#### CRIME MAPPING USING TIME SERIES ANALYSIS IN ASABA, DELTA STATE, NIGERIA: A REMOTE SENSING AND GIS APPROACH

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#### ABSTRACT

This study primarily focus on the potential of using remote sensing and geographic information systems (GIS) techniques for crime mapping and attendant management in enhancement of tight security. Without adequate security as in advanced countries fin an enabling peaceful environment to achieve the eight point agenda of millennium development goal (MDG) adopted by the government, is a nullity It has been observed that a large portion of the men in the Nigerian police can hardly ascertain the area of jurisdiction within their station or could define the shortest distance en-route station to specific crime areas in Asaba, Delta state capital the study area. Thus, the police are far from being well and evenly distributed according to geographic spread, population characteristics or crime incidence. The research method involved primary and secondary data for two sections of time series years (A) 2000 - 2006 and (B) year 2004 - 2010 which are the most potent crime related years since the history of state creation are involved. Primary data involve the use of high spatial resolution remotely sensed satellite digital data Landsat TM -2010 image, base maps and crime data from police headquarter. For secondary data, in section A 200 questionnaires were also administered for detailed information. This involved random sampling using 40 questionnaires for each of the five divided zones namely: 1. Nnebesiroa,, 2. Cable point/traffic light area, 3. DBS/government house area, 4.Ezeneiavenue and 5. Dennis Osadebe way, For the year 2000 - 2006 the analysis and interpretation were carried out using Arc View 3.2 GIS software to present the extent of crime rate in the area. Section B involved collection of crime data for the year 2004 -2010 and analysed with ArcGIS, version 9.3 developed by ESRI. Here, four classified zones namely (1) Okpananm road areas, Nnebisi road, West - End and Asaba- Onitsha express; (2)EzeneiAvenue and Cable point, (3) Umaje, Umuagu, Ibusa road and Isieke area and lastly, (4) Direct Labour Road (DLA), and Summit junctions. These areas classified in the two analyses using their current base maps, are denoted as high, medium and low crime rate zones using crime maps of the two sectional time periods. Thus, five and four zones of major crime incident areas were identified for sections A and B respectively based on the integration of crime rate data superimposed on the base maps generated for crime detection, prevention and control.

**Keywords:** Security, Crime, Remote Sensing, Geographic Information Systems, Mapping, Management, Detection, Prevention and Control.

# INTRODUCTION

Smith and Hogen (1996) defined crime as a wrong which the judges have upheld or parliament has from time laid down that are sufficiently injurious to the public to warrant application of criminal procedure to deal with them. Thus, David (1985) stated that crime is an act or omission which is prohibited by theState and therefore attracts punishment. Crime is a social problem and according to Fitzegard et al, (1981) is universal and has varying forms in all cultures and societies at all stages of organization.

The international crime victims survey (ICVS) data carried out on 55 countries that spread over major continents (Africa, Asia, Central and Eastern Europe, Latin America and Western Europe) showed that between 1989 – 1996 period, more than half of the urban respondents reported that they have been victimized at least once regardless of where inhabited in any part of the world (Ackerman and Murray, 2004). It was also observed that high crime rates are not exclusive reserve of few nations, but a unique activity and there is need to explain the geographic variation in the weight and type of crimes. In this line of thought, a lot of researches were carried out on integrating remote sensing and GIS applications for crime prevention and control through crime mapping. Criminal activities are a deterrent as such, places are unattractive to local and foreign investors and this situation prevails in Nigeria and the Niger Delta in particular. The Nigeria security agencies (police, state security service, military intelligence, etc) are charged with the responsibility of combating crimes. The corpsareineffective in combating these crimes in terms of where and when specific crimes are committed.

World distribution of crime across the landscape is geographically random because, it's a human phenomenon. For crime to occur, there are offenders, their target (victims) and properties located at a point in a given period of time. The conventional system of intelligence and crime record has failed to live up to expectations of the existing crime scenario. These are deficient of effective information technology for accurate, reliable and comprehensive data required for prediction and decision support system for maximum productivity and effective utilization of materials and manpower. On remote sensing, the synoptic views and time series offered by aerial photography and satellite data are eminently suitable as a source of information. Apart from the qualitative nature. Earth resources satellite image data are still not widely used for lack of knowledge and insufficient experience in imageinterpretation still hampers the proper use of these important data today. It uses satellite positioning system, reproductive and provide limited visual analysis

GIS involve the use of array of computer hardware and software, for the purpose of data collection, storage, structuring, manipulating, analyzing and visualizing spatial data referenced by geographic coordinates (Kirmerling, 1994). These tools can be adopted by crime officers to effectively plan an emergency response, determine migration priorities, analyzed historical events and accurately predict future events to help identify potential suspects for increased investigation where no leads are evident.

## **STUDY BACKGROUND**

Crime is as old as man himself and efforts have been directed for ways to combat and reduce it. Criminal activities are in the form of robbery, assaults, theft, internet fraud, alteration of documents, impersonation, advance fee fraud, homicides, kidnapping, etc are everyday occurrence in all parts of the world. The alarming increase in rate of criminal activities in Nigeria is reported in local and international media (print and electronic) in reflection of the index for measured status. This is aggravated by the harsh economy coupled with the rush for quick wealth among youths, account for increased crimes. There is a means of attaining an ideal society where individual status are institutionalized to bring about genuine creation of wealth based on high moral standard and conscience. Response capabilities often rely on varieties of data from multiple agencies data sources. This is critical for adequate information for emergency response dispatch, en-route to an incident spot in terms of corps assistance, in technical planning and response. This will also access quickly and process information on display relatively to location in space to allow for allocation of resources (human and finance) much more quickly and effectively. In "critical mission" by law enforcement agencies, information about the location of incident suspect or victim in crime is often crucial to determination of the manner and size of the response.

Available softwares can help to co-ordinate broad locations using multiple data sources to create layers and view the data that is most critical to the particular crime. With this information, crime officers could determine potential crime sites (by examining complex but seemingly related criteria) and displaying them as overlay spatial interface or maps. Furthermore, mapping of the entire population, human and equipment, fixture to provide for safety of citizens by classifying areas as hazardous locationsidentified into high, medium and low risk zones. This reduces the potentials for internal violence by providing better command and control. This approach could be used as an investigative methodology with locations of connected series of crime committed, to determine the most probable areas of the residence of recipients and offenders. It can serve as the melting points for fast reference on suspects and top priority on searches of crime records, patrol saturation and surveillance, neighbourhood input as carried out for crime mapping in Lima and Columbus (Ohio). This technological input allow officers to be better informed on decision making about which area of the city needed additional police power. But the satellite data and GIS tool are not yet used for crime control and management in Nigeria despite benefits offered by the technology.

## STATEMENT OF RESEARCH PROBLEM

Soneye (2002) estimated that a large portion of men of the Nigerian police can hardly ascertain the area under the jurisdiction of their station or define the shortest route from their influence to specific crime zones. In his study on Ikeja LGA, Lagos State using remote sensing and geographic information systems. Like Asaba, he concluded that the police are far from being evenly distributed according to geographic spread, population characteristics or crime incidence.

Asaba bounded by Onitsha, Anambra State is noted for high criminal activities. The Delta State capital is also associated with high crime rate and this is a threat to socio-economic development and the livelihood of the people in the area. The crime incidents include: kidnapping, armed robbery, theft, burglaries, rituals, etc, take place on daily bases in the area. Due to the menace, people and business organizations relocated to the neighbouring abode such as Ibusa, Ogwashu-uku, Okpanam, and Benin City. As a result of increased crime rate, GIS technique could be applied to reduce high crime rate in the area. In the city feast the security outfits (private and government) have tried to improve the state security but to no avail. The increased wave of crime and general insecurity make the people to take extra precaution by spending a huge part of their income on personal security such as erecting high fences, (equipped with barbwire or electrocuting devices), security monitors and dogs, fixing of alarm gadgets in cars and residence.

The Nigeria security agencies appear to be ill equipped with the task of maintaining law and order through crime detection, prosecution, prevention and control. This is as a result of poor information flow between the agencies and the public as well as collective mobilization in their respective spatial location. In the developed nations, the automated systems are used by law enforcement agencies. There is automated vehicle system which Skomas (1981) described as an assemblage of technologies and equipment which permits centralized and automatic determination, display and control of the position and movement of multiple vehicles throughout an appropriately instrumented area. In a similar system described by Froise (1986) is capable of storing up to 30,000 maps per disk and uses satellite positioning system, reproductive and provide limited visual analysis. The traditional method of fixing many pins stuck into the map at "hot spots" allows for crime map, is prevented. Geographic Information Systems (GIS) involves crime mapping on computer i.e. providing data that can be used to produce cost effective and timely varieties of maps. The use of GIS methodology facilitates various tactical and technical operations that would assist the security agencies, to effectively implement their conventional roles of crime detection, prevention and control.

# AIM AND OBJECTIVES

The aim of this study is to examine the effectiveness ofremote sensing and GIS in crime detection, prevention and control. The objectives include to:

- 1) examine the nature and types of crimes and adduce reasons responsible for crimescommitted in the area using two data sets of time variation.
- 2) appraise the awareness and importance of these tools application in crime mapping and management.
- 3) ascertain the effects of crime rate on the economy of Asaba and
- 4) proffer solutions on the problems of high crime rate in the area.

## LIMITATION OF STUDY

To obtain crime data from the Nigerian police is not an easy task as there is no efficient and consistent method of keeping and retrieving data. The conventional methods employed in keeping records make it very difficult to retrieve information needed. Also, some of these records cannot be said to be reliable. There are instances where police officers find it difficult to give phone numbers of their station to the public and related data. Some information are not given (based on security reasons) which are not relayed to the public and therefore, the data collected are supported by the questionnaires.

#### **RESEARCH METHOD**

The data collected for this study using two data sets (A and B) of different time periods are from both primary (direct observation, oral interviews and the use of questionnaire) and secondary sources (textbooks, journals, internet, government publications, etc). 200 questionnaires were administered to randomly cover the entire area section A to retrieve data that is representative.

#### STUDY AREA Location and Size

Asaba is the capital city of Delta State and was created in August  $27^{\text{th}}$  1991 out of the former Bendel State. It also serves as the Local Government headquarter of the Oshimilli South Local Government Area (Fig 1a &1b due to the need of their current base maps for the study). The town is located on the bank of the Niger River. Geographic references indicate that, it is located on latitude  $6^{\circ}30^{i}$  and longitude  $6^{\circ}45^{i}E$  with estimated area extent of about 200 square kilometres. Asaba is made up of few villages that include: Oko-Anala, Oko-Ogbele and Okwe to mention but few them. The main town has a network of good roads, standard hotels and communication facilities. The Niger Bridge connects Asaba to Onitsha in Anambra State but separated by the River Niger.



# CLIMATE

Climate and climatic variables do considerably influence water resources in the area. The climate of the area is defined by high values of evapotranspiration, humidity, temperature and

rainfall that characterized humid tropical equatorial climate of the deltaic environment. The rainfall is mostly conventional and usually falls at any time of the day resulting from the effects of conventional rainfall and blown land and sea breezes

Asaba experiences a humid tropical equatorial climate with fluctuations from humid in the south due to permanent Local influence of the River Niger to the sub humid in the northeast. The two seasonal winds of NE topical continental air mass that blows from October to February and the SW tropical maritime airmass blows from March to September maintains an average tropical temperature during the dry season and an average rainfall during the rainy season. The mean annual rainfall is 1254–3032mm and temperature of 26.7<sup>o</sup>C with relative humidity of about 69-80% and sunshine of 4.8 bars (Asaba Meteorological Bulletin, 2007).

## **GEOLOGY, RELIEF, DRAINAGE AND VEGETATION**

The vegetation is tropical evergreen rainforest with tall trees and undergrowth. This has been interfered by anthropogenic activities such as farming, bush burning, grazing and rapid development in the area. Due to these effects, the vegetation of the study area has been observed as mainly of secondary type with patches of trees in grassland.

River Niger and its tributaries drainage system is characterized by very low velocity of flow due to its low elevation together with very high capacity discharge of sediments. This results in features such as braided channels, lagoons, canals, bars, creeks, meanders as shown in the Nigeria Surveys topographical sheet of the area.map of that result from alternative flooding and exposure episodes of a long rainy season with short dry season accompanied with tidal movements. In the rainy season, high rainfall and poorly drained soil of low retention capacity results in wide spread flooding and erosion. Thus, 80% of the entire area is flooded with the rivers overflowing their banks at the peak of wet season as the coastline is buffeted throughout the year by tidal current (tides) of the Atlantic Ocean (Ejemeyovwi ,2008).

Most of the area lies below sea level (bsl) with only few places of 20mm height above sea level (asl) (Odemero and Ejemeyovwi, 2008). This result in marshy and waterlogged condition of the entire landscape, a poorly drained environment coupled with several tributaries and distributaries that empty waters into the River Niger,

The surface geology of the study area is made up of Ameki and Ogwashi- Asaba formations in the northeast of Delta state and the coastal plain sands (Benin formation) that astride the northern boundary with Edo State and beyond. The Ogwashi-Asaba formation is made up of coarse grained sands containing lignite and peaty clay seams. It is poor of ground water and characterized by the widespread occurrence of lost circulation (Rayment, 1965). Both the Ameki and Ogwashi-Asaba formations are richly endowed with kaolinites, while the latter formation also contains lignite seams Ejemeyovwi (2008). Three geologic formations are recognizable form the distinct attributes of depositional circles of sediments since early cretaceous (135my  $\pm$  65) in the area. They are upper Benin sands, middle Agbadaofinterbedded sands/marine shales and lower Akata made up of massive and regressive marine shales and clays deposits (Nwachukwu and Odjegba, 2001).

## **POPULATION OF THE AREA**

The area is naturally made up mainly of the Igbo (Delta) ethnic group and as a state capital, large population of Urhobo, Itsekiri, Ijaw, Isokos are residents. The total population the area was estimated to be 49,725 in 1991,123,746 in 2006 (NPC,2006) and a population of 1,723,745 due to influx of migrants especially as a state capital.

## **HUMAN ACTIVITIES**

Asaba is mainly an administrative town with high commercial activities carried out. The banking industry has about twenty commercial banks in Asaba, located along the Nnebisi road. There is only one major market in the area, (Ogbogonogo market) which is also located along the Nnebisi road. The State government and the private investors have contributed in no small measure to the development of the place e.g. the Ogbogonogo market was reconstructed by the state government with modern facilities to enhance maximum commercial activities in the area. A small market is alsolocated along the cable point area. There are also high commercial activities in areas of transportation industry with Delta line and private ownership. There are notable companies and hotels in Asaba. These includeindustries such as textile, aluminium industry along the Agbor- Benin expressway, general steel mills (GSM) in Ibusa road and hotels like grand, sunrise, Nairese, etcLumbering activity with saw mills located in the area. The traffic light area have wood/furniture works, due to presence of hard wood of the humid tropical trees with various species such as Opepe, mahogany, matsonia, Iroko, etc.

Agricultural activities in the form of farming, animal husbandry (poultry and rearing of animals) are carried out in the area. When the river Niger overflows its bank, it enriches the soil fertility for the cultivation of crops e.g. cassava, yam, maize in the area. A lot of fishing activities is also carried out along the river Niger and its tributaries. The river Niger beach is a tourist area that is a hospitable place for tourism.

#### SETTLEMENT PATTERN

The settlement pattern of Asaba is a nucleated type of settlement though with some linear disposition. The major road is the Nnebisi road and the river Niger by the town, makes for nucleated pattern of settlement and the houses are closely built but houses across the Onitsha - Asaba expressway are dispersed in a linear pattern.

## **CONCEPTUAL FRAMEWORK**

The conceptual framework of geographic profiling is used to explain how to track and locate crime offenders based on the techniques of GIS in crime detection, prevention and control. Geographic profiling theory was developed by a Vancouver police officer, Detective Inspector Kim Rossmo in 1991 at Simon Frazer University after seven years of research study. The research tool predicts most likely location of offenders (i.e. home, work, social arena, travel outs, etc). It could also be employed in cases involving serious crimes such as kidnapping, sexual assault, homicide, arson, robbery, break and entry, bombing, predatory assault times (sexual, homicide, child molesting), multiple crimes location (telephone calls, credit cards, internet fraud and missing persons). A minimum of five crimes or related sites are required for a complete profile. However, some forms of analysis can be done with fewer sites. The practical display of GIS technique in 1991 was called "Criminal Geographic Targeting". The profiling assisted design is an investigative support technique in violent crimes. It helped prioritize the array of detailed information of crime cases generated as information management strategy. The process is based on software analysis of the various locations of a connected series of offences, neighbourhood characteristics in which they occurred and the psychological profile of criminals to determine the most probable areas in which the offenders reside or work.

Geographical profiling involve information management strategy that can be used in focussing criminals for adequate investigation with Its result help in prioritizing suspects and their locations to develop investigative tactics suitable for an area defined by the "geoprofile". The strategy has provided a geographic focus that optimizes the research for the offender (Rossmo, 2000). The geographic profiling is an effective tool to hit upon the most probable location of the offender and it cannot "solve" cases. It enables crime officers and analysts to focus their investigation on a small part of the community, rather than on the entire city. This means, it reduces the amount of time and resources required for a major investigator. The analysts also determine how sophisticated and organized an offender is, whether the crime was planned or opportune and whether the offenders approach a high or low risk victim. Furthermore, there can be an objective measurement to pinpoint as precisely as possible the locus of points of criminal activities.

The construction of geographic profile in Asaba, Delta State involves complete familiarity with case files, examination of the crime scenes, interview of investigators and witnesses and possession of study area maps and analysis of neighbourhood demographics for both the abduction site and body dumpsite for computerized analysis. The geographical coordinates of incident are determined and the physical addresses of where the victim was last seen or abducted from are noted. Best measures are made by visiting the crime locations and obtaining coordinates with a global positioning system device. Maps produced can indicate the exact location of the incidents and the physical address of the victim and they are amenable to spatial analysis. Most offenders have certain associated places where experience has taught them that suitable victim(s) could be found. The area of interest can be reduced to a great extent for focus on high crime rate areas for detection chances of criminals to increase, since GIS can produce results of spatial queries in specific areas of interest.

## LITERATURE REVIEW

Remote sensing/GIS has great potential in crime management and has been applied in many places experiencing high crime rate. Below is a brief review of related literatures. Rilwani and Eguabor (2000) carried out a research on the need for remote sensing and GIS in crime prevention, detection and control in Edo State Police Command. They came out among other things with the following conclusions: These tools can conventionally used in improving the efficiency of the traditional methods employed by the Edo state Police in fighting of crime and Information including photographs on missing persons especially wanted criminals stored in a GIS environment can be used to locate and rescue missing persons, or detect and apprehend wanted persons for subsequent detention.

Also, the role of remote sensing and GIS in crime management has been given attention by Pickles (1991); Smith (1992); Curry (1998); Monmonier (2001); Crampton (2002), and Cutter et al (2003). The continuous changes in global environment in which large array of data are generated are the inherent limitation posed by processes of conventional analytical technique and the opportunities offered by automation, have all combined to give rise to emergence the techniques in crime management. Sonoye (2002) carried out a research on Remote Sensing/GIS based evaluation of the adequacy of "police stations in Ikeja LGA, Lagos State" and considered a direct relationship between propensity to commit crime and distance away from a police station. Thus, he opined that efforts at mobilizing police facilities

and/or establishing new stations, should give precedence to geographical spread, population characteristics and crime incidents. As a veritable tool for site selection, the application of GIS could yield a remarkable benefits in evaluating and integrating these parameters into selecting suitable sites (for additional stations) if and when considered necessary. Furthermore, he stated the merits for enhanced management of crime is wild or diverse and the tools can be used to select optimal locations for police facilities especially police station, to design and formulate crime-based policies, to analyze the variables that enhance crimes (e.g. the social and economic characteristic of offenders and hot spot areas), to store and retrieve crime records, to pick offenders with global positioning systems (GPS), to visualize crime occurrences and patterns with a view of identifying these hot spot areas.

ESRI (2010) observed that crime mapping and the rate of access to crime management has recently increased tremendously, and the possibility of internet access to these GIS based experiences in the area is being focussed presently. Crime mapping and analysis can support all levels of combating crime; strategic operation and tactic. The increased surveillance (particularly electronically) has given rise to the sobriquet "surveillance society" (Pickles, 1991; Lyon, 1984) that capture the idea that surveillance has become an "institutionally central and pervasive features of modern social life" (Lyon, 1994). There are many surveillance equipments used by the police to monitor and check residents as they go about their daily business (Crampton, 2003) which include closed circuit TVs (CCTVs), digital face matching, such as the one in Tampa Florida (Canedy, 2001). The US Department of Justice criminal analysis application was developed to assist police department in analyzing crime data on a regional basis (David, 1985). The Chicago Police Department also developed an operational centre in an effort to help prevent murders and aggravated battering with firearms The US Federal Bureau of investigation new DNA database combined DNA index system (CODIS) have since 2000, authorized collection of DNA data from persons convicted of violent crimes (FBI, 2001). If these surveillance equipments are relayed to GIS system and subsystem, it will assist the police.

These tools have been very useful in monitoring out-of-jail offenders. In the US, the out-ofjail offenders are required to wear an ankle bracelet or tag which can receive global positioning system signals and transmit its location through a cell phone system to a GIS monitoring centre. In Iowa, the police have required some offenders to wear a device from a company called insecure trace which tracks individuals by GPS and transmits the location to the web or GIS monitoring centre (Crampton, 2003).

To Jeffery and Estes (1990), the major GIS activities can be summarized in 4ms connoting measure, map, monitor and model. GIS evolution emanates from the need to integrate and manage increasingly accessible geographical data on specific phenomena such as crime which usually comes in different themes, sources, scales and formats.

## DATA PRESENTATIONAND ANALYSIS

(A) The year 2000 – 2006. The sampled data were obtained using the stratified random sampling technique for which, Asaba was divided into five major zones (Table1). These are Nnebesi road, cable point/traffic light area, DBS/government house area, Ezenei avenue and Dennis Osadebe way. In these zones, 40 questionnaires were distributed in each to give a total of two hundred questionnaires for the survey administered by Ogobalh, F. O. On the sex of respondents, 65% of the respondents were male while 35% were female of the total population sampled in the area. A number of respondents were sampled ont their opinion on

crime rate in each of the five zones, the respondents are of the opinion that Asabi is noted for (high), crime rate with 123,70 (medium) and 7 (low) in the areas as shown below (table 1).

	High	Medium	Low
Nnebesi Road	18	11	1
Cable/traffic light	45	20	3
DBSgovt house area	15	10	1
Ezenei avenue	20	14	1
Dennis Osadebe	25	15	1
Total	123	70	7

#### TABLE 1: AREAS OF CRIME IN ASABA

Source: Fieldwork

The table shows areas of high crime rate are cable point traffic light and Dennis Osadebe whose record is trailed by Ezenei avenue and Nnebisi road while DBS/govt house have the lowest crime record as shown in crime map (figure 2).



The respondent reasons for high crime rate in Asaba are due to unemployment (55%) while 15% shows that poverty is another factor. In the same vein, low level of education of the people (27.5%) and lack of parental upbringing (2.5%) are adduced reasons that account for high crime rate in the area. On the nature of crimes committed, the respondents(26%) of them sampled strongly believed that burglary is one of the major crimes in the area after armed robbery (29%) with aggravated assault (31.5%) being the most committed crime. Others with 10% for rape, 1% and 2.5% respectively are for murder and others crimes31.5% depicts experienced in Asaba (table 2).

Nature of Crime	No. Of Respondents	Percentage
Burglary	52	26
Robbery	58	29
Aggravated assault	63	31.5
Rape	20	10
Murder	2	1
Others	5	2.5
Total	200	100

#### TABLE 2: NATURE OF CRIME COMMITTED IN ASABA

Source: Fieldwork

According to some police officers interviewed in the B divisional headquarter, crime is perpetuated mostly in slums and squatter settlement in the area. The rapist usually operates at night (usually between 8pm and 5am) in an uncompleted buildings, sawmill, and in mechanic workshops. Such areas include the cable point area, Ogbuosi area, and around the Niger bridge.

On how crimes affects the social economic development, 24.5% of respondents agreed that migration of people from the area hampered the socio-economic development of Asaba, 15.5% are of the view that relocation of establishment from the area also affect the socio-economic development, 5% stated that crime has led to high governmental spending on security system and 55% strongly agreed that crime has disrupted the commercial activities in the area.

On the assessment on effectiveness of various ways of detecting criminals, 26.5% indicated that police in Asaba combat crime by mounting road blocks and checkpoints, 45% stated that police arrest and detain criminals as a means of crime control and detection. However, 15% also share their view that police use patrol team as a means of controlling crime in Asaba while 10% and 3.5% are of the opinion that police uses informant and other means to combat crime in the area.

#### **CRIME STATISTICS**

The crime data were collected from B division headquarters, Asaba(Table3). This comprises of annual recorded summary of crime types committed. The crime recorded are shown in table 3 that include murder, man slaughter, attempted murder, suicide, assault, rape and indecent assault, kidnapping, armed robbery, theft and other stealing, burglary and house breaking. It is observed that the year 2000 and 2002 recorded the highest crime, followed by 2001 and 2003 years. There was a slight drop in crime rate from the year 2003 – 2006.

Types of Crime	Years		-	-	-	-	
	2000	2001	2002	2003	2004	2005	2006
Murder	15	10	20	3	5	6	4
Slaughter	12	7	15	1	1	2	-
Attempted murder	25	20	40	8	6	3	1
Suicide	1	-	-	-	-	1	-
Assault	35	40	50	25	30	20	17
Rape and indecent assault	4	5	-	4	3	4	2
Robbery	3	3	1	2	1	3	-
Armed Robbery	38	45	35	30	22	20	17
Theft and other stealing	40	33	30	22	30	40	38
Burglary	21	17	15	12	10	7	2
House Breaking	17	18	17	20	15	20	10
Annual total crime committed	211	197	223	127	123	126	91

## TABLE 3: CRIME STATISTICS RETURNED FROM THE YEAR 2000 - 2006.

Source: B Division Crime Statistics Return.

There is a graphical fluctuation of crime record between the 2003, 2004, and 2005 years corresponding with 127, 123 and 126 to a drop of 91 in 2006 respectively. This is illustrated with line graph in figure 3 below.



Years

Fig. 3: A line graph showing crime statistic of the year 2000 to 2006.

The reduction in crime according police resulted from improved new methods of crime prevention and control as well as effective training of officers for crime detection in the area. These include installation of car gadgets, effective communication system and situational report in the police department. He explained further the reasons for high crime rate recorded in the year 2002 resulted from political atrocities committed amongst politicians and their opponents during the election period. AThe trend is illustrated with line graph above.

The public interviews observed that most crimes were not detected or reported for documentation as there is no love lost between the police and public. The police are not friendly, as most information volunteered end up in hands of criminal and the people with their families live in danger.

## (A) SUMMARY OF FINDINGS

The crime rate in Asaba and indeed all parts of the Niger Delta have increased over the years with perfection and sophistication. The security agencies are ill equipped in effective handling of array of data that justify high technology and sufficient manpower. To define the jurisdiction of specific police stations adequately is still a problem for both the force and the populace. Indeed, citizens hardly know which specific station to go to when they are victims of any crime occurrences. GIS could be used to embark on vigorous enlightenment campaigns and education of all concerned. That, GIS can go a long way in achieving this justifies the need for the usel of the tool in the basic training and skill development programmes of the force at all levels (Sonoye, 2002). These have not been able to effectively tackle the issue of crime particularly Asaba and generally in Nigeria. Based on the study, the crime rate in Asaba and all parts of the Niger is high, due to the high level of unemployment and low level of education. GIS could be used in improving the conventional method used by the police in fighting crime rather road blocks to locate and apprehend wanted person. GIS can also be used for 24 hours surveillance of high crime areas for control and prevention as shown in this research work

#### B) The year 2004 – 2010

This section is aimed at presenting and discussing the findings of the study of the use of geographical information system (GIS) in crime trends in Asaba between 2004 and 2010 is presented in survey carried out by Mr Osu Micheal. The findings based on analysed data collected are as follows:.

## TYPES OF CRIMES REPORTED IN ASABA

The various types of crime committed in Asaba as reported by the Nigeria Police Force for the period 2004 -2010 showed that a total of six hundred and twenty eight (628) cases of armed robbery, Eight thousand, one hundred and four (8104) cases of assault on persons, Fifteen thousand, three hundred and thirty five (15,335) cases of stealing, Nine (9) cases of kidnapping, Nine hundred and ninety two (992) cases of malicious damages, fifty five (55) cases of murder. While the rape cases were three hundred and twenty nine (329), other minor crime were eight hundred and twenty five(825) (see Table 4 and Fig 3 for details.

Table 4.1: Showing True crimes reported in Asaba

Zones		Okpanam	g	Inebisi rd	Vest End	saba-	Dnithsa	xpress	zenei	ve	able	oint	Imueze	unaba vgiri Str		Jmuagu	sieke	Jmuaje
Year	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007
Armed Robbery	20	OE	23	13	15	28	24	31	36	35	17	21	25	23	10	19	20	21
Assault	1020	306	670	224	227	75	63	600	201	600	215	220	60	20	540	269	500	198
Stealing	800	623	504	229	336	1000	750	753	600	510	220	330	1002	713	600	450	400	196
Kidnaping	0	0	o	0	0	4	1	0	0	0	0	0	0	-	0	0	a	0
Mallcious damages	27	81	20	42	48	30	24	25	72	27	38	40	25	20	23	50	20	40
Murder	6	0	61	2	4	9	64	5	61	0	0	0	Ħ	ri -	0	0	+	1
Kape	19	12	17	14	17	18	10	17	12	21	11	19	15	φ	in	2	15	6
Others	51	42	31	15	13	40	45	50	45	31	14	10	39	\$	41	5	20	6

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nisa rd	2008	23	203	300	5	*	4		
	2009	21	55	800	0	23	0	ß	30
	2010	25	45	529	0	15	0	4	31
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aves	2010	15	49	609	7		4		
			1010	1535	6	992	55	329	82
		628	8104	2					

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Fig 3: crimes committed in Asaba

## **ROLE OF THE NIGERIA POLICE IN CRIME DETECTIONS AND CONTROL**

The Nigeria Police Force is charged with the responsibility of the maintaining law and order and protection of lives and properties of the Nigeria citizenry. In a bid to carry out these statutory duties, the law enforcement agent of the Government ensures that there is peace, decorum and sanity in their areas of operation. This is done by routine checks of vehicles on the roads/ street as well as periodic and scheduled patrols by men of the police forces to forestall peace, to scare, monitor or arrest criminal and other offenders of the law. To effectively carrying out their patrol activities in Asaba, Geographical information system could be used to map the patrol line (GIS produced map) for several patrol vans/ teams for effective crime control and monitoring in the area. (see Fig 4)



#### ROLE OF GIS AS A TOOL FOR CRIME MONITORING (HOT SPOT **DELINEATION**)

Geographical information system is an effective tool in crime monitory through the mapping of the crime hot spots in Asaba (Fig.5 and Fig.6).





## INTEGRATED GIS WITH TRADITIONAL POLICE METHOD

Geographic Information System (GIS) tools are expensive although it could be used in improving the efficiency of the conventional method employed by the police in fighting crime. To define the jurisdiction of specific police stations adequately is still a problem to both the force and the populace. Indeed, citizens hardly know which specific station to go to when they are victims of any crime occurrences. GIS could be used to embark on vigorous enlightenment campaigns and education of all concerned.Remote sensing and GIS can go a long way in achieving this feat but it justifies the need for the appraisal of the tools in basic training and skill development programmes(reference level) of the security forces at all levels,The effectiveness of GIS has to do with scientific and timely information management and communication that are essential for security agencies operation. This compliment men on patrol based on geographical data on areas of high crime rate, commercial areas, areas of government institutions as well as areas with sensitive installation can be used by police on duty (Rilwani and Eguabor, 2000)

#### **B). SUMMARY OF FINDINGS**

The following are the major findings

Crimes of various types increased over the years from (2004-2010) in Asaba as result of political activities but had a unique features in each of the zones. The political hub areas in zone A and B had started to experience kidnapping which was alien to the areas, the traditional zones had fewer crimes reported.

This study revealed one striking reality necessary for consideration which is that, the areas of high crimes for the period of 2004- 2010 were Okpananm road areas, Nnebisi road, West -End and Asaba- Onitsha express. These are areas of high socio- economic activities as well as the political hub of the town while Direct Labour Road (DLA), Cable point, Umueze, Jesus saves, Agiri Street, Ezenei Avenue as well as Summit junction roads are areas of moderate crimes. These are areas with markets and other moderate economic activities. In the low crime category are areas such as Umaje, Umuagu, Ibusa Road, and Isieke area which are highly traditional buildings harbouring the indigenes of Asaba.

## CONCLUSION

The study involved understanding pertinent locations and spatial pattern of crime monitoring over a tine series period of seven years of two data sets (2000-2006) and (2004 -2010) in Asaba, Delta State. The results have far reaching implication of security planning and management. Also, the findings have far reaching implications for road monitoring and road patrol in the country especially when similar studies are conducted in other parts of Nigeria. It can form the basis for generating regional or national empirical modals based on the peculiar crime factors identified in this study. Therefore, to stem crimes in Asaba, the Nigeria police and other security agencies should intensify more efforts and opt for the application of GIS in the quest for effective policing and crime management.

#### **RECOMMENDATIONS**

The following recommendations are made based on this research study.

- The government, (Federal, State and Local Government) should set up remote sensing • and GIS departments for security agencies to provide timely spatial analysis of crime location, human and resource allocation for administrative planning.
- The patrol units should be equipped with GIS facilities and relay with remote sensing • equipment such that human and financial allocations could be known for timely intervention by for response.
- Crime data should be pasted on web sites to facilitate data sharing, in upsetting some security and privacy concern.
- Government should provide more employment skill acquisition and grantand micro credits to youths in the area.
- Furthermore, an enabling peaceful environment be created with this methodology • already adopted by developed countries for foreigninvestors into the area. These will go a long way in minimizing high crime rate in Nigeria fornational security, political stability for economic development.

#### REFERENCES

- Ackerman, W. V. & Murray, A. T. (2004). Assessing spatial pattern of crime, Lima Ohio.Elservier Ltd, Great Britain, PPI-50.
- Allen, J. R. L. (1963). Late Quaternary Niger Delta. Geol.Enmajubu.Journal., Vol. 5, pp. 1-12.

Anne, C. (2004). GIS fight crime. Chicago Week.GM Enterprise, U.S.A.

- Canedy, D. (2001). Tampa scans the face in its crowd for criminal. New York Times, July 4, U.S.A.
- Chabrow, E. (2002). Every move you make, every breath you take. Information Week, August 30.
- Crampton, J. W. (2002). The risk of security, environment and planning. Society and Space. Vol. 20, Pp. 631 – 635.
- (1998).Digital Geographic R. Places: Living with Curry, M. Information Technologies, Routledge, P. 12. London and New York, pp. 10-15.
- Cutter, S. L.; Richardson, D. & Wilbank, T. (2003). The geographical dimension of Terrorism; Action Items and Research Properties. Routledge, P. 23. London and New York.
- Clinnard, M. B. & Abbot, D. J. (1973). Crime in developing countries: A comparative perspective: John Wiley and Sons, London, 8p.
- David, J. S. (1985). Police and People. John Wiley Publication, London. Pp. 21-42.
- Ejemeyovwi, D.O. (2008). The environment of the Niger Delta. A contribution in G, Ojie (ed.) reversed Man and his Environment. A publication of GST, Delta State University. In Press.
- Odemerho, F & Ejemeyovwi, D. O. (2008The physiographic and drainage system of Delta State, Nigeria. In Odemerho, F.(ed.). Delta State in maps. A publication of Geography and Regional Planning Delta State university, Abraka.,vol.1.pp1-10
- Emeji, M.J. & Obinna, V. C. (2002). An environmental management framework for the Niger Delta Issues, Forms and Challenges. African Jour. of Environmental Studies, vol. 3, no. 12, pp. 172-181.
- Evamy, B.O.; Horemboure, J.; Kamerling, P.; knoap, W.A.L,; Molloy. F.A. &Rowkinds, P.R. (1978).Hydrocarbon habitat of tertiary Niger Delta.InAAPGBulls;vol 622, no.1, pp 1-3.
- ESRI, (2010), ARC Views Vol. 3, September 15.
- Fitzegard, M. G., Molennar, O. A. & Panson, J. (1981). Crime and Society. Routledge and K. Paul Ltd. London. . 348 p.
- Friedman, A. R. (2000), Advanced Statistic for Economists, New York, Routledge, Pp 272.
- Hacking, A. (1990). Space of surveillant stimulation, New York, Routledge, pp. 131 148.
- Jeffery, S. & Estes, J. (1990). Geographic Information System: An Introduction Prentice Hall, New Jersey, 13 p.
- Kimerling, J. A. (1994). Geographic Information System and Cartography. Proceedings of the Seminar and Teaching Conventional Digital Line.Istanbul Technical University, Istanbul, Turkey, Pp. 35 – 47.
- Kartik, K. (2004). Application of GIS in crime analysis and geographic profiling, India Indus Corp Pub Ltd.
- Laboratory, (2000) U.S. Department of Justice Washington, D.CPsp.1-17.
- Lyon, D. (1994). The electronic eye, the rise surveillance society. University of Minneapolis Press, P. 259.
- Monmornier, M. K. (2002). Spying and maps, Chicago University Press, USA; P. 242.
- Murray, O. (2001). Explanatory spatial data analysis techniques for examining urban crime.Britt. 1. Criminol. Vol. 4, Pp. 308 - 329.
- Nwachukwu, J. J. & Odjegba, E.T. (2001), Compaction in a reservoir Sandstone of the Niger Delta. Nigeria Jour. of Mining and Geology, vol. 37, No.2pp208-307.
- Odemerho, F. (2008). The geology of Delta Sate. In Odemerho, F. (ed.) Delta State in maps. A publication of Geography and Regional Planning Department, Delta State University press.Abraka.

- Odemerho, F &Ejemeyovwi, D. O.(2008). The physiographic and drainage system of Delta State, Nigeria. In Odemerho, F. (ed.). Delta State in maps. A publication of Geography and Regional Planning, Delta State university, Abraka.
- Pickle, J. (1991). Geography, GIS and the surveillantsociety. Papers and processing of applied Geography Conference, Vol. 14, Pp. 80 90.
- Rilwani, M. I. &Eguabor, D. (2000).The need for GIS in crime prevention, detection and control.A case study of Edo State Police Command, Journal of the Nigeria Cartographic Association, pp. 86 -95.
- Reijers, T.J.A. (1996). Selected chapters in Niger Delta geology, Lagos: SPDC Publication, Lagos, Nigeria.
- Skomal, E. N. (1981). Automatic Vehicle Locating System. Van Nostrand Reinhold, New York. Pp. 3 4.
- Smith, N. (1992), Progress in Human Geography, New York University Press, Pp. 257 271.
- Smith, R. S. & Hogen, O. J. (1996). The Justice System. New York University Press, 123p.
- Sonoye, A. S. O. (2002). A GIS based evaluation of the adequacy of Police Station IkejaLGA, Lagos State. The Nigeria Cartographic Association, Pp. 50–59.