Crime Pattern Analysis and Hot Spot Analysis in Bishnupur District of Manipur

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Abstract— Manipur a northeastern state of India reported increasing crime rate as per NCRB records. Crime mapping using GIS environment in India is in budding stage and it is almost nil in the state of Manipur. Mapping different categories of crime/ criminal activity for pattern analysis and hotspot analysis is being done in the Bishnupur District of Manipur. There are alto-gather seven police stations in this district. Present study is dealing with spatial analysis of criminal activities for five years (2016–2020) using Spatial Statistics tool and hotspot analysis (Getis-ord Gi*). Mapping of crime location(point mapping), density map and hotspot analysis map are carried out using ArcGIS. Statistical database of criminal activities were taken up, involving different nature of crime which are categorized as property crime, suicide, crime against women, terrorist act. Date, time and location are also considered for this study. The result of the study shows spatial concentration of criminal activities like property crime records the highest in Nambol, Manipur. Jurisdiction under Nambol Police Station recorded the highest number of crime as compare to other police stations of the district during this period. And that Keibul Lamjao Police Station recorded the lowest number of criminal activities.

Crime pattern analysis is definitely going help in improving our understanding of the dynamics of unlawful activities and can enhance prediction policing. Policy makers of police department will be benefited from complex maps of criminal activities in Tactical crime analysis.

Index Terms— Crime mapping, pattern analysis, hotspot analysis

I. INTRODUCTION

Crime exists from the time immemorial but considered as crime only when law came into existence. Crime is human displeasing and immoral act that is not accepted by the society or government. Its definition is varied from state to state and country to country. An act can be a crime in one place and the same act is not considered a crime in another e.g. Liquor act. With the advancement in technology criminals are running fast and ahead of the criminal justice systems. Hence, criminal justice systems are now depending on scientific technique to solve and technology to predict and prevent crime.

Crime rate in Manipur is also increasing day by day and need of investigation and analysis become a must. Crime mapping using GIS environment in India is in budding stage and it is almost nil in the state of Manipur.[1]

Taking advantage of Technology, strategic crime analysis can be evident with the help of GIS. Why is crime mapping necessary? It is to understand the whole scenario of criminal activities like crime location, crime pattern, hotspot, other statistical analysis, etc. Why GIS? It is to understand why crime occurs. GIS environment solved problems related with space and time. Crime occurs because space and time of criminal activities intersects with space and time of victims.[8]

Space-time integration in crime mapping using GIS environment is to study the Past historical events of criminal activities for its interpretation & documenting and Real time understanding of criminal events for modelling of Future criminal scenario.[5]

Ready for reference map is generated for crime pattern analysis and hot spot analysis for Bishnupur district as the study area. Maps enable areas of unusually high or low concentration of crime along with the spatial density to be visually identified. Point maps, nature of crime map, density maps, hot spot analysis maps and buffer are generated for easy reference of spatial analysis so that policy makers and administrator may adopt policies and programme for criminal activities prevention.[2]

Analysis of criminal activities and nature of crime are done for three blocks of Bishnupur district of Manipur, India. In order to identify the sensitive areas; proximity analysis for buffer identification is being done in ArcGIS.[6]

II. DATABASE AND METHODOLOGY

The entire database is gathered from the spot and the department of Police, Government of Manipur. Date, time and location data of criminal activities from the Police Stations are collected for the study. Statistical database of criminal activities were taken up, involving different nature of crime which are categorized as property crime, suicide, murder, crime against women, terrorist act. Criminal activity like Burglary, theft, robbery and vehicle lifting are listed under the property crime category. Hanging, drug overdose, drowning and all the accidental deaths are listed in suicide

category. All criminal acts like molestation, domestic violence, sexual assault, rape are listed in crime against women category. Criminal act like bomb explosion, encounter, drug trafficking and kidnaping are listed as terrorist act. Homicide by shooting, stabbing, strangulation, beating etc. are considered murder category.[3]

Some of the location data are taken on the spot using GPS while others are located on the google earth. Present study is dealing with spatial analysis of criminal activities for five years (2016–2020) using Spatial Statistics tool and spatial analyst tool. Hotspot analysis using Getis-ord Gi* was performed. Mapping of crime location(point mapping), density map etc. are carried out using ArcGIS. Buffer of 500m is obtained for hotspot area. The model helps to identify spatial concentration of crimes in the district of Bishnupur.[7]

III. STUDY AREA

Bishnupur is one of the district of Manipur in Indian northeastern states Stretching between 93.43 degree E and 93.53 degree E Longitudes and 24.18 degree N and 24.44 degree N Latitudes, the total geographical area of the District is 496 Sq. Km. (https://bishnupur.nic.in/) Bishnupur district comprises of three sub divisions/blocks as Moirang, Bishnupur, and Nambol and has seven Police Stations (PS) viz. Bishnupur PS, Nambol PS, Moirang PS, Kumbi PS, Loktak PS, Keibul Lamjao PS, and Women PS. Its Population is 237,399 [2011]. Total population of Nambol block is 61882, population of Moirang block is 112,739 and that of Bishnupur block is 62.778. It is just around 15Km from Imphal (kangla). It is one of the biggest business centre of Bishnupur district.[4]
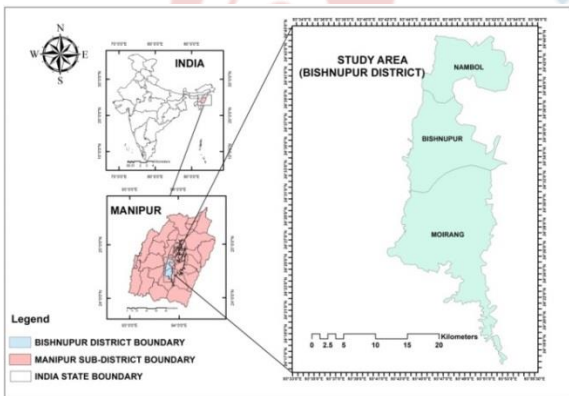

Figure 1. Study area.

IV. RESULT

Spatial and statistical analysis of databases is performed in GIS platform. It was found that property crime is the most abundant crime in the district during 2016- 2020. The study analyzed Nambol block area; it shows as hotspot area as compared with other two blocks. Crime is found to be clustered in Nambol area especially in Nambol bazar and Oinam bazar areas with high concentration of property crime and terrorist act. Property crime followed by the terrorist act is the highest criminal activity taken placed in the district. Same pattern is followed in Nambol block too. Suicide is the least occurred crime in the district. In order to identify the sensitive areas; proximity analysis for buffer identification is being done. From the 500m buffer map we can see that most of the crime buffer area overlaps with each other. It shows that crime occurrence is very congested towards each other.

V. CONCLUSION

Criminal activities are most frequented in the jurisdiction of Nambol block during the five year duration of 2016 to2020 considered for present study. However, Police stations viz. Kumbi Police station, Loktak Police Station and Keibul Lamjao Police Station recorded very less number of crimes hence included under Moirang block. Women Police Station is included in Bishnupur block for the study. Nambol Police station is taken as crime incidence for Nambol Blok. There is congestion of dwelling in Nambol region. Nambol is also one of the biggest business centre of Bishnupur district and nearest to Imphal, the capital city of Manipur.

Analysis of criminal activities and nature of crime are done for the three blocks in the Bishnupur district of Manipur, India. New police outposts or frequency of police patrol may increase in or around Hot Spot areas or in the buffer region Nambol block. This will also be helpful in adopting preventive measures in the district. A concrete idea about criminal activities in the district will be gained by crime analyst and policy maker from the present study.
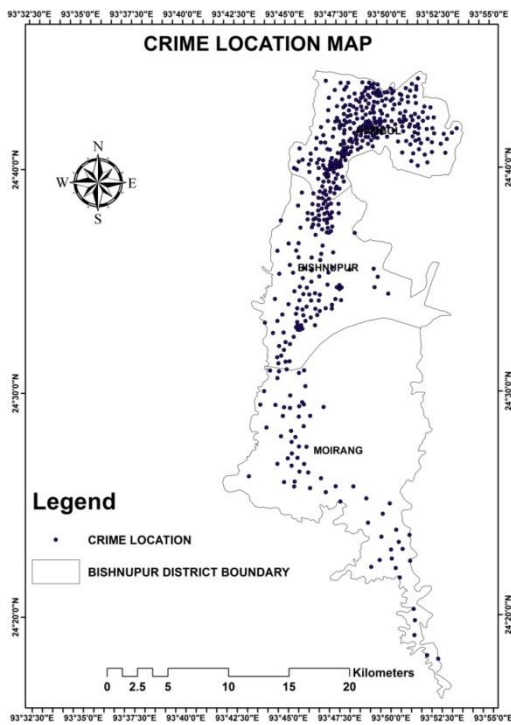
Table 1. Number of crime category wise in three blocks

SUB- DIVISION (block)	CRIME AGAINST WOMEN	MURDER	PROPERTY CRIME	SUICIDE	TERRORIST ACT
NAMBOL	35	22	172	13	68
BISHNUPUR	16	15	81	3	28
MOIRANG	10	11	37	4	7
TOTAL	**61**	**48**	**290**	**20**	**103**

Figure2. Point data analysis of various nature of crime occurrence in Bishnupur District, Manipur(location map)
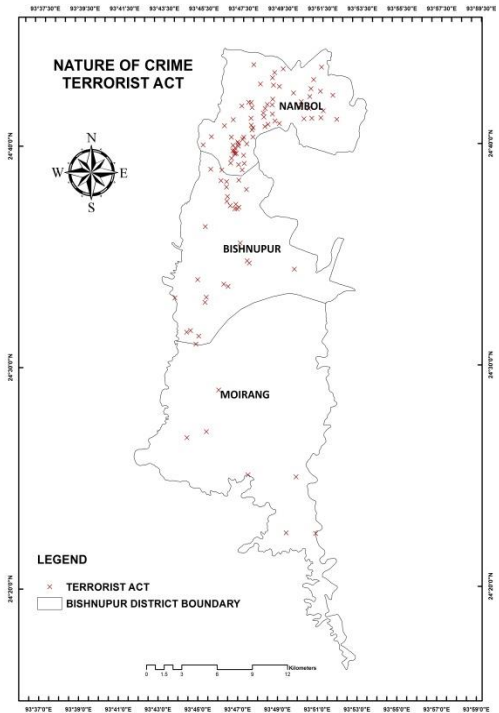

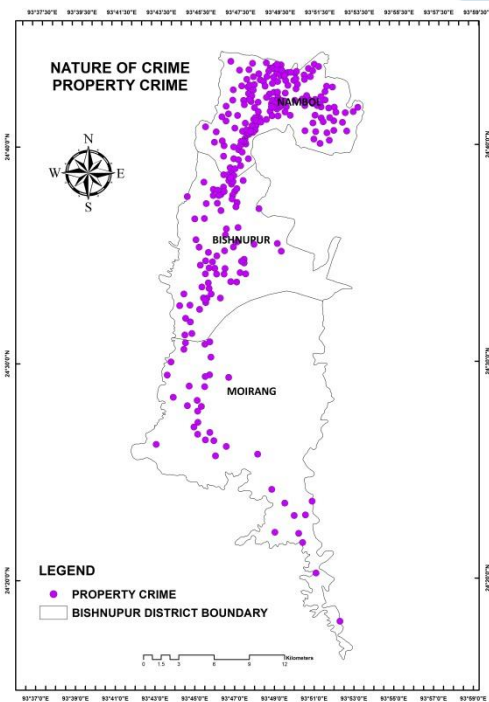**Figure 3(b).**Pattern analysis for Terrorist Act in Bishnupur district.

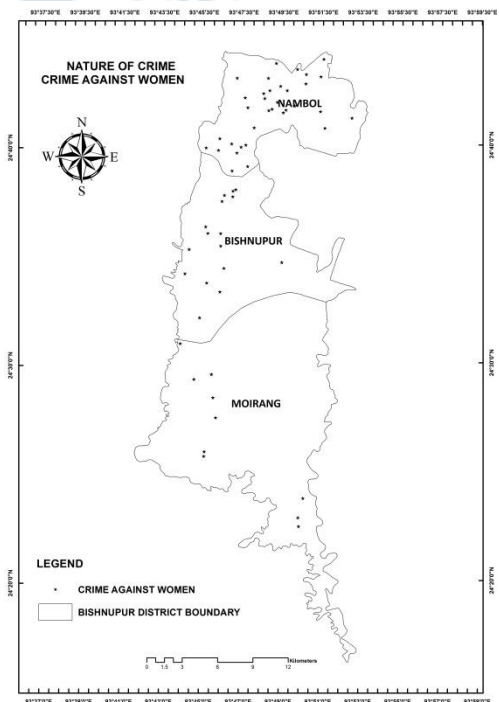**Figure 3(a).** Pattern analysis for Property crime in Bishnupur district.

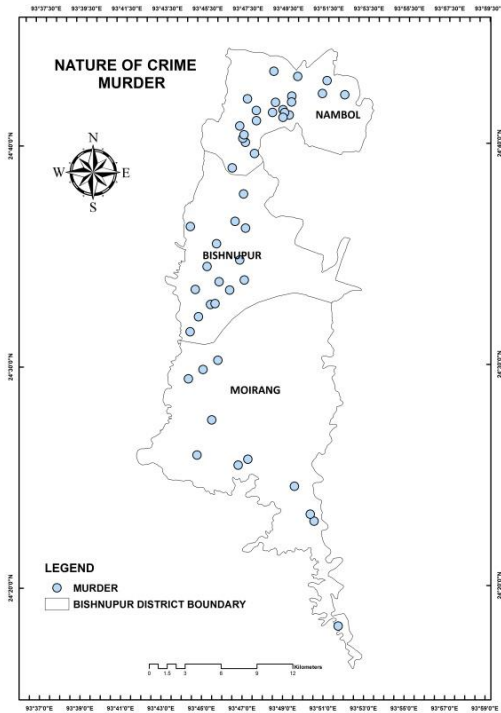**Figure 3(c).** Pattern analysis for crime against women in Bishnupur district.

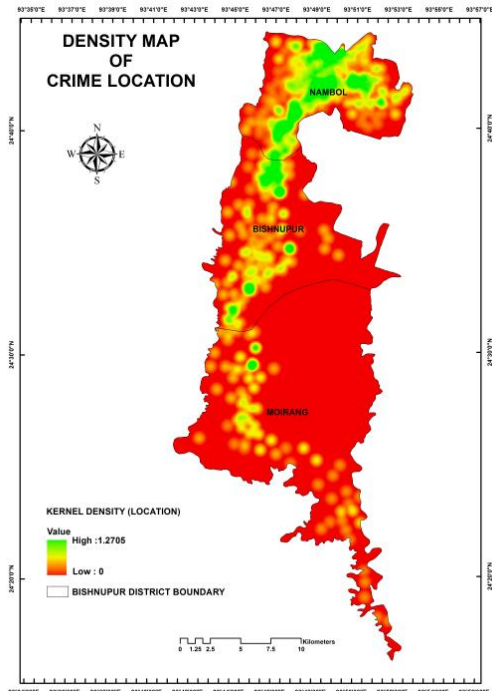**Figure 3(d).** Pattern analysis for murder in Bishnupur district.

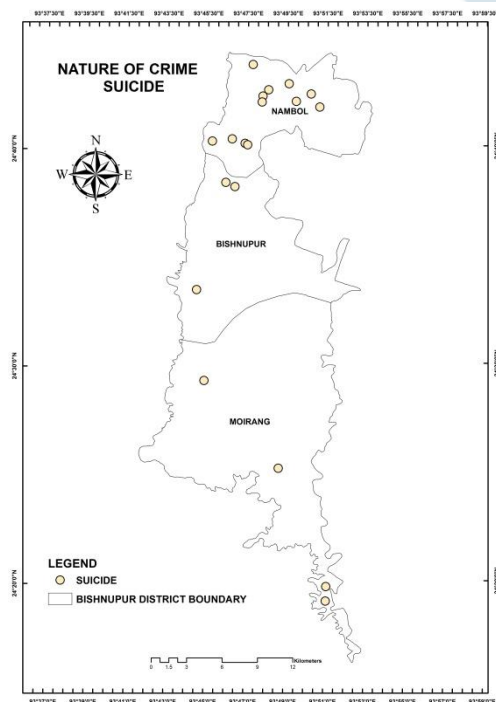**Figure 4.** Crime density analysis of Bishnupur District.

Figure 3(e) Pattern analysis for suicide in Bishnupur District.
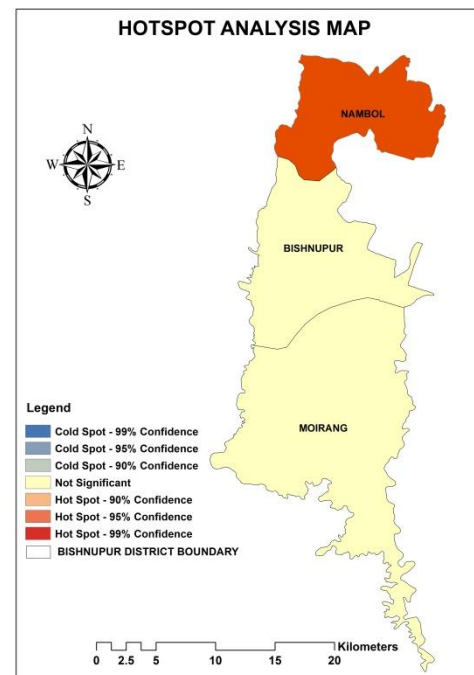

Figure 5. Hotspot analysis of Bishnupur district, Manipur using Getis- Ord- G* method.
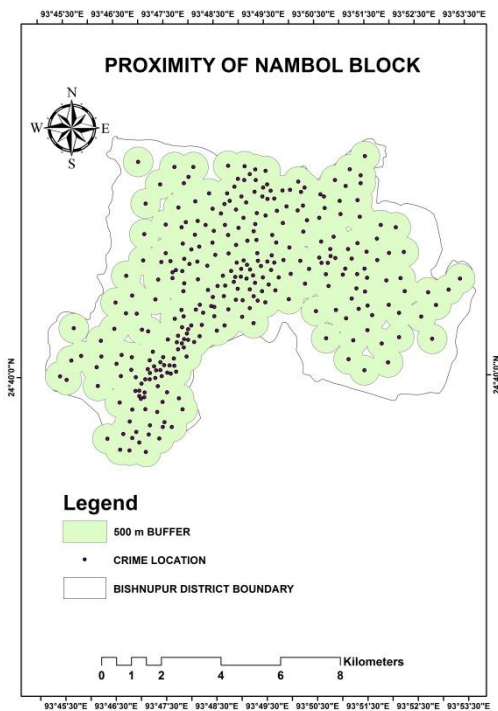
Figure 6. Discrete subset analysis of crime location buffer of 500m in Nambol Block of Bishnupur district.

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