

## Geospatial Analysis of Crime in Ajmer City with Respect to Clock Tower

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## Abstract

Crime is an act generally accepted to cause harm or damage to people, and its purpose is clearly defined and punished under law. According to Mayhew (2009), crime and geography are interrelated in many ways. Crime geography studies the analysis of crime, its place, and the impact of crime (including criminals) to understand how crime is influenced by society and space. This study includes the crime analysis and geographical area of Bell Tower Police Station, showing the location and time of crime from 2009 to 2019. The frequency and decline help us better understand crime and its occurrence. The main objective of this study is to improve the existing knowledge about crime and its occurrence in Ajmer city and provinces. This study aims to shed light on crime in Ajmer city, Rajasthan.

According to Mayhew (2009), the crime area refers to the study of crime with the aim of gaining knowledge about the effects of crime, criminal behavior, and the interaction of crime with people and places, including criminals. Cain's jealousy manifested itself in the killing of Habil (son of Adam and Eve), which led to the first crime in human history (Gillani, Mahmud, Rehman, & Rashid, 2008). Violence always causes unrest and distrust in society. Simply put, crime is a crime because it attempts to obtain something or break a law.

Geography is essential when studying crime because there is always a place, time, and reason for a crime. Understanding crime patterns can help in:

- Identifying where crime occurs most frequently.
- Combating crime.
- Establishing areas where crime is more prevalent.

Crime is considered harmful behavior that injures people and is prohibited and punishable by law.

Why people commit crimes without thinking about consequences can be attributed to several factors:

- **Parental Sociability:** Cleckley's concept of sociopathy was adopted in the 1980s to explain the family "Cycle of Violence." Children who are neglected or abused tend to commit more crimes later in life. (Roy Morsch/Corbis)

- **Heredity and Brain Activity:** In 1961, prisoners in California underwent lobotomies, often performed on inmates. (Ted Streshinsky/Corbis)
- **Education:** Merton's study on state prisoners (1990s) revealed that education was generally very low, with many criminals unable to read beyond primary school. Crimes such as theft, robbery, car theft, drug offenses, and shoplifting are among the most severe. Poverty, unemployment, and low standards of living can make people more likely to engage in criminal activities.

This study aims to analyze crime patterns in Ajmer city, Rajasthan. Crime and each area's circumstances have a geographical significance, and this study will help understand the phenomenon better through the following purposes:

1. Conduct a detailed spatio-temporal analysis of crime incidents (2009-2019).
2. Discuss crimes against women, such as rape, insults to dignity, harassment, and dowry deaths, which occurred at Clock Tower Police Station, Ajmer city.
3. Suggest measures for the increase/decrease in crime and assess the status of crime reporting.
4. Promote public awareness regarding the spread of crime and advocate for its reduction.

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## Area of Study

This study examines the pattern, location, and timing of crime incidents from 2009 to 2019 in Ajmer city, located at 27.0238°N latitude and 74.2179°E longitude in Rajasthan, India. Ajmer has a total area of 342,239 square kilometers and is situated on the lower slopes of the Taragarh hills, covering 8,481 square kilometers. The Nagpahar range separates Ajmer from the Thar Desert. According to Kannan (2013), Rajasthan is the largest state in India, spanning 342,239 square kilometers, and is one of the ten largest states by population. The Aravalli Range divides the state into two parts, extending 690 miles from Delhi to Gujarat.

Ajmer, located in the "Heart of Rajasthan," has nine villages, 1,111 hamlets, and three census villages, with a population of 543,000 (2011 census). The economy includes farming, industrial activities, and services such as financial markets and food franchises. Ajmer, designated as a smart city, is enhancing its infrastructure and consists of 12 divisions spread across 16 tehsils. There are also nine Panchayat Samitis in the district.

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This study involves crime analysis and geographical data from the Clock Tower Police Station, focusing on crimes committed between 2009 and 2019. The crimes, including gambling, Excise Act violations, theft, and car theft, are analyzed for their frequency. Understanding the spread of crime over the years and regions helps us grasp the factors contributing to its increase or decrease.

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## Literature Review

The literature review focuses on key research topics such as violence and crime. Information has been gathered from textbooks and various specialized studies, emphasizing the effects of crime in society over time and across different locations. This review summarizes significant studies on crime in India and other nations.

The **Oxford English Dictionary** defines crime as "an act prohibited by law or prescribed for public welfare and punishable by law." According to Nigam (1965) in *Criminal Law in India*, understanding the law is crucial, as crime and law are interrelated. Traditionally, law is seen as an order prohibiting certain actions, making crime an offense against this order. However, not all disobedience to the law constitutes a crime; for instance, civil law violations might not always be criminal offenses. Nigam identifies three aspects of crime:

1. **Injury:** Crime results from human acts that the state seeks to protect against.
2. **Punishment:** Protection involves the threat of punishment.
3. **Legal Process:** A specific legal process is used to determine the causation of injury and appropriate punishment.

The complexity of crime is evident, as criminals often exploit societal vulnerabilities. For instance, Fischer (2001) analyzed data from 1986 to 1998 and concluded that direct democracy has little effect on crime rates in Swiss cantons. In a study by Fajnzylber, Laderman, and Loayza (2002), a positive correlation was found between crime and income inequality across 39 countries from 1965 to 1995. Farrell et al. (2011) and Elonheimo (2014) noted a long-term decline in crime in many developed countries, but evidence for a similar trend in developing countries remains scant. Cohen and Felson (1979) argue that rising populations in developing countries correlate with increasing crime rates. Nick Ross (2013) highlights an increase in theft in rural China during its economic boom, exemplifying how modernization can lead to new crime patterns.

Kannan (2020) observes that urban change significantly affects social structures, with women experiencing these changes differently than men.

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## Methodology

Crime exhibits geographical characteristics, with the location of incidents being crucial to understanding crime dynamics. Data collection is essential for effective research, necessitating well-defined methods for gathering, designing, processing, and interpreting data.

This study aims to narrate the crime landscape in **Ajmer city**, a cultural hub that includes tourist hotspots like **Dargah Sharif** and **Pushkar**. Crime data from the **Clock Tower police station**, covering the period from 2009 to 2019, serves as the primary source for analysis.

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## Incidents and Discussions

Annual crime incidents at the **City Tower Police Station** are recorded in the Crime Reporting Book under the Indian Penal Code (IPC) and Code of Criminal Procedure (CrPC). The site of crime aids in deriving conclusions based on definitive data regarding crime frequency and trends. Key crime categories include:

- **Gambling:** Betting on uncertain events for monetary gain.
- **Theft:** Illegally removing property without consent.

### Crime Data Overview

- **Total Crimes in 2011:**
  - Gambling: 735 (11% increase from previous year)
  - Law Violations: 346
  - Car Theft: 179 (2% increase over 11 years)
  - Theft: 192 (4% increase from 2009 to 2019)

### Comparative Crime Rates (2009 vs. 2019)

Type of Crime	2009 (%)	2019 (%)	% Difference
Gambling	19.72	31.7	+11.98
Special Consumption Tax Law	16.7	5.20	-11.5
Theft	3.8	7.51	+3.71
Car Theft	7.3	9.3	+2%

### Characteristics of Clock Tower Crime Trends

#### Historical Trends:

- 1991-2000: 23.4%
- 1981-1990: 22.4%
- 1971-1980: 17.5%

**Location Impact:** Proximity to transportation hubs increases crime due to higher foot traffic.

#### Contributing Factors:

- Unemployment
- Overcrowding
- Poverty
- Inadequate government programs
- Law enforcement challenges
- Increased immigration and illegal immigration
- Educational deficiencies

The interplay of these factors contributes to rising incidents of gambling, theft, and car theft in the area.

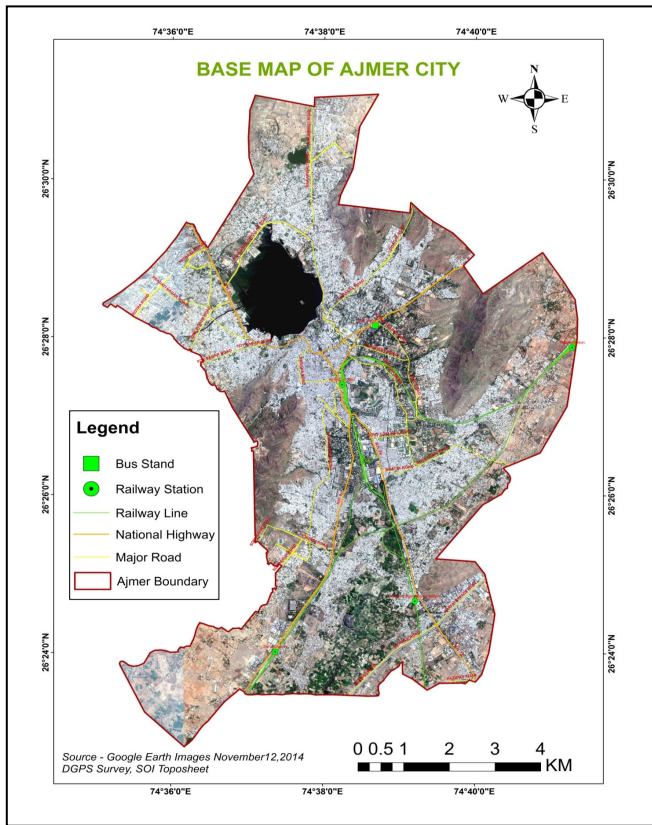


Figure 1 Base Map of Ajmer City

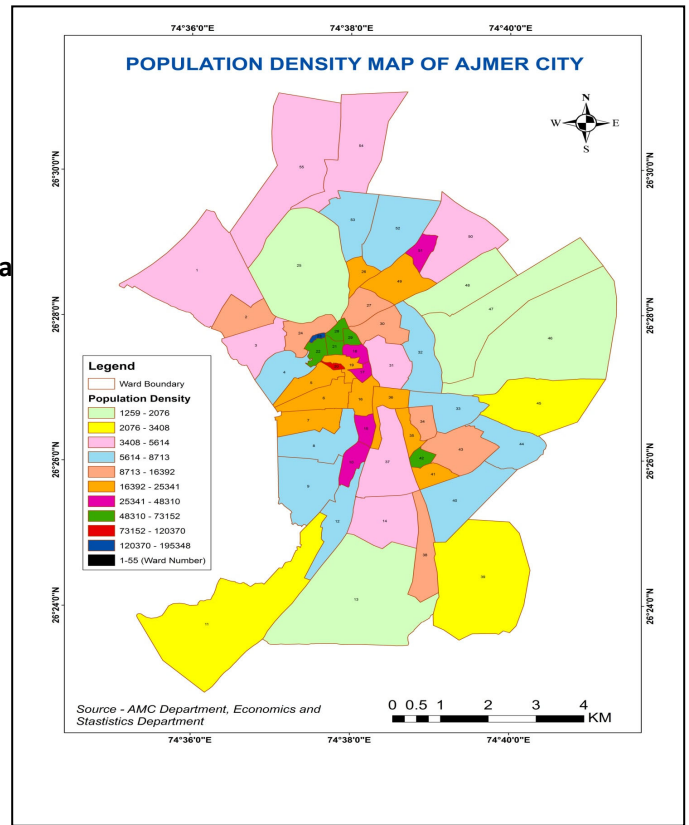


Figure 2 Population Density Map of Ajmer City

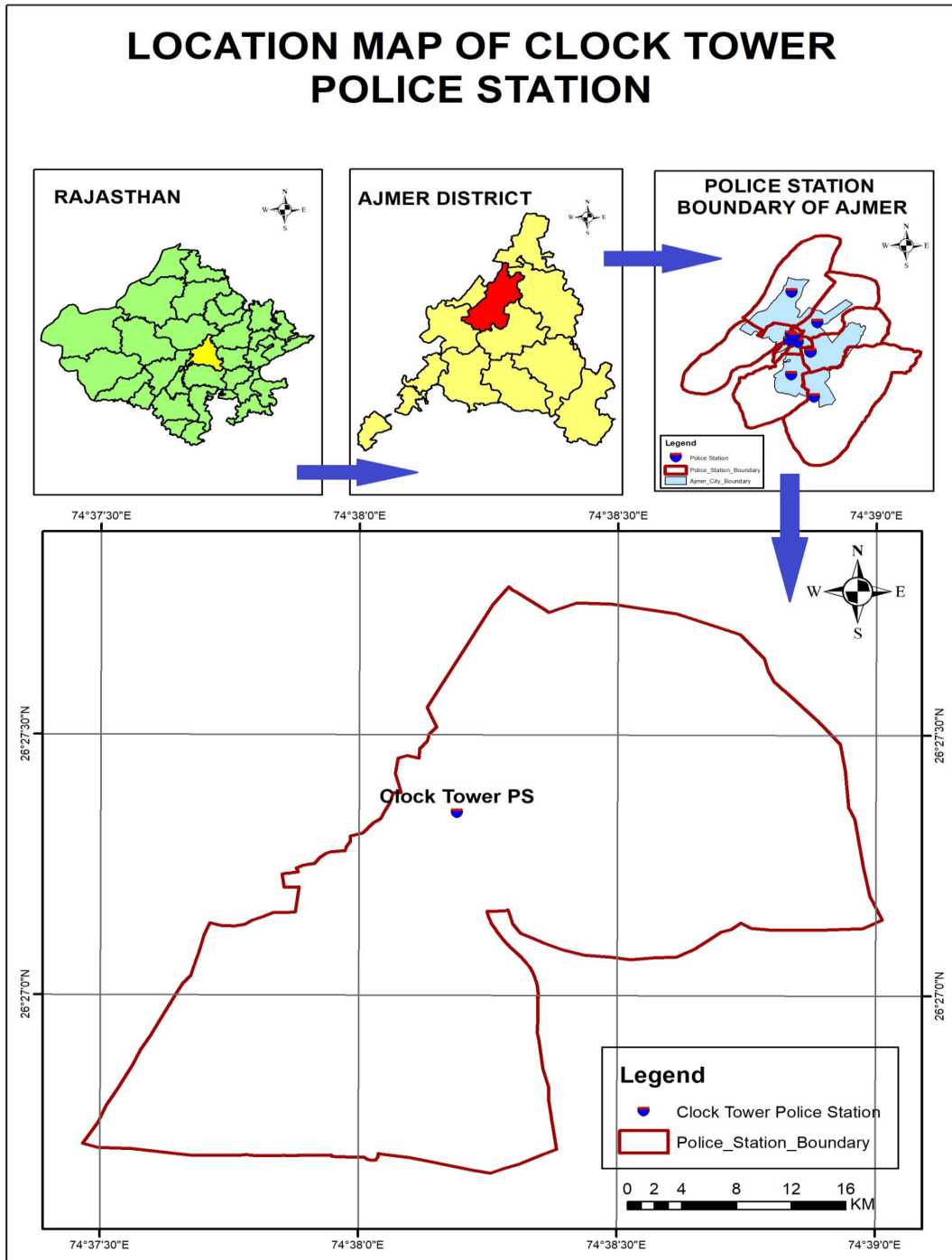


Figure 3 Location Map of Clock Tower Police Station

## Study Overview

This study comprises an analysis of crime and the geo-spatial location of the **Clock Tower Police Station**. It examines the incidence of criminal activities from 2009 to 2019, focusing on categories such as **Gambling, Excise Act violations, Theft, and Vehicle Theft**. By analyzing the frequencies of these crimes, we aim to gain a better understanding of crime patterns and their underlying causes.

## Change Detection and Crime Mapping

Change detection can be traced using crime mapping through **Geographical Information Systems (GIS)**. This tool allows for a detailed analysis of crime locations over the years, highlighting areas where crime is spreading. The concept of **Crime Sprawl**—the spread of crime from one location to nearby areas—can be illustrated through this mapping process.

## Review of Literature

The literature review provides a summary of previous research on crime, drawing from scholarly articles, books, and various sources relevant to this area of study. Numerous attempts have been made to explore the aspects of crime within specific temporal and spatial contexts. The following paragraphs summarize significant research on crime in India and other nations.

The **Oxford English Dictionary** defines crime as “an act punishable by law as forbidden by statute or injurious to public welfare.”

According to R.C. Nigam (1965) in *Law of Crime in India*, understanding what constitutes crime requires first understanding the law, as these two concepts are closely interrelated. Traditionally, law is seen as a command dictating a course of conduct. A crime can thus be defined as an act of disobedience to such a law; however, not all disobedience qualifies as a crime—for instance, violations of civil laws do not necessarily constitute criminal offenses.

**Kenny (1966)**, in *Outlines of Criminal Law*, asserts that the controlling power of the state regarding criminal prosecution is undeniable. He identifies three characteristics of crime:

1. A crime is a harm caused by human conduct that the state seeks to prevent.
2. The prevention of crime includes the threat of punishment.
3. Special legal proceedings (criminal proceedings) are utilized to determine whether the accused caused the harm and should be held legally accountable.

**Merry (1981)**, in *Defensible Space Undeclared: Social Factors in Crime Control*, found that individuals do not automatically scrutinize their surroundings, even when surveillance is feasible, which offenders exploit. She criticized the defensible space theory for overlooking social dimensions of crime prevention.

**Brantingham and Brantingham (1995)** emphasized that crime events are not uniformly distributed across geographic areas; some regions consistently experience lower crime rates than others.

**Ahmad Siddique (1997)** highlighted the close nexus between poverty and criminal behavior in India.

**Cerro & Meloni (2000)** conducted an empirical analysis of the relationship between unemployment and crime in Argentina from 1990 to 1999, concluding that both unemployment and income inequality significantly correlate with crime rates.

**Fischer (2001)** analyzed pooled cross-section data from 1986 to 1998, incorporating political institutions, and found that direct democracy has no significant effect on crime rates in Swiss cantons.

**Fajnzylber, Laderman, & Loayza (2002)** examined the causality between crime and income inequalities across 39 countries from 1965 to 1995, identifying a correlation between the Gini index, robbery rates, and homicide rates. Their findings indicate a positive relationship between crime rates and income inequality both within and among countries.

**Lancher (2007)** found a negative correlation between educational attainment and crime rates.

**Mangai Natarajan (2016)** discussed crime in developing countries, noting that while crime rates in developed nations have been declining, developing nations are facing an increase in various forms of crime. Routine activity theory suggests that as affluence increases, these countries may experience crime patterns similar to those observed in developed nations decades ago.

**Kannan (2020)** mentioned that urban transformation initiatives alter not just the physical landscape of cities but also the social networks and lifestyles of residents. Notably, women are impacted differently by these changes compared to men.

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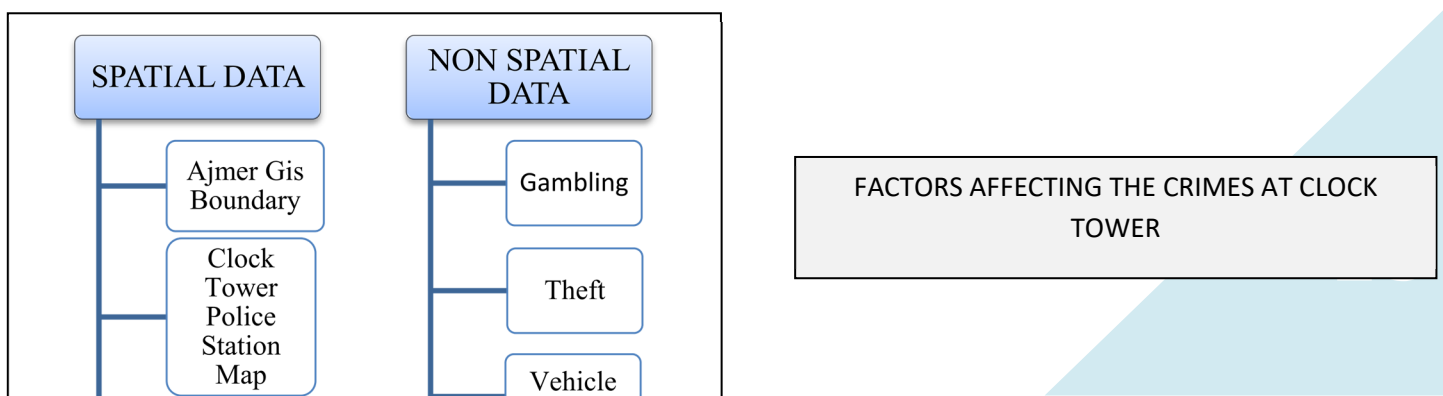
## Methodology

Crime possesses an inherent geographical quality; when a crime occurs, it is linked to a specific location. Understanding the role of 'place' is crucial in researching crime and its incidents. The collection of data is a critical task, necessitating specific methodologies.

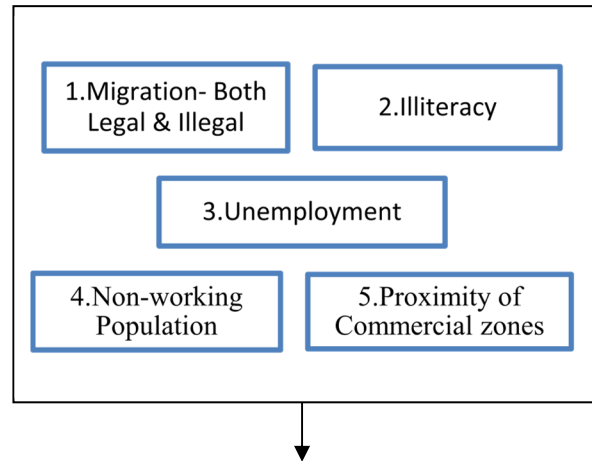
This study aims to analyze and interpret crime occurrences over a defined space and time. Ajmer city, known for its cultural and social activities as well as tourist attractions like **Dargah Sharif** and **Pushkar**, is a hotspot for criminal activities.

Crime data in Ajmer is recorded by local police stations, and this study employs a **secondary data collection** method. The data were primarily gathered from the **Clock Tower police station**, utilizing the annual crime record book covering the years 2009 to 2019.

**Figure 4 Methodology Framework**







## Results & Discussions

The crime scenario within the jurisdiction of the **Clock Tower Police Station** has been recorded annually in the crime data book, following the relevant sections of the **Indian Penal Code (IPC)** and the **Code of Criminal Procedure (CrPC)**. This data includes the respective locations, the real-time of incidents, and the recorded time when reports were filed. The location data played a crucial role in cartography, aiding in the spatial and temporal analysis of crime patterns.

### Yearly Crime Rate Analysis at Clock Tower

This dissertation focuses on a yearly analysis of four major crimes, selected for their higher frequencies compared to other offenses recorded at Clock Tower. The main crimes analyzed are:

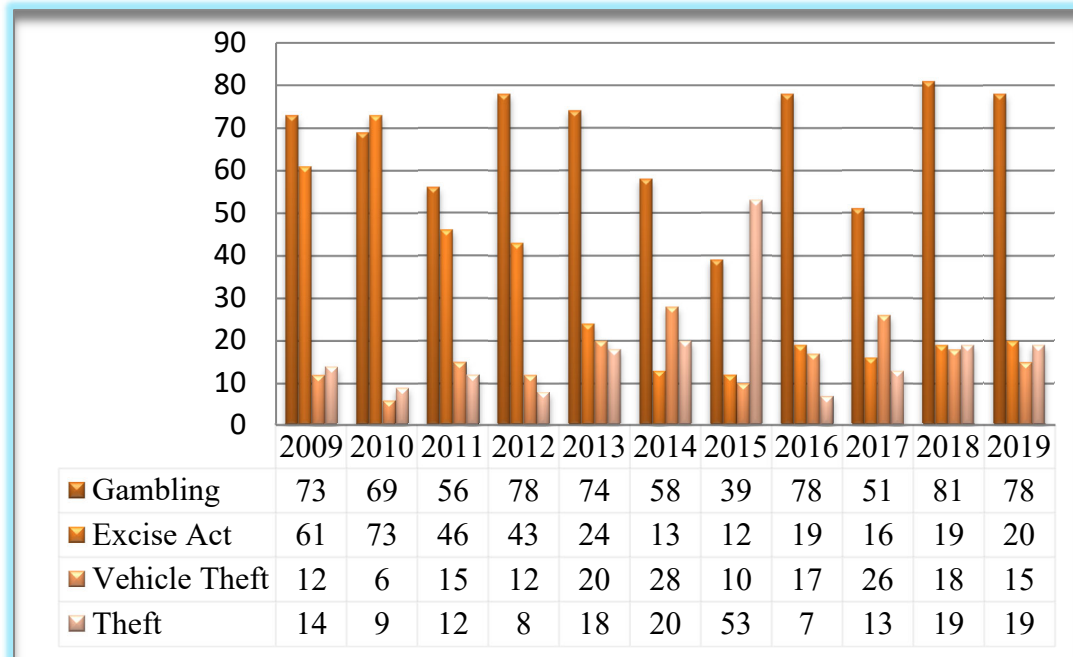
1. **Gambling:** The wagering of money or something of value (the "stakes") on an event with an uncertain outcome, primarily intending to win money or material goods.
2. **Excise Act Violations:** The illegal possession and sale of liquor without a government license.
3. **Vehicle Theft:** The act of stealing a vehicle without the owner's consent.
4. **Theft:** Defined as the physical removal of an object that can be stolen, performed without the owner's consent and with the intention of permanently depriving the owner of it.

### Findings

Graphs illustrate that **Gambling** and **Excise Act violations** show significantly higher frequencies compared to **Theft** and **Vehicle Theft**, which remain relatively consistent across the 11 years of data collected.

This data suggests that while gambling and related activities are prevalent, the rates of theft and vehicle theft have not fluctuated dramatically, indicating potential stability in these criminal behaviors over time.

Figure 5 Clock Tower, Ajmer (2009-2019)



The Total Crimes in 11 years were-

- Gambling:-735 – Registered cases were Increased in 11 years with increase of 11% probably due to the low compensation fine of the crime.
- Excise Act:- 346 – Decrease in the cases due to the increase of active policing at clock tower.
- Vehicle Theft:-179- Increase of 2% in over 11 years
- Theft-192 -: Increase of nearly 4% from 2009 to 2019 cases

Figure 6 Comparison of 2009 and 2019

Crime Type	% in 2009	% in 2019	Difference

<b>Gambling</b>	<b>19.72%</b>	<b>31.7%</b>	<b>+11.98%</b>
<b>Excise Act</b>	<b>16.7%</b>	<b>5.20%</b>	<b>-11.5%</b>
<b>Theft</b>	<b>3.8%</b>	<b>7.51%</b>	<b>+3.71%</b>
<b>Vehicle Theft</b>	<b>3.2%</b>	<b>5.20%</b>	<b>+2%</b>

## Factors Responsible for the Hike in Crimes at Clock Tower

### 1. Migration

- Ajmer is categorized as a significant hub for inter-district migration, with migrants settling in urban areas.
  - **Migration Statistics:**
    - 1991-2000: 23.4%
    - 1981-1990: 22.4%
    - 1971-1980: 17.5%
- Illegal immigration from neighboring countries contributes to increased theft, looting, and gambling.

### 2. Proximity to Transportation Hubs

- The Clock Tower area's closeness to the railway station and bus stand heightens susceptibility to criminal activities due to increased foot traffic.

### 3. Presence of Inner Pockets

- Unnoticed areas within the police station's jurisdiction create higher risks for crimes such as gambling, theft, and vehicle theft.

### 4. Lack of Employment

- A portion of the population faces underemployment, resulting in inadequate aggregate spending, which hampers economic stability and increases crime rates.

## Reasons for Increased Gambling, Theft, and Vehicle Theft

- Increased population
- Decrease in employment opportunities
- Poverty
- Lack of government schemes
- Inadequate policing
- Rise in immigration
- Increase in illegal migrants from neighboring countries
- Lack of education and awareness

## Reason for Decrease in Excise Act Violations

- Increased regular inspections of liquor shops and storage facilities
- Responsible usage and demand for liquor
- Enhanced monitoring of liquor transportation

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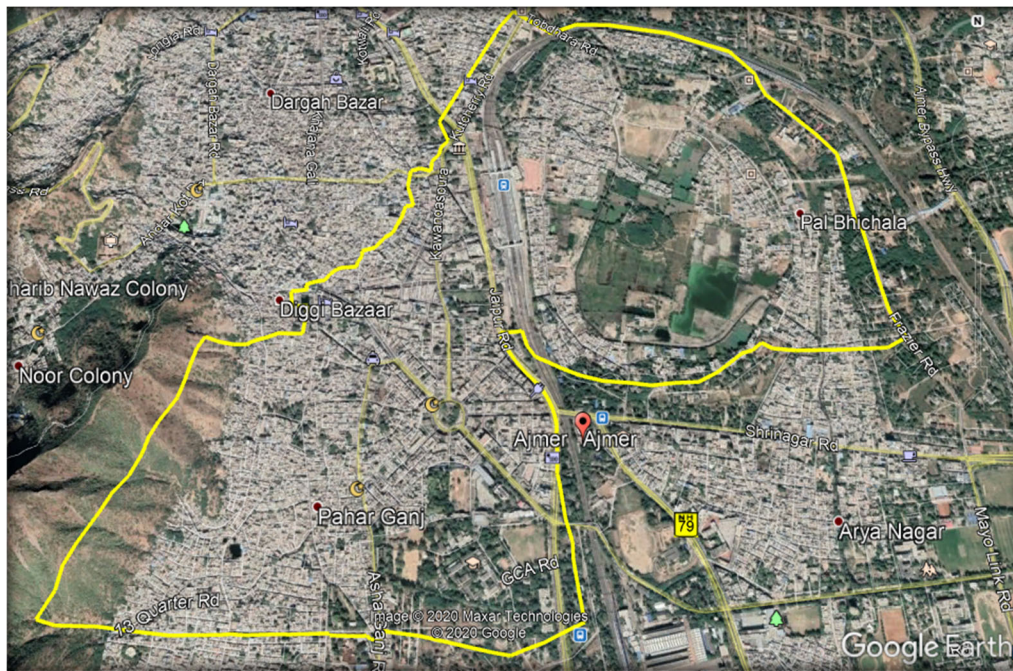
## Conclusion

Several studies have analyzed crime patterns, including Kannan (2017), who noted that crime mapping using GIS tools provides foundational investigative analysis, including geographic profiling and crime clustering. This study emphasizes identifying crime-prone zones in Ajmer city, aiding law enforcement in strategic planning and operations (Thangavelu, Sathyaraj, and Balasubramanian, 2013). The objective is to forecast crime occurrences based on historical data.

## Recommendations for Crime Reduction

1. Conduct ground-level research to understand the persistent increase in gambling, particularly in hotspots like **Kesarganj** and **Diggi Chowk**. Regular daytime patrols (3-5 PM) in these areas are necessary due to frequent gambling-related FIRs.
2. Raise awareness among shopkeepers and households in markets near **Kesarganj** and **Madar Gate** to mitigate theft cases, which have risen from 2009 to 2019.
3. Address the gradual increase in vehicle thefts, particularly around **St. Francis Hospital** and **GCA College**, by enhancing security measures such as high-security number plates and vehicle registration tracking.
4. The ongoing decrease in Excise Act violations illustrates the effectiveness of active policing and the regulation of liquor shops in the Clock Tower area.
5. Implement surveillance through CCTV cameras at crime hotspots, with daily footage analysis to track suspected criminals.
6. Introduce heavy fines and longer prison sentences for theft attempts to instill a sense of guilt among potential offenders.
7. Conduct monthly assessments of gambling-prone areas to instill fear among gamblers and deter participation.
8. Increase awareness among youth and provide more employment opportunities, even at smaller levels, to help reduce crime rates in Ajmer.

**Figure 7 Geo–Spatial Crime Mapping of Clock Tower, Ajmer**



Satellite Image taken by Google Earth encircling the clock tower police station where major densities of crime location is highlighted are areas of Diggi bazaar- Shishakhan, Diggi chowk and Kesarganj, Sabji mandi, Nawab ka beda and areas near Ashaganj at clock tower in Ajmer City.

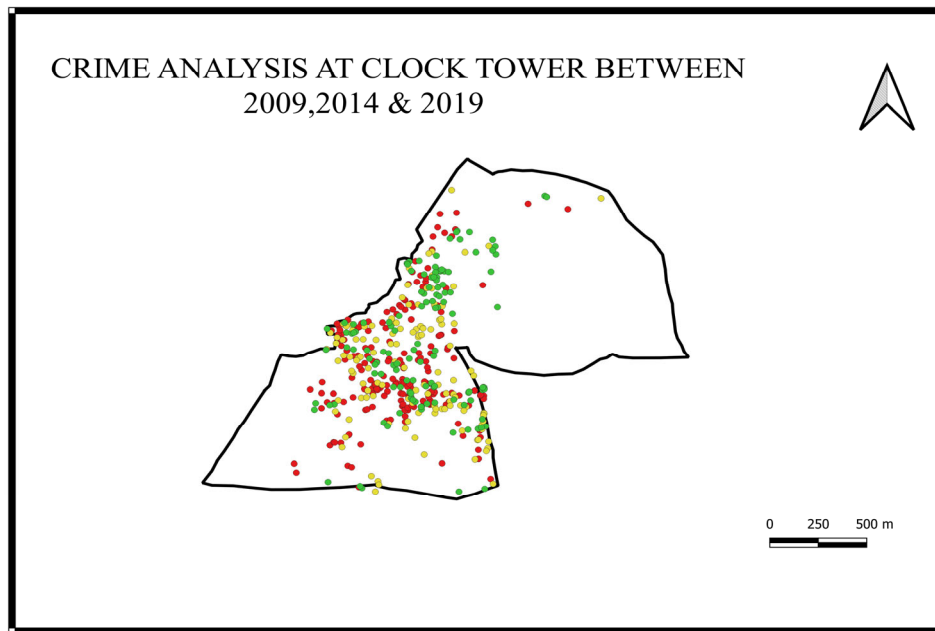


Figure 8 Crime Analysis at Clock Tower Police Station

These three years 2009,2014 and 2019 map shows the density of crimes (Gambling, Theft, Vehicle Theft and Excise act) in the areas of clock tower- Madar gate and Diggi chowk where in the pockets like

Sheeshakhan, Peer Road and Kesarganj, where Ashaganj and Sabji mandi are the main areas. However, scattered criminal location in the pockets of Kawandaspura and Pahadganj

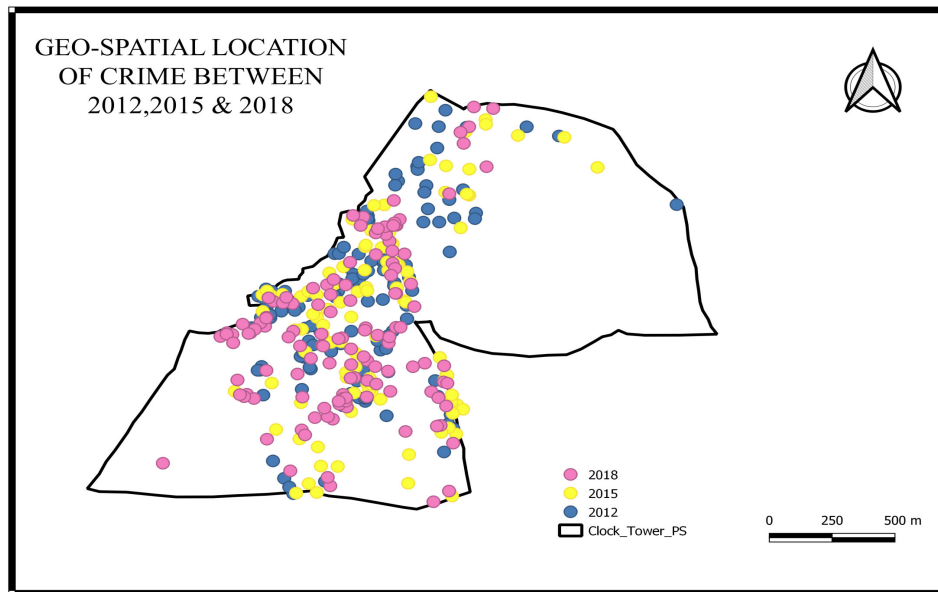
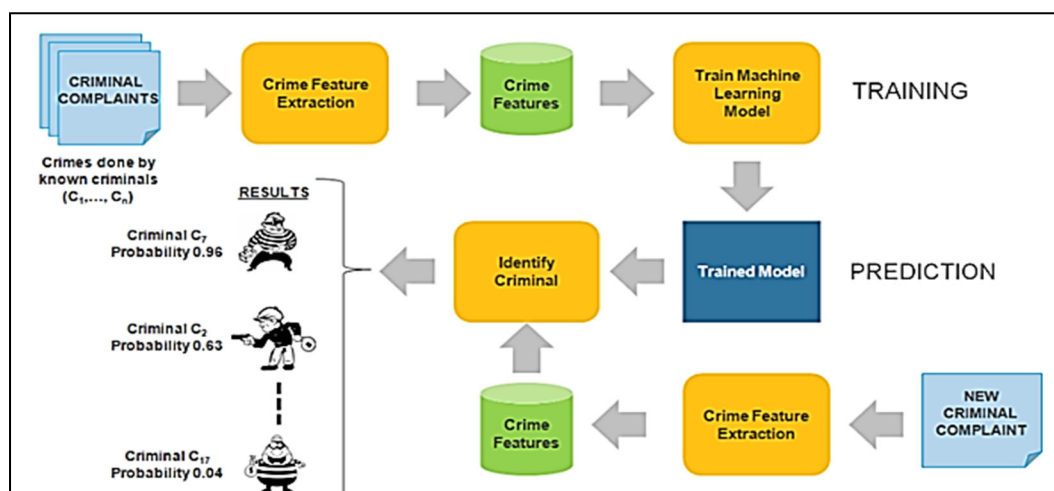


Figure 9 Geospatial Location of Crime incidences

Geo-Spatial Location of Crime between 2012,2015 and 2018- this map where pink dots, yellow and blue dots are depicting spatial space where crime incidences take place in the areas of Madar gate, Kawandaspura, Kesarganj-Ashaganj, Sabji mandi also at Diggi bazaar areas of Diggi chowk and near Anslems’ school and St. Francis hospital Crime Sprawl towards areas of Pahadganj and near clock tower towards Topdara can be seen in this three mid-year analysis.

Figure 10 A Model for Modern Policing





With the help of advanced computing and mapping software, models that will help in policing should be developed. In these models, by extracting crime features of criminal incidence, such as location, time, type of offence, proximity to other incidences and crowded places, etc., we can train a machine learning model. Based on the given algorithm, these models can predict future crimes and help in tracing criminals. We should also add new criminal data to these models continuously so that they do not outdate.

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