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Analysis of the effective change in the functions of land use and its impact on city structure, the study area Karrada / Baghdad / Iraq

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Abstract. The idea of the research came from the control of real estate developers and investors in the private sector on changing the activities of land uses, contrary to the basic design of cities. This change will be in two types, but the activity will be changed completely, such as converting green areas and orchards into commercial areas such as restaurants and markets, or by increasing the intensity of the activity itself within the same use as splitting the residential areas into small or multi-story housing units. The aim of the research is to quantify this situation in the Karrada district of Baghdad, and trying to find a vision to solve this problem by assuming that this change can be directed positively forward by changing the city's structure functionally, as one of the biggest problems is leaving the issue without question. On the other hand, the weak implementation of the law in general, and therefore the difficulty of controlling the profitability of the investment movement in changing the city's activities. Since this phenomenon appeared clearly after the structural change of the economy and society in Iraq after 2003, the time period for the study was chosen from 2007 to 2019. Where the year 2007 was considered the beginning of assimilation of changes after 2003 and their urban appearance with their socio-economic impacts, and 2019 is the current time when this change reaches its peak.

Keywords: Spatial Analysis, Urban Space, Social Interaction, Land Use.

1. Introduction

The concept of urban spaces remains wide and included in landscape studies, social sciences, physical and environmental practices, social practice, and many disciplines. In landscape studies, urban free spaces are defined as spaces devoid of buildings such as backyards, public or private gardens, streets, roads, squares, parks, rivers, forests, wetlands and urban beaches, or urban spaces that have not been noticed by anyone. These spaces also form a diffuse fabric without which one cannot imagine the existence of cities, and they are found everywhere.

This research defines urban spaces as spaces devoid of buildings as well as commonly used places such as streets, squares, parks, public buildings, and all spaces designated collectively where public domain activities are carried out, whether publicly or privately owned. They may even exist without material and tangible support, bearing in mind that institutions and public spaces are important and collectively designated spaces and spaces for human manifestation.



2. Types of individual activities that take place in public spaces

Urban spaces usually represent the highest percentage of city land, even among densely populated megacities [1]. Since the sense of place is derived from the experiences of the body, each medium needs at least ten destinations to create a mass of places in which visitors and residents alike can interact in the city for several days at a time, what if the city could have dynamic neighborhoods. Then everyone can access distinct public spaces and parks within close proximity to their homes. This is a realistic goal for any city that is serious about enhancing and revitalizing its urban life. In every city there is a desire for unique and vibrant public places where friends meet with each other and where social and economic interactions take place, but in many cases, cities and neighborhoods lack effective public spaces that bring communities together and impart a sense of belonging and participation that can revitalize city life [2].

There are three types of people activities that take place in public spaces:

First, the most common activity in public spaces is observing other people and this activity occurs in people watching because there is a metaphor for the idea of theater in public spaces [3]. When it is in public, people are actors and audiences at the same time, as spectators we can observe various activities simultaneously, examples of these activities are young children learning to walk, young women who dress stylishly and beautifully. At the same time, as actors, we enjoy presenting our values to the audience. Through our clothes, our attitudes, and our behavior [4].

Second, in public spaces, people tend to stay in or move around in urban agglomerations [5], for example, many UC Berkeley students rest on the memorial amphitheater in the park in front of the library and most of them are small gatherings together. People on a busy street tend to stay within the main pedestrian stream, because being surrounded by other people creates a feeling that we are part of the group and less alone.

Third, the last people-to-people activity in public spaces is interaction with others, including acquaintances and strangers [6]. A large proportion of people in public spaces are in groups and these people meet, talk, laugh and then say goodbye to each other, when interacting with strangers, people respond politely to others with facial expressions and body movements [7].

3. Definitions of urban space

Several definitions of urban space exist in landscape studies, social sciences, physical and environmental practices, social practice, and many disciplines. If we see a “space” as a three-dimensional structure in which things can be organized and in which events and activities can occur, then a “place” can be created within “space”. The main differences between “space” and “place” are place identity, place connections, social process, memory and uniqueness. Successful public spaces are vital and safe places that work well and offer many diverse methods and activities for people to use in different ways, needs of those in public spaces depend on the activities and motivation, urban spaces include open spaces, public and private places, streets and malls.

Urban spaces include open spaces, public and private places, streets and malls, it is important to plan for social interaction in urban spaces by planning for all groups of society. So, we found term Triangulation is the concept of grouping together to create a crowded and vital place for many different types of people at different times of the day. One of the tests for the extent of triangulation of a place is to assess how long the average person stays there. Another indicator is the number of different age groups that use the place.

The role of streets, transportation, and easy access to urban spaces are important as they are worth visiting destinations. Inclusive public spaces allow people of different generations to coexist in ways that may mitigate expectations of problems between them, the management of public places is by organizing security and with the full participation of society. Providing public services through the design of urban spaces. Societal participation is important in the making of the place and the exclusion of any category of society in urban spaces should be avoided [8].

Individual use and social interactions in public spaces are influenced by an understanding of public space, issues of policy, practice, and social interactions in urban public spaces. The planning of urban spaces is

based on the design of streets and places that are comfortable for people, and the achievement of sustainability and the broader goals of society.

4. Case study area

Eastern Karrada is a sub-district located within the Rusafa district, its area is (Karrada secondary sector), (20.9 km²), and its population is approximately 650 thousand people according to the Municipal Council of the Karrada region, and is crossed by two main streets, the first (Karrada Road - Inside) and extending from Jamal Square Al-Din Al-Afghani (Kahramana Square) in Mafraq to Al-Zawiya. The first part of it is called Al-Mahdi Street, and the second is called Al-Harith Street. As for the second main street, it is (Karrada Road - outside) extending from Ammar bin Yasir Square (in the pool) to the Baghdad University building in Jadriya. The section extending from it between Freedom Square and the university site is called Sixty Street because its width is sixty meters.

Eastern Karrada occupies the southern part of eastern Baghdad on the eastern side of the Tigris River directly connected to the center of the capital. Because of its geographical location, where it occupies a central plain area, it has been linked throughout Iraq with several ports. So, the northern port penetrates the Rusafa district center heading towards northern Iraq, and the northwestern port It heads from the suspension bridge to the Karkh district. Where it branches out in three directions towards northern Iraq, towards the west towards Al-Rutba, and towards the south and southwest towards the cities of Hilla and Karbala. As for the eastern and southeastern port, it heads towards New Baghdad and from there to Baqubah and eastern Iraq, and the southern port heads to the city of Kut and southern Iraq.

5. Land uses

By analyzing the maps of land use and calculating the areas of basic uses in the Karrada region. It becomes clear to us that the dominance of residential use is mainly, and this is logical because it is the main use in the city. Followed by the open, agricultural and industrial areas during the three years in which the residential uses have been monitored. This is also logical because the dominant feature of the Karrada region is the spread of orchards and agricultural lands, note figures 1, 2 and 3 with table 1.

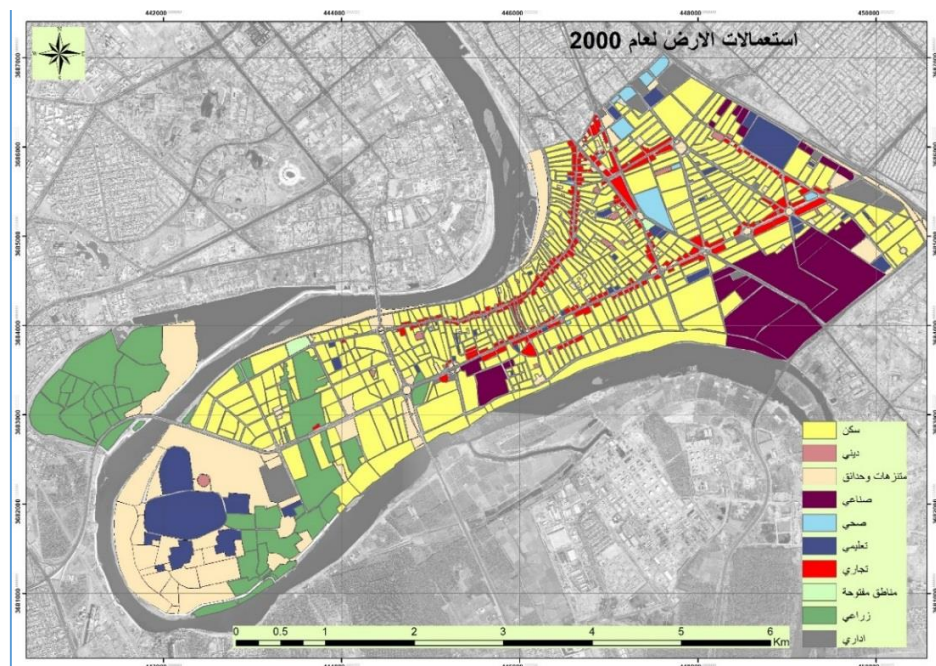


Figure 1. Land uses for the eastern Karrada study area for the year 2000

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

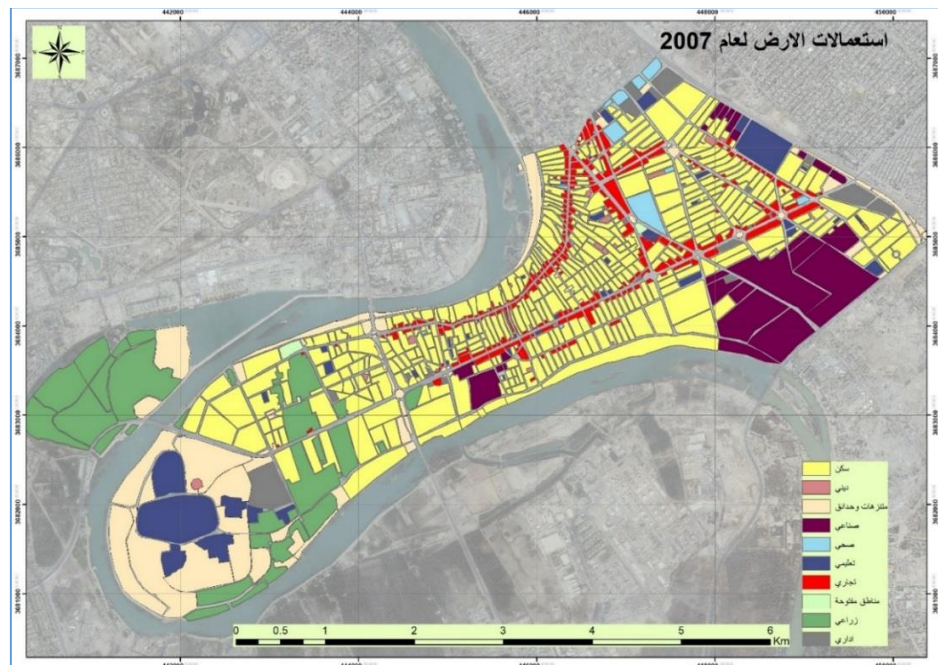


Figure 2. Land uses for the eastern Karrada study area for the year 2007

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

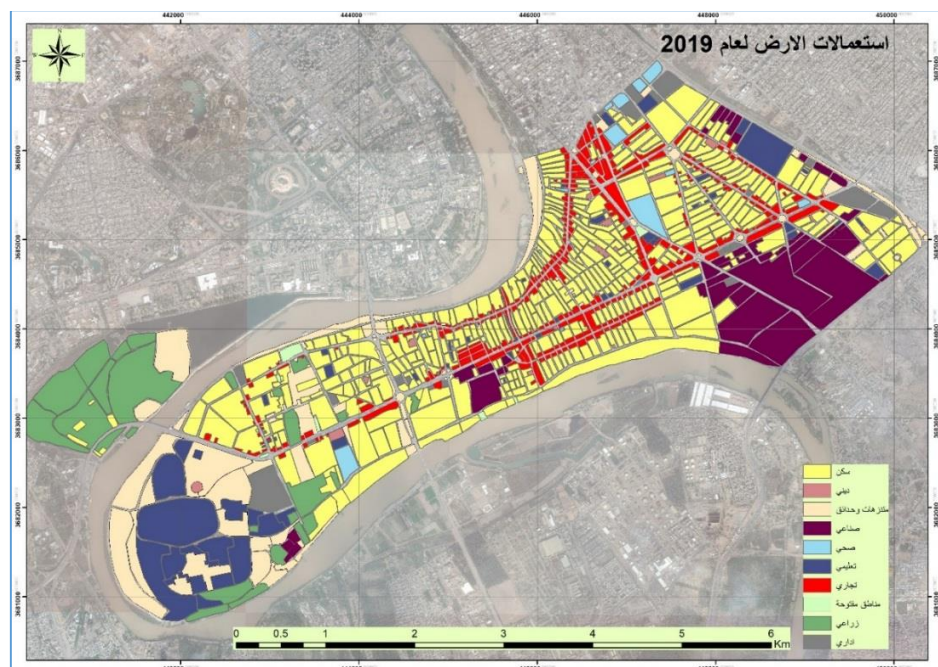


Figure 3. Land uses for the eastern Karrada study area for the year 2019

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

Table 1. Land use in the study area for the year 2000, 2007, 2019 in square meters.

land use	Year2000	Year2007	Year2019
Religious	77059	130770	91970
Open	3000561	2388925	2387390
Industrial	1766921	1888650	2050605
Hospitals	244389	291680	306185
educational	1211116	1283445	1923085
commercial	698575	927940	1306245
Urban space	44895	95115	55480
agricultural	2509690	2597320	1788700
Administrative	434535	560510	530790
residential	7989404	7812790	7536695
Total	17977145	17977145	17977145

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

We find that there is a clear decrease in residential use, the use of open areas and agricultural use, during the period from 2000-2019, while it is offset by a remarkable increase in commercial use, reaching from 2000 to 2019 of about 87%. While educational uses reached about 87%. (59%) compared to the year 2000. This is due to the increase in private education in the Karrada region at all its primary, secondary and university levels. This was matched by a slight increase in the urban spaces areas amounting to (23%) from the year 2000. Which was originally a small value and did not exceed a percentage (0.2%) of the total use in the Karrada region in 2000, while it reached (0.3%) only in the year 2019. It is also noted that the increase in health use as a result of the increase in private investments in this sector was about (25%) compared to the year 2000.

6. Change in land use for the Karrada region

Table 2 shows that the highest change in the increase in land use for the period 200-2007 is in religious use, followed by commercial and administrative use, offset by a sharp decrease in the increase in open areas, and this change continued for the period from 2007-2019. We notice the high increase in educational use as a result with the spread of private education in an unprecedented way, accompanied by a very large decrease in green areas, religious uses. Overall, it is possible to summarize the change in land use for the period from 2000-2019, with an increase in commercial use, followed by private education, at the expense of the decrease in open areas and green areas.

Table 2. Change in land use for the periods (2000-2007), (2007-2019), (2000-2019) in square meters.

land use	Change from 2000 to 2007	Change from 2007 to 2019	Change from 2000 to 2019
Religious	70	-29	19
Open	-20	0	-20
Industrial	7	8	16
Hospitals	19	5	25
educational	6	50	59
commercial	33	41	87
Urban space	112	-41	23
agricultural	3	-31	-29
Administrative	29	-5	22
residential	-2	-3	-6

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

7. Discuss the results

The residential use area in the year 2000 amounted to (7812790) square meters, at a rate of 44.4% of the total area, decreased slightly in 2007, and in 2007 the total residential use area became (7840890) square meters, 44% of the total. While the area became the total residential use in the year 2019 is (7476415) m², i.e. with a higher decrease, as it reached (42%) of the total, meaning that the total area became less in the year 2019, in order to convert (2.5%) of residential use into commercial and industrial use, than it is in general 2000. The reason is due to the increase in land prices in the study area.

Religious use was its area in 2000, up to (77059) square meters, constituting (0.4%) of the total area of the Karrada region, and in 2007 it became (130,770) square meters at a rate of (0.7%), an increase close to double the area from the year 2000. It became (91970) square meters (0.5%) in the year 2019, and this indicator can be considered as the trend to exploit green spaces and gardens of religious facilities as areas for investment and maximization of resources. As happened recently in the vicinity of Al-Firdous Square in the northeast of the study area due to the scarcity of land and the increase of its value in the study area. Since the number of pieces for religious use was around (24) units.

Likewise, agricultural lands are transformed into urban space by cutting palm trees and stripping the land from agriculture in preparation for converting it to another use. As well as, the transformation of agricultural use into residential use in 2019, and agricultural lands have been transformed into religious use, a hospital and the German Medical College. The decrease in the area of green open and agricultural uses, as the total area of open areas in the year 2000 was (5510251) square meters by (30.6%), while in the year 2007 it became (4986245) square meters by (27.7%), that is, it decreased by (3%) It turned into residential and educational buildings in the study area, and the decrease continued until 2019, when the area reached (4176090) square meters, i.e. a rate of (23.2%).

Table 3. Decreased open and green uses for the years 2000, 2007, 2019

year	(%)	Area (m ²)
2019	23.2	4176090
2007	27.7	4986245
2000	30.6	5510251

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

8. A comparison of urban spaces in the study area for the years 2000, 2007 and 2019

Urban spaces were considered in this research as spaces devoid of buildings, and places commonly used, such as streets, squares, public parks, public buildings and all spaces designated for collective gathering, where public activities are performed, whether publicly or privately owned. Bearing in mind that institutions and public spaces are important and collectively designated spaces and spaces for showing the human being. As we mentioned earlier in the first chapter, in this way the religious use was considered as a part of commercial use. As well as, open spaces, green areas and agricultural areas in which an urban gathering in the study area would be urban spaces and places of urban gathering, and on this basis the total areas of urban spaces were calculated for the years 2000, 2007 and 2019. In the study area.

All urban spaces of the nature of social interaction have been identified from aerial photographs of the years 2000, 2007 and 2019 of the study area, and parts of commercial uses such as malls, parts of parks and parks, and some recreational and religious uses, and others can be illustrated with figures 4, and 5, 6, for the years 2000, 2007, and 2019 respectively.

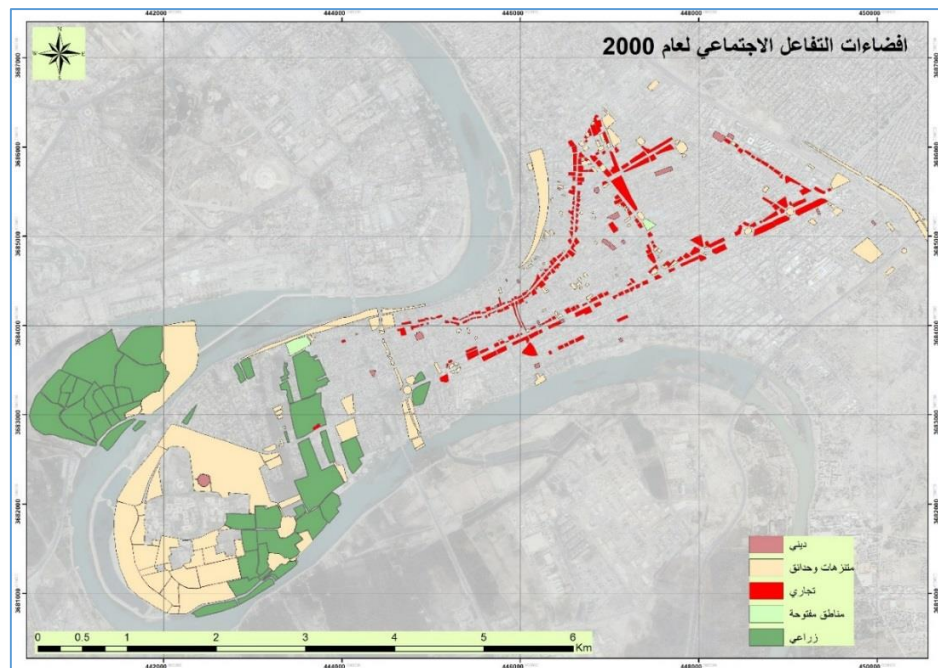


Figure 4. Land uses with social interaction for the Karrada region for the year 2000

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

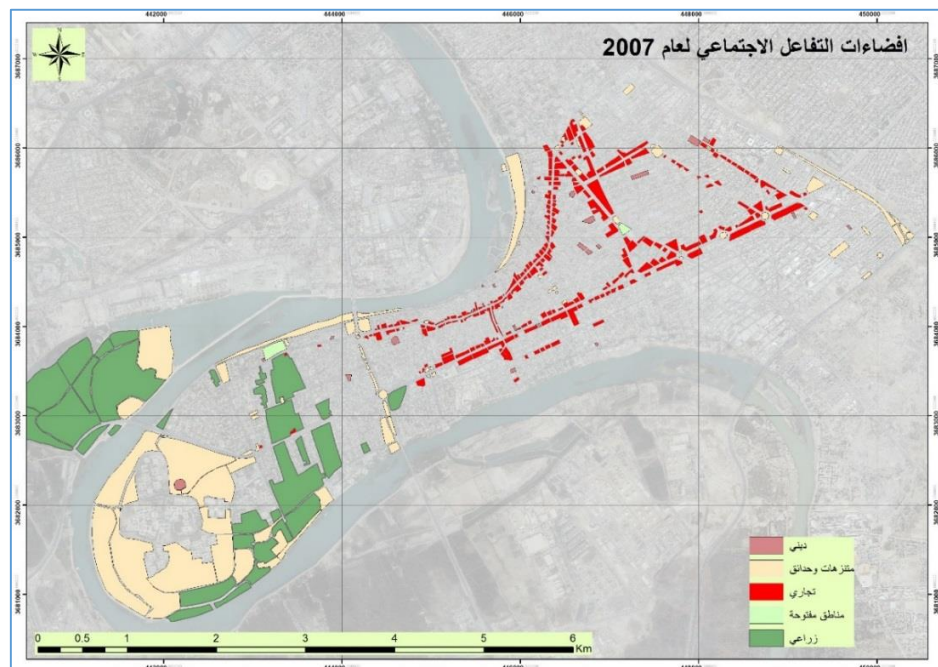


Figure 5. Land uses with social interaction for the Karrada region for the year 2007.

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

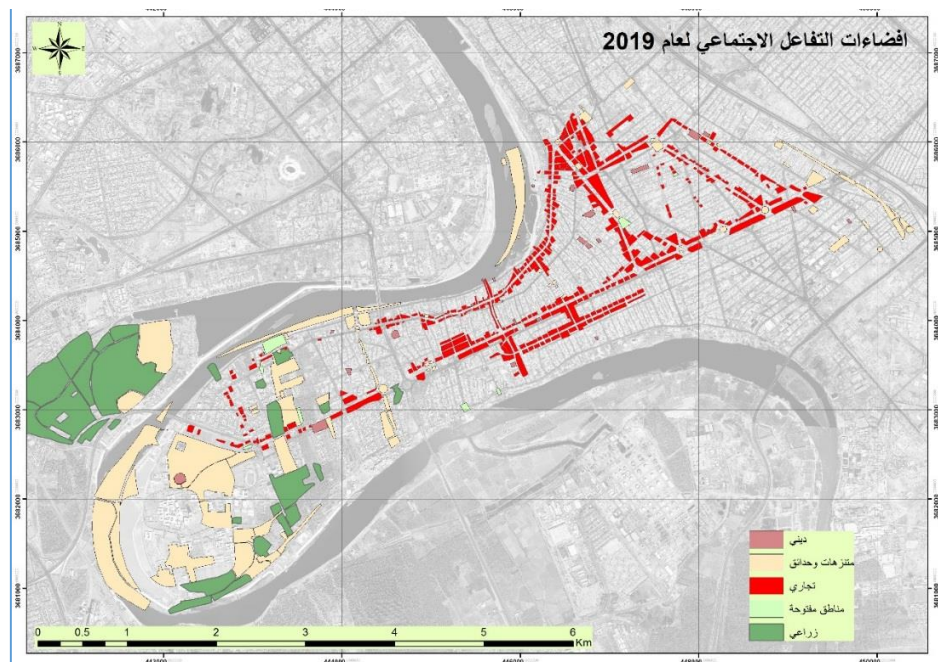


Figure 6. Land uses with social interaction for the Karrada region for the year 2019.

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

9. Spatial analysis of urban spaces

It is evident from the results of the interpretation of the previous figures 4, 5, 6, and the results of them from Table 4 that the spaces for social interaction decreased in number from 2000 until 2007, due to the security circumstance that passed through the country. Then these spaces increased to reach (309) in 2019, but it is noteworthy that the spaces designated for urban social interaction spaces continued to decrease from 2000 to 2019, albeit slightly. Which indicates an increase in demand for social interaction spaces, but in return for a value. The high ground was limited in the expansion of the area, so the resort was divided into spaces and reduced to increase the number of interactive spaces.

Table 4. Distribution of urban social interaction spaces in the Karrada region for the years (2000, 2007, 2019)

year	places	Area (m ²)
2000	329	5913301
2007	259	5600435
2019	309	4668247

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

Figure 7 and 8 show a comparison between the number of social interaction spaces for the years (2000, 2007, and 2019), so shows a comparison between the spaces of urban social interaction spaces in a whole, as well as for the years (2000, 2007, 2019). Since the lowest percentage of the area in 2019 was about (29%), followed by (2007) and (2000) in close proportions, up to (35%) and (36%), respectively. As well as the spatial change in the distribution of spaces for social interaction can be observed. In the Karrada region for the years 2000, 2007, and 2019, from figures 9, 10, and 11 respectively.

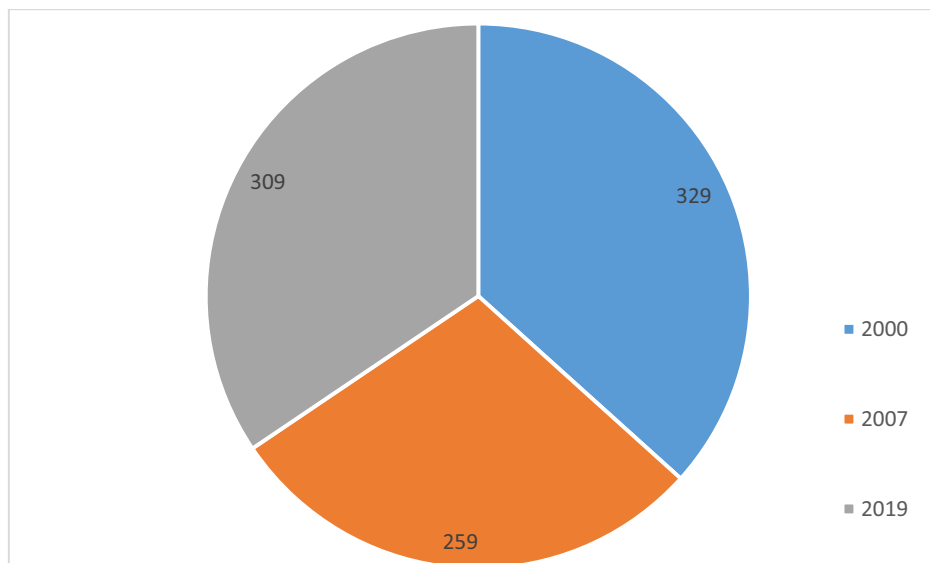


Figure 7. A comparison between the number of social urban spaces in the Karrada region for the years (2000, 2007, 2019).

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

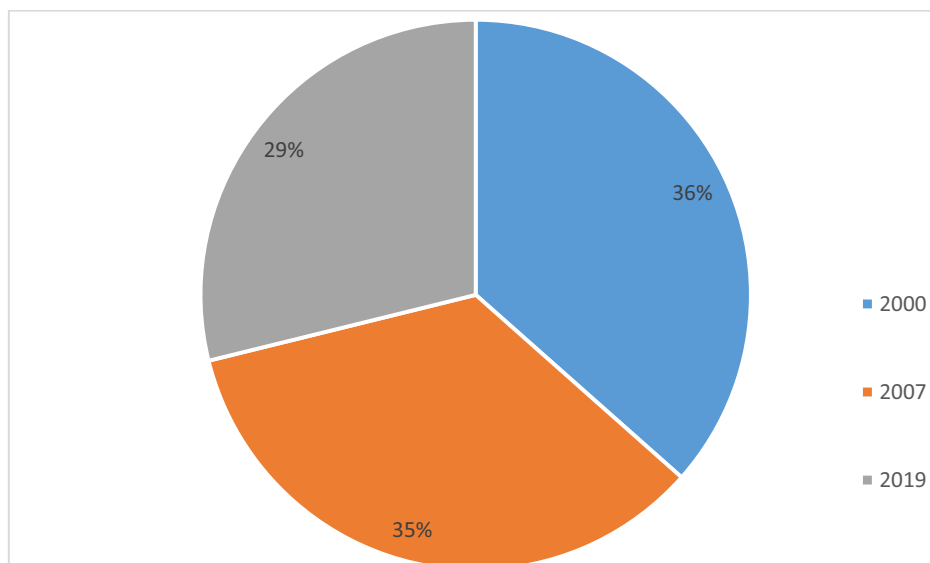


Figure 8. A comparison between the areas of social urban spaces in the Karrada region for the years (2000, 2007, 2019).

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

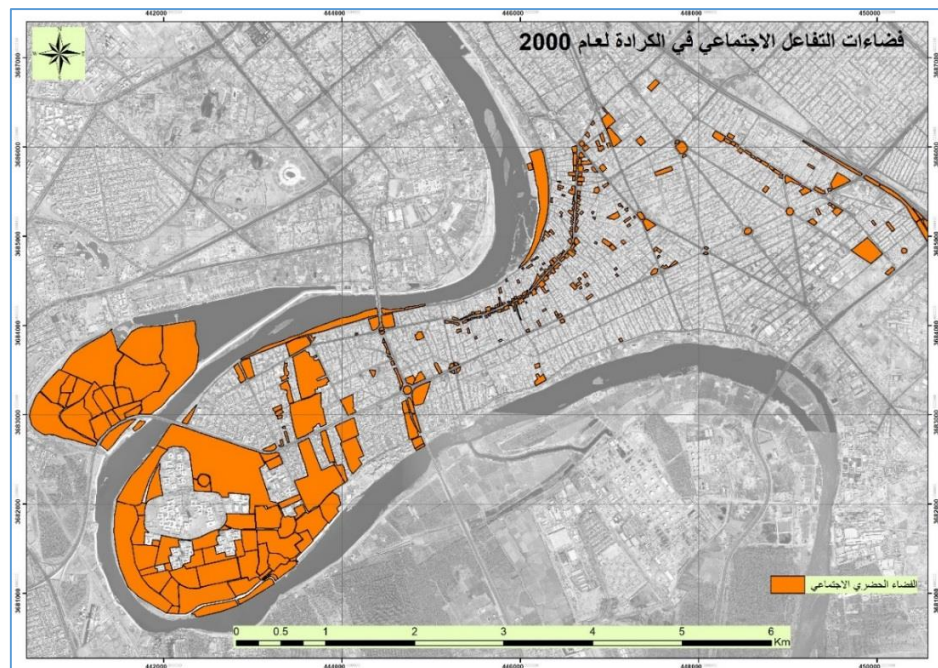


Figure 9. Spaces of social interaction for the Karrada region for the year 2000

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

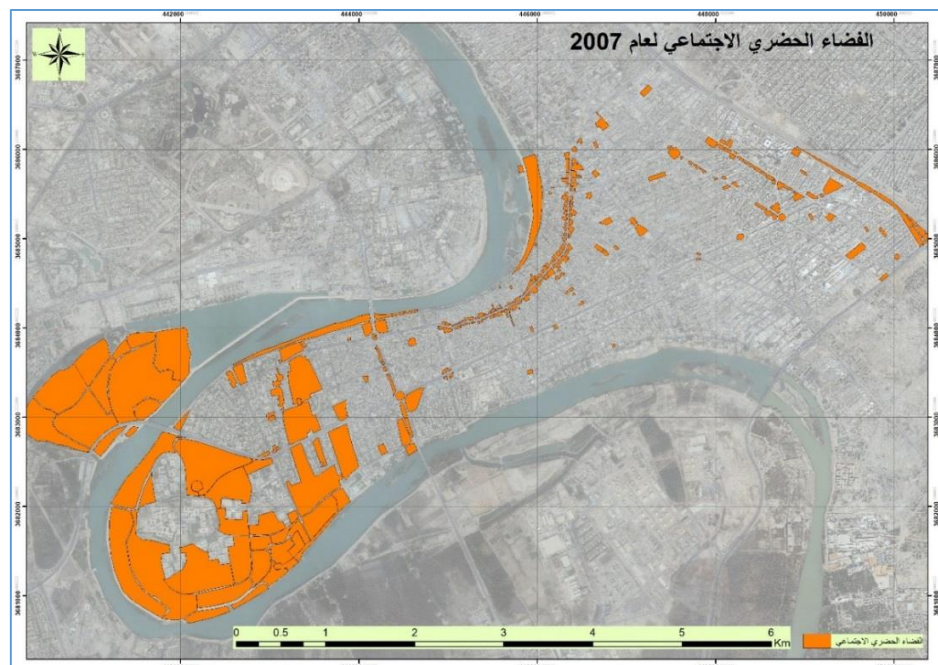


Figure 10. Spaces of social interaction for the Karrada region for the year 2007

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

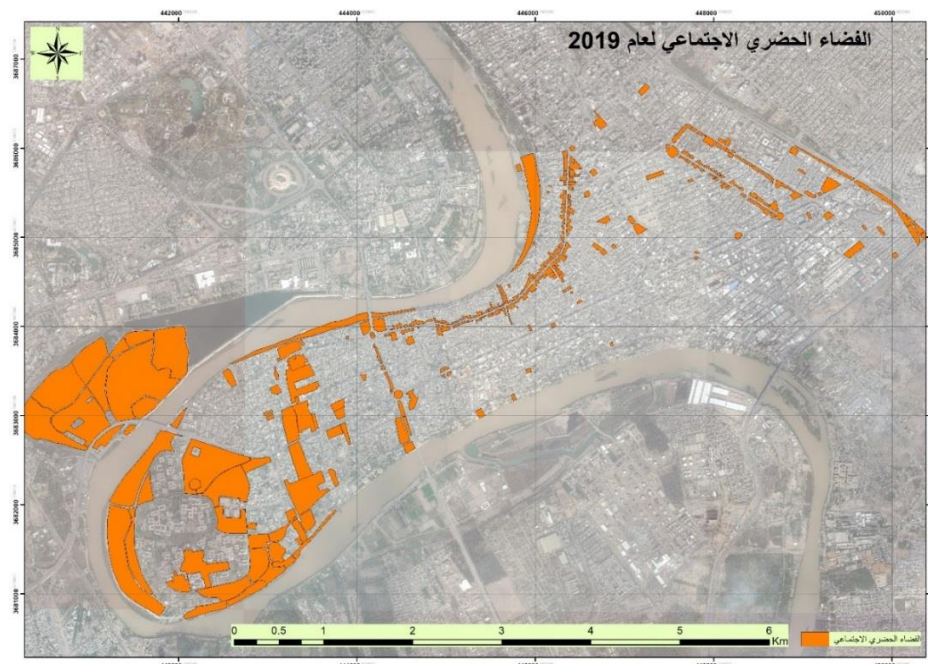


Figure 11. Spaces of social interaction for the Karrada region for the year 2019

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

The total area of urban spaces for the year 2007 was (5600435) square meters, or (31%), while in the year 2019 it became (4668247) square meters and by (26%), i.e. the total area decreased by (32188) square meters and by (5%) due to the excess Residential, educational, and part of other uses on open areas and agricultural areas in a relatively large way, but at the same time the number of its units became more. The commercial use exceeded the residential use, which is considered one of the urban gathering places, especially in Karrada Street inside and some other places in the study area, and thus the number of units increased and the area for urban spaces decreased.

10. Spatial analysis of the urban social interaction spaces in the eastern Karrada region

To know the methodology of distribution and spatial spread of social interaction spaces, an attempt has been made to apply the closest neighbor model to analyze the distribution of social interaction spaces, as the model consists of three values as follows [9]:

- 1- The first value and ranges from (0 to 1), which is the spread value and it shows that the phenomenal distribution pattern tends to cluster as the value approaches zero, on the contrary, whenever we head towards a value of (1), the phenomenon is randomly and unrestricted.
- 2- The value of (p-value), which represents the probability that the studied phenomenon originated under the randomness of the system and without controls, or that the spread of the phenomenon is the result of invisible constraining factors.
- 3- The value of (z-score), which is the degree of restriction of the spread of effectiveness.

The results were as shown in figures 12, 13, 14.

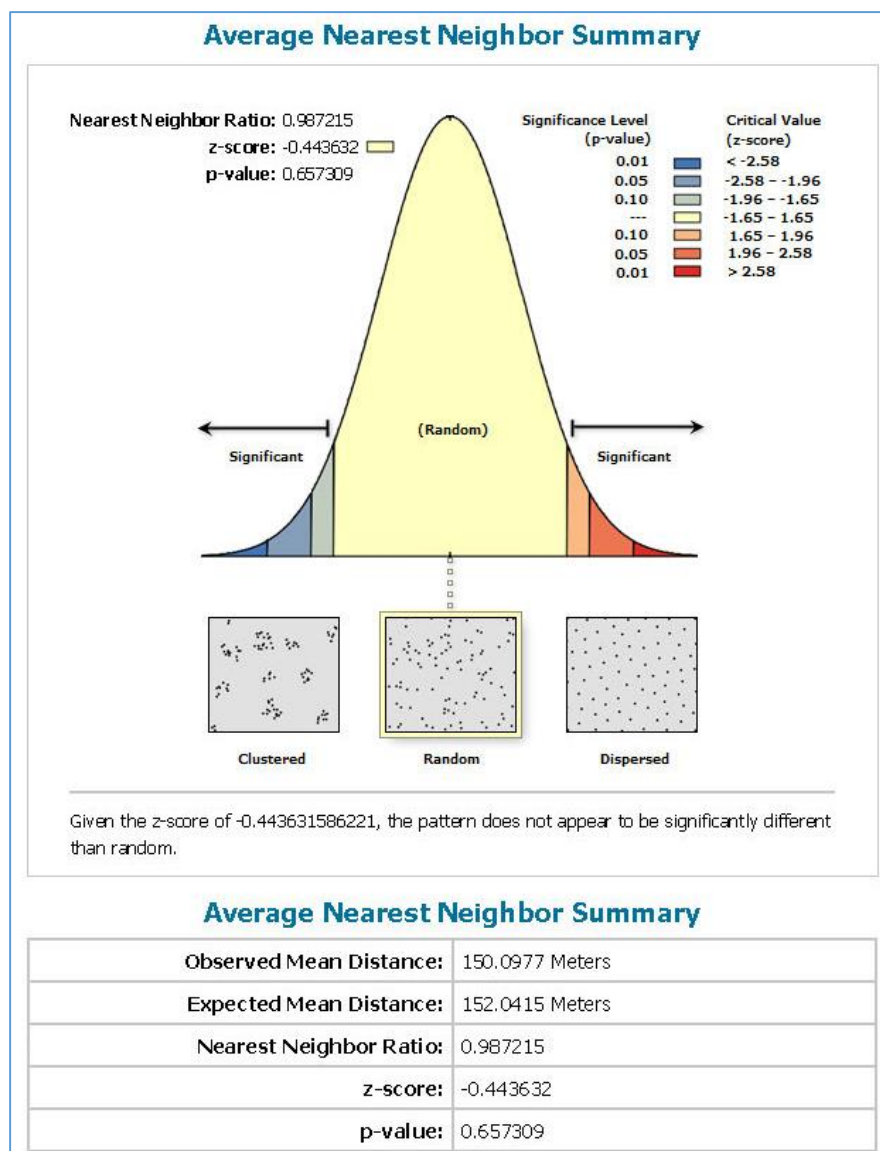


Figure 12. Results of the closest neighbor model for the distribution of urban social interaction spaces in the Karrada region for the year 2000.

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

In general, we find that spaces for social interaction in the Karrada region tend to spread in an almost absolute random manner in 2000 and 2007, especially in 2007, when it reached its greatest value, but it went directly to the gathering and the emergence of converging groups of these spaces in 2019. But it can be read the value of the (p-value) parameter representing the extent of randomness of the propagation system, we find it very normal in 2000, up to (0.65). While it was very restricted in 2007, close to the value of (1), indicating that the system is affected by a large group of restrictions affecting its distribution. It approached randomness in 2019, if it tended to converge from the zero value in a large way, and it is striking that it is indicative of the absence of any controls in restricting the spread of this phenomenon.

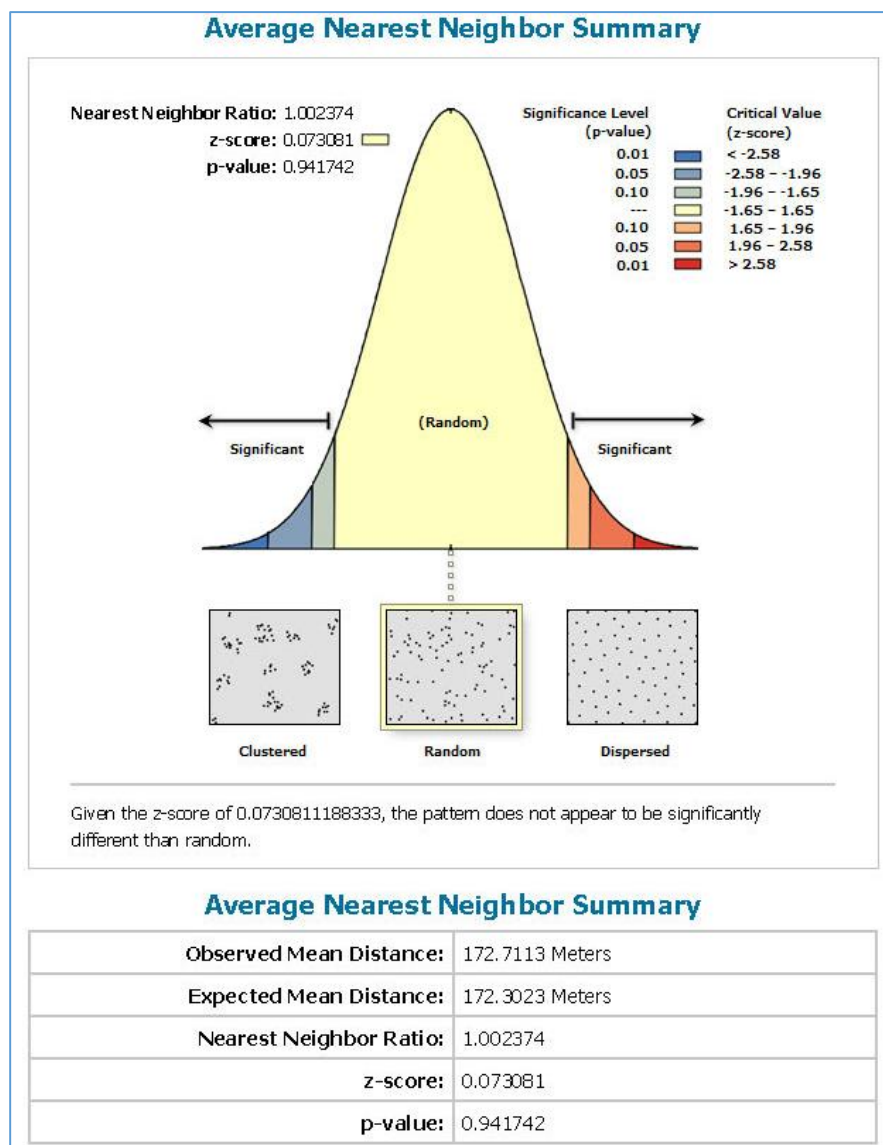


Figure 13. Results of the closest neighbor model for the distribution of urban social interaction spaces in the Karrada region for the year 2007.

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

As for the value of the (z-score) parameter, which indicates the degree of restriction of effectiveness, it is generally low less than the zero value. In a clear indication there are no restrictions in the expectation of the emergence of the effectiveness of urban social interaction spaces anywhere in the study area.

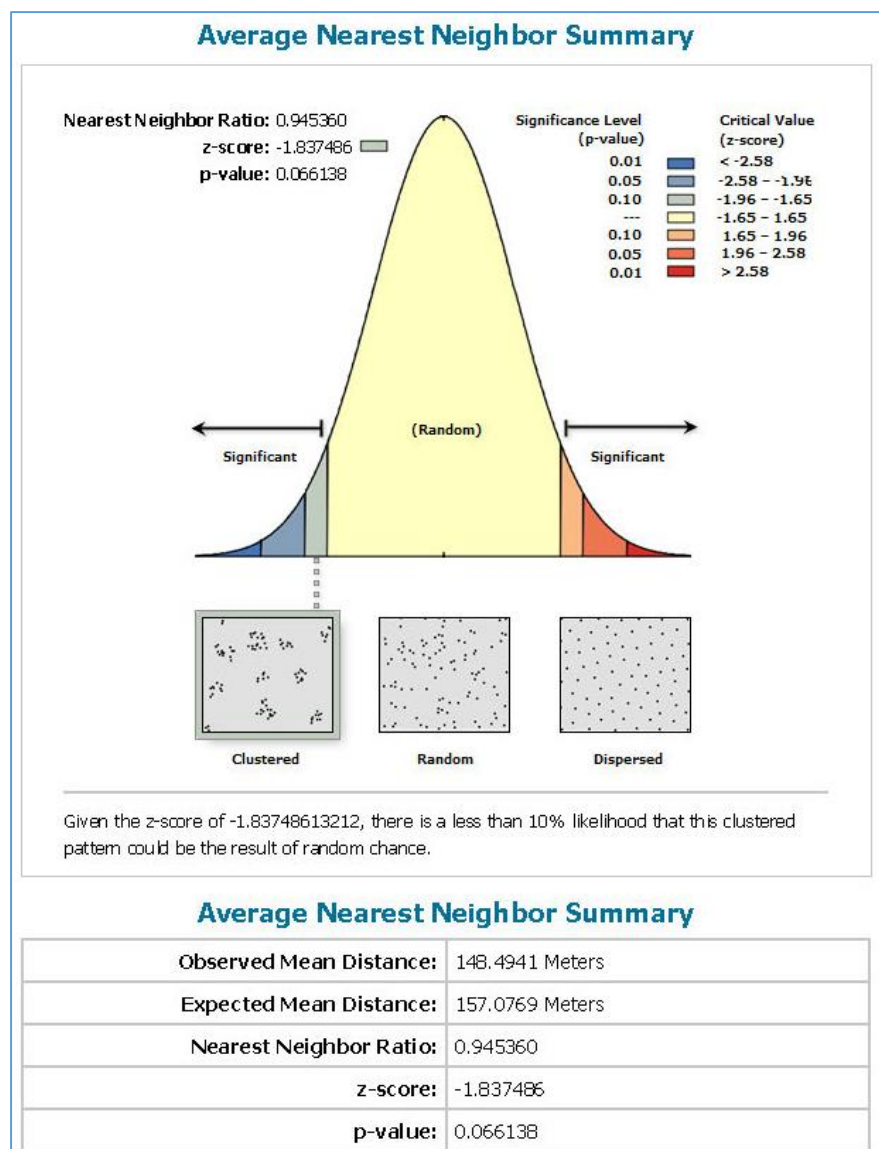


Figure 14. Results of the closest neighbor model for the distribution of urban social interaction spaces in the Karrada region for the year 2019.

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

Figures 15, and 16 show the spatial concentration curves for the effectiveness of the urban social interaction space in the Karrada region for the years 2000, 2007, and 2019. They show that the year 2019 tends to concentrate in finding these activities in the Jadriya area and its surroundings at the expense of the rest of the regions, as it appears from the semi-map. Correspondence in the curves of the northern part of the Karrada region, in contrast to the southern and western part represented by the Jadriya region and the area bounded between the vicinity of Arsat Al-Hindiya Street and Karrada Street outside.

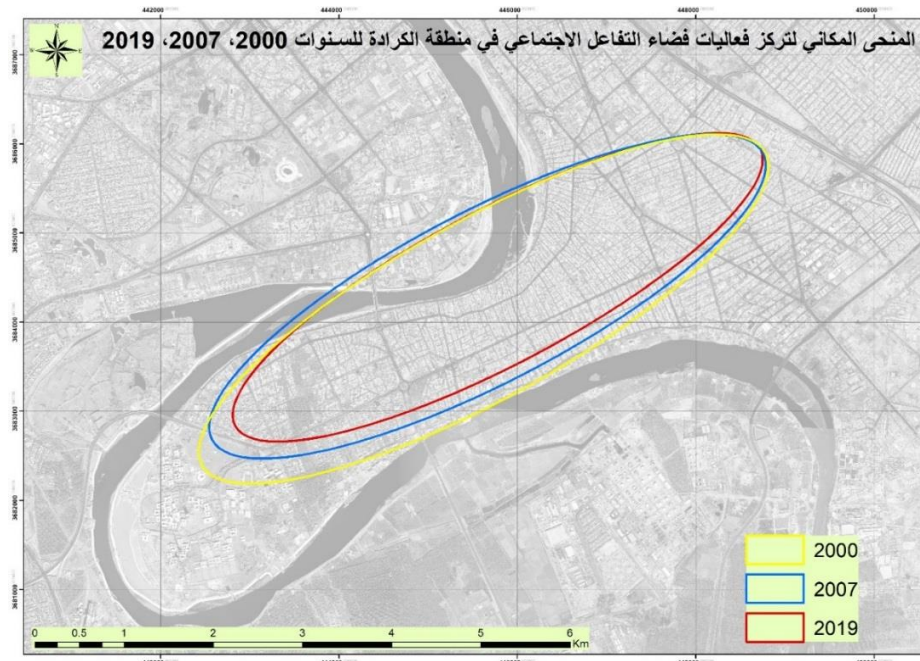


Figure 15. The spatial orientation of the concentration of social interaction space events in the Karrada region for the years 2000, 2007, 2019.

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

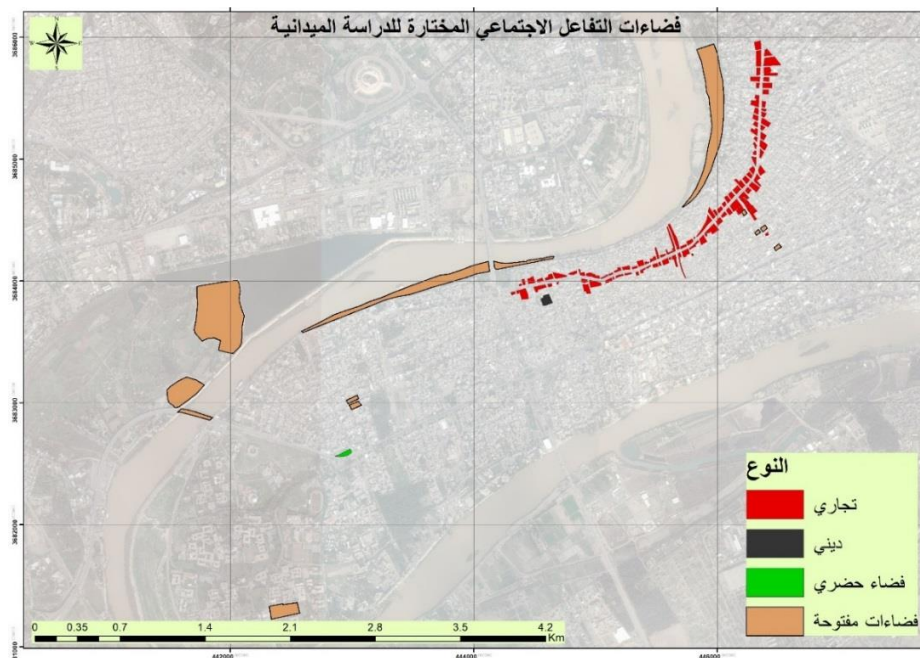


Figure 16. Selected social interaction spaces in the study area.

Source: The researcher depending on the satellite image and the geographic information database systems prepared for the study area with land use survey in the study area.

11. Conclusions

1. The agricultural area has transformed over the years to other land uses such as residential, commercial, industrial and other uses, which led to the disappearance of agricultural orchards over time.
2. There are many urban spaces as places for urban gathering and social interaction, such as religious centers, hotels, entertainment clubs, malls, family and cultural gathering places, open green spaces, the main streets in the study area, as well as the Jadriya Bridge.
3. The shortage of residential use space and its transformation into commercial and industrial uses despite the increase in the number of housing units through building housing in home gardens and dividing residential units for more than one house in one housing unit.
4. Many orchards and agricultural lands have been transformed into residential and commercial uses, urban spaces and other uses, which led to the shrinking of orchards and open urban spaces in the study area.
5. Significant increase in housing and population density during the studied time period for the study area and the shortage of home gardens and open areas.
6. Increasing industrial use in the study area in order to convert parts of residential use into industrial use.
7. Parts of residential land uses, agricultural uses, and open areas are transformed into educational units in the study area.
8. Increasing the area of commercial use, by converting parts of the residential and agricultural use area to commercial use in the study area.
9. There is a large overlap and compactness of land uses in the study area, such as residential use with commercial, industrial, educational, health, administrative and other other uses due to the importance of the study area and the importance of its strategic location as it is in the center of Baghdad.
10. The total area of urban spaces has decreased over the time period of the study area due to the area of other uses exceeding the area of urban spaces, but at the same time the number of units for urban spaces increased during the previous period of time due to the excess of commercial use over residential use and because commercial activity creates places for urban agglomeration. It leads to an increase in the number of units for urban spaces.

12. Results

1. Preserving the remaining agricultural areas and orchards in the study area by not allowing it to be converted to other land uses.
2. Preserving the places of urban gathering in the study area, especially religious places, entertainment clubs, malls and open green spaces with the possibility of developing and increasing them.
3. Preserving the remaining home gardens in the housing, through the enactment of laws prohibiting construction if these laws do not exist and if they exist, then their activation is important, and the violators are held accountable.
4. excluding the industrial use from the study area by taking it out of the city.
5. Building vertical housing in the study area to meet the housing need in it.
6. The region's need for new urban recreational spaces. The research suggests creating new urban spaces through the rehabilitation and development of the wedding island and transforming it into a modern urban space and a beautiful tourist place that attracts people from all areas of Baghdad and the governorates of Iraq for its strategic location and beautiful green nature, and environmental tourism to maintain agricultural use in it.
7. The research proposes the construction of a pedestrian bridge that runs parallel to the Jadriya Bridge and connects the Jadriya area with the touristy wedding island to meet the great need for the area for a pedestrian bridge and to reduce the great crowding of people on the Jadriya Bridge.
8. Developing Abu Nawas Street parks and making them modern urban parks similar to the parks in international experiences and providing them with public services due to their great importance to urban agglomeration in the study area.

9. Supporting social, cultural, artistic and sports activities and children's games and developing them in urban spaces due to their importance in attracting residents to urban spaces, urban gathering and social interaction.

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