	153,32	0,56	4.57	7047	6	8	102	31,67	Peop: Prop: Pe&Pr:	39 55 8	12,11 17,08 2,48	0,69 1,46 1,01
	Etlik	130,36	Plann. In-tra.	104,67 25,69	37039	284,13	0,89	3.89	9512	4	3	97	26,19	Peop: Prop: Pe&Pr:	64 27 6	17,28 7,29 1,62	1,19 0,76 0,80
	Aşağı Eğlence	85,58	Plann.	85,58	30201	352,90	0,98	3.56	8487	4	3	120	39,73	Peop: Prop: Pe&Pr:	56 53 11	18,54 17,55 3,64	0,84 1,20 1,18
	İncirli	123,40	Plann. In-tra.	61,40 62,00	27603 (2)	223,69	0,57	4.26	6476	10	3	101	36,59	Peop: Prop: Pe&Pr:	61 33 7	22,10 11,96 2,54	1,09 0,89 0,89
	Esertepe	14,67	Plann. In-tra.	9,10 5,57	17919 4200 (3)	286,30	0,61 (a)	4.82	3712 871(i)	1	4	14	33,33	Peop: Prop: Pe&Pr:	6 6 2	14,29 14,29 4,76	0,77 1,16 1,84
	19 Mayıs	9,63	Plann.	9,63	27403 3750 (3)	389,41	0,82 (b)	4.48	6119 837(ii)	1	3	11	29,33	Peop: Prop: Pe&Pr:	5 6 0	13,33 16,00 0,00	0,82 1,48 0,00
	TOTAL or MEAN	949,71	Squat. Plann. In-tra.	297,61 419,14 232,96	169 680	178,67	0,31	4.32	39243	31	42	529	31,18	Peop: Prop: Pe&Pr:	293 195 41	17,27 11,49 2,42	- - -

(Notes to this table is given in the next page)

Table F.1 (cont'd) (Notes to the Table F.1)

* This variable is found by subtracting the "Rate of Stove Use" from "1", which is used as a proxy variable to show the lack of comfort brought by development level

** This variable is found by dividing the "total population" to "number of water-sewage users"

(1) Since all the population of this neighbourhood live in *R*, the total population is taken as it is even though some part of this neighbourhood characterized by undeveloped areas remains outside of *R*.

(2) Since very small portions of these neighbourhooods lie outside of the *R*, total population is assumed to be all included in the *R*.

(3) These values are found by multiplying the total water-discharge user by household size.

(a) The "Rate of Stove Use" is found by division of squatters by the total buildings counted for calculation water-discharge user in Esertepe.

(b) Since the physical characteristics of this neighbourhood is similar to the portion remained in *R*, the neighbourhood's "Rate of Stove Use" is assumed to be the same for the portion remaining in *R*.

(i) This number is calculated as follows:
The buildings stay in the *R*, counted as 4 storey 44 apartment housing and they assumed to have 2 water-discharge users in each storey making 352 users
" , counted as 11 storey 11 apartment housing and they assumed to have 4 water-discharge users in each storey making 484 users,
totally 836 apartment water-discharge users
, counted as 1 storey squatter and they assumed to have 1 water-discharge users in each making totally 35 squatters water-discharge users
total users 871"

(ii) This number is calculated as follows:
The buildings in *R*, counted as 3 storey 7 apartment housing and they assumed to have 1 water-discharge users in each storey making 21 users
" , counted as 4 storey 102 apartment housing and they assumed to have 2 water-discharge users in each storey making 816 users,
total users 837"

APPENDIX G

FEATURES OF THE CLUSTERING AREAS (HOTSPOTS) IN THE STUDY AREA

1st Clustering area (Hotspot): Square of terminal stop of minibuses

Contains a large traffic island, *squatter* housing and mixed land use including mostly apartment housing units with central city functions of commercial and service uses, and it is a place where *Ulus-Ayvalı* minibuses terminate and start their way back to one central business district (CBD) of the Metropolitan Area. Hence, this intersection point is the meeting and distribution point for people whom transport to/from one of the main centres of the Metropolitan Area, namely *Ulus*. This square remains in the area of *in-transition* settlement, which started during the 1990s and is about to finish with a high pace, and where most of the apartment buildings are older than 5-6 years. Further, this place is located only about 200 meters away from the intersection point of the three north half neighbourhoods' boundaries and at the crossroads of the three main roads forming the boundaries and main arteries of these neighbourhoods like *Selim Road, Özlem Road, Mehtap Road*, and *Sarıkamış Street*.

2nd Clustering area (Hotspot): Süleymaniye Kültür Merkezi (*Süleymaniye Culture Centre*) and near surroundings

Located on the mid east and mid west borders of *Ayvalı* and *Etlik* neighbourhoods, respectively. This area is also distinguished by the characteristics of being on the boundary of a *planned* and *in-transition* area. Nevertheless, all the clustering incidents appear to be distributed in the *planned* section. A cultural centre building called *Süleymaniye Kültür Merkezi* is found in the centre surrounded by mostly residential uses. In this big complex building, there are commercial, service sector, cultural, and religious facilities. In the east and west of the clustering there are two parks, where three incidents occurred which compose about 20% of the incidents in this clustering (16), and in the south there are one primary and one high school.

3rd Clustering area (Hotspot): Metro Gros Market and its parking area

Located in a *planned* area and in the southernmost part of *Ayvalı* neighbourhood and of the study area. The difference of this *planned* section from the previous one is that it consists of almost no residential uses in the south of 6th Road and west of *Hacı Mustafa Tarman İlköğretim Okulu* (a primary school). Almost all the incidents at this place are clustered within, nearby, and in parking of *Metro Gros Market*, which is the only one-roof wholesale commercial centre for all kinds of goods in Ankara serving at regional scale.

4th Clustering area (Hotspot): Kasalar Kavşağı (*Kasalar Junction*) and near surroundings

Corresponds to one of the two big road junctions called "*Kasalar Kavşağı*", which is located in the southern entry of Etlik Police Station Zone (EPSZ) in *Aşağı Eğlence* neighbourhood surrounded by mainly residential land uses in the north west and east. This junction connects *Yeni Etlik Road, Giresun Road*, and *Halil Sezai Erkut Road*, which form the boundary between Yenimahalle and Keçiören Districts. In the south east and north east directions of this intersection point there lie two parks, *Fatih Sultan Mehmet* and *Kanuni*, respectively. *Fatih Sultan Mehmet* is a linear park where a small open café exists on its *Kasalar Kavşağı* end, and this park also lies in an area which connects cluster "4" to another major one, which is shown by "5". Within and near surroundings of this park totally nine incidents occurred, four of which were geocoded within the set of 29 incidents. Totally, these nine incidents form 20% of the clusterings of incidents (4th and 5th) within a distance of one plot in all directions (44).

5th Clustering area (Hotspot): Aşağı Eğlence Kavşağı (*A. Eğlence Junction*)

Is the second big road junction located on the other southern entry of EPSZ in *Aşağı Eğlence* neighbourhood. This junction is located in a mixed land use area and connects the main roads of *Gen. Dr. Tevfik Sağlam Road, Giresun Road* and *Yunus Emre Road*, and is called "*Aşağı Eğlence Kavşağı*". Most of the incidents in this area are clustered within and nearby *Etlik Ticaret Merkezi* (*Etlik Commercial Centre*), which is one of the three commercial and business centres found in the study area. In this centre, there are shops and offices for almost all kinds of retail goods and services. There are two high-rise housing blocks and their parkings constructed above this centre.

6th Clustering area (Hotspot): Near surroundings of the junction of Gen. Dr. Tevfik Sağlam Road and Atadan Road including Etlik Police Station

Located within an area about 200m radius centred around 150m east of EPS and including a main junction of *Gen. Dr.Tevfik Sağlam Road* and *Atadan Road*. This area is also located in the *planned* section, and is characterized by mixed land uses of commerce, service and housing. Together with the previous two clustering areas this locality compose the most crowded, vivid and colourful section of the study area, *R,* and with its central city or central business district characteristics, this area functions as a sub centre in the south west of Keçiören District when a wider metropolitan region is considered.

APPENDIX H

LIMITATIONS AND RESOLUTIONS FOR THE DATE-TIME VARIABLES

In the study, there were certain limitations of the time-date variables of the incident data set, for which certain resolutions were found. The geocoding process in *R* for the three types of incidents (which cover totally 529 incidents) had resulted in placement of 500 incidents to their almost exact places within less than hundred meters range correctness, and placement of 29 incidents to their street/road/linear park addresses, mid points of which were assumed to be the incident places (less than hundred m accuracy geocoding ratio: 94,52 %, refined mid point geocoding ratio: 5,48 %).

As for the *temporal* and *spatio-temporal* analyses are concerned, 100 data, out of 500 (incidents belonging to set of geocoding for 500 points) do not have discrete date and/or time information. They are known by date or time interval, or by date and time interval. The distribution of these data with respect to incident types reveals that 96 % of these composed of incidents against property and specifically committed in the form of all kinds of burglary, theft and/or robbery (Table H.1) and as a "single-event incident"[16]. Time-date information concerning these 100 incidents, which are known by date or time interval, or by date and time interval, is given in Table H.2.

Only 17 % of these data create problem when a temporal analysis is performed on discrete dates (4^{th}, 5^{th} and 6^{th} categories). Even though 100 % of these data suffer from time information inefficiencies in analyses on discrete timing during a day, this loss of data could be reduced to 20% (to categories of 4^{th}, 6^{th} and 7^{th}) by utilizing time intervals within a day.

Therefore, for the 1^{st}, 2^{nd}, 3^{rd} and 5^{th} categories, these problems were resolved by using 3 different time intervals which split 24 hours of a day into meaningful parts as interviewed with police officers (Dağ, 2005; Şahin, 2005) and as utilized by Henry and Bryan (2000:9-11). These time intervals are; 08:00-18:00 (interval between first hours of daily routines and end of these routines), 18:00-00:00 (interval between end of daily routines and first hours of people are

Table H.1 Distribution of three types of incidents with respect to their geocoding accuracy and lack of time-date info

Against	**# of incidents belonging to set of geocoding for 29 points**	**# of incidents belonging to set of geocoding for 500 points**	**# of incidents without a discrete date and/or time info from 500 point set**
People	17	276	2
Property	8	187	96
People and property	4	37	2
Total	**29**	**500**	**100**

[16] Only one incident found to be multiple-event having a secondary event of buying of a theft good.

Table H.2 Distribution of 100 incidents known by date or time interval, or by date and time interval

Category	**Date**	**Discrete Date**	**Time**	**Time interval Either 00≤…<08 or 08≤…<18 or 18≤…<00**	**# of incidents**
1	Known date	√	Known time interval within a day	√	41
2	Known date	√	Known time interval connecting two successive days (1)	√	27
3	Known date	√	Uncertain time interval but known as between the first hours of people are asleep in the night and first hours of daily life (2)	√	7
4	Unknown date (3)	X	Unknown time or time interval	X	7
5	Unknown date (3)	X	Known time interval within a day	√	5
6	Known date interval	X	Known time interval for a minimum of three days	X	5
7	Known date	√	Unknown time or time interval	X	8
Total					**100**

(1) All these cases have a category of 00-08 on the second day, because this period covers the only largest common portion of all the time intervals in which the incidents occurred.
(2) Since these incidents time information is entered as "at an uncertain time in the night" all these cases assumed to fall into an interval of 00:00 and 08:00
(3) During data entry it is estimated from the date of registry known as "about......days/months ago"

asleep during the night), and 00:00-08:00 (interval between first hours of people are asleep during the night and first hours of daily routines).

Without such utilization of time intervals, about half of the incidents against property would have not been represented in the whole data set of three types of incidents, which would have resulted in biased time related analyses.

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EDUCATION

Degree	Institution	Year of Graduation
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MS	METU-Geodetic and Geographic Information Technologies	2000
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WORK EXPERIENCE

Year	Place	Enrollment
2001-Present	Environmental Protection Agency for Special Areas	Urban Planner-GIS Expert
1998-2001	METU-Geod. and Geog. Information Technologies	Research Assistant
1996-August	Dampo Danışmanlık Araş. Mim. Planlama	Intern Planning Student
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FOREIGN LANGUAGES

Advanced English, Beginner German

PUBLICATIONS

1. Erdoğan, A. and Bihi, İ. (1998). *Alternative and Progressive Examples of Environmental and Ecology Friendly Settlements and of Sustainable Development* in Selçuk in the year 2000s: METU 2nd Year Student Projects of 1994-95 academic yaer of the Department of City and Regional Planning, ed. Selçuk Belediyesi, İzmir:Arkadaş Matbaacılık Ltd. Şti.

2. Erdoğan, A., (1999). *Preparation of Urban Information Systems: Implementation on Fethiye-Kayaçukuru* (Published in Turkish) in Proceedings of 'Implementations of Urban Information Systems in Local Authorities' organized by Karadeniz Technical University, Dept. of Geod. and Phot. Eng., ed. T. Yomralıoğlu, Trabzon: KTÜ Matbaası.

3. Yenice Z.F., Keskin L., Erdoğan A. (2001). *An Evaluation on Environment and Planning Policies and Practices of European Union and Turkey in the Context of Sustainability* (Published in Turkish) in Proceedings of 'Accession Partnership of Turkey to EU and Urban Planning' organized by Chamber of City Planners, Ankara: Özkan Mat. Ltd. Şti.

4. Erdoğan, A. and Düzgün, H.Ş. (2003) *Statistical Approaches in GIS-Based Techniques for Sustainable Planning: Kayaçukuru Case* in Proceedings of '43rd Congress of the European Regional Science Association', Finland.

5. Erdoğan, A., (2003). *The Use of Geographic Information Systems in Sustainable Planning: Kayaçukuru Case* (Published in Turkish) in Proceedings of 'Selçuk University 30th Anniversary of the Education in Geodetic and Photogrammetric Enginering' organized by Selçuk University, Dept. of Geodetic and Photogrammetric Eng., Konya.

6. Erdoğan, A. and Düzgün H.Ş. (2003) *Space and Crime: Crime Mapping and Other Analytical Approaches* (Published in Turkish), Polis Dergisi, Yıl:9, Sayı:36:482-490.

7. Düzgün, H.Ş. and Erdoğan, A. (2003) *A Methodology for Mapping and Spatial Analysis of Auto Theft and Theft From Auto Incidents in the City of Konya*, Forensic Science International, Vol.136, Suppl.1: 15-16.

8. Erdoğan and Düzgün, H.Ş.B. (2004) *An Integrated Approach for Mapping and Spatial Analysis of Auto Theft and Theft From Auto Criminal Incidents,* in Proceedings of 'The Seventh Annual International Crime Mapping Research Conference', Boston-USA.

9. Düzgün, H.Ş. ve Erdoğan, A, (2004) *Database and Software Design for the Use of Event Notebooks Data in Crime Mapping* (Published in Turkish), Polis Dergisi, Yıl:10 Sayı 42:139-146.

THESES

"Environment Friendly/Sustainable Development Planning of Fethiye-Kayaçukuru Using GIS-based Techniques" for M.S. in Geodetic and Geographic Information Technologies. (2000).

HOBBIES

Driving, playing 'bağlama', traveling, trekking, sports, cinema-theatre, reading