



## *RESEARCH ARTICLE*

### **RELEVANCE OF GEOGRAPHIC INFORMATION SYSTEM IN COUNTERING INSECURITY AND CRIMES IN KAJURU, KADUNA STATE**

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#### **ABSTRACT**

This study assesses the role of GIS in curbing insecurity and crimes in Kajuru local government of Kaduna state, Nigeria. The research identified the causes of insecurity as well as assessed the use of GIS in curbing insecurity and crimes in the study area. Both primary and secondary data were used for the study. A simple descriptive research method was used, by administering questionnaire which was used as the instrument to a sample population 399 people from the entire population of Kajuru local government. The findings revealed that: inadequate funding of security personnel, lack of modern equipment both in weaponry and training, inadequate and disparities in provision of social amenities, unemployment especially among youths, poverty and bribery and corruption causes insecurity and crimes. Higher incidence of unemployment, terrorism and kidnapping among populace, disrupted businesses and economics activities, unwanted loss of lives and properties, disrupt of school calendar and closing of schools, dislocation and disruption of family and communal life were found to be some of the major effects of insecurity in the study area; finally the study also proved that, GIS facilitate tracking the movement of criminals, GIS can help security agencies to determine potential terrorists site, using GIS automated system, terrorists could be monitored, tract and smashed across borders and highways. The research recommended that there should be more need of using GIS technology in addressing the problem of insecurity in the study area and all over the country at large.

**Keywords:** GIS, countering, insecurity, crime, Kajuru.

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## 1.0. INTRODUCTION

Insecurity is a state of being subjected to danger or injury on the other hand, crime is one of the continuous problems that bedevil the existence of mankind. Since early days, crime has been a disturbing threat to man's personality, property and lawful authority (Ayuba, Mugu, Tanko & Bulus, 2016). Today, in the modern complex world, the situation is most highly disturbing. Crime started in the primitive days as a simple and less organized issue, and ended today as very complex and organized. Therefore, the existence of crime and its problems have spanned the history of mankind. Due to the complex nature of the subject of crime, its causes and consequences, various academic disciplines such as criminology, sociology, geography, psychology and demography study it from their own perspective (Hafiz, 2011).

The distribution of crime across the landscape is geographically random since crimes are human phenomena. Several factors, including the lure of potential targets and simple geographic convenience for an offender, influence where people choose to break the law. Therefore, geography plays an important role in law enforcement and criminal justice (Francis, 2016). The International Crime Victim Survey (ICVS) has collected data on 55 countries, spread over six major regions including Africa, Asia, Central and Eastern Europe, Latin America, and Western Europe. The findings showed that for the 1989 to 1996 period, more than half of urban respondents reported being victimized at least once, regardless of what part of the world they inhabit (Zhuo, 2008). This shows that criminal activities continue to be a major concern in contemporary society (Francis, 2016).

Francis (2016), asserts that there is no place or society that is completely devoid of crime. The existence of crime is as old as the creation of man itself and man has always looked for ways to combat it and reduce it as much as possible. Murray, (2011) elucidated that the occurrence of criminal activity such as theft, assault, armed robbery, homicide etc. is something that takes place every day in almost all reaches of our world. They stressed that there is a great deal of debate on the causes of crime and affirmed that in the 1980s the rate of crime occurrence grew sharply to nearly epidemic proportions.

Due to insecurity, the rate of crime in Nigeria is attributed to the rate of unemployment estimated at 13.9% by the National Bureau of Statistics (2017), high rate of poverty estimated at 62.6% by the United Nations Development programme (2016) and corrupt Police Force that is ill-equipped to fight crime (Adibe, 2009). The idea that unemployment, poverty and corruption are related to a whole series of other misfortunes such as illness, despair, and crime, is not new (Aminu, 2013). Nigeria is currently caught in the web of insecurity and crime dilemma, manifesting in the convulsive upsurge of both violent and non-violent crimes. But the most alarming and terrifying is the present escalation of violent crimes and the barbarity, lethality and trauma the perpetrators unleash on the hapless citizenry across the length and breadth of the country. Notable in this regard are the rising incidents of armed



robbery, assassination and ransom-driven kidnapping, which are now ravaging the polity like a tsunami and spreading a climate of fears and anxieties about public safety (Uche, 2008). Ackerman and Murray (2004) stated that high crime rates are not unique features of a few nations, but statistically normal features of life all over the world.

In urban areas like Kaduna due to population explosion, stark economic inequality and deprivation, unemployment, socio-political condition among others are factors that contribute to crime occurrence (Dodo, 2008). Certain environmental factors such as the physical layout of an area, proximity to various services and land use mixes are likely to influence criminal behaviour and are fundamental to the explanation of criminal activities in a spatial context. The issue of access, exposure, opportunity and the availability of targets are also important elements in helping to explain crime from an environmental perspective (Ayuba, Mugu, Tanko & Bulus, 2016).

Geographic Information System (GIS) as a tool can be used by relevant agencies such as police personnel to plan effectively for emergency response, determined mitigation priorities, analyze historical events, and predict future events. The ability to access and process information quickly while displaying it in a spatial and visual medium allows agencies to allocate resources quickly and more effectively. In the 'mission-critical' nature of law enforcement, information about the location of a crime incident, suspect, or victim is often crucial to determine the manner and size of the response. GIS software helps co-ordinate vast amounts of location-based data from multiple sources. It enables the user to create layers for the data and view the data most critical to the particular issue or mission (Johnson, 2000).

Irrespective of Government's huge investment in fighting insecurity and crime in the country, the issues of insecurity and crime has remained the bane of social and economic wellbeing of the people of Nigeria making the once peaceful nation now a heaven for criminals. Due to insecurity issues and crimes many deaths have been recorded in the past month across Kajuru LGA (Kaduna state). Authorities reported that on March 10, 2022 unknown armed men entered Barde village in Kajuru LGA and started shooting sporadically, resulting in the deaths of 16 persons. On March 11, 2022 gunmen reportedly attacked Iri, Dogon Noma, and Ikirimi villages, also in Kajuru LGA. The means of getting offenders is very much limited and the security personnel as it appears is yet not fully exposed to modern technologies that will help them combat crime properly. It is therefore with this in mind that this research works is carried out. This research attempts to explore the role of geographic information system (GIS) in curbing insecurity and crimes in Kajuru local government area of Kaduna State. It is hoped that by adopting this innovative approach in combating crime the spate of crime will be drastically reduced in the study area.

### 1.1. Research Questions

The following research questions were formulated to guide this study.

- i. What are the causes of insecurity and crime issues in crimes in Kajuru local government area of Kaduna State?
- ii. What are the roles of GIS in reducing the effects of insecurity and crime issues in the study area?

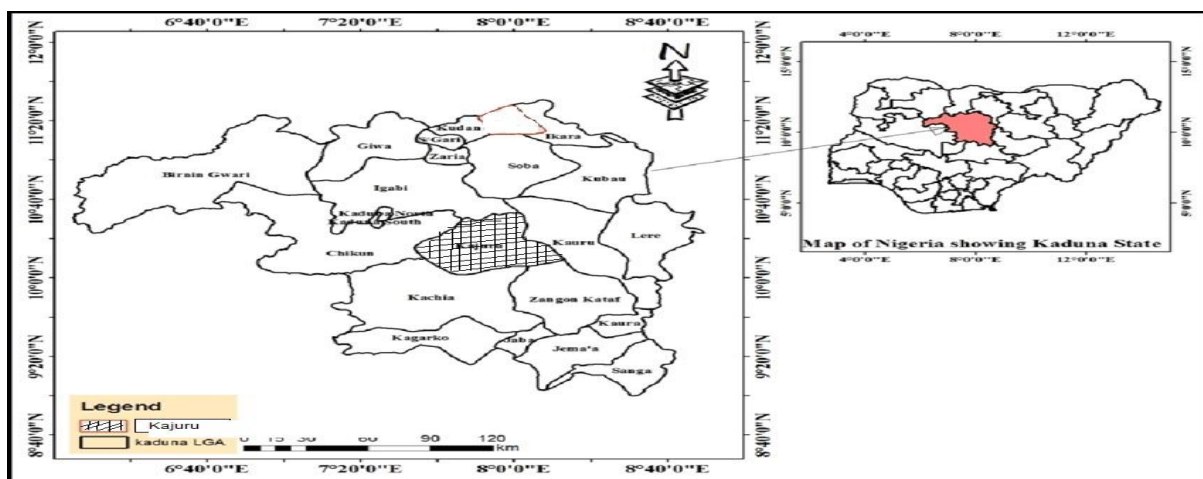
### 1.2. Aim and Objectives of the Study

The aim of this research is to assess the role of GIS in curbing insecurity and crimes in Kajuru local government area of Kaduna State. To actualize the aim, the following two specific objectives were investigated.

- i. To identify the causes of insecurity and crime issues in the study area.
- ii. To assess the role of geographic information system (GIS) in curbing the effects of insecurity and crime issues in the study area.

## 2.0. THE STUDY AREA

Kajuru is a local government area in southern part of Kaduna State, Nigeria. Its headquarters is in the town of Kajuru. The local government is located on latitude  $7^{\circ} 34'E$  and  $8^{\circ} 13'E$  and longitude  $9^{\circ} 59'N$  and  $10^{\circ} 55'N$ , with an area cover of 2,229 km<sup>2</sup> (Suberu, 2013). Kajuru local government shares boundaries with Igabi Local Government Area to the north, Chikun Local Government Area to the west, Kaura Local Government Area to the east, Zangon Kataf Local Government Area and Kachia Local Government Area to the south-west and south respectively (Suberu, 2013). See figure 1.



*Figure 1: Kaduna State Showing Kajuru L.G.A. of Kaduna State*

**Source:** Modified from the administrative map of Kaduna state



### 3.0. MATERIALS AND METHODS

#### 3.1. Reconnaissance Survey and Data

Reconnaissance survey was done in order to be acquainted with the study area and also to identify the method of sampling this study. The sources of data used in carrying out this research are primary and secondary sources of data. Primary Data were collected through direct field surveys, structured questionnaires' administration and oral interview. Specifically, data on the causes of insecurity and crime issues were obtained from the respondents in the study area through the administration of questionnaires and oral interview.

Data on the effects of insecurity and crime issues were obtained from the respondents in the study area through the administration of questionnaires and oral interview while data on the role of geographic information system (GIS) were obtained from the respondents in the study area through the administration of questionnaires and oral interview. On the other hand, secondary data were obtained from internet, newspapers, journals, theses and databases which will be useful and helpful in generating ideas, facts and issues relating to the study.

#### 3.2. Sample Size and Design

Kajuru Local Government Area has an estimated population of 109,810 people according to the 2006 national population census. Simple random sampling technique was used in arriving at the sample size. This figure is projected to 2022 which gave 190,409 populations. The projection was done using Kaduna State growth rate of 3.5%. In the geometric method of projection.

The formula is  $P_p = P_1(1 + r/100)^n$ . This formula is the basis of Malthus's population projection. **Where**

$P_p$  = Projected population;  $P_1$  = Population as per the recent census;  
 $R$  = Annual rate of increase or decrease of population;  $n$  = Number of years  
 $P_p$  =  $109,810(1+3.5/100)^{16}$   
 $= 109810(1.035)^{16}$   
 $= 109810 \times 1.73398604$   
 $= 190,409$  approximately

To determine the sizes of the questionnaire to be administered Yamane (1967) formula for sample size determination was used. This is shown below:

$$n = \frac{N}{1+N(e)^2} \quad n = \frac{190409}{1+190409(0.05)^2} \quad n = \frac{190409}{1+190409(0.0025)} \quad n = \frac{190409}{1+476.0225} \quad n = \frac{190409}{477.0225}$$

$n = 399$  A total of 399 respondents were obtained and sampled.





### 3.3. Research Instrument

To actualize this research, the researchers will employed the used of self-designed questionnaire to collect data from the respondents. The questionnaire is divided into two sections, section A and B. Section ‘A’ solicits information on respondents bio-data while section ‘B’ comprised of questions on role of GIS in curbing insecurity and crime. Responses are rated on five likert scale of SA – Strongly Agreed (5), A – Agreed (4), Undecided – U (3), Disagree - D (2) and SD – Strongly Disagreed (1).

### 3.4. Validity of the Instrument

Validity refers to the degree to which an instrument accurately measures what it intends to measure. Three common types of validity for researchers and evaluators to consider are content, construct and criterion validities. The content validity will be determined by giving the instrument to research experts in field of Geography, the researchers’ supervisor to make meaningful corrections, commentary and observations. Kerlinger (1986) hold the view that, the validation of the content of the research instruments by experts is an important and acceptable technique.

### 3.5. Techniques of Data Analysis

This section explains how the data collected were analyzed.

**Objective 1: Identify the causes of insecurity and crime issues in the study area.** This objective was achieved through the use of questionnaire to obtain relevant information about the causes of insecurity and crimes issues in the study area. The data generated through questionnaire and observation techniques were analyze using simple descriptive statistics techniques. It was summarized and tabulated for easy presentation, analysis and interpretation.

**Objective 2: Assess the role of geographic information system (GIS) in curbing the effects of insecurity and crime issues in the study area.** This objective was achieved

through the use of questionnaire to obtain relevant information about the role of geographic information system (GIS) in curbing the effects of insecurity and crime issues in the study area. The data generated through questionnaire and observation techniques were analyze using simple descriptive statistics techniques. It was summarized and tabulated for easy presentation, analysis and interpretation.

## 4.0. RESULTS AND DISCUSSIONS

This chapter deals with the presentation, interpretation, analysis and result of data collected through the questionnaire distributed and retrieved. A total number of 399 copies of



questionnaires were distributed and 362 copies were duly returned, hence the analysis and interpretation of the result will be based on the returned copies of the questionnaires.

#### **4.1. Assessment of the Demographic Characteristics of the Respondents**

The demographic characteristics of the respondents were descriptively evaluated using simple percentages and the results are succinctly presented in Tables 1 to 3 for easy perusal and comparisons.

The assessment of gender distribution is presented in Table 1 and the results reveal that 188 of the respondents are male, which account for 52 percent of the total response which is slightly higher than the female respondents with a total number of 174 with a 48 percent.

**Table 1: Analysis of Gender Distribution of the Respondents**

<b>Gender</b>	<b>No of Respondents</b>	<b>Percentage</b>
<b>Male</b>	188	52
<b>Female</b>	174	48
<b>Total</b>	362	100

Source: Field Survey (2022).

Table 2 shows the ages of the respondents, the data indicates that 126 respondents representing 34.81% were between the ages of 15-20 years, 111 respondents representing 30.66% were between the ages of 21-30 years, 79 respondents representing 21.82% were between 31-40 years while 46 respondents representing 12.71% were 41 years and above. This revealed that majority of the respondents are between the ages of 15-20 years.

**Table 2: Analysis of Age Distribution of the Respondents**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>15-20 years</b>	126	34.81
<b>21-30 years</b>	111	30.66
<b>31-40 years</b>	79	21.82
<b>41 years and above</b>	46	12.71
<b>Total</b>	362	100

Source: Field Survey (2022).

Table 3 Represent the level of education of the respondents, 42 respondent having 11.6% have no formal education, 39 have went for primary education, 158 reached secondary education and 123 respondents proceeded to tertiary education, the respondents represent 10.77%, 43.65% and 33.98% in a respective order. The majority of respondents stops at secondary school, Most of which have graduated from senior secondary school and have sat for the senior secondary certificate exams, few are those who have dropped out from the secondary school. Also the respondents that proceeded to tertiary education attended schools such as Federal/State Collages of Education, Federal/State/Private Universities and Federal/



State Polytechnics. The questionnaire was ready and interpreted in Hausa for those that have no formal Education.

**Table 3: Level of Education of the Respondents**

Level of Education	Frequency	Percentage (%)
Non formal Education	42	11.60
Primary Education	39	10.77
Secondary Education	158	43.65
Tertiary Education	123	33.98
Total	362	100

Source: Field Survey (2022).

#### **4.2. Evaluation of the Causes of insecurity and crime issues**

Data in table 4 indicated that 269 respondents representing 73.76% strongly agreed that Inadequate funding of security personnel, lack of modern equipment both in weaponry and training cause insecurity, 89 representing 24.58% agreed. This finding is in line with the work of Ekpoh, Edet and Ukpog, (2020) who found that lack of security personnel is among the major causes of insecurity.

**Table 4: Inadequate funding of security personnel, lack of modern equipment both in weaponry and training cause insecurity**

Response	Frequency	Percentage (%)
Strongly Agree	267	73.76
Agree	89	24.58
Undecided	5	1.38
Disagree	1	0.28
Strongly Disagree	0	0.00
Total	362	100

Source: Field Survey (2022).

Table 5 indicated that 154 respondents representing 42.54% and 150 respondents representing 42.54%, strongly agreed and agreed respectively that inequality and disparities in provision of social amenities causes insecurity, this finding is in line with Achumba, Ighomereho and Akpan-Robaro (2013), who found out that among the major factor that contributes to insecurity in Nigeria is the growing awareness of inequalities, and disparities in life chances which lead to violent reactions by a large number of people.



**Table 5: Inequality and disparities in provision of social amenities causes insecurity**

Response	Frequency	Percentage (%)
Strongly Agree	154	42.54
Agree	150	41.43
Undecided	51	14.09
Disagree	7	1.94
Strongly Disagree	0	0.00
Total	362	100

Source: Field Survey (2022).

The data from Data in table 6 revealed that 192 respondents representing 73.76% strongly agreed that unemployment especially among youths causes insecurity and violent crimes issues, 158 representing 24.58% also agreed. This finding is in line with the study conducted by Adagba, Ugwu and Eme (2012) who stated that particular youth's unemployment have contributed to the rising cases of violent conflict in Nigeria.

**Table 6: Unemployment especially among youths cause insecurity and violent crimes issues**

Response	Frequency	Percentage (%)
Strongly Agree	192	53.04
Agree	158	43.64
Undecided	10	2.76
Disagree	1	0.28
Strongly Disagree	1	0.28
Total	362	100

Source: Field Survey (2022).

The figures from table 7 showed that that 136 respondents representing 37.57% and 161 respondents representing 44.49%, strongly agreed and agreed respectively that poverty as a cankerworm causes insecurity in the study area, This is found to be true as related by Adagba, Ugwu and Eme (2012) who stressed that one of the major causes of insecurity in the country is the failure of successive administration to address challenges of poverty.

**Table 7: Analysis of Poverty as a Cankerworm that Causes Insecurity**

Response	Frequency	Percentage (%)
Strongly Agree	136	37.57
Agree	161	44.49
Undecided	52	14.36
Disagree	9	2.49
Strongly Disagree	4.	1.10
Total	362	100

Source: Field Survey (2022).



Data from table 8 pointed out that 239 respondents representing 66.22% strongly agreed that bribery and corruption lead to insecurity, 107 representing 29.55% agreed. This is also in line with the findings of Oluwarotimi, (2012), that among Nigeria's contributing factors to political conflicts and terrorism is as a result of high level corruption.

**Table 8: Bribery and Corruption Lead to Insecurity**

Response	Frequency	Percentage (%)
Strongly Agree	239	66.22
Agree	107	29.55
Undecided	10	2.76
Disagree	3	0.83
Strongly Disagree	1	0.28
Total	362	100

Source: Field Survey (2022).

#### 4.3. Role of GIS in Reducing the Effects of Insecurity and Crime Issues

Attempts were made to quantitatively determine the effect of insecurity and allied crime issues in the study area and the issued-based results are summarized in Tables 9 to 12 depict disparities in compliance to respondents' perceptions..

Table 9 revealed that 120 respondents representing 33.14 percent strongly agreed and 169 respondents representing 46.68% agreed that GIS facilitate tracking the movement of criminals. However a number of respondent are not certain as 42 respondents representing 11.6 percent rather couldn't decide, 19 respondents representing 5.25 percent disagree and 12 respondents representing 3.31 percent strongly disagreed. Some of the respondent have no idea how the GIS works or certainly have not seen its impact. Ibrahim and Kuta, (2015) states that despite the advanced strategies in GIS such as crime analyses which have great potential for impacting a departments efficiency, crime reduction, and professionalism, today relevant officials in most crime departments in Nigeria may or may not have the necessary skills to engage in computerized crime mapping.

**Table 9: GIS facilitate tracking the movement of criminals**

Response	Frequency	Percentage (%)
Strongly Agree	120	33.14
Agree	169	46.68
Undecided	42	11.60
Disagree	19	5.25
Strongly Disagree	12	3.31
Total	362	100

Source: Field Survey (2022).



Table 10 indicated that 156 respondents representing 43.09 percent strongly agreed that GIS can help security agencies to determine potential terrorists sites, also 182 respondents representing 50.28 percent agreed. This was found to be in line with the findings of Usman (2015) who states that GIS can help security agencies to determine potential terrorist's sites by examining and displaying them in a geographical layered, special interface or map.

**Table 10: GIS can help security agencies to determine potential terrorists sites**

Response	Frequency	Percentage (%)
Strongly Agree	156	43.09
Agree	182	50.28
Undecided	22	6.08
Disagree	1	0.28
Strongly Disagree	1	0.28
Total	362	100

Source: Field Survey (2022).

From the data in table 11, 234 respondent representing 64.63% agreed and 102 respondents representing 26.72% strongly agreed that through the GIS automated system, terrorists can be monitored, tract and smashed across borders and highways. This can be found in the roles of GIS in curbing insecurity and crimes by Usman (2015).

**Table 11: Through the GIS automated system, terrorists can be monitored, tract and smashed across borders and highways**

Response	Frequency	Percentage (%)
Strongly Agree	102	26.72
Agree	234	64.63
Undecided	23	6.35
Disagree	2	0.55
Strongly Disagree	1	0.28
Total	362	100

Source: Field Survey (2022).

Also the data in Table 12, revealed that 253 respondent representing 69.88 percent agreed and 102 respondents representing 17.12 percent strongly agreed that GIS allows us to better understand social phenomenon like criminality, violence and fear, and to work on solving them. This was also found to be in line with the roles of GIS in curbing insecurity and crimes stated by Usman (2015).

**Table 12: GIS allows us to better understand social phenomenon like criminality, violence and fear, and to work on solving them**

Response	Frequency	Percentage (%)
Strongly Agree	68	17.12
Agree	253	69.88
Undecided	33	9.11
Disagree	2	0.55
Strongly Disagree	1	0.28
Total	362	100

Source: Field Survey, 2022.

#### **4.4. Summary of Major Findings**

Based on the research objectives;

- The causes of insecurity in the study area includes; Inadequate funding of security personnel, lack of modern equipment both in weaponry and training, inequality and disparities in provision of social amenities, unemployment especially among youths and violent crimes issues, poverty as a cankerworm are among the major causes insecurity and crimes in Kajuru local government area of Kaduna State.
- Based on the responses research found that insecurity results to higher incidence of unemployment, terrorism and kidnapping among populace in the study area, disrupted businesses and economic activities, unwanted loss of lives and properties among populace, disruption school calendar and led to closing down of schools, dislocation and disruption of family and communal life and it lead to deepening of hunger and poverty as some of major effects caused by insecurity around the study area.
- Despite some responses are uncertain about the use of GIS to facilitate tracking the movement of criminals and use of GIS to help security agencies to determine potential terrorists sites majority of the responses agreed that it can be used for such purposes. Also the result shows that through the GIS automated system, terrorists can be monitored, tract and smashed across borders and highways and GIS can be used for better understanding of social phenomenon like criminality, violence and fear, and to work on solving them.

## **5.0. CONCLUSION**

### **5.1. Conclusion**

The research uses people opinion on insecurity in Kajuru local government to determine the role of using GIS in curbing insecurity in the study area. The responses shows how informed



are the people of the study area about the causes and menace of insecurity, and how fully they are aware on the use of GIS facilities in curbing insecurity in the study area. Though uncertainty was recorded, and this could be attributed to the fact that the GIS have not being used effectively and efficiently in the field of solving the problem of insecurity in the area. The responses started with majority strongly agreeing on the causes and effects of insecurity and crimes in the study area to majority only agreeing the use of GIS. This could be related to the general problem of the country.

## **5.2. Recommendations**

Based on the findings of the study, the following recommendations are made:

- i. Since most of the respondents were very much aware of the causes and effects of insecurity and crimes in the study area. It can be generalized that most of the residents are aware too, hence there is need for every responsible body put hand together and solve the problem.
- ii. In view of the response by the respondent and other sources (journals, newspapers), there is more need of using GIS technology in addressing the problem of insecurity, since most people agree it worked, the responsible bodies should apply more knowledge and facilities in using the GIS to solve the general problem of insecurity.
- iii. The information obtained didn't only show that GIS is effective in the study area, rather it could be suggested to be used in all areas that have problems with insecurity and crimes. Thereby bringing and restoring back peace in different places in the country.

## **Competing Interest**

The authors have declared that no conflicting interest exist in the paper.





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