CHAPTER 1
INTRODUCTION

Criminal behaviour occurs in space, and the geographical context in which this behaviour occurs often plays an important role in shaping that behaviour and the space in which it occurs; while space on its own explains little, the spatial patterning of behaviour is key to understanding and explaining much of human behaviour (Goodchild and Janelle, 2004). Indeed, it is through the mapping and visualisation of criminal behaviour that one can truly begin to examine causality and inform criminological theory and prevention efforts. Over the past decade Geographical Information Systems (GIS) have become the key tool in the spatial analysis and visualisation of crime. The availability of detailed socio-economic and demographic datasets combined with crime information and computerised information technologies, such as GIS, permit a large number of quantitative techniques to be used (and developed) to assess potential cause and effect relationships, particularly in the ecological analysis of crime (Ackerman and Murray, 2004). Ecological studies of crime are studies in which the units of analysis are spatially defined population aggregates (Anselin et al., 2000). In social geography, the term ecological has two meanings; on the one hand it refers to the analysis of data relating to aggregates rather than individuals and second, following the tradition of the Chicago school of urban sociology, it refers to the investigation of the relationship between people and the urban environment (Evans, 1980). The ecological school stresses the correlation between environment and crime (Eloff, 2006). Subsequently the causes of crime are to be found in the way space, or the geographical areas in which people live and interact, socially create conditions that favour criminal or non-criminal behaviour.
The ecological approach has among its historical antecedents the work of Shaw and McKay (1942) who developed an ‘ecological’ perspective of crime and deviance after mapping thousands of incidents of juvenile delinquency\(^1\) in the city of Chicago. The researchers based their social disorganisation theory on the notion that atrocious physical and social conditions endured by the poor, and which were a consequence of the process of urban growth, pushed residents into a life of crime (Allen, 2007). Over the past century criminologists have employed several other theoretical frameworks to acquire insight into delinquency. Whilst a comprehensive exposition of these theories can be found elsewhere (see Brown et al., 1996; Bartollas, 1997), a number of the larger schools of thought are noted here.

The first is the sociological theories of crime causation which trace crime phenomena to social arrangements existing outside the individual (Schurink and Schwabe, 2000). The large number of theories that fall within this broad framework can be classified into the structural perspective, the cultural and subcultural approaches and radical or conflict theories. In all instances, the nature of the social environment is used to explain the cause of delinquency, although the various theories focus on somewhat different aspects of the social environment and their causal influence on human behaviour.

A second theoretical position is that delinquents cannot help committing their socially unacceptable behaviour. They are controlled by either biological or psychological factors that cause them to become involved in delinquent behaviour (Bartollas, 1997). Such inherent factors exist internal to the individual with the individual subsequently having little or no control over their behaviour. More recent developments in
criminological theory have attempted to integrate the plethora of existing theoretical frameworks in order to better explain the causes of delinquency. This development has been driven partly through the increased sophistication of statistical methods which has enabled researchers to look simultaneously at the effect of a number of variables upon behaviour (Brown et al., 1996). The increased advancements in GIS and statistical techniques has also allowed the ecological approach to ‘reawaken’ much criminological theory as a result of its unique methodology which includes the usage of population or demographic data from official sources to account for varying spatial patterns of crime and delinquency.

Despite the plethora of ecological studies on delinquency however there are still considerable differences of opinion and no theoretical consensus within ecological research specifically regarding the association between community characteristics and crime (Schulenberg, 2003). From a local perspective, South Africa has contributed very little theoretically and/or empirically to the ecological tradition in criminology. In fact, with the exception of a handful of studies indicated in Table 1, the ecological determinants of crime locations in post-apartheid South Africa are largely unknown.

According to the literature presented in Table 1 a number of ecological factors characterise high crime areas in South Africa including high unemployment, a high rate of urbanisation, low income per capita, and low levels of education. All of these variables provide valuable insights into the processes influencing criminal activity with a number of variables being common ecological determinants of crime locations in international ecological studies.
Table 1: Ecological studies of crime locations in post-apartheid South Africa

<table>
<thead>
<tr>
<th>Source</th>
<th>Spatial level</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJCP (2007)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>- Province - Police station boundary - Municipal</td>
<td>Correlate measures of inequality and deprivation from the CJCP Youth Study and 2003 NVS&lt;sup&gt;e&lt;/sup&gt; with 2007 crime statistics</td>
</tr>
</tbody>
</table>

<sup>a</sup> October Household Survey  
<sup>b</sup> Income and Expenditure Survey  
<sup>c</sup> Labour Force Survey  
<sup>d</sup> Centre for Justice and Crime Prevention (www.cjcp.org.za)  
<sup>e</sup> National Victimisation Study

In contrast to the ecological studies of crime locations shown in Table 1, no specific local literature could be found identifying the ecological determinants of delinquency in post-apartheid South Africa. A limited number of apartheid-era ecological studies were conducted however and include Lötter (1964) and Schurink (1978). Both researchers found that individual elements of social class (ie. educational level, occupation and income) correlated negatively with levels of delinquency in the former
Pretoria municipal area of apartheid South Africa. Schurink (1978) did however have to ‘delineate’ his own level of aggregation and only suburbs\(^2\) inhabited by whites\(^3\) were considered in his analyses. While subsequent micro-level research highlight specific individual risk factors for delinquency such as age (Strijdom and van der Colff, 1975; Maree, 2003), gender (Strijdom and van der Colff, 1975; Glanz, 1990), employment status (Meletse, 1994), socio-economic status (Maree, 2003) and family status (Brown, 1984; Glanz, 1990; Schurink, 1994), few studies investigating the association between ecological variables and delinquency have occurred in the country; none in post-apartheid South Africa and none utilising GIS.

IN NEED OF AN URBAN ECOLOGICAL THEORY OF CRIME IN SOUTH AFRICA

In reference to the incidence and nature of crime at present Altbeker (2007, p.38) refers to post-apartheid South Africa as “a country at war with itself”. Comparisons of pre- and post-apartheid crime statistics (incomplete and unreliable as they may be) suggest no significant decline in current crime levels from the highs experienced during the interregnum of 1990-1994. Currently, crime levels remain alarmingly high despite the adoption of a number of crime reduction initiatives since democratisation including the National Crime Prevention Strategy (NCPS) of 1996, and the National Crime Combating Strategy (NCCS) launched in 2000. For all the ambition of their authors all policies have failed to reduce levels of violent crime in the country, and served to alienate the ruling African National Congress (ANC) from its constituency. One of the main reasons often sighted for the failure to bring crime under control in South Africa, particularly in its urban environments, is the lack of theory to guide
appropriate strategies for crime combating and prevention (Dixon, 2001). Internationally (mostly North American and Western European) a number of theoretical contributions have been made to assist in the prescribing of policies that work to reduce crime (see Shaw and McKay, 1942; Akers, 1973; Cohen and Felson, 1979; Sampson and Wilson, 1995). While such ‘Western’ theories are potentially limited in their generalisability to other political, social and cultural settings, they do provide an empirical base from which to understand local crime, its causation and to inform local crime reduction initiatives.

In South Africa, ecological studies of crime and delinquency are sorely lacking. As a result local researchers are continuously confined to the social conditions - and ecological interpretations - pertinent to ‘Western’, in particular North American, theoretical frameworks when conducting local crime analyses and interpreting criminological findings. Local researchers currently bemoan the lack of any theoretical context for understanding crime and delinquency in South Africa and demand a more thorough understanding of the factors that facilitate criminal behaviour (see Dixon, 2001, Shaw, 2002; Louw, 2004; Altbeker, 2007). A cursory review of local literature reveals that while ‘Western’ theories of crime have often been used to interpret and explain research findings in the country (see Schurink, 1978; Gilfillan, 1999; Schwabe and Schurink, 2000; Davis, 2001; Weir-Smith, 2004), few contemporary crime theories have been practically implemented and assessed. Moreover, Willis et al. (1999, p.232) contends that while South Africa has traditionally had a “Western influence” in its criminology, the country has not yet made any significant progress in developing an indigenous perspective on crime.
The socio-political history of South Africa makes the country unique in ecological analyses of crime and delinquency. The primary reason for this being the fragmentation of space; the segregation of state-defined population groups into certain spaces; and the surveillance and control of those spaces by the former apartheid regime (Mabin, 2005). The urban spatial organisation under apartheid resulted in former ‘whites-only’ urban spaces being favoured in terms of the distribution of social and economic resources. Former ‘non-white’ spaces on the other hand became increasingly marginalised with residents being socially and economically disempowered. Fourteen years into democracy and the South African city is changing. Racial desegregation has resulted in almost every suburb in urban South Africa experiencing rapid change or anticipating it (Mabin, 2005). As a result the South African city is fast losing its original modernist-apartheid features whilst becoming globally and regionally connected and displaying more and more social diversity reminiscent of the post-modern, post-industrial city. The changing social geographies of urban South Africa provide a unique ecological platform to theorise about possibly the greatest threat facing this fledgling democracy, crime.

AIM

The primary aim of the thesis is to contribute towards an urban ecological theory of crime in South Africa through a geo-analysis of offenders using GIS.

A greater exploration into the causes of delinquency can be used to not only inform policy makers and practitioners engaged in the criminal justice sector but can also be used to design appropriate interventions aimed at targeting the ‘ecological’ root
causes of the problem. While both the location of crime and the location of offenders are important considerations in any crime theory or hypothesis, the dearth of ecological research focusing specifically on delinquency in post-apartheid South Africa makes addressing this shortcoming in criminological research more urgent.

From a geoinformatics perspective, there is a constant need in South Africa to develop and integrate quantitative geo-analytic techniques for synthesising and understanding crime activity as well as to correlate the output of geoinformatic analyses with the needs of police. This thesis will make a contribution in this regard by using GIS to interpret the ecological relationship between delinquency and urban location in post-apartheid South Africa. In addition, leading to the improved expansion of GIS procedures to be utilised in the fight against crime.

STUDY AREA

As a geographical focus area, the region under consideration is the City of Tshwane Metropolitan Municipality (CTMM) (Figure 1) located in the Gauteng province of South Africa. The CTMM or ‘city of Tshwane’ (pop. 2 million; 3 200 square kilometres) provides an exemplary opportunity to explore the dynamics between offenders and ecological factors. The region represents one of the six major metropolitan areas in South Africa and was established on 5 December 2000 with the amalgamation of various local governments, and encompasses, among others, the following areas: Soshanguve, Centurion, Temba, Hammanskraal, Brooklyn, Hatfield, Mamelodi and Pienaarsrivier.
Figure 1: Location of the city of Tshwane used as a case study in the thesis
DATA

The research and results that are presented in the thesis are based on fieldwork that took place at all five correctional centres located within the city of Tshwane during March 2006. These five centres include Pretoria Central Correctional Centre (consisting of Pretoria Medium and Pretoria Maximum), Pretoria Female Correctional Centre, Odi Correctional Centre and Atteridgeville Correctional Centre. In order to conduct research at the South African Department of Correctional Services (DCS) a research application was compiled at the beginning of 2005 and submitted to the DCS in June 2005. The application was provisionally approved in January 2006 by the Research Ethics Committee (REC) of the DCS and dates were specified during which research could be undertaken at the afore-mentioned correctional centres. Planning meetings were held with the author and the DCS’ Commissioner for Research, the DCS’ Area Coordinator for Corrections in the city of Tshwane as well as with the relevant Area and Regional Managers at each of the five correctional centres. Each facility was visited on numerous occasions during the course of 2006 in order to obtain the offender data required.

PROCEDURE AND PRESENTATION

The thesis comprises independent yet interrelated research papers (Chapters 2-7) encapsulated by an Introduction and Conclusion. Each of the research papers in the thesis has either been published by the author (some documents are co-authored) or are in various stages of submission and review for publication in local and international academic journals at the time of the completion of the thesis. Although a number of papers are co-authored the general thesis as well as the focus and
construction of each paper within the general thesis were primarily developed by the author. The publication status of each article is noted on the chapter title page. Some theoretical and methodological repetition occurs between chapters. This is difficult to avoid since the documents are included as the text appears in the academic literature or in submission for publication. In addition, some discrepancies in the data collected from the DCS occur across chapters. These discrepancies are addressed in the respective chapters as endnotes. Relevant acknowledgements and references are presented at the end of each chapter. The style of graphical presentation is similar throughout the thesis although published documents may show some variations due to external editorial requirements. While each chapter stands individually, together they provide a comprehensive view from an interdisciplinary approach.

**Chapter Two** identifies five key requirements in the development of an urban ecological theory of crime in post-apartheid South Africa. Each requirement can be considered a research objective of the thesis, with each requirement being addressed in subsequent chapters.

The first requirement in the pursuit of an urban ecological theory of crime in South Africa is addressed in **Chapter Three**. The chapter details a review of GIS within a policing context in the country and identifies potential geo-analytic procedures and tools to be used in the spatial analysis of crime. Among the procedures identified and posited for future crime analysis in the country are geodemographic classification systems. A new variant of such a system is constructed in Chapter Six.
Chapter Four initiates the empirical component of the thesis with an ecological test of the social disorganisation theory within a South African context. The chapter achieves an important initial objective of the thesis in that it establishes the degree to which an archetypal ecological theory of crime can be used to account for the spatial distribution of offenders in South Africa.

Chapter Five employs a range of statistical techniques to analyse the effects of a number of socio-demographic variables on delinquency rates within the city of Tshwane. The chapter identifies and examines the various ecological risk factors that account for a high number of offenders emanating from certain urban locations. The ecological risk factors identified in this chapter are used to construct the geodemographic classification system in Chapter Six.

Chapter Six introduces a geodemographic offender profiling system for the city of Tshwane. The system employs the findings of previous chapters and combines ecological theory, aggregated GIS-based data and k-means clustering to produce offender risk profiles for the city of Tshwane ranging from high to low. The chapter also challenges past and present crime reduction policy initiatives.

In Chapter Seven a contribution is made towards an urban ecological theory of crime in post-apartheid South Africa. The theoretical and empirical work set out in Chapters 3-6 are collated and referenced in this historical discourse on crime during the apartheid and post-apartheid periods.
The final chapter, Chapter Eight, presents a general conclusion drawn from the thesis. The main findings of the thesis are reviewed as independent and interlinked components. A review of the thesis highlights the complexity inherent in understanding the offender-environment nexus.

Throughout the empirical component of the thesis, which comprises Chapters 4-6, ArcGIS 9.2 was used to create the various datasets and to statistically analyse these datasets through the application of, amongst others, spatial correlation, factor analysis, and cluster analysis procedures. ArcGIS 9.2 was also used in the creation of the geodemographic offender profiling system, a new variant of geodemographic classification systems in GIS.

ENDNOTES

1 Throughout the course of the thesis the terms delinquency and offending are used interchangeably dependent on specific editorial requirements. In both instances the word refers to a criminal act committed by an individual.

2 Throughout the course of the thesis the terms suburb and neighbourhood are used interchangeably dependent on specific editorial requirements. In both instances the word is defined as a spatially delineated district within a town or city.

3 The South African population is still officially classified into racial groups. ‘Black Africans’ represent the descendants of west and central African populations. The ‘Indian’ population group represent the descendents of south Asian populations. The ‘Coloured’ group comprise a mixed population including the descendents of the
indigenous Khoisan population, imported Malay slaves, and people born out of mixed-race relations. The collective term ‘blacks’ or ‘non-whites’ from this point onwards (and throughout the thesis), refers to these groups while the ‘white’ population includes the descendents of European and other non-Indian Asians. While it might be expedient to employ the term ‘black’ or ‘non-white’ here, the group designated by the term should not be considered homogeneous.
REFERENCES

_Cities_, 21, 423-437.


CHAPTER 2

KEY REQUIREMENTS IN THE DEVELOPMENT OF AN URBAN ECOLOGICAL THEORY OF CRIME IN SOUTH AFRICA

Gregory Dennis Breetzke and Andre Carl Horn

1 Department of Geography, Geoinformatics and Meteorology, University of Pretoria, Pretoria 0002, South Africa, andre.horn@up.ac.za

* A revised version of this chapter is published in the South African Journal of Criminology

ABSTRACT

South Africa is a country ravaged by crime yet few theoretical frameworks exist by which to guide crime reduction initiatives, and fewer incorporating a spatial component. Space is becoming an increasingly important factor in crime research with both the spatial distribution of offences and offenders seemingly playing important roles. Empirical research investigating the spatial dimension of crime in South Africa is sorely lacking however which is a worrying fact given the importance this factor plays in understanding criminal behaviour. In this paper key requirements in the development of an urban ecological theory of crime in South Africa are outlined and investigated. The satisfaction of these five key requirements will not only result in a better understanding of the unique motivating factors behind crime in the country but will also serve to inform a theoretical approach to crime reduction.
INTRODUCTION

Crime is a destructive socio-economic phenomenon and the search for the rationale behind crime and its control thereof is an ongoing task. The rate and nature of crime in post-apartheid South Africa is currently perceived as one of its main challenges (Altbeker, 2007). Since 1994, two diverse strategies have been employed to control the rapid escalation of crime in the country – the National Crime Prevention Strategy (NCPS) adopted in 1996 and the National Crime Combating Strategy (NCCS) launched in 2000, both with arguably limited success (see van der Spuy, 2001; Leggett, 2004). According to Dixon (2001) a more thorough theoretical understanding of crime and its causes in the country is required in order to guide and prescribe crime reduction initiatives. According to the researcher such a theory should go beyond idealist views linking present levels of crime in the country to the continuity of apartheid divisions and he rather calls for an approach of critical realism. In addition to the legacy of apartheid a critical realistic perspective acknowledges the impact of unrealistic economic expectations linked to unequal opportunities and of a shift in state policy towards neo-liberalism (Bond, 2000) and the challenges of a typical society in transition (Shaw, 2002). Due to its socio-political history South Africa is a unique country where the rate and violent nature of crime cannot be explained alone by universal reasons for crime, the general characteristics of a typical country in transition, globalisation, neo-liberalism, and even the unique legacy of apartheid. Critical introspection should also acknowledge that crime in South Africa has become a phenomenon that ‘fuels itself’ (Altbeker, 2007), amongst others, as a result of post-apartheid moral degeneration, and a political-administrative hegemony that is increasingly in conflict with itself. Only the ignorant will argue that a new critical
realistic perspective should be devoid of a localised urban ecological interpretation of crime, a topic largely neglected in South Africa.

This paper aims to identify a number of key requirements in the development of an urban ecological theory of crime in South Africa. Methodological issues that hinder the understanding of the socio-economic, criminological and ecological interpretations of crime in the country are also noted with specific reference to geographical information technologies. The paper concludes by outlining a number of tangible benefits that could result from a better ecological understanding of crime in the country.

**KEY REQUIREMENTS**

The purpose of this section is to identify a number of key requirements in the development of an urban ecological theory of crime in South Africa. In each instance we delve into the requirement and provide a brief overview and assessment of its current status in the country.

**Requirement 1: Assess the present status of GIS within crime science in the country**

A major reason for the revival of ecological studies of crime over the past number of years has been the development of Geographic Information Systems (GIS). The rapid advancement and proliferation of GIS has increased interest in crime mapping and revolutionised crime science (Bowers et al., 2004). The technology is *sine qua non* for ecological studies across all disciplines as it allows for the structuring and
manipulation of rapidly multiplying aggregated data sources and converting it into useful information (Longley and Clarke, 1995). Within a crime context this translates into the establishment and exploration of links and spatial relations between data derived from crime reports, census variables, transport information and land use, among others (Bowers and Hirschfield, 1999). GIS can additionally support both exploratory and confirmatory analysis, provide tools for both inductive and deductive approaches, and support both scientific research and the implementation of public policy based on GIS models (Mark, 1999). Recently, several tools have also been integrated into GIS software to facilitate more rigorous analyses of the spatial patterning of crime through the use of exploratory spatial data analysis (ESDA) procedures. According to Cameron (2005) the central feature of ESDA is the use of formal statistical tests to determine whether crime or offender locations show evidence of clustering or are randomly distributed. These include nearest neighbour analysis tests for point pattern data and spatial autocorrelation tests for aggregated data or event data that have intensity values applied to them. In both instances a more thorough spatial understanding of the distribution of criminal events are provided to the user.

The decreasing cost of desktop computers and the increased availability of georeferenced information at a neighbourhood-level have also allowed ever more sophisticated and flexible GIS representations to take shape (Messner and Anselin, 2004). More recent manifestations of GIS technology in crime science include hot spot analysis (Block and Block, 1995; Eck et al., 2000; Bowers et al., 2004), journey-to-crime modelling (Liggett et al., 2003; Rossmo, 2000), geographic profiling (LeComber et al., 2006; Cooper et al., 2001; Laukkanen and Santtila, 2006), and
more recently, geodemographic analysis (Ashby, 2004; Ashby and Longley, 2005; Williamson et al., 2006). In all these applications GIS provides an important platform from which to understand the spatial and temporal incidence of crime and in doing so analyse and extend existing criminological theory. Thus, the contemporary GIS-based ecological approach is far removed from the meta-explanation of classical ecological theory and instead offers an integrated and complementary dimension to critical crime analysis.

The use of GIS in crime science in South Africa is in its infancy. Region-specific and demographically representative monitoring of crime only began after the democratically elected government came to power in 1994 (Blackmore, 2003), while the use of crime mapping within the South African Police Service (SAPS) is at an embryonic stage (Eloff, 2006). From a governmental perspective, recent legislation has been put into place to ensure that a GIS exists (or is at least supposed to exist) at the majority of police stations in the country. Currently the Crime and Information Analysis Centre (CIAC) of the SAPS collates and coordinates crime information across the country in order to provide intelligence at all levels of policing namely station area, provincial and national (Buys, 2003). A number of semi-privatised parastatals also conduct independent geographic investigations of crime including the Human Sciences Research Council (HSRC) (see Schwabe and Schurink, 2000a; Weir-Smith, 2004) and the Council for Scientific and Industrial Research (CSIR) (see Gilfillan, 1999; Schmitz et al., 2002), among others. Independent research utilising GIS within a crime context include Lochner and Zietsman (1998), Redpath (2001) and Erasmus and Mans (2005). In a number of these examples however concerns have been expressed regarding the actual ability of the government, in general, and the
SAPS, in particular, to harness the technology to supplement the policing process. Researchers express concerns ranging from incomplete spatial data (Gilfillan, 1999; Schwabe and Schurink, 2000b; Eloff, 2006) to the ineffective capturing and coding of crime information at the crime scene (Schwabe and Schurink, 2000b; Buys, 2003). These concerns not only question the ability of researchers to undertake ecological studies of crime in the country but highlight a pressing need for a more thorough investigation to assess the present use and status of GIS within crime science in the country with regards to Geographical Information (GI) infrastructure, capacity and knowledge. Within this context it is also important to highlight the various geo-analytic operations that GIS offers to crime scientists in South Africa as well as identify the major inhibitors to the potential offered by the technology to supplement policing and inform researchers regarding existing ecological approaches to crime.

**Requirement 2: Gauge the applicability of international ecological theories of crime in a local context**

A growing body of literature has emerged to test empirically common theories of criminal activity including the social disorganisation theory (Ouimet, 2000; Cahill and Mulligan, 2003), routine activities theory (Felson, 1997; Smith *et al*., 2000), strain theory (Sharp *et al*., 2001; Froggio and Agnew, 2007), and the general theory of crime (Sorenson and Brownfield, 1995; Burton Jr *et al*., 1999). Despite these criminological theories being predominantly developed in the United States (US) cross-national analyses and testing of so-called ‘American’ theories of crime has taken place in Australia (Braithwaite, 1995), Britain (McCulloch, 2003), Yugoslavia (Separovic, 1983), China (Bao *et al*., 2004), the Philippines (Maxwell, 2001), Korea (Kang, 1983; Moon and Morash, 2004), Japan (Fenwick, 1996) and South America (Defleur, 1970).
In each instance the theory that underlies the prospective ‘American’ approach is tested within a local context to gauge its relevancy and accuracy, with varying degrees of success. In some instances, localised concepts have been blended in with ‘American’ theory to help explain crime and delinquency. For example in Australia, Braithwaite (1995) incorporated localised shame and reintegration with ‘Western’ theory, while Korean criminologist Jin-Kew Shin incorporated concepts from Western developed countries in formulating his own ‘dynamic theory of criminal behaviour’ (Kang, 1983). Within this context Willis et al. (1999) bemoans the lack of attention given to theoretical developments unique to the historical, cultural, and social structural characteristics of lesser-known societies. Local researchers already highlight the lack of any theoretical context to use in understanding crime in South Africa (Dixon, 2001, Shaw, 2002; Altbeker, 2007), while Ovens (2003) has long advocated for the ‘Africanising’ of existing criminological theory.

In South Africa common criminology theories such as those of the ecological school have never been practically implemented and assessed (Eloff, 2006). A cursory review of local criminological research reveals that while ‘American’ theories of crime have often been used to interpret and explain research findings in the country (see Schurink, 1976; Gilfillan, 1999; Schwabe and Schurink, 2000b; Davis, 2001; Weir-Smith, 2004), they have never been utilised as a basis to, for instance, inform variable selection for ecological analysis or to provide a clearer specification for the use of one or more statistical model. As Eloff (2006, p.230) understates:

“There is room for improvement in environmental criminology in the South African context, as well as in the integration of specific natural science concepts within criminology to expand the knowledge base of
future criminologists to apply new technologies to improved crime prevention strategies and crime analysis.”

As a result the relevance of existing ecological theories and their associated concepts of collective efficacy, social cohesion and community fragmentation, among others, within a local context are largely unknown. There is thus a need in South Africa to assess and investigate the applicability of international ecological theories of crime in order to potentially develop and extend existing theories using local theoretical knowledge. South Africa is a country with unique social, economic, political and environmental features. Among the more prominent socio-political factors to have scarred South African society is the creation of the former homelands and urban townships that were spatially designed and implemented by the former apartheid regime (Schwabe, 2000). These townships segregated South African society on the basis of race and the results of this urban development may be spatially incongruent with an ‘American’ theory of crime where for instance, ethnic heterogeneity plays a significant facilitating role in delinquency. In addition, the impact of post-apartheid neo-liberalist exclusions, moral degeneration, and cultural and political strive on the applicability of ‘American’ theories to the mutating spatial ecology of crime in South Africa is also largely unknown.

A test of existing ecological theory is therefore a key requirement not only in evaluating the ethnocentrism of American criminology but also in the development of an urban ecological theory of crime in South Africa. If existing ecological theory is found to accurately account for the spatial distribution of crime phenomena in South Africa then the theory holds true, if not, then as Inverarity et al. (1983, p.31) notes:
“The problem in evaluating a theoretical statement is not one of discovering exceptions, but of imagining alternative theories that explain the phenomenon better.”

**Requirement 3: Identify the ecological determinants of crime and delinquency**

The location of crime and the spatial origin of offenders are both fundamental considerations in any quantitative assessment and extension of existing criminological theory. This requirement is subdivided into two separate sections dealing first with the need to identify the ecological characteristics of crime locations, and second, the need to identify the ecological characteristics of offender locations.

- **Crime locations**

  In ecological theory the characteristics of the population and the characteristics of the place influence whether or not a crime will occur or the ‘crime potential’ of an area, i.e. the likelihood that a crime will be exhibited in an area as a function of various ecological features (Brantingham and Brantingham, 1993; Brantingham and Brantingham, 1999). Two basic data requirements are essential in an ecological investigation into the spatial patterning of crime locations. The first is crime information, which typically acts as the dependent variable in the model and most often appears in the form of a crime rate; the second is some form of demographic or ‘lifestyle’ data aggregated by area acting as the explanatory variables most often in the form of census or other ancillary datasets. While variations of these two data requirements are common in international ecological crime research (see Ouimet, 2000; Cahill and Mulligan, 2003; Oh, 2005; Andresen, 2006), the basic premise is generally the same, which is to illuminate the characteristics and features of crime locations within an areal unit. Locally, crime information is released by the SAPS to
the public in the form of crime statistics. These crime statistics are released annually in an aggregated form as a crime count per police station boundary. Despite crime statistics in general being compounded by scepticism and mistrust (Herbert, 1982; Altbeker, 2005), they nevertheless represent the only official and spatially complete crime dataset available in the country. In terms of demographic or ‘lifestyle’ data, the primary source of information is the censuses released by Statistics South Africa (SSA). Other ancillary datasets released by SSA which can also be utilised in ecological studies of crime include the victimisation, labour force and general households surveys as well as datasets released from other government departments and parastatals including the Environmental Potential Atlas (ENPAT) of the Department of Environmental Affairs and Tourism (DEAT) and the CSIR’s land cover dataset.

While it may appear as if the basic data requirements are available to ecologically analyse crime locations in the country two major methodological issues restrict investigations. The first is the misalignment of administrative units such as police station boundaries with census boundaries such as enumerator areas (EA), sub-place and municipal boundaries. The result is that census data for example, as an auxiliary dataset in ecological studies of crime, can only be used from provincial boundary level upward (Eloff, 2006). This provides a very coarse ecological portrayal of the determinants of crime in the country and makes any inferences drawn from these findings more susceptible to the inherent limitations associated with the mapping defined boundaries such as the modifiable areal unit problem (MAUP) and the ecological fallacy (Bailey and Gatrell, 1995; Openshaw, 1984). Although a number of alternate disaggregation procedures have been used in South Africa to counter the
problem of spatial incongruencies (see Gilfillan, 1999; Schmitz and Stylianides, 2002; Eloff, 2006; Naude, 2007), GIS researchers often question the assumptions upon which these procedures are based (see Vickers, 2003; Singleton, 2004).

Figure 1 illustrates the misalignment of police station boundaries with sub-place and municipal boundaries for the city of Tshwane. The misalignment is clearly evident throughout Tshwane with some police station boundaries not only cutting across smaller sub-places but also spilling over into other municipalities and magisterial districts. In some instances Schmitz and Stylianides (2002) note that police stations have to serve up to five larger administrative units simultaneously, so depending on where the crime occurs within the police station’s area of jurisdiction – this could result in one investigating officer being required to appear at the same time of the same day in five different courts, tens of kilometres apart! This not only provides a logistical and administrative nightmare for policing authorities but also hinders ecological studies using these spatial boundaries.
Figure 1: Misalignment of subplace boundaries within police station boundaries
The second issue that hinders ecological investigations into crime locations in South Africa is the problems related to the Case Administration System (CAS) of the SAPS. The CAS is a spatial unit that was created to record accurately information at a police station and contains information such as the code, address and time of the crime. The first problem relates to the uncertainty regarding the spatial partitioning of police station boundaries into smaller so-called CAS blocks. Embedded within police station boundaries are finer aggregated areas known as CAS blocks. When a crime occurs in South Africa it is spatially located within a CAS block, which defines what police station is responsible for managing and investigating the offence. Major problems relating to CAS blocks include the fact that they have not all been electronically captured in the country resulting in there being no clearly defined spatial boundaries for CAS blocks and an associated lack of diagnostic controls as to what they constitute (Cooper, 2007, pers. comm). Uncertainty abounds within the SAPS regarding the location of spatial boundaries defining CAS blocks resulting in crimes being reported and recorded at police stations outside their jurisdiction. Whereas a CAS block could entail numerous neighbourhoods it could also be defined as a road or as a railway station. To confuse matters further, a railway station may constitute a CAS block in some regions of South Africa but in other regions it could constitute part of a greater CAS block containing additional railway lines, parking facilities and other rail amenities (Eloff, 2006). When a crime occurs it could therefore be spatially located in the ‘wrong’ CAS block and would then be aggregated up and reported at the wrong police station level. The result is that at the initial and most integral stage of the GIS process - data collection - there is doubt regarding the accuracy and authenticity of crime data. An independent audit report in 2004 also found that effective record keeping was also not always possible within the CAS due to the lack...
of computers. In one province, for instance, 29 police stations did not have computer equipment (SAPS, 2004). Another report of the auditor-general to Parliament in 2005 found ineffective monitoring and control of the CAS to the extent that dockets at certain units were assigned to members who had since left the unit; the status of cases and dockets on hand per investigator was not always reviewed and followed up by the area or provincial offices. In a single province, for example, the status of 18 407 dockets remained unchanged for more than five months, and a lack of trained staff, and controls to safeguard docket-related information resulted in ineffective docket keeping and an increased risk of dockets being lost or stolen (SAPS, 2005). For other technical problems pertaining to CAS consult Louw (1998).

Other non-spatial problems and practices involving crime data in the South African context are summarised by Schwabe and Schurink (2000b) as follows:

- The tendency to capture only the most serious offences with less serious crime phenomena not included in the crime statistics
- Inconsistency in the definition of crime phenomena and crime definitions being unclear
- Ineffective collection of relevant and comprehensive information at the crime scene, including the location where the crime was committed
- Inaccurate capturing and reproduction of crime statistics as a result of poorly trained officials
- Corruption of police officials
- Manipulation of crime statistics through the application of a variety of non-standardised weightings.
Despite these problems a limited number of studies have been undertaken in the country to examine the ecological causes of crime locations. These include Gilfillan (1999) who used regression analysis to indicate which socio-economic variables best predicted crime locations. The researcher aggregated a number of demographic variables from the 1996 census from an EA level to the police station level and constructed ordinary regression models for over 26 different crime categories ranging from murder to car hijacking. The researcher found a spatial relationship between the prevalence of poverty, low social status, and deficient social structures and norms in certain parts of the country leading to an increase in crime across certain crime types. In this instance GIS not only enabled crime to be put in its geographical context but also allowed for the effective integration of information on different crime types with demographic and other variables. With reference to the methodological issues raised earlier, Gilfillan (1999) did indicate the problems he experienced during the process of aggregating demographic variables from one spatial level into the police station level. The problems experienced were such that some demographics from the census such as unemployment and related socio-economic indices as well as family structure and cohesive indicators were not used. More recently, the Centre for Justice and Crime Prevention (CJCP) launched its Crime and Victimisation Mapping Tool² that maps crime trends in different provinces, police districts and towns of the country. Among the findings, the researchers identified hot spots of criminal activity in predominantly rural areas as opposed to major metropolitan areas as well as a spatial association between high levels of inequality and house robberies and high levels of equality with more social contact crimes. Other ecological studies of crime include Brown (2001) and Blackmore (2003). In all these additional studies however a coarser magisterial or provincial unit of analysis is modelled which, as mentioned previously,
are less precise than smaller areal units and can therefore give rise to misleading inferences regarding the effects of the characteristics of neighbourhoods in relation to existing crime patterns. Nevertheless these examples indicate that despite being plagued by methodological constraints, ecological studies of crime locations and their correlation with socio-economic and other community conditions are proceeding. While this information may be encouraging to crime researchers in the country, a review of international ecological crime research indicates that a lot more needs to be done to match international spatial analytic studies of crime.

- Offender locations

In contrast to the ecological studies of crime locations, there have been no investigations into the unique spatial relationships that underlie the geographic distributions of offenders across areas in post-apartheid South Africa. As a result both the population and place characteristics of areas affected by high and low rates of offenders are unknown. A number of ecological studies of delinquency were conducted in apartheid South Africa and include Lötter (1964) and Schurink (1976, 1978). Both researchers found a correlation between the spatial distribution of offenders and ‘low social class’ in designated areas in the former Pretoria municipality of South Africa. An examination of local literature since these studies indicate a relative dearth in ecological studies of delinquency in the country, and no studies conducted since democratisation. There are a number of possible reasons why an investigation into this aspect of criminality in post-apartheid South Africa has been neglected. First, the methodological issues referred to earlier also holding true for ecological investigations into offender patterns in the country. Second, the sensitivity of the information involved. Knowing ‘where offenders live’ can potentially lead to
the negative labelling of neighbourhoods and the inferences gained from such knowledge could be construed in some parts of the country as blatant racism. Third, in a new democracy like South Africa, which has already suffered socio-spatial segregation in terms of its political history, the profiling and subsequent stereotyping of neighbourhoods as ‘high risk’ or ‘hot-spots’ could echo state policies of years gone by. A need exists in post-apartheid South Africa however to transcend the racial stigmatising of delinquency and refocus towards a spatial appraisal of offenders and their distribution. In doing so, policymakers can gain a spatially based perspective of the motivators driving criminal behaviour and integrate that knowledge in current crime reduction initiatives.

A number of non-spatial studies have however been conducted to gain more insight into offenders in post-apartheid South Africa. Local researchers highlight poor socio-economic status (Blackmore, 2003), community disorganisation (Pelser and de Kock, 2000), availability of alcohol and drugs (Maree, 2003), high unemployment (Brown, 2001; Blackmore, 2003), family characteristics (Wedge et al., 2000), poverty (Maree, 2003), racial and economic inequality (Demombynes and Özler, 2005) as being general risk factors for delinquency. When contrasted with international studies assessing criminogenic risk for offenders Maree (2003) found that South African research findings do concur with foreign studies regarding the main categories of criminogenic risk factors although changes were noted regarding the sequencing of the risk factors with factors present within the family considered more often as risk factors in a local context with environmental and community risk factors also emphasised more. Ecological studies assessing criminogenic risk for delinquency are less forthcoming however and this highlights the need to gain spatially based insight
into the ecological motivations behind offenders particularly if, as Altbeker (2007) suggests, a strategic shift is required in South Africa from managing crime to managing offenders.

Notwithstanding the methodological issues referred to earlier, ecological studies examining ‘where crime occurs’ as well as ‘where offenders live’ are both important factors in the development of an urban ecological theory of crime in South Africa. It is evident from this synopsis that while a number of studies have been conducted exploring the ecological determinants of crime locations, a major shortcoming of geo-analytic based research of crime in the country is the lack of attention placed on the spatial distribution of offenders. This knowledge, supplemented with an understanding of the ecological causes of crime locations, will not only inform crime prevention programmes and policies regarding the ecological risk factors that influence offender propensity but provide a solid platform from which to develop an urban ecological theory of crime in general in the country.

**Requirement 4: Profile neighbourhoods based on risk**

Closely aligned with the need to identify the ecological determinants of crime and delinquency in the country (Requirements 3) is the need to generate risk profiles of certain geographic areas such as neighbourhoods. An important distinction must be drawn here; determining the ecological reasons for crime identifies either those factors that place people at risk of becoming offenders or that place neighbourhoods at risk of becoming crime locations. Generating risk profiles on the other hand takes this process a step further by dividing neighbourhoods into groups based on similarities in terms of the various ecological risk factors identified. Neighbourhoods
are clustered on the basis of social similarity, rather than locational proximity (Webber and Longley, 2003), with the classification being both mutually exclusive and collectively exhaustive (Harris et al., 2005). The resultant profiles can reflect a prioritisation of neighbourhoods that require specific government intervention based on the characteristics of each ‘risk category’ profiled. Similar to requirement 3, the authors attest that the most pressing need in South Africa is to focus on offenders and in this context construct offender risk profiles of neighbourhoods in the country. By classifying neighbourhoods according to the perceived risk of predisposing residents into a criminal lifestyle, intervention strategies can target the root causes of the problem rather than the symptoms. In reviewing neighbourhood profiles Chainey and Ratcliffe (2005) differentiate between an offender profile and an offending profile. According to the researchers the former represents an investigation into a particular crime in order to determine the type of person likely to be a key suspect, while the latter identifies the more general characteristics of those likely to commit crimes. An offending profile can be obtained directly using information from existing offenders or could be inferred through an ecological examination of the offender’s area of social interaction. The emphasis is subsequently placed on the spatial location of the offender in conjunction with the contextual influences that are exerted on him or her.

A number of offender profiles have been compiled in South Africa. Mistry and Dhlamini (2001) profiled perpetrators of farm attacks as young, single, unemployed black South African males between the ages of 15 and 35 from an unstable family background, while Minnaar (2000) concluded that ‘cop-killers’ were most likely to be single, black males in their mid-20s with a low level of education, and having had a deprived childhood in a dysfunctional home. Other offender profiles have also been
The offender profiles outlined above, while important in highlighting those demographic risk factors for delinquency neglects the geographic context under which they occur. Not all unemployed black South African males commit crime, and it is often within the spatial context of his or her community that these risk factors are accentuated. The tools of spatial econometric modelling, in the form of geodemographic classification systems, are especially well suited to profile these communities at risk.

Geodemographics is posited on the now familiar ‘First law of Geography’, namely that ‘everything is related to everything else, but near things are more related than far things’ (Tobler, 1970). More colloquial expressions would be ‘birds of a feather, flock together’ or ‘You are where you live’ (YAWYL) (Sleight, 2004). In principle, geodemographics assume that two people who live in the same neighbourhood are more likely to exhibit similar characteristics (and behaviour) than two people chosen at random (Debenham et al., 2001). Despite geodemographics having etched out significant research domains in both the disciplines of geography and sociology (Williamson et al., 2006), the use of the technology in criminological research is relatively immature (Ashby and Longley, 2005). Williamson et al. (2006, p.197) finds it extraordinary that “while the recognition of crime-prone communities has a long history, geodemographic analysis of crime and offender trends is underdeveloped.” A number of exceptions do apply however and illustrate the potential of this geo-analytic technique to provide valuable insight into the location of offenders. For example, Ashby (2005) illustrated how the likelihood of offenders residing in Municipal Dependency neighbourhoods is over four times the average rate for all
neighbourhoods in the MOSAIC system. Similarly Williamson et al. (2005) found that approximately 70% of all youth crime committed in Nottinghamshire over a five-year period was attributed to young offenders residing in only 14 of the 61 different neighbourhood types as classified by the MOSAIC system. Other examples are offered in a number of works (Ashby, 2004; Ashby and Longley, 2005; Williamson et al., 2006). Not surprisingly geodemographics has been used within a crime context in South Africa. Schwabe and Schurink (2000a) note the use of geodemographics to create a socio-crime classification of over 1100 police station areas in South Africa. A database consisting of over 250 census variables and 74 crime variables was created and linked to police station boundaries and entered into an ANN. Kohonen’s Self-Organising Map (SOM) algorithm was subsequently used to cluster the 1100 police stations into 20 primary socio-crime categories. The 20 categories reflected a prioritisation of police stations that required specific government intervention according to the dominant crime types and socio-demographic characteristics that occurred in each category. Schwabe (2000) reports on the possible use of geodemographic systems to compile a national or provincial profile of offenders for each crime type in South Africa. The researcher hypothesises that such a system can facilitate a better understanding of the cultural diversity of the country as well as provide insight into the social context of crime and highlight the socio-economic causes of offender development. Rose (2004) also speculates on the use of geodemographics to develop offender profiles, much like retailers identify customers and areas of high market potential.
Following the ecological tradition, there is thus a need to profile neighbourhoods based on risk in South Africa. The ongoing geographic nature of social inequality and deprivation in the country linked with race and ethnicity calls for a closer investigation into this dimension of crime. As ecological risk factors may tend to cluster in certain areas, investigations paying closer attention to these clusters rather than on single variables are preferable. The advantage of an offender profiling system lies not only in the ability to profile potential offenders and thereby improve crime detection rates but more importantly to provide a spatial platform from which to develop an urban ecological theory of crime in the country. Different social structural conditions of at-risk neighbourhoods across racial and ethnic divides can additionally be investigated. According to Ericson and Haggerty (1999) policing is changing from the traditional focus on maintaining law and order to a role that is more about detecting and managing risk and communicating that risk to other institutions in society. A central task of governments should be to control these risks that cause public consternation, including that of delinquency (Giddens, 2002). Locally, Glanz and Schurink (1994) also highlight the importance of identifying at risk individuals as part of a short-term strategy to deal with juvenile delinquency in South Africa. By profiling neighbourhoods by risk a knowledge-based approach to the problem of crime can be obtained that focuses not only on risk factors pertaining to potential offenders, but more importantly on their incidence linked to space.
Requirement 5: Understanding the complexity of crime and the urban environment

Due to its recent political history South Africa is a country that is inherently confronted with social disorganisation and socio-spatial fragmentation (Pieterse, 2004). Increasing income inequality linked to multi-ethnicity, racial and ethnic segregation, family disruption and population mobility are main characteristics of many emerging cities of the world and due to its apartheid history South Africa’s cities represents an archetype in this regard. But, before one can even think about the development of an urban ecological theory of crime in South African cities the complexity of crime, its causes and the changing nature of cities and society should be considered first.

Crime is not an empirical, uncontested fact. Rather, it is an anti-normative process that requires an examination between incivilities (anti-social behaviour), criminality (criminal tendencies) and actual crime (Davies, 2005). The study of crime is further complicated by categories of failed, actual, reported, investigated, charged, and convicted crime, as well as by notions of anomie, alienation and deviance, and by labelling and demonisation. Consequently crime is a relative, culturally contested variable across space and time. Such a relativist, hermeneutic interpretation of crime obviously challenges narrow, empirical explanations of crime. Nevertheless, criminologists have offered a multitude of alternate, sometimes overlapping, often competing theoretical explanations for crime. Based on the interpretations of Herbert (2002) and Davies (2005) five sets of explanations are considered. Individual explanations of crime initially linked crime to ‘innate evil’ in the individual and later to biological deficiency and disorder. Individual criminality may also be the result of learned behaviour among people who never socialised out of anti-social and criminal behaviours. Fonagy (2003) argues that these social and biological explanations may be converging in the individual criminal. There may also be group or sub-cultural explanations for criminal behaviour, for example juvenile delinquency and gangsterism, but also economic desperation and moral degeneration that are linked to notions of values, socialisation, and social, economic and political conflict. Area explanations link crime to the environment including
the physical environment of locality resulting from urban design, architecture and maintenance, as well as the ecological environment of the neighbourhood that, for example, could support theories of social deprivation and social disorganisation, and, third, the perceived environment representative of the cognitive-affective domain of the beholder and/or community. There are also societal explanations for criminal behaviour founded on so-called critical conflict theories that attribute crime to deep-seated structures or mechanisms of society such as economic materialism and apartheid resulting in dynamic consensual and conflict tendencies in society. Finally, there is the explanation of intentional, professional crime as an alternative way life, that is, criminality that cannot be explained by individual deficiency, environmental influence or social disorder, but rather by a premeditated choice of criminality as a mode of economic production and as a career path.

The ecological criminologist should particularly be aware of the changing structure and dynamics of cities as well as societal changes. Increased spatial mobility as a result of improved transportation and increased inter-connectivity as a result of technological advance provide impetus to urban processes such as decentralisation and urbanisation creating polycentric cities (see Pacione, 2005) that not only enlarge the area of individual’s activities but also accentuates spatial polarisations of race and class, that, amongst others, result in distinctly different geographies of crime locations and offender origins in the late-modern city (Herbert, 2007, pers. comm). In addition, overall societal processes such as social, cultural and economic globalisation, de-industrialisation, cultural post-modernism, and changing international and regional migration patterns have a huge impact on the spatial and social expression of urban cosmopolitanism, exclusivity and the nature and patterning of crime. South African social ecology is further complicated by the dynamics and challenges of a unique society in transition where the legacy of the past, new forms of exclusion, and democratic volatility strengthen notions of relative rather than absolute deprivation, individualist immediacy, hedonism and self-actualisation, as well as ontological insecurity (see Dixon, 2001; Shaw, 2002). Thus, although the spatial ecology of crime and offenders
represents only a small part of the crime equation it nevertheless makes a very important contribution to the overall understanding and management of crime.

**CONCLUSION**

It is apparent at this juncture that South Africa is in need of an inclusive critical-realistic theory on crime embedded in space and focusing predominantly on offenders. Crime scientists are becoming increasingly aware of the importance of spatial dynamics in empirical research and as a result ecological studies of crime are returning to the forefront of criminological inquiry (Messner and Anselin, 2004). Within this context, GIS stands at the vanguard of criminological research, in measurement terms as more data is being collected about aspects of crime than ever before; and in analysis terms as the toolkit of spatial analysis GIS offers allows it to match diverse data sources and accommodate the uncertainties created by scale and aggregation effects (Longley, 2005). Indeed much of the growth in the ecological analysis of crime over the past 25 years has been supported by the development of improved procedures for the analysis of ecological data (Gruenewald et al., 2006). The rapid development of GIS technology and the concomitant testing and extension of ecological theories of crime worldwide must not leave South Africa in its wake.

This paper identified a number of key requirements in the development of such an ecological theory. To satisfy these requirements would not only result in a significantly better ecological understanding of crime and delinquency in the country but in a number of important tangible benefits. From a governmental perspective, a theory inclusive of an ecological understanding of crime and, particularly, offenders, will provide a number of important benefits to the tactical, operational and strategic plans of the SAPS. In **tactical terms**, the intelligence garnered from an ecological understanding of crime in South Africa can be used to guide operational units to specific locations and individuals linked to criminal activities, potentially
leading to the arrest of wanted suspects and suspicious persons. In operational terms, the development of an ecological theory of crime in South Africa will inform a number of operational actions that are undertaken by the SAPS. For example, the routes for vehicle and foot patrols could be better delineated; the locations of roadblocks could be better identified; the locations of cordon-and-search and stop-and-search operations could also be better targeted. These operational locations would not necessarily take place where the ‘most crimes occur’ or where the ‘most offenders live’ but where the risk of crime occurring or offenders residing is high. Lastly, from a strategic perspective, government and other role players that deal specifically with addressing the long-term solutions to crime can utilise the knowledge to highlight the root causes of crime and measure ways to address them.

An urban ecological theory of crime in South Africa should ideally include aspects pertaining to both the location of crime as well as offenders. The exploratory work on the social ecology of crime must, of course, be expanded upon but it is the opinion of the authors that the most pressing need is to launch an investigation into the residential distribution and related geo-demographics of offenders. Currently no empirical investigations have examined the potentially unique ecological relationships of offenders in post-apartheid South Africa and of its cities in particular. The formalisation of an urban ecological theory of offender distributions in South African cities will be original across the two complementary disciplines of GIS and criminology. In terms of the key requirements referred to in the article, such research would represent for the first time that GIS technology has been used to: (1) determine what ecological risk factors are associated with high or low levels of criminal behaviour in the country, (2) measure what effects location has in terms of generating an offender profile of a suspect in South Africa, i.e. the importance of space, (3) profile and develop a taxonomic delineation of neighbourhoods assessing risk of offender development, and finally, (4) develop an ecological understanding of crime in the country. The knowledge garnered from such investigations will necessarily impact on the associated field of criminology in South Africa. Local crime scientists would be able to provide feedback to the
dominance and ethnocentric bias of American criminology as well as lay a theoretical foundation for a critical-realistic and ecological understanding of crime in the country.

ENDNOTES

1 Sub-place (SP) level is the next level up from Enumerator Area (EA) and one below the main place in the geographical area hierarchy structure of SSA and represents the highest spatial resolution at which Census2001 information has been legally provided by the South African government. SSA defines the sub place level as the combination of all EAs with a population of less than 500 with adjacent EAs within the same sub-place. 21 243 SPs were coded during Census2001 covering the entire country.

2 http://cjcp.poweredbyit.com/intro/mapintro.html

REFERENCES


Herbert, D. 2007. Personal Communication. Senior Pro-Vice Chancellor, University of Wales, Swansea.


