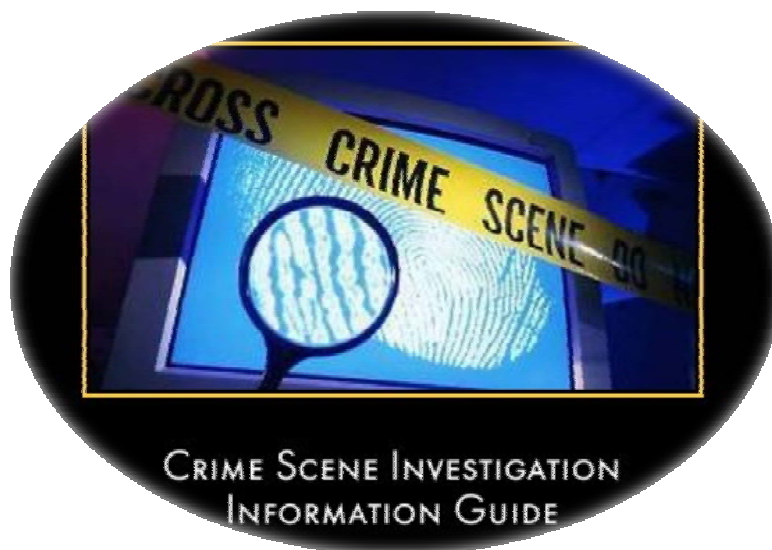
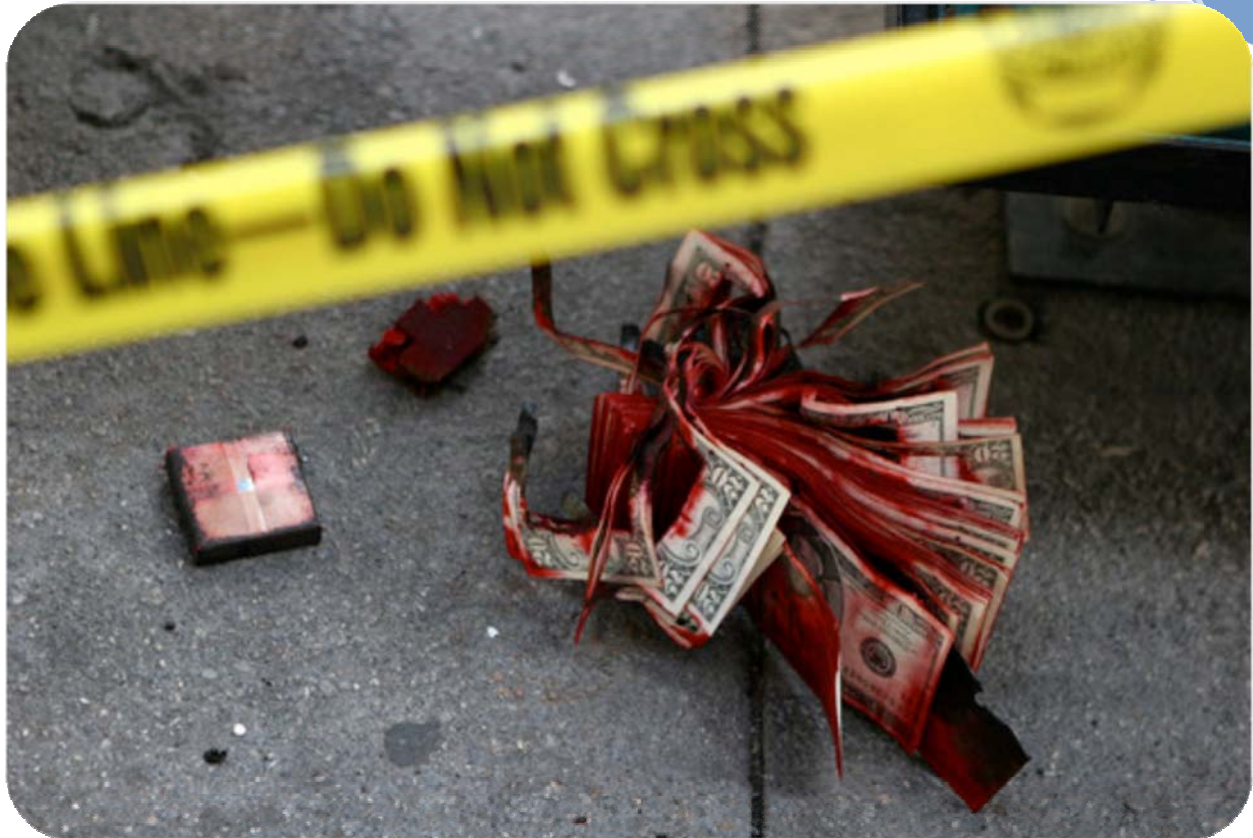




GIS BASED CRIME ANALYSIS
THE CASE OF IQBAL TOWN DISTRICT ZONE

BY

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DEDICATED TO:

OUR PARENTS AND TEACHERS

WHO

ALWAYS

PRAY FOR

OUR SUCCESS

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Salman Mushtaq

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Abstract

Police agencies in Pakistan intend to use computers for data storage and analysis. But no real GIS application exists. Even data storage and analysis by using computers is in a rudimentary stage. GIS provides very advanced techniques for data analysis and there is a need to apply this potent technology in Pakistan Policing. The present research is done as a model for the implementations of GIS in Pakistan Policing. The aim of the present research is to analyze the crime scenario of Iqbal Town District Zone by using GIS technology. Crime is being analyzed manually in different disciplines but crime analysis in GIS does not exist.

The research is an effort to give crime analysis a new direction. GIS software, Arc View 3.1 was used in present study. Dereferencing of spatial data was done in image analysis (an extension of Arc View). Data pertaining to the property offences as robbery, auto theft and auto snatching. The distribution of crime incidents showed that almost the whole of the study areas is witnessing crime include. The GIS analysis techniques are used for hot spot analysis, buffer analysis, and index of concentration. These analyses are done on different maps layers produced in Arc View. The description and analysis of these maps are useful for identifying and demarcating hot spot of crime, displacement of crime and illustrating the relationship between the mapped crime pattern and geographic characteristics of the study area.



CHAPTER-1

INTRODUCTION

1.1- HISTORY AND BACKGROUND:

History of crime is as old as man himself. ***According to the Bible:***

"The first crime of the world was committed when two sons of Adam, Able and Cane fought and, the elder of the two, killed the other."

According to the Holy Quran the story of the first ever committed crime in the world has been revealed as:

"Tell them the true story of the two sons of Adam, when each of them offered a sacrifice, it was accepted from one of them but not from the other, who said: I will kill you. The other said: Allah accepts an offering only from one who fears Him. If you stretch your hand to kill me, I shall not lift mine to slay you; for I fear Allah, the Lord of creation. I would rather, should add your sin against to your other sins and thus incur the punishment of Hell. Such in the reward of the wicked. His soul promoted him to slay his brother; he killed him and thus become one the lost."

Thus commission of crime began on the surface of the Earth with the creation of man and it has continued ever since. In early human groups known as tribes or clans there existed methods for detecting and resolving undesirable acts. If a member of a particular family violated the set norms or moral codes of a tribe, the other family members were held responsible for detection, apprehension and even execution of the offending member.

However, as civilization developed, social and cultural traditions were codified into formal laws.

According to Gilbert (1986):

"An early example would be the laws of Hammurabi, developed in Babylone about 2100 B.C."

Such codification necessitated means of detecting those who refused to obey the law.

At present many communities have developed the methods of crime research, detection and justice, but some communities are still lagging behind in this field.

Pyle (1951) stated that:

"Many communities do not have precise knowledge of criminal justice information in such a manner as to enable them to adequate plan for comprehensive criminal justice programmers. But most communities have considerable information pertaining to the incidence of crimes; few have analyzed these data in relation to specific neighborhood characteristics such as population distribution, socioeconomic levels, environmental changes and the nature of the land use."

As a concept, in its most basic form, crime analysis must be only slightly younger than crime itself. The first crime required no analysis, since it was not yet part of a pattern or trend. The second may have been related to the first, and the third to either the first or second, or both. Each subsequent crime had a greater chance of being related to a preceding one, and the development of the first crime pattern probably soon arrived. The history of crime analysis as a profession—in contrast to its history as a concept—lies in the informal method of pattern identification used by patrol officers, detectives, and administrators. Informal crime analysis, in its simplest sense, is performed by all officers as they investigate crimes.

August Vollmer:

August Vollmer (1876-1955) has been called "the father of American policing," and indeed, he seems to have pioneered most of the innovations that continue to define modern police work today.

Vollmer became City Marshall of Berkeley, California in 1905. The post was re-named "Chief of Police" in 1909, and Vollmer was to occupy it until 1932. When Vollmer joined the department, Berkeley was characterized by gangs of marauders and vigilante justice. Trains refused to stop there. By the time Vollmer left, Berkeley was regarded as one of the safest cities in America.

Vollmer's list of contributions to modern policing include bicycle patrol, vehicle patrol, radio communication, scientific investigation, a fingerprint system, demands for higher police education and professionalism, and the development of a police academy and a school of criminology at the University of California.

Far more important for our purposes, though, are his innovations in crime analysis. In 1906, he directed the development of a basic records management system that helped organize police reports in a manner conducive to analysis.

He encouraged regular review of police reports and mapped crime locations with colored pins. More important, he used crime information to create patrol districts.

Though the term "crime analysis" had not yet been invented, one quote from Vollmer's "The Police Beat" shows he was familiar with its concepts:

On the assumption of regularity of crime and similar occurrences, it is possible to tabulate these occurrences by areas within a city and thus efforts, his early steps in crime analysis do not seem to have been followed by his contemporaries.

O. W. Wilson:

Orlando W. Wilson (1900-1972) is regarded as one of the most significant police reformers of the century, and it is no coincidence that he was a protege of August Vollmer. Wilson's vision reaches us primarily through his books on police management, including *Police Records* (1942), *Police Administration* (1950), and *Police Planning* (1957).

Wilson was running the Chicago Police when he published his second edition of *Police Administration* in 1963. Under the heading "Specialization within a Large Planning Division" he used the term "Crime Analysis"

"The crime-analysis section studies daily reports of serious crimes in order to determine the location, time, special characteristics, similarities to other criminal attacks, and various significant facts that may help to identify either a criminal or the existence of a pattern of criminal activity. Such information is helpful in planning the operations of a division or district."

This is the earliest known source of the term "crime analysis," though Wilson's use of it suggests that there were already crime analysis sections in existence at the time of his writing. Indeed, in his 1950 edition, he mentions the importance of identifying patterns and trends but does not suggest a formal program for doing so. By the 1972 edition, however, crime analysis had increased enough in importance that Wilson devoted several pages to it, covering administrative issues and a unit's regular responsibilities.

1.2- RESEARCH PROBLEM:

Research on crime is as important in CIS as in other disciplines. However, it is common that various disciplines are different in their approaches.

Thus whereas disciplines like sociology social work and psychology, study human behavior and the interaction between the man and society directly, GIS examines the problem of crime in relation with a geographic location.

In various countries particularly those in the developed world, GIS experts have paid great attention to the problem of crime.

Police department in those countries have crime analysts to geographically analyze and visualize crime data.

The data provided by these analysts after analysis helps managers for better decision-making and resource allocation. However in less developed countries like Pakistan, not much attention is paid to conduct research in this field. Thus it is need of the time that research based on new technology should be conducted in Pakistan. The proposed research would be an attempt to analyze crime patterns and crime trends in relation with a geographic location.

1.3- MAJOR OBJECTIVE:

The major objective of the proposed study would be an attempt to "*analyze of the spatial patterns and trends of crime*".

Minor objectives of the study may be:

- To investigate crime patterns and crime trends with reference to a geographical location.
- Provision of a good tool for analysis of patterns of crime and the criminals in order to help law enforcement agencies in preventing crime.
- To make an attempt to introduce new GIS technology and its capabilities for crime analysis.
- To compare crime patterns and crime trends of different locations at different scales (Province level, Range level, District level etc.
- To make an attempt to introduce to crime investigators and law enforcement agencies with visual support capabilities of GIS which can likely to increase efficiency of the Police Department?
- To make an information system which may be served as a prototype for GIS implementation in Police Department?

1.4- RESEARCH QUESTIONS:

In the following study we will try to find the answers of question like:

- Where are crimes occurring?
- What is the crime pattern in the study area?
- Which are the crime prone localities in the study area?

- Is there any proximity relation between crimes and police stations?
 - Is there any proximity relation between crimes and major roads?
 - Is there any spatial variation in crimes occurring in the study area?
 - Is there any temporal variation in crimes occurring in the study area?
-
- What is the crime rate in the study area?

1.5- PRIORWORK:

A lot of work has been done and is going on all around the world especially in the developed countries like U.S.A. But in developing countries like Pakistan and other southeastern countries not much work is done in this field. Crimes are being analyzed manually in different disciplines but not many researches are conducted in GIS field.

Punjab Police intends to shift major portion of their manual record into electronic database and to make this database available to its investigation officers within the districts. Crime and Criminal Record Management System is going to be the primary information management system for Lahore Police. The system encompasses 4 interlinked software application modules:

- FIR & Investigation Management System
- Criminal Record Management System
- Stolen & Recovered Vehicle Management System
- Investigation Personal Management System

But this would be only attribute database and no maps are used to geographically analyze crime data. In Pakistan a GIS base study was conducted by Roman Pryjomko, United Nations Development program consultant and International land System Inc. The study area of that research was Karachi.

1.6 Methodology:

In every scientific discipline, physical or social, there are some instruments and criteria to measure a particular phenomenon. Physical scientists for example have established laboratories and scientific formulas for this purpose.

There are certain specific techniques for every discipline. Crime analysts have their own specific techniques to analyze crime patterns and crime trends.

The method for the proposed study would involve the following phases:

- Selection of units for measurements.
- A framework would be defined that what types of data is required for this study.
- Collection of spatial and attribute data.
- Verification, Rectification, Rescaling etc. of data if required.
- Conversion of analogue data into digital format i.e. data in the form of paper maps, facts and figures on papers would be converted into digital form by putting it in computer through scanning and digitizing of paper maps and keyboard entry of tabular data.
- Management of existing digital data (if available) to make it compatible with other geographic and attribute data. Classification of data would also be performed at this stage.
- Analysis and interpretation of data including overlay procedure and queries based on spatial and attribute data.
- Test of the functionalities of the developed database to see if it functions according to the predefined objectives.
- Repetition of any phase (if required).

1.7- SOURCES OF DATA:

Data collection is the primary task in various investigations. Data are collected from primary as well as secondary data sources. For this research two types of data were required spatial data and attribute data. These spatial or geographic and attribute data would be collected from:

- Office of Additional Inspector General (A.I.G), Investigation branch, Lahore.
- Office of Superintendent Police (S.P), Investigation branch, Anarkali, Lahore.
- Office of Superintendent Police (S.P CIA), Qila Gujjar Singh, Lahore.

CRIME REPORTING

- Office of Superintendent Police (S.P), Sadar Zone, Lahore.
- Related information cells of Police Department.
- Official website of Punjab Police.
- Office of District Town/Tehsil Nazim of Iqbal Town Zone.

1.8- STRUCTURE OF THE PROJECT:

The study would be organized into six chapters.

- First chapter would include introductory aspects, background, problem statement, objectives, methodology, prior work and sources of data.
- Second chapter would discuss about the definitions of crime, criminal Law, classification of crime etc.
- Third chapter would consist of data collection procedure, data conversion and data organization.
- Fourth chapter would describe the spatial pattern of crime. In this chapter crime pattern would be analyzed in traditional manner.

Crime tables, charts and graphs would describe the crime pattern. A GIS touch would also be given at some stage but full analysis capabilities would be discussed in the next chapter.

- Fifth chapter would discuss functions for analysis, the analyses done for crime patterns and trends with reference to the study area and Capabilities of the built Information System.

Summary of the research, Conclusion, Analytical Problems, and Recommendations would be part of the sixth chapter.

CHAPTER-2

CRIME AND ITS EXPLANATION

2.1- INTRODUCTION:

In the preceding chapter introductory aspects have been discussed in detail. The present chapter deals with the definitions and classifications of crime and crime analysis. It also sheds some light on some related aspects.

In fact the variety of facts prohibited by criminal law includes a wide assortment of behaviors ranging from drunkenness to murder. To talk about crime in general is often vague and non-limited and to talk about specific crime is usually best in the welter of particulars. As far as crime mapping and analysis is concerned there is a need to define what crime analysis is and what types of analysis can be done to crime data? So the present chapter addresses itself to the theories of crime and

criminal behavior, definitions of crime mapping and crime analysis. This is important since the various theories about the problem if described and explained help to formulate and define hypothesis for supporting or refuting the present theories.

2.2- DEFINITION OF CRIME:

It is indeed very difficult to explain the concept of crime in terms of one particular definition because ideas about what is crime and what is not have always varied from age to age. Some writers use the term "crime" to denote antisocial, immoral or sinful behavior but according to others crime is any conduct, which is forbidden by the law. For example, *in the words of Seligman (1963):*

"The concept of crime and of antisocial conduct may vary so greatly in a feudal society where in States, social life is highly organized and differentiated, such as in modern democracies."

In the broadest legal sense a crime in most countries is an act committed in the violation of law and for which a court may impose a variety of punishments.

According to Backer and Barness (1952).

"In the modern societies non-conformity is defined not only by mores and social norms but by laws enforced by social Government.

Nonconformity to certain type of law is called crime to other delinquency."

In Criminal Procedure Code of Pakistan 1988, for example, an offence is defined as:

"Any act or omission made punishable by any law for the time being in force, it also includes any act in respect of which a complaint may be made under Section 20 of the Cattle Trespass Act, 1871."

Above all these definitions if we see crime in two different scenarios i.e. Islamic and Western, definition of crime is different in meanings and concepts.

"Crime as defined in western law is a voluntary conduct that violates a public law and for which punishment may be imposed in the name of the state."

"Crime as defined in Islamic law is the commission of the prohibited act or the omission of the duty that is commanded. These two definitions are not significantly different."

One major difference between the two theoretical perspectives is that the Islamic law is designed and used as a moralizing instrument and as an agent of prevention.

As we are not discussing crime and its different theories it is useless to discuss crime definitions in detail. We would take legal definition of crime into consideration because legal crime is reported and makes the crime record.

2.3- DEFINITION OF CRIMINAL LAW:

Some acts impair or endanger the internal peace and security of the state and community therefore employs a body of precepts and practices to protect itself by the use of force. Such a body of precepts and practices are termed as "laws" or "codes". Criminal law presupposes a rule of law in defining acts as criminal. It regulates the apprehension, charging and trial of suspected persons and fixes punishments for convicted offenders.

A crime is considered an offence against the state rather than an act against a specific individual.

Therefore, political authority promulgates specific rules regarding human conduct, which are uniformly applicable to all members of all classes. These specific rules are enforced by punishment and ministered by the state.

Sometimes it so happens that an act committed by someone falls within the given definition of crime and purview of criminal law but it is not brought into the notice of or reported to the police or other responsible agencies. In these cases the act is not considered a crime.

2.4- CLASSIFICATION OF CRIME:

Crime is not a homogeneous type of behavior. It differs from society to society because it is related with the customs, values and norms of a particular society. A crime in one society therefore may or may not be regarded a crime in another. Hence there are a number of ways in which crime may be classified. Social scientists have begun to classify criminal activity according to discernible behavior system of those who are engaged in it. This topology holds the advantage of enabling criminologists to apply more accurate methods to the study of criminal behavior.

Crimes are mostly classified into two categories; felonies and misdemeanors; the most serious are felonies and are usually punishable by death or by confinement in a state Jail. On the other hand misdemeanors are also usually punishable but those are punished by confinement in a local Jail or fine.