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Research Article

GEOGRAPHICAL DISTRIBUTION OF POLICE STATIONS IN BAQUBA DISTRICT USING GEOGRAPHIC INFORMATION SYSTEMS (GIS)

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ABSTRACT

This study aims to know the spatial variation in the distribution of police stations in the administrative units of Baquba district. In addition to its reliance on the descriptive and analytical approach in addition to the cartographic representation using geographic information systems, the study also proved the validity of the hypothesis that states that there is a spatial disparity of the police stations in the study area, and it developed several points that could reach the optimal distribution of police stations in Baquba district.

KEYWORDS

Baquba District, latitudes, longitudes, GIS, Geographical analysis, pattern.

INTRODUCTION

Since man was created on the face of the earth and he is looking for security, because without it, life cannot be sustained, as all activities, whether economic or

social, depend on it. The absence of security and the spread of crime prevented the achievement of the desired goal and made the economies of many



countries in a critical situation as well as societal confusion, and based on this and the importance of the issue in the lives of Iraqis in general and the people of Baquba district in particular, the idea of studying this phenomenon came under the title (Geographical analysis of the distribution of police stations in Baquba district and their role in controlling crime using geographic information systems GIS) because of the important roles played by police stations and chief service and security that help in controlling crime and achieving security.

1. STUDY PROBLEM:

The problem of the study is represented in the presence of a main question: "What is the nature of the geographical distribution of police stations in Baquba district, and is the signature of police stations within the criteria specified for them?"

2. STUDY HYPOTHESIS:

There is a structural defect in the geographical distribution of police stations in Baquba district, which caused the spread of multiple types of crimes in the district, and there was no agreement between the signature of police stations and the criteria set for them by the Ministry of Interior, neither in terms of population nor area.

3. STUDY OBJECTIVES:

1. The study aims to show the reality of the geographical distribution of police stations in Baquba district and their suitability to the standards set by the Ministry of Interior.
2. The study aims to use geographic information systems (GIS) programs, and apply them in the field of security work, and to reveal the discrepancy in the distribution of police stations and its impact on the high crime rates.

4. THE IMPORTANCE OF THE STUDY:

The importance of the study lies in the fact that it was able to determine the spatial variation of police stations at the level of administrative units in Baquba district, as well as their lack of conformity with the standards of the Ministry of Interior.

5. STUDY METHODOLOGY:

In order for the study to reach its goal, it relied on the descriptive approach, the statistical method, and the cartographic analysis.

6. SPATIAL AND TEMPORAL BOUNDARIES OF THE STUDY AREA:

spatial boundaries:

The study dealt with the phenomenon of crime in the district of Baquba and at the level of administrative units, which include (Baquba district, Buhrz district, Al-Baba district, Canaan district, and Bani Saad district).

As for the temporal limits, the study covered the period from 2012-2020, as the available data are within this period.

THE FIRST TOPIC

1. Administrative units in Baquba District (location, area and population):

Baquba district is the administrative center of Diyala Governorate, located in the central part of eastern Iraq, where its population until 2020 reached about (632,708) people distributed among its five administrative units, which are (Baquba district, Al-Fabara district, Buhrz district, Bani Saad district, Nahia Canaan), and in order to show the geographical characteristics of the administrative units of Baquba district.

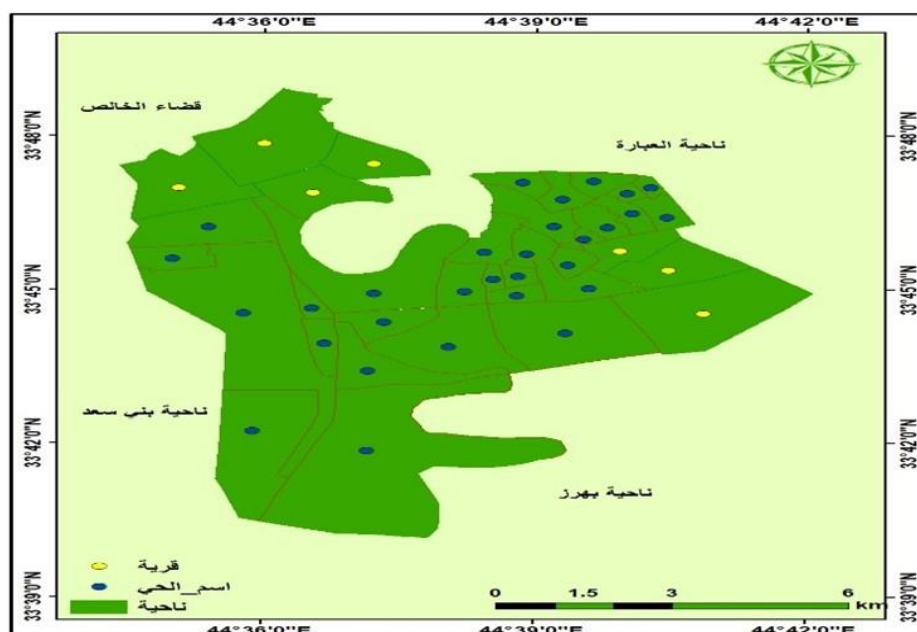


1. 1. Baquba District:

The district of Baquba, the center, is located in the north of Baquba district, between latitudes (“33°39’”) and (“33°48’”) in the north and between longitudes (“44°36’”) and (“44°42’”) east, as shown on Map (12), and it is bordered from the north-east by The ferry is from the northwest, the Khalis district, from the

southeast it is bordered by Buhraz district, and from the south by Canaan, its area is estimated at 224.1 km², and its population until the year 2020 reached about (302028) people, the district consists of the urban area, which in turn is divided into (30 A residential neighborhood, while the rural area consists of seven villages.

Map (12) showing the location of the district of Baquba in relation to Baquba district



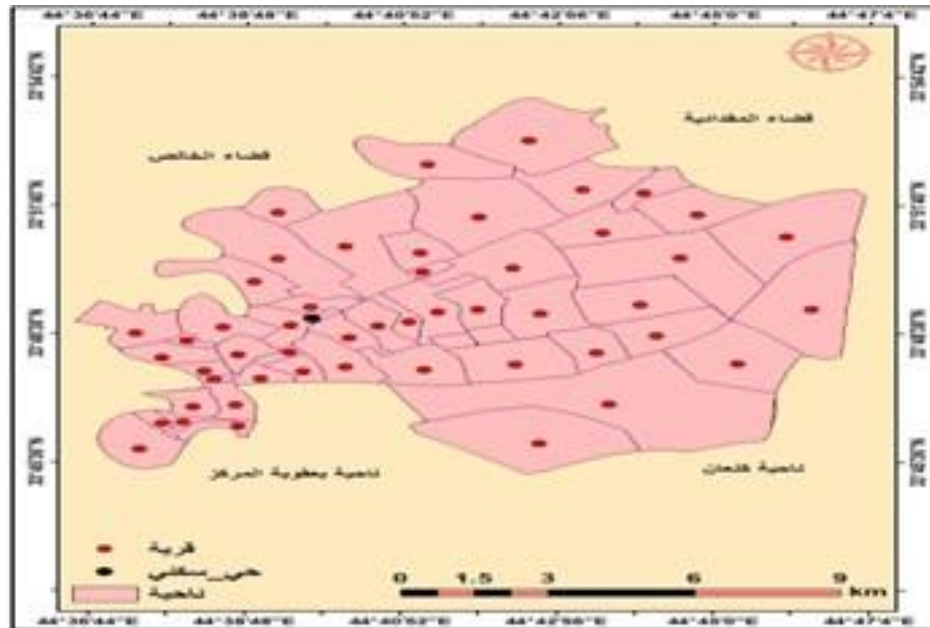
Source: From the researcher’s work based on the maps of the Ministry of Planning/ Center for Geographical Information Systems used for statistical purposes/ at a scale of 1:104000, and using the ARCMAP 10.7.1 program.

1. 2. Ferry District:

The Ferry District is located in the northeastern part of Baquba District, between latitudes 33° 45’ 36” and 3° 54’ 42” north, and longitudes 44° 36’ 44” and 44° 47’ 4” east. It is shown on map (13). It is bordered on the north by

Al-Salam, on the east by Wajihya and Abi Saida, on the west by Khalis district, and on the south by Baquba Al-Markaz. Its area is estimated at about (155.2 km²), and its population until 2020 reached about 85,790 people, including the urban area in the sub-district.

Map (13) showing the location of the Ferry District in relation to Baquba District



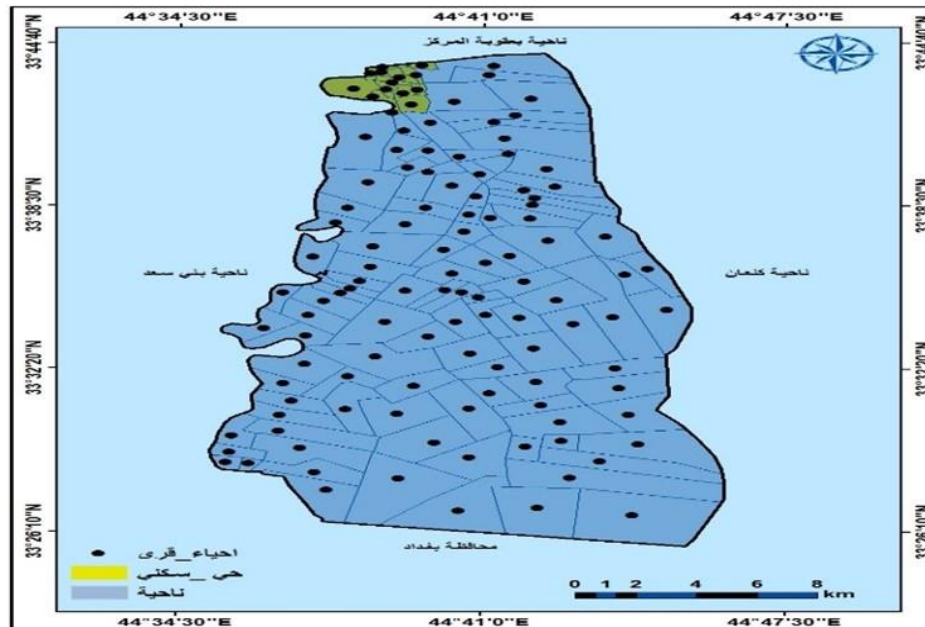
Source: From the researcher's work based on the maps of the Ministry of Planning / GIS Center used for purposes of Statistics/ at a scale of 1:109,406, using ARCMAP 10.7.1.

1. 3. Buhrz District:

The Buhrz District is located between latitudes (33° 26' 10") and (33° 44' 40") north and longitudes (44° 34' 30") and (44° 47' 30") east as shown on map (14). The administrative area is bordered to the north by the District of Baquba the Center, to the east by the District

of Canaan, to the west by the District of Bani Saad, and to the south by the Baghdad Governorate, its area is about (433.1) km², and its population has reached up to the year 2020 about (55591) people referred to Previously, Table (1), the urban area includes (14) residential neighborhoods, while the rural area of Buhrz District includes (108) villages.

Map (14) showing the location of District Buhraz in relation to Baquba District



Source: From the researcher's work based on the maps of the Ministry of Planning/ Center for Geographical Information Systems used for statistical purposes/ at a scale of 1:226,487, and using the ARCMAP 10.7.1 program.

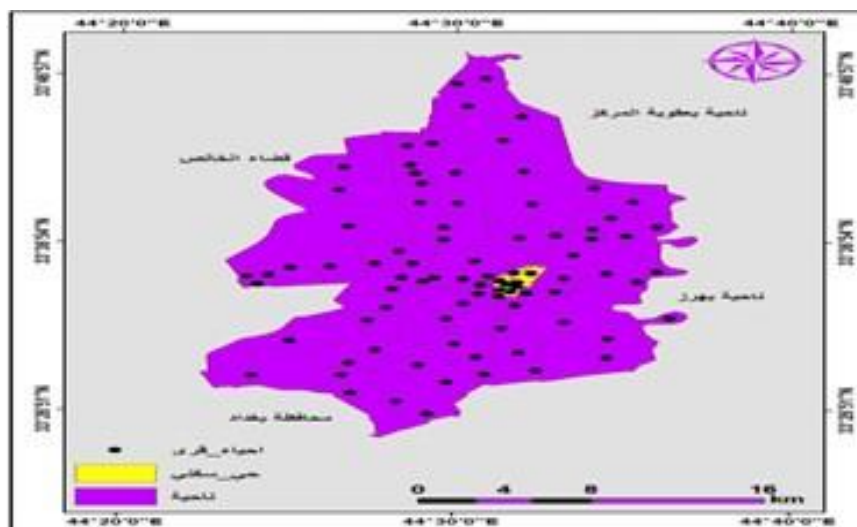
1. 4. District Bani Saad:

The Bani Saad District is located between latitudes (33:26"51) and (33:46"57) in the north and longitudes (44"20) and (44"40) in the east, as shown on Map (15). It is bordered on the north by the Baquba District The center, and from the east by the district of Buhraz, and

from the west by the district of Hibhab, and from the south and south-west of the province of Baghdad, with an area of about (498.6) km², and its population until the year 2020 reached about (139,632) people, the urban area in the district includes ten neighborhoods Residential, while the rural area includes (82) villages.



Map (15) showing the location of District Bani Saad in relation to Baquba District



Source: From the researcher's work based on the maps of the Ministry of Planning/ Center for Geographical Information Systems used for statistical purposes/ at a scale of 1:238,000, and using ARCMAP 10.7.1.

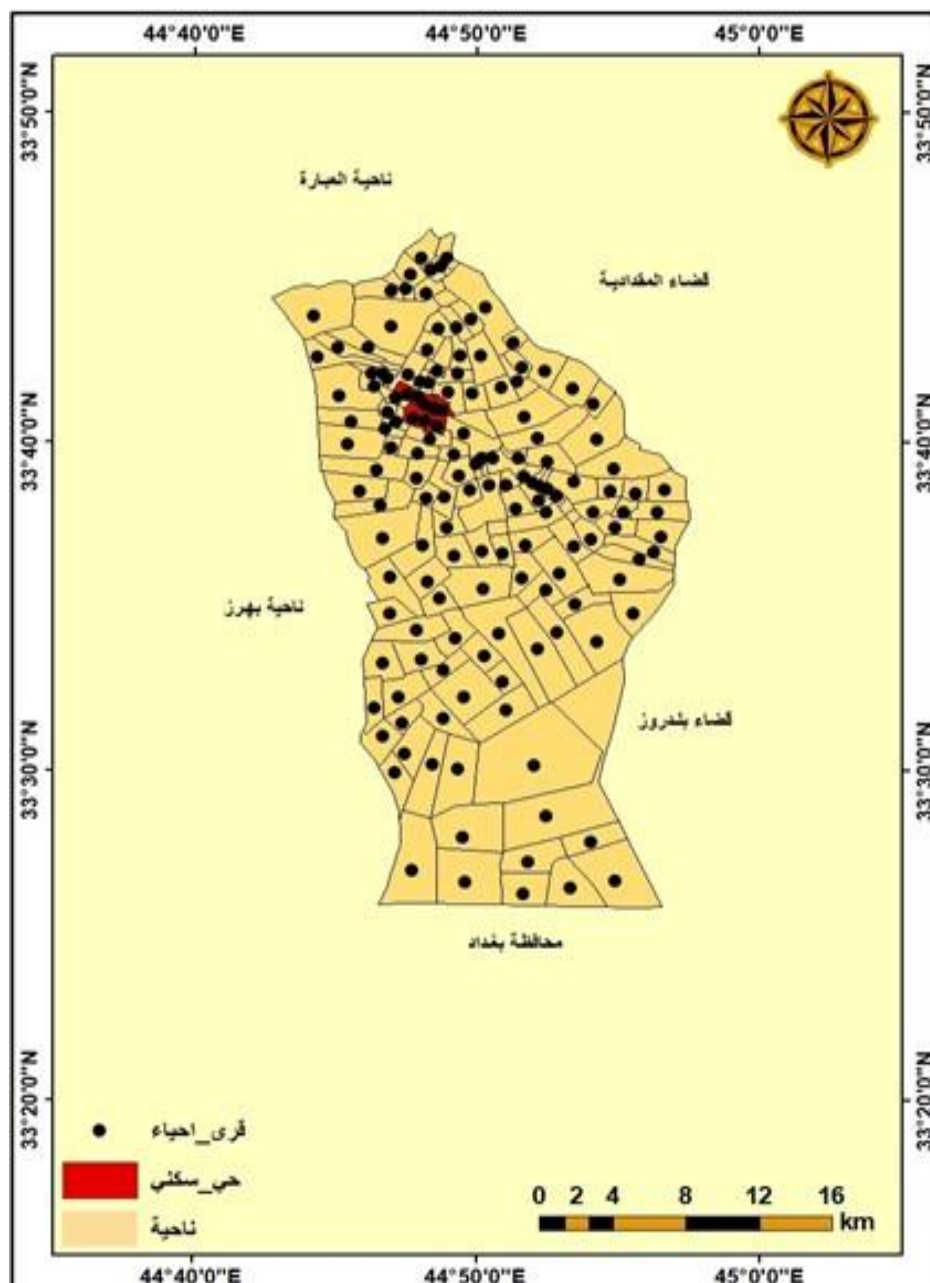
1. 5. District Canaan:

District Canaan is located between latitudes 33-20 and 33-50 north and longitudes 44-40 and 45 east as shown on map (16). From the northwest, the District Ferry District, from the west by the Buhraz District, and from

the south, the Baghdad Governorate, its area is about (630.3 km²), and its population has reached (49667) people until the year 2020, and the urban area includes eight residential neighborhoods, as for the rural area, it includes 144 villages.



Map (16) showing the location of District Canaan in relation to Baquba District



Source: From the researcher's work based on the maps of the Ministry of Planning/ Center for Geographical Information Systems used for statistical purposes/ at a scale of 1:263,569, and using ARCMAP 10.7.1.



THE SECOND TOPIC

GEOGRAPHICAL DISTRIBUTION OF POLICE STATIONS IN BAQUBA DISTRICT

The local police apparatus is one of the important formations affiliated with the Ministry of the Interior, operating under national sovereignty, and many see it as the most prominent representative of the state, and the police apparatus is considered one of the vital and basic services in the city, due to its role in protecting the security and safety of society, and from the above and the importance of the issue, the study focused on a geographical analysis of police stations in Baquba district using GIS techniques, and to find out the extent to which their spatial distribution matches the standards set by the Ministry of Interior for the creation of police stations, with the aim of performing their role within what is decreed and planned.

1. Standards of the Ministry of Interior for the creation of police stations:

1. It is possible to request the creation of a police station in the capital for every (100) thousand residents, especially in a typical building. On the outskirts of Baghdad, a police station can be created for every (50,000) thousand people with a geographical area of (20) km².
2. Governorate centers A center can be created for every (60,000) thousand people.
3. Districts and sub-districts A police station can be created for every (25-60) thousand people.
4. Regions and sub-districts A police station can be created for population centers spread around (25,000) people.
5. Remote areas far from police stations with a scattered shape or located on major roads, the unstable security situation and the population

number of not less than (10) thousand people, a police station can be established.

6. Attached with the creation form is a letter from the Statistics Department about the size of the population in the area in which the center is proposed to be established.
7. The name of the center should be indicative of the name of the area (the neighborhood and the locality), which facilitates the possibility of identifying its location and inferring it easily and knowing its spatial specialization.
2. Geographical analysis of the distribution of police stations in Baquba district and the pattern of their spread:

A number of technical means are adopted in geographic information systems, in order to reach to determine the spatial nature of the nature of the study area. And matching, conditional evaluation of sites, building future scenarios, establishing ranges and corridors around phenomena, developing models for choosing the best sites, juxtaposition analysis, spatial measurement and spatial approximation and others, which allows flexibility of work and shortening time and effort and access to optimal solutions and policies in order to support the security decision.

According to the administrative division shown in Table (16), Baquba District is divided into (5) administrative units, in which police stations are distributed as follows. (5) Centers for District in Baqubah Center, (9) centers for District Ferry District, recording the highest percentage of the total centers in the district, amounting to about 37%, (3) centers for District Buharz, and (2) Centers for District Canaan, registering the lowest percentage of the total Police stations in the district, and (5) centers for District Bani Saad. The spatial discrepancy in the population distribution also



leads to the variation in the average service provided by police stations, as it rose to the highest value in District Baquba Center (302028) thousand/person,

while the average service for police stations in District Canaan decreased to (49667) thousand/person.

Table (16) shows the number of police stations according to the administrative units of Baquba District in 2021

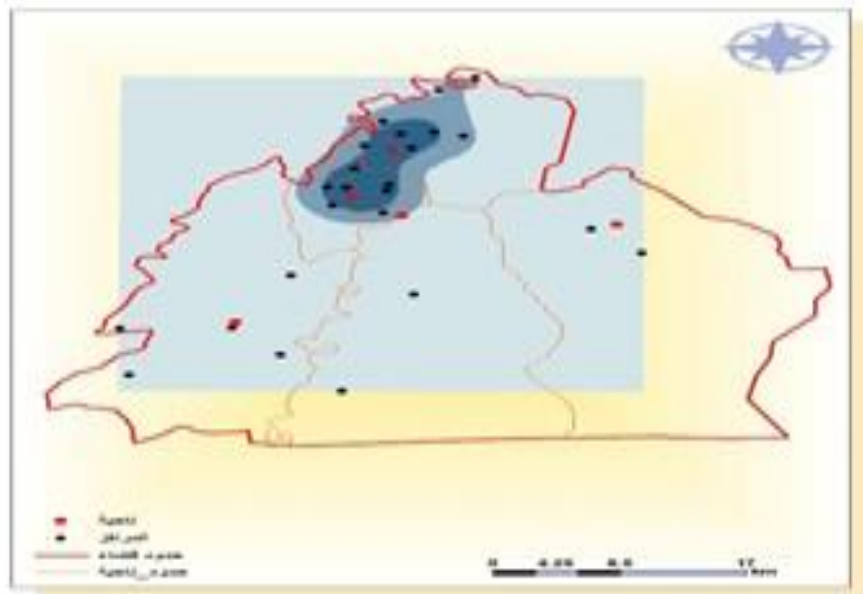
District	District Number	District Percentage	Population/ Thousand
Baquba District	5	%21	302028
Ferry District	9	%37	85790
Buhraz and Canaan Districts	3	%21	55591
	2		49667
بني سعد Bani Saad	5	%21	139632
Total	24	%100	632708

Source: From the researcher's work based on the data of the Diyala Governorate Police Directorate, and Diyala Governorate Statistics Directorate 2021.

When observing the map (17), it becomes clear that the direction of the spread of police stations is towards the north-east and south-west, in addition to the concentration of more than half of the number of stations in the two areas of the Ferry District and Baquba, the researcher also identified the pattern of

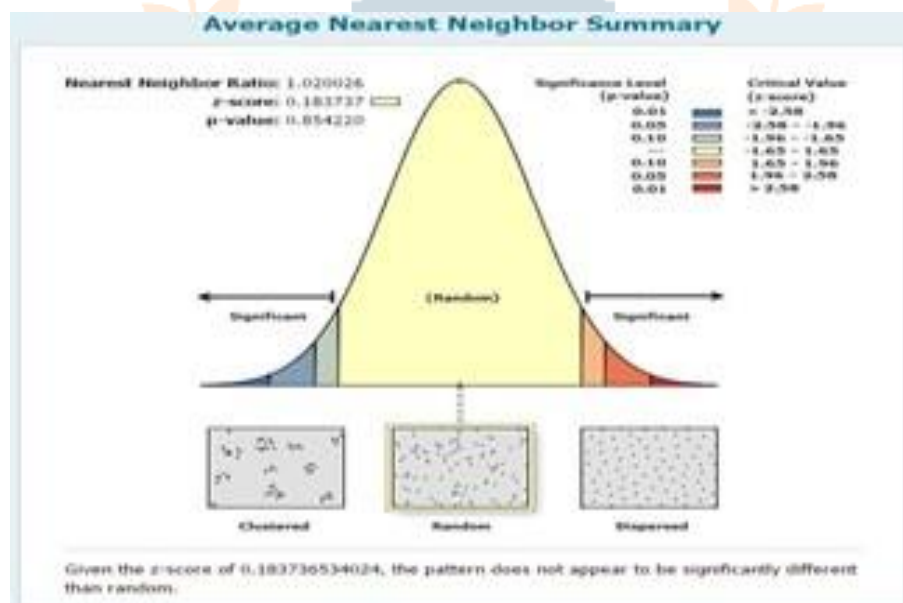
the spread of police stations through the tools SPATIAL STATISTICS and then Analyzing pattern Then the Nearest neighbor, and through Figure (14) and looking at the standard score of (0.183736534024), it was found that the distribution pattern of police stations in Baquba District is random.

Map (17) showing the geographical distribution of police stations in Baquba District



Source: From the researcher's work based on the administrative map of Baqubah and using ArcMap 10.7.1.

Figure (14) shows the distribution pattern of police stations in Baquba district



Source: From the researcher's work by applying the nearest neighbor indicator using ArcMap 10.7.1.

2. 1. Geographical analysis of the distribution of police stations in the district of Baquba the center and the pattern of their spread:

The study of administrative units at the sub-district level is one of the studies that give more accurate and clear details than studies that are at the level of a governorate or district. As the study of aspects provides an opportunity to deal with geographical phenomena and to reveal the reasons for their discrepancy.

Based on the foregoing, it is clear that the district of Baquba Center includes (5) five police stations, which constitute 21% of the total centers in Baquba district, as shown in Table (2), and it is entrusted with the task of maintaining security and protecting the population in 30 residential districts as well as seven villages.

Table (17) shows the population of police stations in Baquba District

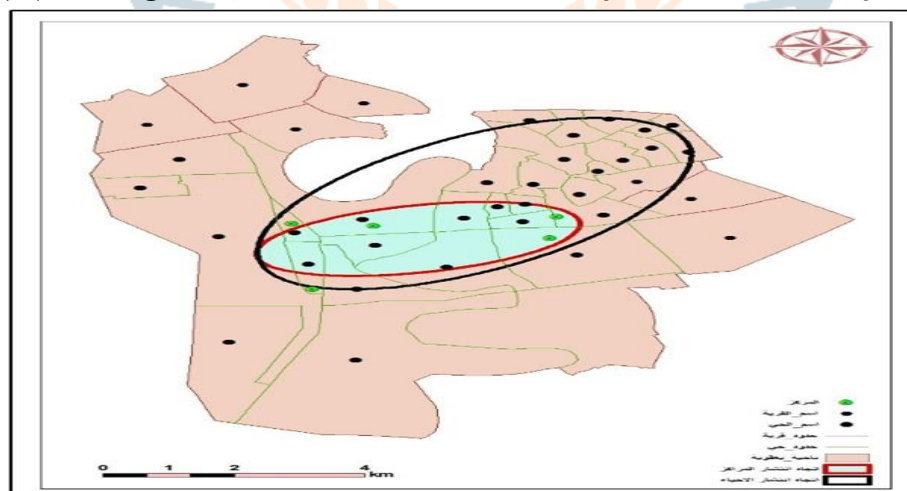
District	Al-Sharqi	Al-Tahrir	Baquba Al-Jadeedah	Al-Mafraq	Al-Othmaniah	Total
Population/ Thousand	60000	45,500	11,700	115000	60000	292,200

Source: From the researcher's work based on data from the District Police Department in Baquba.

It is clear from table (17) that there is a discrepancy in the average service provided by police stations at the district level with the penalty of the center, where the Mafraq police station is characterized by the highest

value in terms of the average service provided to citizens, amounting to about 115,000 people, while the lowest value of the average service was recorded in the new Baquba Center It reached about 11,700 people.

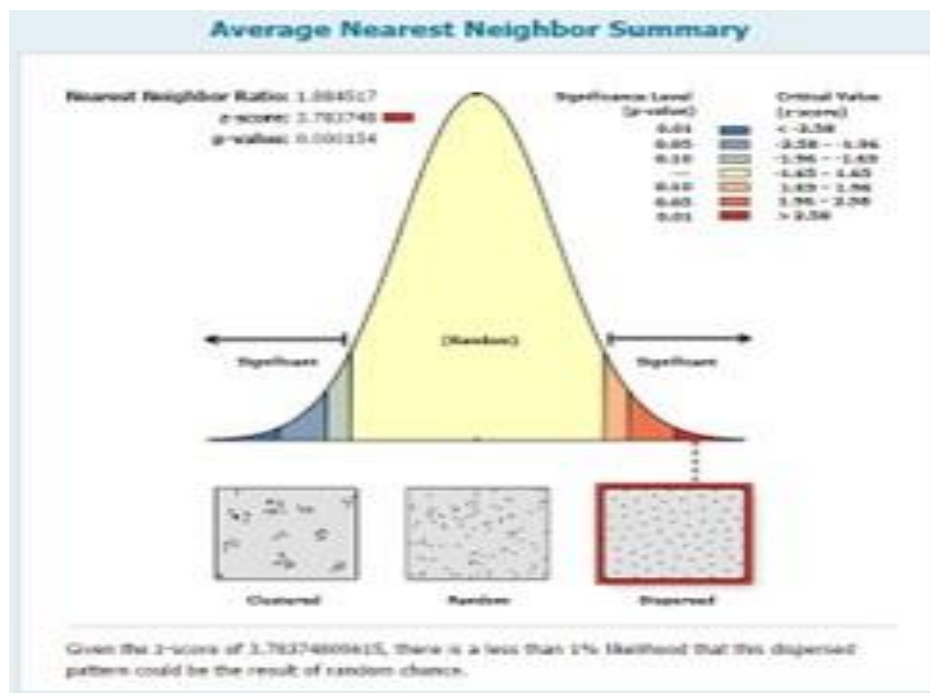
Map (18) showing the direction of the distribution of police stations in Baquba District



Source: From the researcher's work based on the maps of the Ministry of Planning, the Center for Geographical Information Systems, for the inventory of residential areas.



Figure (15) shows the distribution pattern of police stations in District of Baquba



Map (18) also indicates that the distribution of police stations in the district of Baqubah, the center, is oriented from east to west, distributed within an area of (10,600) km² of the total area of the district. As for residential neighborhoods, the direction of their distribution is from the north-east to the south-west, this indicates that the distribution of police stations does not correspond to the direction of the distribution of residential neighborhoods.

While Figure (15) shows the distribution pattern of police stations in the district with the punishment of t

he center, and from looking at the (R) value of (1.884517), the distribution pattern is (Dispersed).

2. 2. Geographical Analysis of the Distribution and Pattern of Police Stations in the Ferry District:

It is clear from Table (18), that the District Ferry District includes (9) nine police stations, which constitute (37%) of the total stations in Baquba District, and it is entrusted with the task of maintaining security and protecting the population in one residential neighborhood as well as (46) villages.



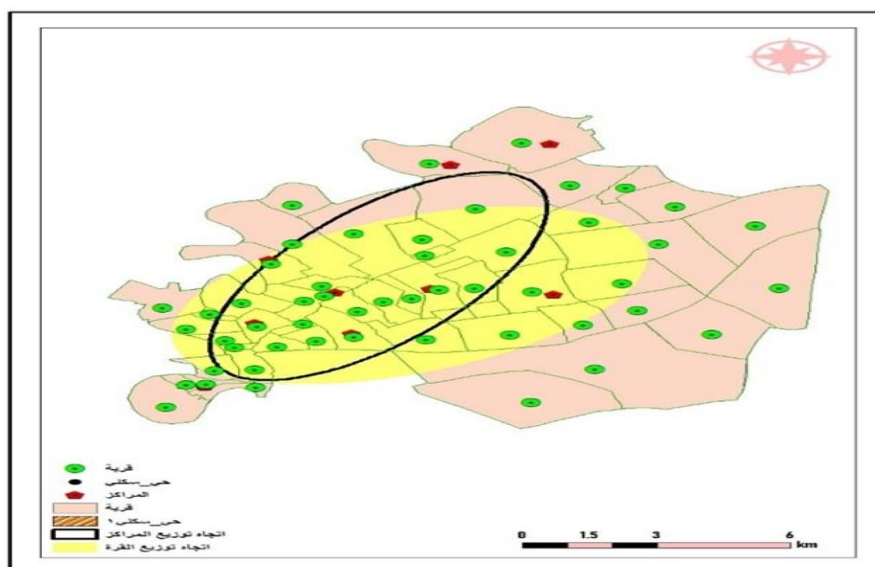
Table (18) shows the population of police stations in the Ferry District

District Name	Al-Kibbah	Zagniah	Dawra	Al-Sada	Al-Nasser	Al-Dourien	Ferry District	Khernabat	Al-Hoeider	Total
Population/Thousand	493	5,452	12,546	34,203	7,787	9000	4000	17000	20850	111,331

Source: Researcher's work based on District Ferry District Police Department data.

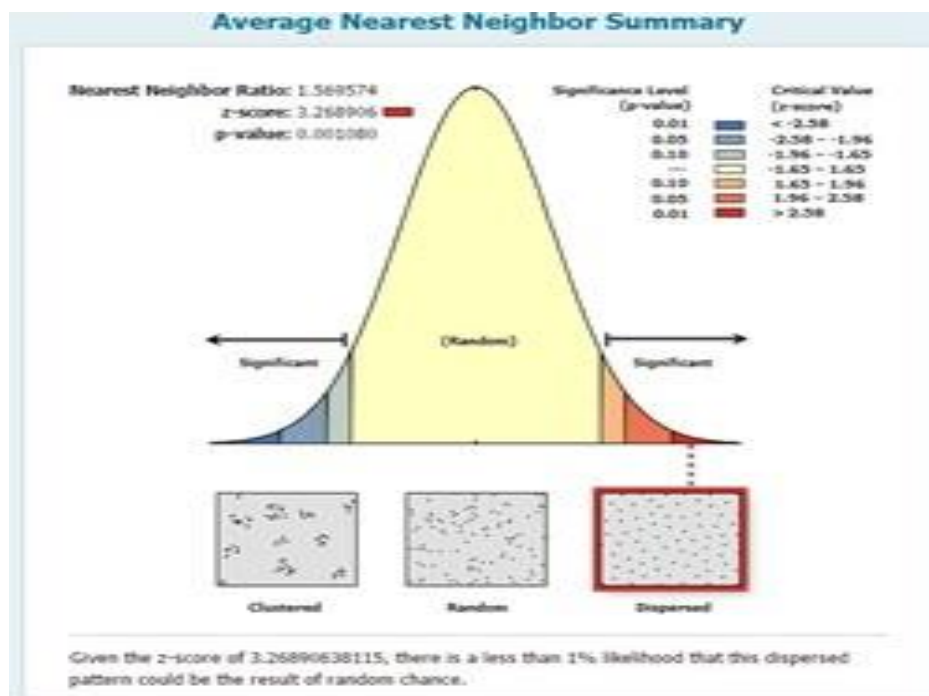
The average service provided by the District Ferry District police stations varies, as the highest value of the average service provided to citizens in Al-Sada Center was about (34203) thousand / person, while the lowest value of the average service was recorded in Al-Kubba Center at (493) thousand / person.

Map (24) showing the direction of the distribution of police stations in the Baquba District



Source: From the researcher's work based on the maps of the Ministry of Planning, the Center for Geographical Information Systems, for the inventory of residential areas.

Figure (16) shows the distribution pattern of police stations in District of Baquba



Source: From the researcher's work based on map (24).

Map (24) also indicates that the distribution of police stations in the Ferry District, its direction is generally from the southwest and northeast, while residential neighborhoods and villages, the direction of their distribution is from the southwest and east, which indicates that the distribution of police stations does not correspond to the direction of Distribution of residential areas.

While it is clear from Figure (16), that the distribution pattern of police stations in the Ferry District is (Dispersed), the dispersal pattern is similar to the

pattern of the distribution of police stations in the District of Baquba.

2. 3. Geographical analysis of the distribution of police stations in the District of Buhraz and Kanaan and their distribution pattern:

It is clear from the table (19), that the district of Buhraz and District of Canaan includes (5) police stations, which constitute 21% of the total centers in Baquba district, and it is entrusted with the task of maintaining security and protecting the population in the neighborhoods and villages of the two districts, given that District Canaan is affiliated with security to the District Police Department Behrz.

Table (19) shows the population of police stations in Canaan and Buhraz districts

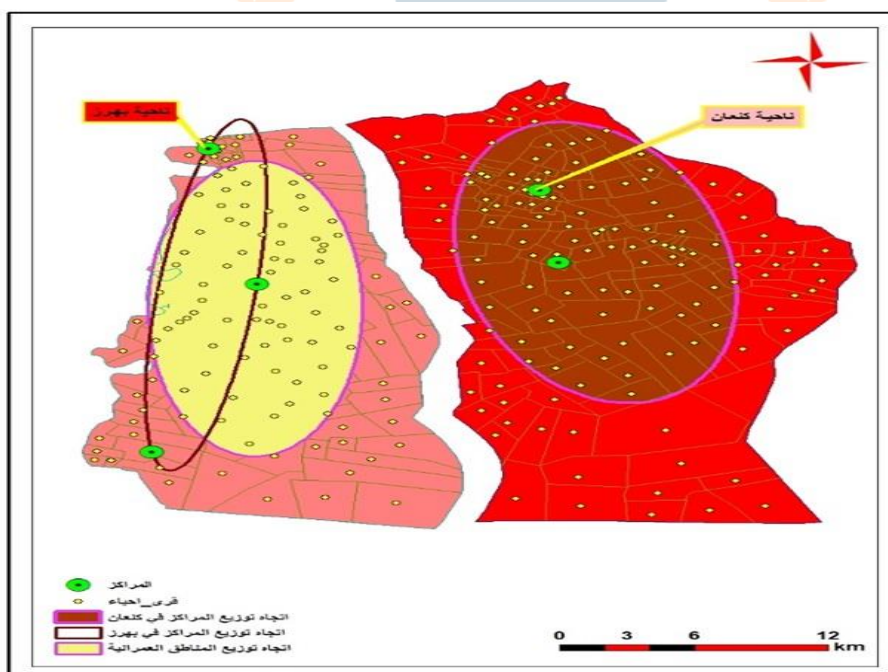
Name	Buhraz	Abo Khamis	Jawad Basho	Canaan	Al-Tahaddi	Total
Population/ Thousand	62000	16000	2500	45000	8500	134000

Source: From the researcher's work based on data from the District Police Department in Buhraz.

The average service provided by the District Ferry District police stations varies, as the highest value of the average service provided to citizens in Buhraz Police Station was about (62,000) thousand / people,

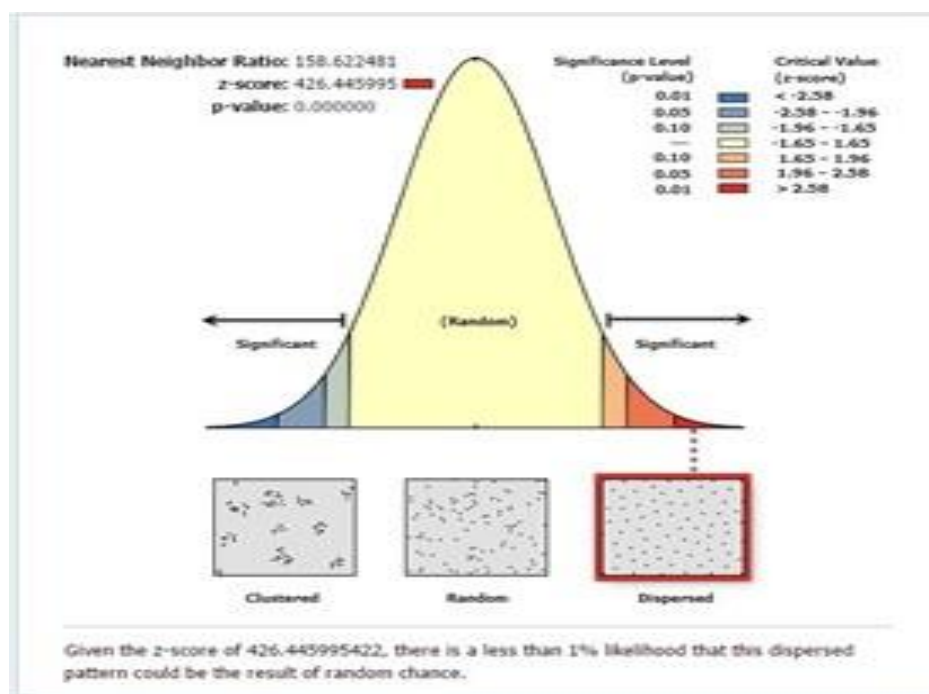
while the lowest value of the average service was recorded in Jawad Al-Basho Police Station (2,500) by about (493) thousand.

Map (34) showing the direction of the distribution of police stations in the regions of Canaan and Buhraz



Source: From the researcher's work based on the maps of the Ministry of Planning, the Center for Geographical Information Systems, for the inventory of residential areas.

Figure (17) shows the distribution pattern of police stations in Buhrz and Canaan districts



Source: From the researcher's work based on a map (34).

Map (34) also indicates that the distribution of police stations in the Canaan District, its direction is generally to the south and north, and is consistent with the direction of the distribution of residential neighborhoods and villages. Corresponds to the direction of distribution of residential areas.

While it is clear from Figure (17), that the distribution pattern of police stations in Buhrz and Canaan districts is (Dispersed), the dispersal pattern is similar to the distribution pattern of police stations in Baquba Al Markaz District and Ferry District.

2. 4. Geographical analysis of the distribution of police stations in District Bani Saad and the pattern of their spread:

It is evident from Table (20), that District Bani Saad includes (5) police stations that constitute 21% of the total centers in Baquba District, and it is entrusted with the task of maintaining the security and protection of the population in the neighborhoods and villages of the district.

Table (20) shows the population of police stations in District Bani Saad

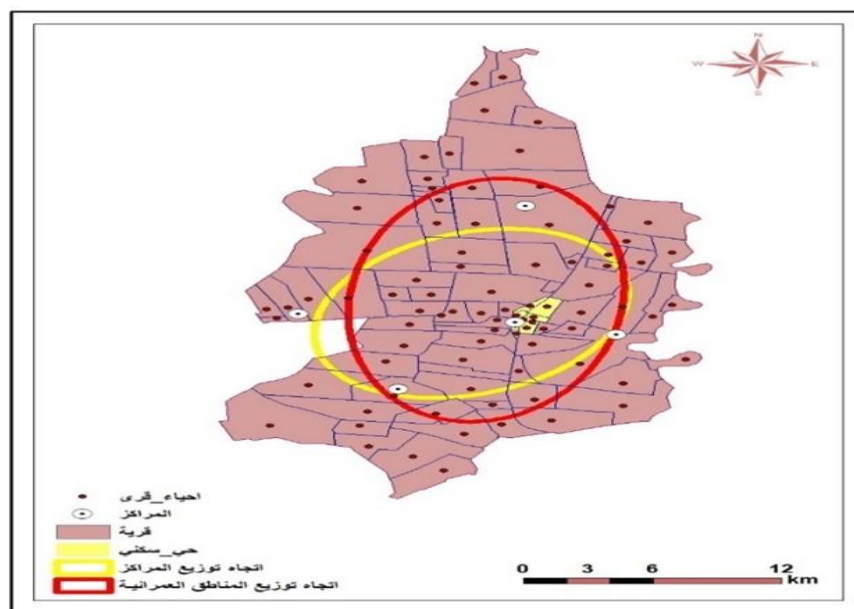
Name	Bani Saad	Abo Sair	Swed	Muhammad Sakran	Al-Waziriah	Total
Population/ Thousand	39000	21429	29492	40000	28929	158,850

Source: From the researcher's work based on the data of the District Bani Saad Police Department

The average service provided by District Bani Saad police stations varies, as the highest value of the average service provided to citizens in Muhammad Sakran police station was about (40,000) thousand / people, while the lowest value of the average service

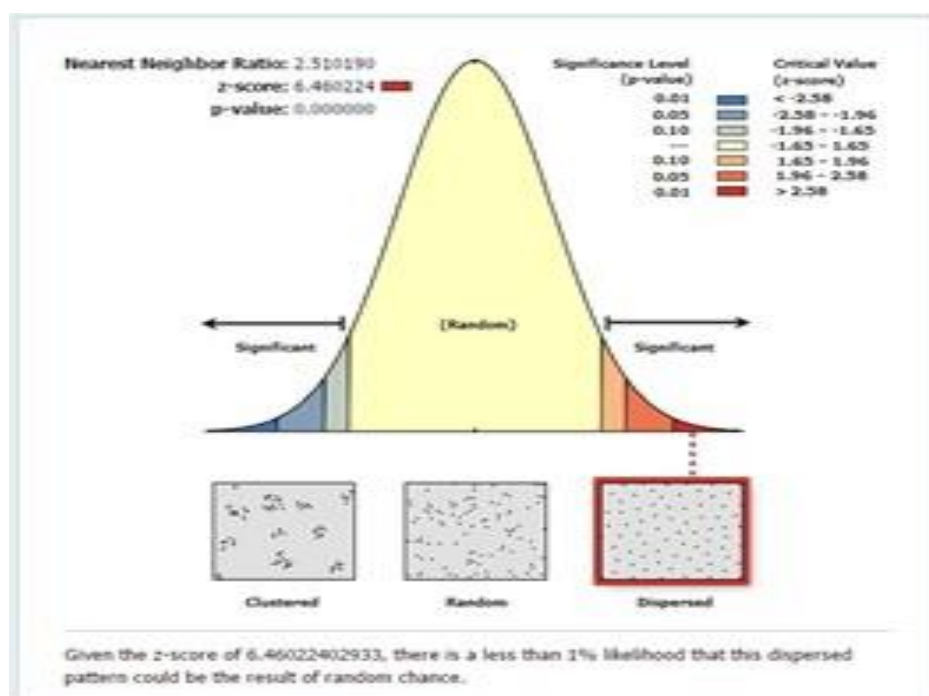
was recorded in Abu Sir police station at about (21,429) people.

Map (40) showing the direction of distribution of police stations in District Bani Saad



Source: From the researcher's work based on the maps of the Ministry of Planning, the Center for Geographical Information Systems, for the inventory of residential areas.

Figure (18) shows the distribution pattern of police stations in District Bani Saad



Source: From the researcher's work based on map (40).

Map (40) also indicates that the distribution of police stations in District Bani Saad, in general, is to the southwest and east, and does not correspond to the direction of the distribution of residential neighborhoods and villages.

While it is clear from Figure (18), that the distribution pattern of police stations in District Bani Saad is (Dispersed), the dispersed pattern is similar to the pattern of distribution of stations in the administrative units of Baquba District.

CONCLUSIONS

We conclude from the foregoing that it is clear that the police stations in Baquba district were not distributed on the basis of planning standards, which stipulate that the service scope of the police station is (800) m2, and

the distribution of centers was not taken into consideration based on the standards of the Ministry of Interior, which depend on the population as a criterion. To create a police station in any region or administrative unit, in addition to the fact that security cadres were not distributed to police stations according to the standards of the Ministry of Interior (each police station has 75 security men), and it is clear that police stations in Baquba district were distributed according to certain conditions and requirements.

RECOMMENDATIONS

1. The study recommends reconsidering the distribution of police stations and their personnel in line with the population numbers and the urban expansion of administrative units in Baquba district.



2. The study recommends raising the efficiency of policemen in Baquba district in using modern technical means, by preparing training programs that keep pace with the development in the methods used in crime control.
3. The study recommends paying attention to geographical studies that deal with the security aspect, through cooperation between the Ministry of Interior and the scientific and research institutions of the Ministry of Higher Education specialized in this aspect.
4. The study recommends expanding the use of geographic information systems by police stations, to prepare maps and adopt them as an important tool in analyzing crime patterns and knowing the areas of their concentration.

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