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The Geographic Distribution of Tourism Services in Al-Kharj City Using Geographic Information Systems: A Study in Tourism Geography

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Abstract

This study aims to identify the geographical distribution pattern of tourism services in Al-Kharj city using GIS. It focuses on designing an accessibility map for accommodations, restaurants, cafes, and parks and creating a database by linking descriptive data with spatial data. The study addresses the lack of tourism service maps in Al-Kharj city and adopts a descriptive and analytical approach. The notable findings include the concentration of residential accommodations and parks in the city center, while restaurants and cafes follow an oval-shaped distribution. Approximately 455 accommodation sites exist, with most concentrated in the northwestern region (36.9%). Accessibility varies, with shorter travel times in the central and northwestern areas. There are around 773 restaurants and cafes, primarily located in the central area, with density decreasing away from the center. Parks, with approximately 60 sites, are concentrated in the central and northwestern areas. Access times range from a few minutes in the central area to over half an hour in the eastern and southern parts. The study provides valuable insights into the geographic distribution patterns and accessibility of tourism services in Al-Kharj city. The study recommends developing the road network in Al-Kharj city, particularly in the east and south, to enhance the density of tourism services. Utilizing geographic information systems (GIS) to create an electronic tourism atlas is suggested to improve access routes and showcase Al-Kharj's tourism potential. This will facilitate tourists' navigation and discovery of the city's attractions.

Keywords: Geographic distribution, tourism services, Geographic Information Systems

1. Introduction

The tourism industry has become one of the most prominent modern economic activities and has gained significant attention from countries worldwide as a primary source of income. Furthermore, unlike other productive industries, its financial return is branched and diverse, benefiting various other supportive and auxiliary activities, whether economic, social, political, cultural, or other human activities. Its importance has increased with advancements in contemporary communication methods (United Nations World Tourism Organization [UNWTO], 2020).

Given that tourism services are among the essential services needed by tourists at any destination, these services have become a topic of interest in geographical tourism studies,

particularly from a spatial distribution perspective. Al-Kharj city is considered a front for agricultural tourism due to its rich natural and heritage components. Therefore, it was imperative to create a digital map highlighting tourist services to facilitate the visitor's easy access to the location, from which the study draws its importance (Echtner & Ritchie, 1991).

With the emergence of Geographic Information Systems (GIS) and their capabilities in spatial analysis, researchers' interest in this technology has grown. Due to its ability to analyze quantitative and descriptive data, improve understanding of patterns and spatial processes, and integrate spatial and non-spatial data into a single system for easy processing and updating, GIS has become a vital tool in studying tourism (Baggio, 2008; Tsou, 2004; Shelton, 2022).

The ability of this technology to comprehend and analyze the spatial distribution pattern of tourism services and to continuously update both paper and digital maps highlight the significance of using it. This is done by depicting the locations of tourism services on the map and creating a geographical tourism database for the locations of tourism services in the study area. These factors underscore the significance of Geographic Information Systems (GIS) as an effective tool in geographical research and applications (Baggio, 2008; Shelton, 2022; Al-Dulaimi, 2010).

The study zeroes in on the geographical distribution of locations such as residential accommodation, restaurants, and parks, which are among the most influential tourism services affecting tourism in Al-Kharj city. According to Echtner & Ritchie (1991), these services have a significant impact on tourists' perceptions of the destination and their overall travel experience, underscoring the importance of the GIS's comprehensive geographic analysis.

1.1 Study Problem

Tourism services are a key component of tourist countries, and their development, geographical distribution, and more should be among the priorities of the developmental plans for cities. The Saudi Vision 2030 emphasized interest in the tourism sector, its services, and their distribution across the Kingdom's regions. However, it was noticed that there are no maps for the tourism services in Al-Kharj city that illustrate the pattern of geographic distribution. This defines the problem of the study through the following questions:
1. What is the pattern of geographical distribution of tourism services in Al-Kharj city?
2. Is there a concentration of tourism services in Al-Kharj city?
3. How can GIS be utilized for creating a tourism database, mapping tourism services' locations, and determining their spatial extent and distribution?

1.2 Study Objectives

Through the spatial analysis of accommodation, restaurant, and park locations in Al-Kharj city, this study aims to achieve the following objectives:
1. Identify the distribution pattern of accommodation facilities, restaurants, and parking locations in Al-Kharj city.
2. Design an access map to the accommodation facilities, restaurants, cafes, and parks.
3. Establish a database for tourism service locations by linking descriptive data with spatial data.
4. Attempt to depict the reality of tourism services in Al-Kharj city, which might assist stakeholders and decision-makers in obtaining a clear picture leading to proper planning and ensuring fairness and balance with other services in Al-Kharj city.

1.3 Study Significance

- The importance of the study is linked to several aspects, among the most prominent of

which is highlighting the significance of applying spatial analysis methodology for tourism services in Al-Kharj city using Geographic Information Systems (GIS).

• Its importance also stems from its contribution to the production of digital maps that provide tourist offices and tourists with data and information about the study area.

1.4 Study Limitation

1. **Subjective Boundaries:** Due to the nature of the study, it falls within the scope of tourism geography, which deals with the distribution of tourism services.
2. **Spatial Boundaries:** The study is limited to Al-Kharj city, which is located south of the Riyadh region in the center of Saudi Arabia between 230 10' and 240 30' north latitude and 460 30' and 480 east longitude. Its area is about 20,000 km2, which is 5.4% of the total area of Riyadh Region, which is about 371,441 km2. Administratively, Al-Kharj region belongs to Riyadh region, where it borders Riyadh to the north, Al-Muzahmiyya and Al-Hariq governorates to the west, Houta Bani Tamim governorate to the southwest, Al-Aflaj governorate to the south, and Eastern province to the east.
3. **Temporal Boundaries:** The study is limited to examining the geographical distribution of tourism services in the study area and data issued by government agencies for the year 1442 AH.
4. **Spatial Boundaries:** The study is based on the implementation of its tasks and the achievement of its objectives in Al-Kharj governorate in the Kingdom of Saudi Arabia.

2. Methodology

The methodology employed in this research utilizes Geographic Information Systems (GIS) to discern the spatial distribution pattern of tourism services within Al-Kharj City. The central aim of the study is to develop an accessibility map encompassing accommodations, restaurants, cafes, and parks through the integration of descriptive and spatial data. The approach combines descriptive and analytical techniques, responding to the lack of comprehensive tourism service maps available for the city.

To attain this objective, the study initiates by gathering descriptive data related to accommodations, restaurants, cafes, and parks present in Al-Kharj City. This data is subsequently linked with spatial information using GIS technology, facilitating the creation of geographical representations that outline the dispersion of tourism services across distinct regions within the city. The primary focus rests on identifying the concentrations and distribution patterns of these services across various locales.

This research used a descriptive causal approach, leveraging quantitative methods, statistical tests, and Geographic Information Systems (GIS) technology to analyze tourism service data in Al-Kharj city. GIS overcame traditional method constraints, aiding in planning, managing, and mapping tourist sites. Data analysis involved techniques like spatial averaging, nearest neighbor analysis, and density computations. The study aimed to explore the spatial dimensions of tourism services in Al-Kharj city, utilizing GIS for efficient data collection and spatial database creation.

The research has identified approximately 773 restaurants and cafes, predominantly clustered in the central locale, with their density diminishing as one moves farther away from the city center. Correspondingly, around 60 parks are concentrated in the central and northwest sections of the city. Notably, the mean geographic center aligns precisely with the actual center located within the Al-Salam neighborhood. Accessibility times exhibit a spectrum ranging from a few minutes in the central region to over thirty minutes in the eastern and southern regions.

2.1 Definition of key terms

Geographic Distribution: Geographic distribution refers to the spatial arrangement or pattern of a particular phenomenon, such as the distribution of tourism services across a specific geographical area (e.g., a city, region, or country). It involves analyzing and understanding the dispersion and concentration of these services in relation to geographical factors (e.g., distance, accessibility, topography) and human activities (e.g., population, economic development). (Smith, 2022)

Tourism Services: Tourism services encompass the range of activities, facilities, and products that are specifically designed to meet the needs and demands of tourists. These services can include accommodation, transportation, hospitality, attractions, tour guides, recreational activities, and other amenities that enhance the travel experience and cater to the preferences of visitors. (Johnson & Chen, 2021)

Al-Kharj City: Al-Kharj City refers to a specific urban area located in Saudi Arabia. It is situated in the Riyadh Province and is known for its historical, cultural, and natural attractions that draw tourists from both domestic and international markets. Al-Kharj City serves as a case study in this research, focusing on its geographic distribution of tourism services. (Al-Saud, 2020)

Geographic Information Systems (GIS): Geographic Information Systems (GIS) are computer-based tools and technologies used for capturing, storing, analyzing, and visualizing geographic data. GIS enables researchers to integrate various types of spatial information, such as maps, satellite imagery, and geospatial datasets, to examine and understand the relationships, patterns, and processes within a specific geographic area. It plays a crucial role in assessing the geographic distribution of tourism services in this study. (Li & Zhang, 2022)

Tourism Geography: Tourism geography is a subfield of geography that focuses on the study of tourism and its spatial dimensions. It involves analyzing the interactions between tourists, destinations, and the environment from a geographical perspective. Tourism geography examines various aspects, including the distribution of tourism resources, the spatial behavior of tourists, the impacts of tourism on local communities and the environment, and the planning and management of tourism destinations. (Hall & Page, 2021)

3. Theoretical Framework

In this section, we will examine the concept and significance of tourist maps. Tourist maps are extensively distributed and utilized worldwide, mainly because of their association with the tourism industry, which is recognized as a vital aspect of human activity. The primary objective of a tourist map is to assist tourists in navigating to popular attractions and areas where services and activities are accessible. Tourists from various countries acknowledge the crucial role that tourist maps play in the tourism process (Al-Omari, 2005).

The tourist map, a modification of a topographic map, displays both natural and human-made attractions, acting as an attraction (Keates, 1989). With rising tourist demands, simple modifications aren't sufficient, leading to the creation of specialized tourist maps:

1. It contributes to understanding the spatial distribution of tourist and heritage sites and their accessibility.
2. It is an essential document in the tourism and leisure industries and a fundamental tool that cannot be disregarded, especially in the present time.
3. It serves as a significant communication medium in tourism activity, introducing the potential, places, and tourist attractions of the mapped area, as indicated by Amold (1992).
4. It encourages tourists to visit certain areas and provides facilities and services. information about tourist service centers and more.
5. It conveys a wealth of diverse information about the natural, social, economic, and other aspects of the mapped area to tourists and others.
6. It is one of the most efficient communication tools for delivering spatial information to

users because it represents information in a permanent visual format.

It is worth noting that the tourist map differs from other maps in its marginal information, which includes many tables and data on tourist facilities and services. It provides extensive information about the natural and human characteristics of the mapped area, such as topography, climate, population, economy, time data, distances, landmarks, tourist attractions, and recreational activities (Saleem, 2016, p. 23).

4. Results

4.1 The spatial analysis of accommodations

4.1.1 Geographic distribution of residential housing facilities locations

Spatial analysis of residential facilities refers to investigating and evaluating potential sites for the construction of residential and shelter facilities (Smith, Johnson, & Thompson, 2021). The goal of this analysis was to identify the most appropriate sites in terms of accessibility and suitability to meet community needs (Johnson, Williams, & Davis, 2022). The spatial analysis of housing sites considers a variety of factors and criteria, including the suitability of land to evaluate the compatibility of the site for housing, such as the availability of vacant or appropriately designated land for residential use (Brown, Anderson, & Thompson, 2023). Site accessibility is analyzed, considering proximity to major amenities such as schools, hospitals, shopping centers, and public transportation. General topography and planning are examined and include geographic and terrain features, including natural landscapes, rugged terrain, and potential environmental hazards (Jones, Garcia, & Martinez, 2023). Social and cultural impacts are considered, including social and cultural factors surrounding the site, such as neighboring residential areas, cultural availability, and diversity. The infrastructure assessment evaluates the availability of basic infrastructure in the surrounding area, such as roads, water supply, sewer systems, and electricity (Roberts, Miller, & Davis, 2022). Local policies and regulations related to urban planning and housing must be considered.

Residential accommodation plays a significant role in the tourism industry, offering a diverse range of options in Al-Kharj city. These include hotels, tourist resorts, hotel apartments, furnished units, villas, chalets, and campsites (Table 1 and Figure 2 provide visual representations of these options).

**Table 1:** Residential Accommodation Facilities in Al-Kharj City (2022)

Percentage (%)	Number	Type
36.9	168	Villas
25.1	114	Chalets
4.0	18	Hotel Apartments
1.8	8	Hotels
9.5	43	Campsites
12.1	55	Resorts
10.8	49	Furnished Units
100.0	455	Total

Source: collected and calculated from field research and planning administration data, Al-Kharj Municipality, Riyadh Region, 2022.
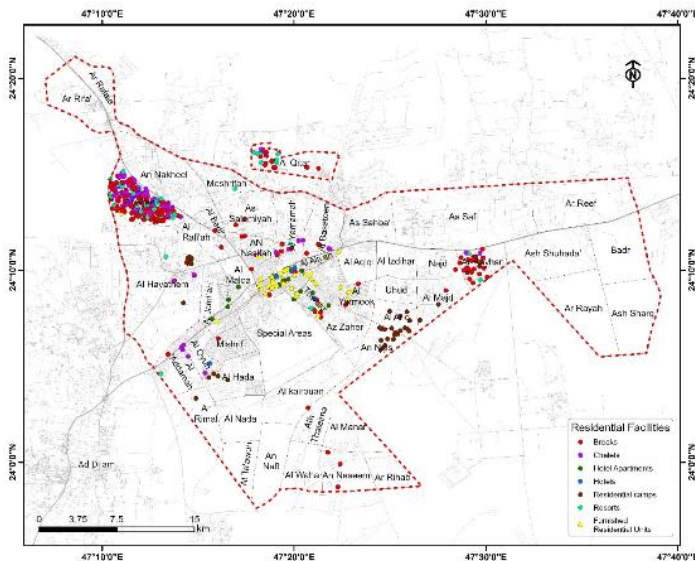
The total number of residential accommodation sites in Al-Kharj city is approximately 455 sites. These sites vary in type, including approximately 168 rest houses, which are predominantly concentrated in the northwestern region of the study area, accounting for more than one-third

(36.9%) of the total residential accommodation sites in Al-Kharj city. The next category is chalets, accounting for 12.1% of the total sites, followed by resorts, with a total of 55 resorts, representing 12.1% of the total residential accommodation sites in Al-Kharj city. Furnished residential units come next, concentrated in the central part of Al-Kharj city, accounting for 10.8% of the total residential accommodation sites in the city.

Hotel apartments are concentrated in the central part of Al-Kharj city and amount to approximately 18 apartments. Finally, hotels constitute a total of approximately 8 hotels, representing 1.8% of the total residential accommodation sites in Al-Kharj city.
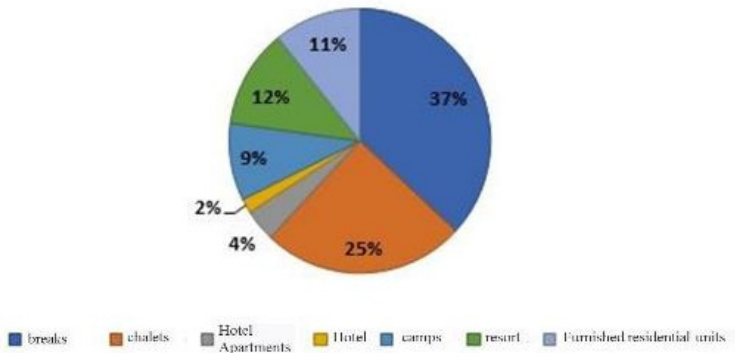
Figure 1: Relative Distribution of Residential Accommodation Sites in Al-Kharj City in 2022
Source: Al-Kharj Municipality. (2022). Field Study Report on Residential Accommodation Sites in Al-Kharj City. Unpublished raw data.

Figure 2: The Distribution of Residential Housing Sites in Al-Kharj City in 2022
Source: Al-Kharj Municipality. (2022). Field Study Report on Residential Accommodation Sites in Al-Kharj City. Unpublished raw data.

4.1.2 Measures of Central Tendency for Residential accommodations Sites

a. Mean Geographic Center

The mean geographic center, also known as the hypothetical ideal center, is the point that represents the location where the distribution of the phenomenon under study is the same in all directions. It does not necessarily correspond to an actual occurrence of the phenomenon but serves as a focal point that moves with the gravity of the distribution over time. On this basis, it is the average of the X coordinates and the average of the Y coordinates of all features of the phenomenon under study in all directions (Sanakri, 2008, p. 67). The spatial mean function is the equivalent of calculating the arithmetic mean for spatial data, where the location is considered the geographical average of the places of occurrence of the phenomenon under study (Dawood, 2008, p. 162). This feature is one of the objectives of central tendency analysis, which aims to detect point patterns and identify the mean center, which is the focus of the spatial distribution of points. Figure 3 shows the mean geographic center, or centroid, of the distribution of residential accommodation in Al-Kharj city, which is in Farzan district.

b. The Phenomenal Intermediate Center

This tool identifies the phenomenon or characteristic that falls closest to the center of the distribution of the phenomenon's instances under study. This location is determined by calculating the arithmetic mean of the distance between all the phenomenon's locations (Dawood, 2008, p. 164). Figure 3, which refers to the center of the shelter location distribution in Al-Kharj city, reveals that this actual geographical center is in the new Al-Afjah neighborhood. This reflects the convergence of the hypothetical geographical center with the actual average center.

c. Standard Distance Analysis

The standard distance is one of the prominent measures of spatial dispersion for spatial distributions and is conceptually like the standard deviation. The standard distance test measures the shape of the spread of locations around their mean center. It is an indicator of the spatial dispersion or concentration of phenomenon elements. It provides a concise description of the distribution of points around their mean center.

The value of the standard distance is used to draw a circle called the standard circle, which determines the area of concentration of the phenomenon under study. Thus, we can determine the extent of the spatial concentration or dispersion of the phenomenon. The center of this circle is located at the actual mean center coordinates of the phenomenon. A circle with a radius equal to the standard distance surrounds the phenomenon's actual mean center to represent the standard distance graphically. The smaller the drawn circle, the more concentrated the spatial distribution of the phenomenon. Conversely, as the value of the standard distance increases, the size of the standard circle increases, indicating an increase in the spatial dispersion and scatter of the phenomenon's distribution. Therefore, the area of the circle is directly proportional to the degree of spatial dispersion, and vice versa (Dawood, 2008, p. 165).

Based on Figure 3, which illustrates the standard distance of residential housing locations, it can be observed that the circle represents the standard distance and is characterized by dispersion. The number of residential housing facility locations within this circle (356 locations) accounts for 80.2% of the total residential housing locations in Al-Kharj city. On the other hand, residential housing locations found outside the standard distance range (90 locations) account for more than a third (19.8%) of the total residential housing locations in Al-Kharj city.

d. Directional Distribution Analysis:

Directional distribution expresses whether the spatial distribution of a phenomenon has a certain direction or not. It is possible to get an elliptical shape that shows the characteristics

of the directional distribution. The center of this elliptical shape is the same as the mean center, and the major axis measures the value of the direction that most of the elements of the phenomenon are moving in.

Based on Figure 3, which illustrates the directional distribution of residential locations in the city of Al-Kharj, it can be observed that the actual distribution adopts an elliptical shape that extends in a northwestern to southeastern direction. Within the incomplete standard ellipse, there are 376 housing estates, representing 82.6% of the total housing estates in Al-Kharj. In addition, the number of residential sites around the elliptical shape was 79, which is 17.4% of the total residential sites in Al-Kharj.
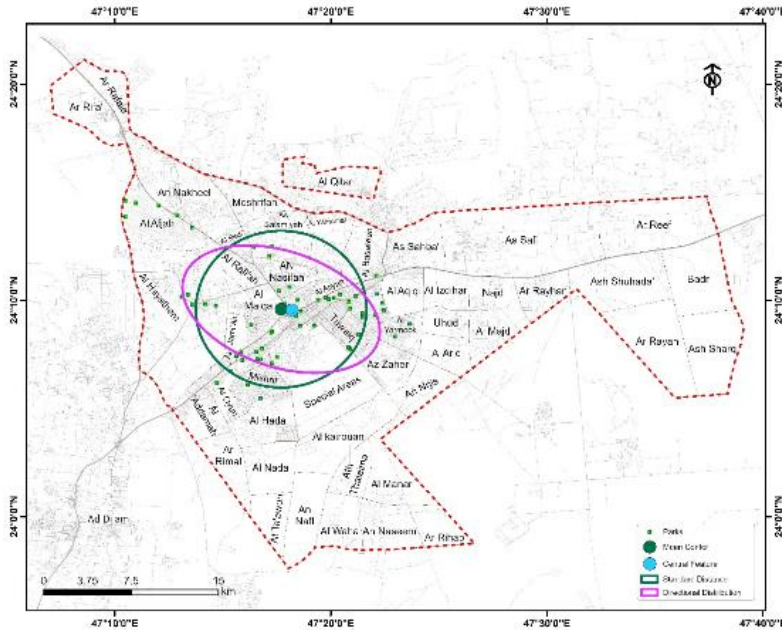

Figure 3: shows the measure of the central tendency of residential sites in Al-Kharj city in 2022.
Source: Researcher's work based on spatial analysis using data from the Planning Department, Al-Kharj Municipality, Riyadh Province, within a geographic information systems environment (2022).

4.1.3 Residential Housing Density

This cartographic-statistical test calculates the density of residential locations in the city of Al-Kharj by measuring the density of points around a central point. The value is highest in the center and decreases with increasing distance from this point. The results of the kernel density analysis show an elliptical pattern that reflects the density of residential locations. The density of residential locations varies from one neighborhood to another in Al-Kharj. Figure (4) illustrates:

Residential sites are concentrated in the far northwest of Al-Kharj, reaching over 5.4 sites per square kilometer. Density decreases slightly as one moves from the northeastern edges toward the city center, ranging from 1.9 to 5.4 sites per square kilometer. Another area of relatively low density is the city center, where density ranges from 0.7 to 1.9 housing units per square kilometer. The density of residential sites decreases further in the central part of Al-Kharj city, ranging from 0.08 to 0.12 sites per square kilometer. In the northern, eastern, southern, and western outskirts, the density of residential sites is almost negligible, reaching less than 0.01 sites per square kilometer in neighborhoods such as Al-Rif, Al-Safi, Al-Sahba, Badr, Al-Shuhada, Al-Rayah, Al-Naqil, and Al-Taa'awun.
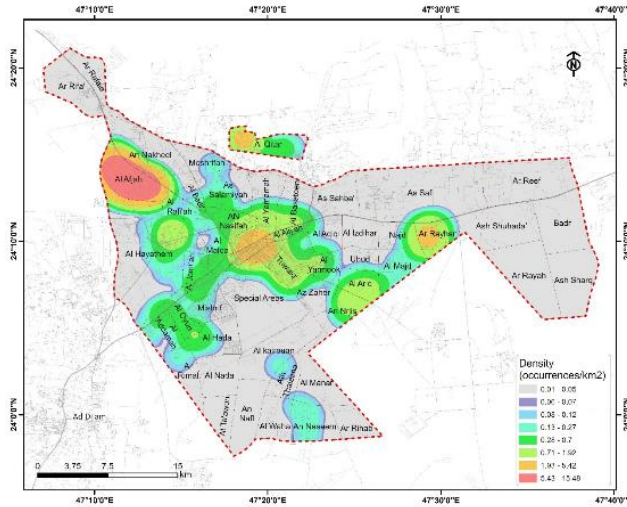
Figure 4: Density of Residential Housing Sites in Al-Kharj City in the Year 2022
Source: Researcher's spatial analysis using Geographic Information Systems (GIS) and data from the Planning Department, Al-Kharj Municipality, Riyadh Region Municipality, 2022.

4.1.4 Time of Access to Residential Housing Facilities

Network analysis is one of the most important functions that a Geographic Information System (GIS) can perform efficiently. Since people's movements and mobility occur through road networks and infrastructure, the form and efficiency of these networks significantly determine people's standard of living and affect the equitable distribution of services. The researcher relied on the analysis of network analysis functions using the accessibility cost matrix and path analysis. Table 2 and Figure 5 illustrate the average access time to residential centers in Al-Kharj City and show the following:

In the central and northwestern parts of Al-Kharj City, including the neighborhoods of Al-Nasifah, Al-Aaliyah, Al-Salam, Al-Warood, and Al-Afja, the accessibility to residential centers is very pronounced, with a time duration of less than 3 minutes. However, in the surrounding areas, the access time to residential centers ranges from 3 to 6 minutes.

In the north, northeast, and south of the central part of Al-Kharj City, the time required to access residential centers increases to about a quarter of an hour (10.5–16.6 minutes).

In the south and far east of the study area, the time required to access residential centers is about half an hour (25–30 minutes). In the north-easternmost part of Al-Kharj City, including Al-Sharq and Badr neighborhoods, the travel time is more than half an hour (30 minutes).

Table 2: Average Time and Distance of Access to Residential Housing Centers in Al-Kharj City in 2022.

Variables	Distance to Residential Housing Sites (km)	Time to Residential Housing Sites (minutes)
Mean	9.99	16.30
Median	6.35	10.63
Minimum	0.00	0.00

Source: Derived from the work of the researcher based on network analysis within the Geographic Information Systems (GIS) environment, relying on the road network data from the navigation data platform "Here," version 11, 2019.
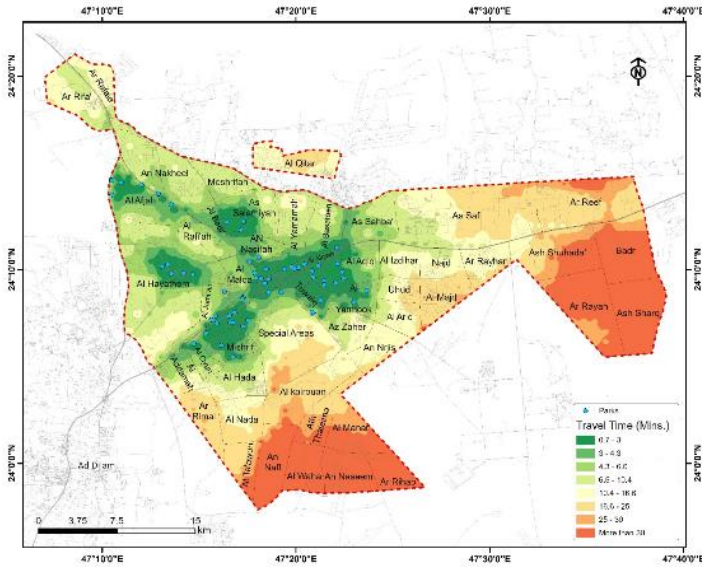
Figure 5: Average Time of Access to Residential Housing Centers in Al-Kharj City in 2022.
Source: Derived from the work of the researcher based on network analysis within the Geographic Information Systems (GIS) environment, relying on the road network data from the navigation data platform "Here," version 11, 2019.

*4.2 The spatial analysis focused on restaurant and cafe locations.*

4.2.1 Geographical distribution of restaurants and cafes

Services are concentrated in the central part of Al-Kharj City, with a total of approximately 773 establishments. The total number of restaurants is around 606, accounting for 78.4% of the total services in Al-Kharj City. Cafés, on the other hand, have a total of 167 establishments, representing 21.6% of the total services in Al-Kharj City.

Table 3: Numerical and Percentage Distribution of Restaurants and Cafés in Al-Kharj City in 2022.

Type	Number	Percentage
Restaurants	606	78.4
Cafés	167	21.6
Total	773	100.0

Source: Researcher's work based on a field study and data from the Planning Department, Al-Kharj Municipality, Riyadh Region Municipality, 2022.
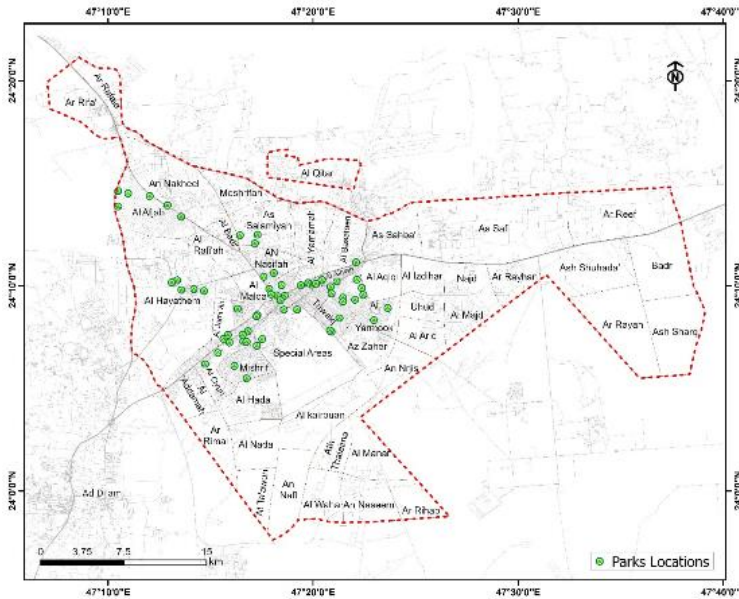
Figure 6: Distribution of Restaurants and Cafés in Al-Kharj City in 2022.
Source: Researcher's work based on a field study and data from the Planning Department, Al-Kharj Municipality, Riyadh Region Municipality, 2022.

4.2.2 *Measures of central tendency for restaurants and cafes*

Mean Geographic Center: Figure (7) indicates that the mean geographic center or centroid of the distribution of restaurant and café locations in Al-Kharj City is in Al-Salam neighborhood.

Median Center: Figure (7) shows the actual geographic center of the distribution of restaurant and café locations in Al-Kharj City, which is in the new Al-Salam neighborhood. This reflects the proximity of the assumed geographic center to the actual median center.

Standard Distance Analysis: Figure (7) illustrates the standard distance of the distribution of restaurant and cafe locations. The circle represents the standard distance, indicating dispersion. Within this circle, the number of restaurant and café locations is 556, accounting for 71.9% of the total.

locations in Al-Kharj City. Locations outside the standard distance circle (217 locations) account for more than a third (28.1%) of the total restaurant and café locations in Al-Kharj City.

Directional Distribution Analysis: Figure (7) demonstrates the directional distribution of restaurant and cafe locations in Al-Kharj City. It shows an elongated oval-shaped distribution extending from the northeast to the southwest. The locations within the elliptical sector amounted to 653, accounting for 84.5% of the total restaurant and café locations in Al-Kharj City. Around the oval shape, there are 120 locations, representing 15.5% of the total restaurant and café locations in Al-Kharj City.

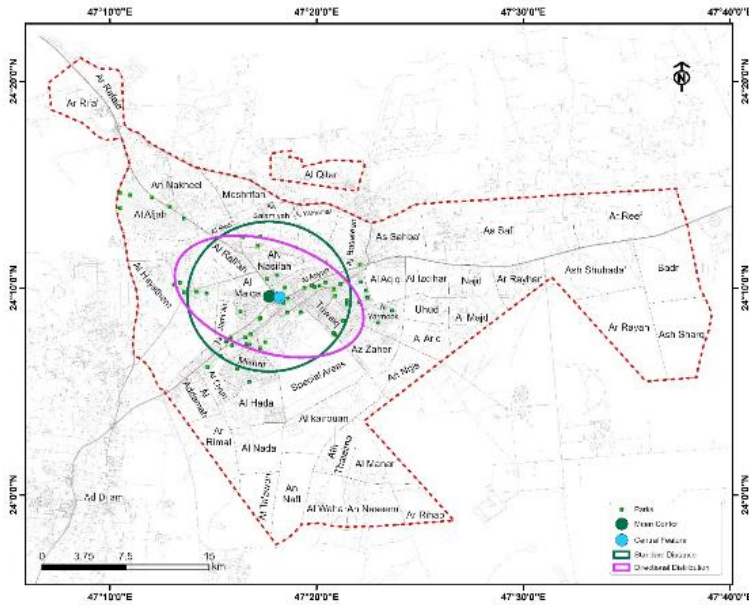### 4.2.3 *Measures of the central tendency for restaurants and cafes*

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Figure 7: Measures of Central Tendency for Cafés and Restaurants in Al-Kharj City
Source: Researcher's work based on spatial analysis within the GIS environment, utilizing data from the Planning Department, Al-Kharj Municipality, Riyadh Region Municipality, 2022.

4.2.4 Density of restaurants and cafes

Figure (8) illustrates the concentration of restaurants and cafes in the central part of Al-Kharj city, especially in Salam and Al-Khalidiyah neighborhoods surrounding the principal streets, with more than 18.54 establishments per km2. The density of restaurants and cafes decreases slightly in this area and reaches (6.5–18.5 establishments/km2) in Azizia and Tuwaiq neighborhoods, then decreases further to (2.3–6.5 establishments/km2). A low density of restaurants and cafes is observed in the northern and eastern parts of Al-Kharj, which ranges between 0.4 and 0.9 establishments per km2, while the density of restaurants and cafes in the northern, eastern, southern, and southwestern outskirts is almost negligible, with less than (0.01 establishments/km2).
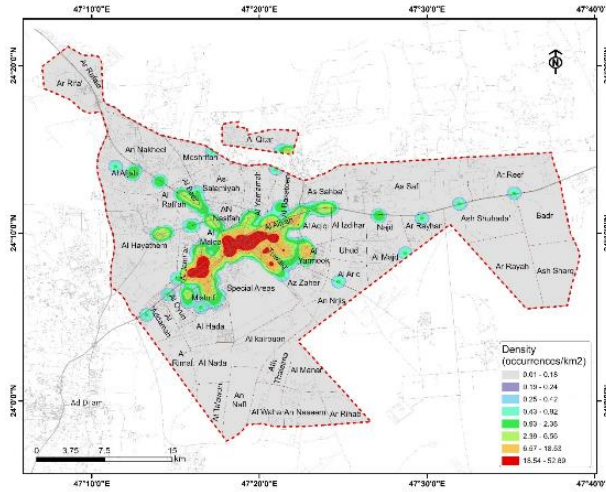
Figure 8 shows the density of restaurants and cafes in Al-Kharj in 2022
Source: Based on the researcher's work using spatial analysis and geographic information systems data from the Planning Department, Al-Kharj Municipality, Riyadh Region, 2022.

4.2.5 Access Time to Restaurants and Cafes

The average access time to restaurants and cafes in Al-Kharj city can be observed from Table 4 and Figure 9, revealing the following:

Table 4: Average access time and distance to restaurants and cafes in Al-Kharj city in 2022.

| Variables	Distance to Restaurants and Cafes (km)	Time to Restaurants and Cafes (minutes)
Mean	11.86	19.41
Median	8.54	13.35
Minimum Value	0.02	0.03
Maximum Value	54.50	87.21

Source: Adapted from the researcher's network analysis within a GIS environment using the navigation data platform "Here," version 11, 2019.

The maximum distance to reach restaurants and cafes is 54.3 km, while the minimum distance is less than a quarter kilometer. Conversely, the longest measured travel time to reach residential centers is 87.2 minutes.

Restaurants and cafes are mainly in the central area of Al-Kharj, which is reflected in the travel time that is less than one minute (3 minutes) in neighborhoods such as Al-Wurud, Al-Salam, Al-Nasifa, Al-Faisalia, and Al-Khalidiya. In contrast, travel time to restaurants and cafes in the western area outside the area increases slightly and ranges from 6.6 to 9.9 minutes in Al-Rafaia and Al-Rafi neighborhoods, which are located northwest of the study area, and in Al-neighborhood.

In the northern, northeastern, and southern parts of the central area of Al-Kharj city, the travel time to access restaurants and cafes increases to about a quarter of an hour (14.9–22.3 minutes). In the eastern and southern parts of Al-Kharj, travel time to restaurants and cafes increases further, reaching about half an hour (22.3–30 minutes) in the Al-Rayah and Al-Qairawan neighborhoods. In

the southernmost and easternmost parts of the study region, the travel time is more than half an hour (30 minutes) in Al-Rahab, Al-Naseem, Al-Waha, Al-Nakhl, and Al-Sharq neighborhoods.
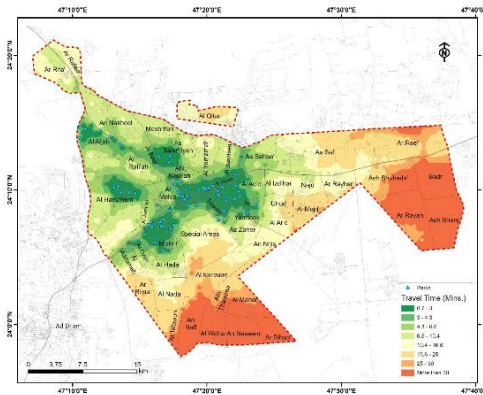

Figure 9 shows the average access time to restaurants and cafes in Al-Kharj city in 2022.
Source: Researcher's network analysis using GIS and the navigation data platform "Here" (v11, 2019).

4.3   *The spatial analysis involved examining garden sites.*

4.3.1 *Geographic Distribution of Parks:*

There is no doubt that parks are one of the most important forms, as they are the oldest, most accessible, and least expensive. They contribute to the purification and beautification of the atmosphere in residential neighborhoods and give the city a civilized appearance. Al-Kharj city has about 60 parks concentrated in the central and northwestern areas, while they are absent in the northeast and south of the study region, as shown in Figure 10.
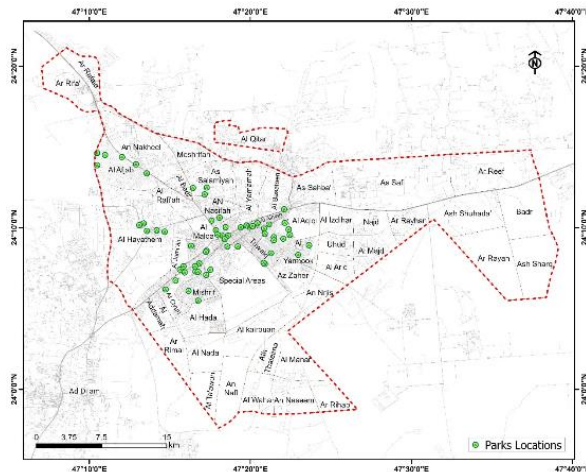
Figure 10: Geographic Distribution of Parks in Al-Kharj City in 2022.
Source: Researcher's work based on field study and data from the Planning Department, Al-Kharj Municipality, Riyadh Region Municipality, 2022.

4.3.2 *Measures of Central Tendency for Parks:*

a. Mean Geographic Center:
Figure 11 indicates that the mean geographic center, or the centroid, of park locations in Al-Kharj City is situated in the Al-Malga neighborhood.

b. Median Center Phenomenon:
It is evident from Figure 11 that the actual geographic center of park distribution is in Al-Wurud neighborhood, in the central area of Al-Kharj City.

c. Standard Distance Analysis:
Figure 11 shows that the standard distance between park locations exhibits dispersion. The number of parks within this distance circle amounts to 41, accounting for 68.3% of the total park locations in Al-Kharj City. Conversely, parks located outside the distance circle constitute 31.7% of the total park locations in Al-Kharj City.

d. Directional Distribution Analysis:
Figure 11 shows that the actual distribution of parking sites in Al-Kharj City has an elliptical shape, extending from the northwest to the southeast. These sites fall within the incomplete standard intersection area, which includes 40 sites that account for 66.6% of the total park sites in Al-Kharj City. The percentage of parks around the elliptical shape is 33.4% of the total park sites. This is because of the horizontal expansion of the city, the greater concentration of services, and the proximity of urban centers within the elliptical frame.
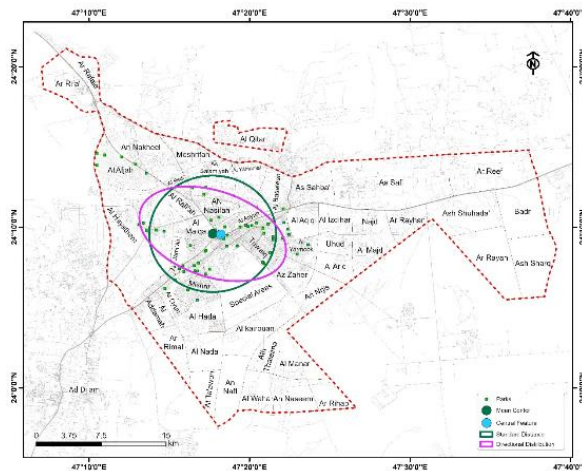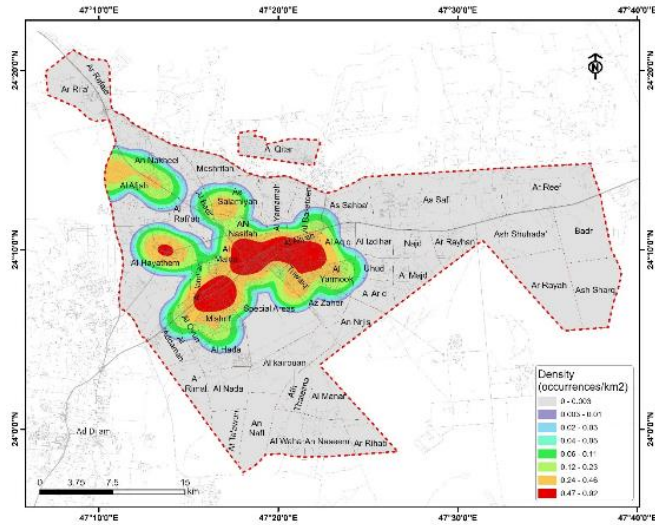

Figure 11: Measures of Central Tendency for Parks in Al-Kharj City in 2022.
Source: Researcher's work based on spatial analysis within a GIS environment using data from the Planning Department, Al-Kharj Municipality, Riyadh Region Municipality, 2022.

4.3.3 *Park Density*

Figure 12 illustrates the concentration of parks in the central area of Al-Kharj City, particularly in the Al-Salam and Al-Wurud neighborhoods, which reach a density of over 0.47 parks per square kilometer. In Tawiq and Mushrif neighborhoods, the density of parks ranges from 0.24 to 0.46 parks per square kilometer. In contrast, park density in Al-Afja neighborhood ranges from 0.04 to 0.05 parks per square kilometer. As the distance from the center of Al-Kharj increases, the park density gradually decreases and reaches its lowest point in the northeast, east, south, and southwest of the

city with a density of less than 0.003 parks per square kilometer.

Figure 12: Park Density in Al-Kharj City in 2022.
Source: Researcher's work based on spatial analysis within a GIS environment using data from the Planning Department, Al-Kharj Municipality, Riyadh Region Municipality, 2022.

4.3.4 The Access Time to Parks:

Undoubtedly, the concentration of parks in the central area of Al-Kharj City impacts the access times to these parks. Table 5 shows that the minimum access time to the parks is less than 0.17 minutes, while the maximum time is 55.2 minutes. In addition, access times of less than 3 minutes were recorded in neighborhoods such as Al-Salam, Al-Aaliyah, and Al-Faisal. On the outskirts of the city, access time ranges from 7 to 9 minutes in neighborhoods such as Al-Sahba, Al-Basatin, and Mushrifah (Figure 13). However, in the eastern and southern parts of the city, including the neighborhoods of Al-Rihan, Najd, Ahad, Al-Arid, and Al-Narjis, the access time increases to about 15–22 minutes. Finally, the highest access time is observed in the southern and southeastern areas of Al-Kharj City, in neighborhoods such as Al-Sharq, Al-Naseem, Al-Waha, and Al-Rahab.

Table 5: Average Access Time and Distance to Parks in Al-Kharj City in 2022

Variables	Distance to Parks (km)	Time to Parks (minutes)
Mean	12.8	16.9
Median	10.4	13.3
Minimum Value	0.11	0.17
Maximum Value	62.3	55.2

Source: Adapted from the researcher's work using network analysis within a GIS environment and the navigation data platform "Here," version 11, 2019.
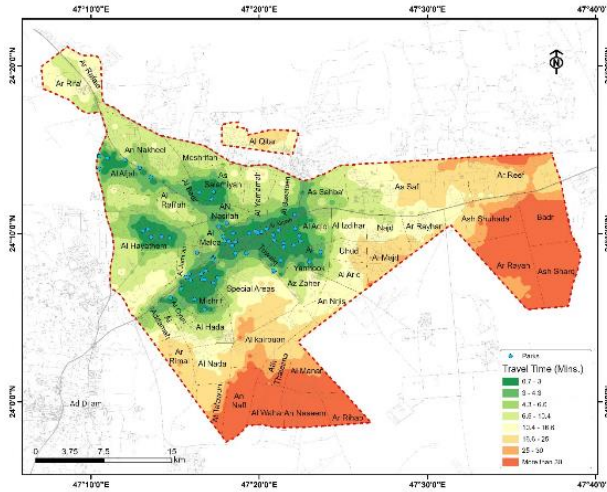
Figure (13): Average access time to parks in Al-Kharj City in 2022.
Source: Researcher's work, GIS-based network analysis using "Here" navigation data platform (Version 11, 2019).

5. Conclusion

The study performed a spatial analysis of Al-Kharj city's tourist services, identifying 455 diverse accommodation options, predominantly in the central Farzan neighborhood. Around 80.2% of residential shelters showed an elliptical distribution from northwest to southeast. In contrast, the Eastern and Badr neighborhoods had longer travel times to accommodations. The city also housed 773 food establishments (606 restaurants and 167 cafes), mostly concentrated centrally and along streets, with increased travel times in the eastern and southeastern parts due to lower road density.

The study found Al-Kharj's amenities, including 60 parks and various accommodation options like resorts, chalets, and furnished units (totaling 455), were mostly located centrally, particularly in the Farzan neighborhood. Around 80.2% of the residential shelters exhibited a northwest-to-southeast elliptical distribution, with the density decreasing towards the outskirts. Locations in the Eastern and Badr neighborhoods had longer travel times to amenities, especially where road density was lower. These findings provide essential insights for urban planning concerning the spatial distribution and accessibility of tourist services.

The study analyzed tourist services in Al-Kharj, identifying 773 food establishments, mainly located centrally and along streets, with longer travel times in eastern and southeastern parts due to lower road density. Around 60 parks were found, mostly in the central and northwestern areas, with increased access time in the south and east. These findings underscore significant spatial distribution patterns, variations, and differences in service locations, offering valuable insights for tourism development.

6. Recommendations

The study suggests several strategies for improving tourism in Al Kharj, including the use of Geographic Information Systems (GIS) to create an electronic tourism atlas and repositioning housing developments centrally. Recommendations also include diversifying accommodation options, prioritizing park establishment in underserved areas, integrating sustainable practices in urban planning, exploring public-private partnerships for tourism development and cultural heritage

preservation, and identifying potential tourist spots while addressing development challenges.

7. Study Limitations

The study's constraints include potential inaccuracies in the Planning Department of Al-Kharj Municipality data used, limited generalizability beyond Al-Kharj, reliance on quality input data and analysis assumptions for spatial analysis accuracy, and the restriction of findings to 2022 data, which may not represent Al-Kharj's current state.

8. Future Directions

Future research avenues include regular data collection and updates, conducting comparative and longitudinal studies for tourism in Al-Kharj, involving local stakeholders in planning, integrating sustainability in tourism development, surveying visitor satisfaction for service improvement, and identifying and incorporating cultural heritage sites into tourist attractions.

9. Study Implications

The study offers crucial insights for Al Kharj's urban planning and tourism enhancement, emphasizing gaps, opportunities, and spatial patterns. It advocates for sustainable practices in urban development and the tourism industry, emphasizing energy efficiency, waste management, and natural landscape preservation. It also underlines the importance of preserving and integrating cultural heritage into Al Kharj's tourism to boost visitor experiences and promote cultural richness.

10. Acknowledgments

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