

## **Problems facing urban street design in residential areas of Al Rawda neighborhood, Riyadh, Kingdom of Saudi Arabia**

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### **Abstract:**

Saudi Arabia endeavor to achieve sustainable development of its cities. It has consistently prepared developing strategies, policies and regional development plans for structural plans that include all sectors, in a way that contributes to the realization of the Kingdom's vision 2030. Mohammed bin Salman stressed the need to preserve the special and unique environmental character of any region by developing laws and mechanisms related to environmental sustainability .They will be done to preserve natural resources in accordance with the best practices and standards in force globally. In order to implement sustainability in cities, one must first know the existing problems and study them in order to develop optimal solutions to solve these problems and implement the requirements of sustainable development in the region. My research provided a more thorough understanding of urban street design in residential areas of Al Rawda neighborhood and its associated problems, which can potentially provide the local governments with methods to improve urban living in Riyadh.

**Keywords:** Saudi Arabia, Riyadh, Al-Rawdah, urban streets, streets design, design problems.



## المشكلات التي تواجه تصميم الشوارع الحضرية في المناطق السكنية في حي الروضة بالرياض ف المملكة العربية السعودية

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### المخلص :

تسعى المملكة العربية السعودية إلى تحقيق التنمية المستدامة لمدنها ، وقد سعت لإعداد استراتيجيات وسياسات وخطط تنمية إقليمية لتطوير الخطط الهيكلية التي تشمل جميع القطاعات بما يساهم في تحقيق رؤية المملكة 2030. وشدد محمد بن سلمان على ضرورة الحفاظ على الطابع البيئي الخاص للسعودية من خلال تطوير القوانين والآليات المتعلقة بالاستدامة البيئية ، وذلك للحفاظ على الموارد الطبيعية وفقاً لأفضل الممارسات والمعايير المعمول بها عالمياً ، من أجل تنفيذ الاستدامة في المدن .

فيجب أولاً معرفة المشكلات القائمة ودراستها من أجل تطوير الحلول المثلى لحل هذه المشكلات وتنفيذ متطلبات التنمية المستدامة في المنطقة ، قدم بحثي فهماً أكثر شمولاً لتصميم الشوارع الحضرية في المناطق السكنية في حي الروضة في الرياض والمشاكل المرتبطة به ، والتي يمكن أن توفر للحكومة المحلية طرقاً لتحسين الحياة الحضرية في الرياض.

**الكلمات المفتاحية:** الشوارع الحضرية ، المناطق السكنية ، المشاكل التصميمية ، الرياض ، حي الروضة.

## 1- Introduction:

Mohammed bin Salman called for preparing Riyadh to be "a major center and hub in providing sustainable transport and logistics services in the Middle East region, and strengthening its leadership role as one of the world's major metropolises, based on the directions of the Kingdom's Vision 2030" programs (vision2030, 2017). The development process will help Riyadh to meet the needs of the Kingdom, raising the average walking speed, reducing the travel time on the city's road network, and directing urban development in line with the city's future vision and strategy. "His Royal Highness Prince Muhammad bin Salman bin Abdulaziz, Crown Prince said that the Kingdom of Saudi Arabia will announce a strategy to develop the city of Riyadh As part of its plans to diversify sources of income and grow the economy. He said: "All the properties that Riyadh possesses give enablers to create jobs, growth in the economy and investments, in addition to many Opportunities, so we look at Riyadh with consideration. "He added: Therefore, we aim for Riyadh to be one of the ten largest economic cities in the world, today it is number forty, out of the forty largest economy in the world as a city". According to the statement of His Highness Crown Prince Mohammed bin Salman, the Kingdom is planning to establish a green Riyadh program to afforest millions of trees in Riyadh, which will reduce the temperature as well as the level of dust. There are also plans to establish huge reserves around the city of Riyadh to improve the situation Environmental projects for the city, in addition to environmental projects in the Kingdom of Saudi Arabia, will be announced later. (Saudi Press Agency, 2021).

### **1-1 The study problem:**

The main problem that this research discusses lies in the absence of the implementation of concepts and applications of sustainability in urban streets of the city of Riyadh. As most of the projects aim to achieve investment purposes without considering most of them the importance of the environment and sustainable urbanization systems. A project called Green Riyadh has been launched, which aims to raise the quality of life in the capital and enhance the cultural, tourism and civilizational aspects by establishing green spaces and encouraging residents to practice a healthy lifestyle, but it is concerned with afforestation of the main axes of the city only without taking into account the streets in the residential areas.

### **1-2 Importance of the study:**

The topic of this research came to present problems facing urban street design in residential areas of Al Rawda neighborhood, Riyadh, Kingdom of Saudi Arabia and analyses the current design of urban streets. These analyses will helped in finding solution and apply new plan for the urban streets there. Which will achieved through the application of the sustainability approach in building and planning the urban environment of the Riyadh, Saudi Arabia.

### **1-3 Research questions:**

- Are the streets well paved?
- How many pits and dilapidated sidewalks are?
- Are there enough green spaces?
- How harmonious the trees are and the interest in greenery?
- Is there an interest in afforestation of public places?
- Are there adequate services, umbrellas and seating areas for pedestrians?
- Is the street thoughtfully divided into pedestrian and cycle paths?
- Has the safety and freedom of pedestrian movement been emphasized by reducing obstacles in the pedestrian path?

#### **1-4 Study Approach:**

Two main approaches will be taken in the study, namely Descriptive and Analytical Approach.

Including:

- Definition of the study area.
- A general picture of the study area.
- Defining and planning the urban environment.
- Study urban street plans in the region.
- clarifying the problems of urban areas.

#### **1-5 Data collection methods:**

I used both qualitative and quantitative methods in my study. Observation and surveys were used to investigate and define the problems in the area. Al-Rawda neighborhood is the neighborhood that I grew up in since childhood. So I lived my experience in its streets, and most of the problems that I will talk about have either I faced personally or faced with one of my family or neighbors. I obtained the information by asking residents, and making observations. In addition, I took photographs of street landscapes that I coded and analyzed

### **2- Riyadh city**

#### **2-1 Historical background:**

The name of the city of Riyadh comes from the original plural of the word “Rawda”. Rawda as it is known is the green land which has different types of plants. Its name is due to the natural fertility provided by the valleys. Trade was particularly important in the Najd plateau extending around and within Riyadh, so Riyadh was a commercial center for the neighboring villages and hamlets (Article 5 of the law of Regions to Royal, 1993).



The city of Riyadh has grown from a relatively small village to one of the most prominent cities of the world. It occupies a special place not only as the capital of the Kingdom, but because it was the nucleus and the first step from which the Arab founders, King Abdulaziz Al Saud, set out in unifying the Kingdom. Then Riyadh will witness a series of urban developments and transformations. In 1953, the state decided to transfer its official apparatus from the Holy City of Mecca to Riyadh, and began building ministries 'headquarters there. It is becoming the main center for the Kingdom's national activities, and the incubator for central government agencies, embassies, and diplomatic missions.

Today, Riyadh is an oasis of innovation in the field of building and construction techniques, materials and equipment. It has the best luxury hotels, major hospitals, and one of the largest airports in the world. It also has five public universities, six private universities, and some specialized colleges and institutes, in addition to cultural centers, sports facilities, stadiums, and public libraries.

Riyadh has gained historical, political and commercial importance since it was an ancient city, and the capital of the Yamamah region called (Hajar). 90 years after it was chosen as the capital of the second and third Saudi state, Riyadh was and is still the scene of many political, economic and cultural events. It won the title of the Capital of Arab Culture in 2000, and the Capital of Arab Media in 2019. It has hosted many local, Gulf, Arab and international conferences and summits. The most recent was the Riyadh Summit 2017, the Gulf Summit 2018, and in November 2020, she hosted and chaired the G20 Summit (Al-Riyadh newspaper, 2019).

## 2-2 Geography of Riyadh:

### 2-2-1 Location:

Riyadh is the capital of the Kingdom of Saudi Arabia, its largest city and the third largest Arab capital by population. Riyadh is located in the middle of the Arabian Peninsula on the Najd Plateau, at an altitude of 600 meters above sea level. It is the headquarters of the Emirate of Riyadh region, according to the administrative division of the Saudi regions. The city of Riyadh is inhabited by about 6 million people, according to the statistics of 2018. The Saudi capital is one of the fastest expanding cities in the world. During half a century of its inception, the area of the small city expanded to 1,800 square kilometers, until it reached 3,115 km<sup>2</sup> in this time. It shares its borders with seven administrative regions in the kingdom, which are: the eastern region in the east, Al-Qassim in the north, Asir, Makkah Al-Mukarramah, the city of Al-Munawara in the west, and Najran in the south.



**Figure1. Map of Riyadh borders**



### 2-2-2 Topography and geology:

The topography of Riyadh changes between the hills and valleys, as it descends from the level of 1010 meters in the northwest to the level of 500 meters in the southeast. The floods drainage in two valleys: Wadi Al-Selay, which is located in the east, and Wadi Hanifa which is located to the west of the city.

The city of Riyadh is located on a sedimentary plateau, with a height of about 600 meters above sea level in the eastern part of the Najd plateau. It contains of several formations. The most important of which is the Al-Jabila Formation, which is located in the west of the city. It consists of fine calcareous rocks. And the formation of the Arabs, which appears as exposed along a 10 km stretch, located in Northwest to southeast. It consists of limestone, breccia and limestone in the upper part of the formation.

The most prominent landmarks of the city are the valleys. The most important of which is Wadi Hanifa, which penetrates the city from the northwest to the southeast, and whose course length is about 120 km .The edge of Heet, which is made of heights extending in a zigzag line from the southeast to the east and the northeast, and the maximum height is about 700 meters above sea level. The rim of a band extending in the middle of the Najd plateau in the form of an arc from the southwest to the northeast, then to the northwest with a length of 1100 km. The Moyazila River, which are sand dunes located to the north of the city. The density of the dunes increases towards the north, where they connect with the sand of Benban .



**Figure 2. Wadi Hanifa and Wadi Al-Selay in Riyadh**



### **2-2-3 climate:**

The climate of the Riyadh region is desert, hot and dry in summer, cold and sometimes rainy. In the winter, the annual average daily temperature is 6.26 Percent, as it rises to more than 50 percent in summer, and decreases in the winter season to zero degrees Celsius, with a relative humidity of 1.33%. The average annual rainfall is 4.84 mm. The area is also exposed for frequent dust and sand storms caused by desert sand dunes Surrounding it.

### **2-3 Demographic characteristics:**

The population of Riyadh was 2.5 million, according to the 2010 census. It rose to 5.6 million people; according to a household survey they conducted developing the city of Riyadh in 2016. Riyadh is one of the fastest growing cities. The Kingdom recorded an annual growth rate of 4%, which is the highest of the estimated national average of 4.1%. According to the 2010 census; the population density of the city of Riyadh has lost. It reached 659.4 people / km<sup>2</sup>, compared to 4000 people / km<sup>2</sup>. According to results Census 2010, Population distribution by gender 56% male and 44% Females of the total population. While males are without Saudis are 63% versus 37% for females.

This apparent difference between Saudis and non-Saudis is due to the average distribution by gender indicates that the majority are expatriates .They are unmarried males for work or married couples who left their families in their places of origin. It is special Age distribution of the population of Riyadh in the category of youth under 24 years old .They represent 46% of the total population of the city. This requires the development of estimates and future needs for services and jobs meet the needs of this category. The category is formed Age 60 years and over is about 19.4%. The population pyramid shows that the Saudis have a base as a result of a high percentage of small molds goes down at the top. This indicates the representation of young people to the largest segment of the population. Added to this is under the age of fifteen or 30% for Saudis And 7.19% for non-Saudis.

**Table 1. Demographic growth evolved between 1862 and 2010**

1862	1938	1944	1954	1960	1968	1972	1974	1987	1990	1997	2010
7,500	47,000	50,000	106,000	160,000	300,000	420,000	662,000	1,389,000	2,100,000	3,100,000	5,254,560

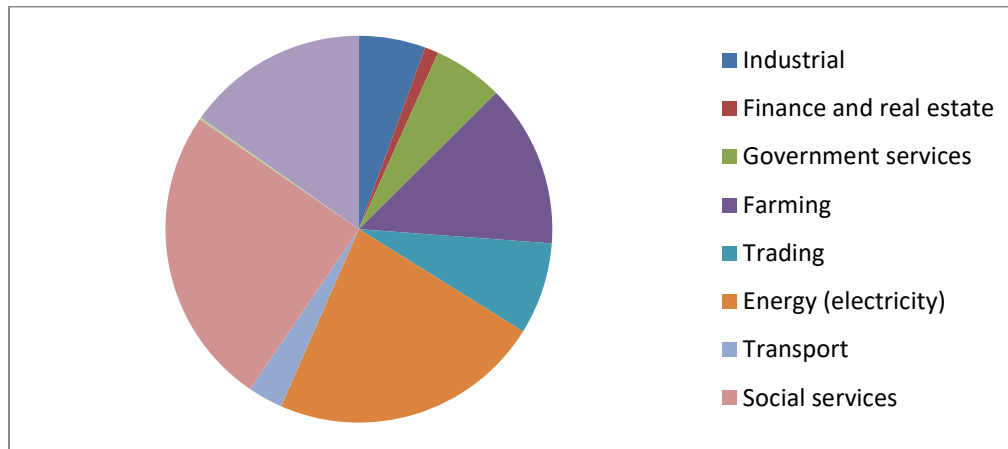
## **2-4 Social and economic background:**

The economy of the Kingdom of Saudi Arabia and its government revenues are dependent mainly on oil and gas resources in the Eastern region. This applies to the Riyadh region and its administration. In 2016, it was launched The Saudi government has a vision 2030 towards a prosperous and sustainable economy to move to a stage after getting used to oil. Therefore, it is necessary from now to Preparedness for prospecting the post-oil phase and strategic thinking in other alternatives to diversify the Saudi economy base at the level National, as well as at the level of the Riyadh region.

### **2-4-1The development of the gross domestic product:**

The GDP was reached in 2012 in the Riyadh region About 417 billion Saudi riyals, representing 3.15% of GDP the Kingdom's total, and 2.29% of the Kingdom's GDP Outside the crude oil and gas sector. It reached an average annual growth rate the gross domestic product in the region is about 12% during the period the real estate and financial services sector ranks first In terms of the contribution to the gross domestic product of the Riyadh region with a contribution of 7.25%, followed by the trade sector with a rate of 4.15% and transportation. And storage and communications by 8.7%, and building and construction by 6.6% And the industrial sector by 2.6%, and the agricultural sector by 2.4%.

**Chart 1.** The contribution of the economy sector In Riyadh region (2012) in the GDP



## 2-5 National and regional transportation network:

### 2-5 -1 Air transport:

The Riyadh region contains three airports, including: King Khalid Airport Al-Dawil airport in Riyadh, and two internal airports, which are Al Dawadmi Airport and one Valley of Durres. The number of passengers reached the airports of the Riyadh region about 31% of the internal flights of the total air transport traffic in the country. King Khalid International Airport is one of the largest in 2012. Airports are a development in the Middle East, on which the region depends on Transportation and air freight.

### 2-5 -2 Railways:

The Riyadh region is connected to the eastern region by a railway line to transport passengers the goods are between Riyadh, Iqqiq, Hofuf and Dammam. It reaches a length Passenger line about 449 km, cargo line 569 km from the port of King Abdul Aziz in Dammam to Riyadh, passing through the cities of Abq. Hofuf, Haradh , and Kharj.

Riyadh is also connected to the Shallal-South line which starts from the city of Riyadh towards the shall , passing through the Qassim areas Hail and Al-Jawf to Haditha City on the Jordanian border. Six stations have been designated in the shall train project - Al Janoub Passenger Transport Services. This includes the King Khalid Airport terminal Al Dawli station in Riyadh, in addition to Al Majmaah, Qasim and Hail stations Al-Jawf and Al-Haditha. New railway lines are currently being implemented.

In the Kingdom, the most important of which is the 946 km irrigation traction project, linking west the Kingdom (the port of Jeddah) on the coast of the Red Sea to the east (the Port of Dammam) on the coast of the Arabian Gulf across the capital, Riyadh.



**Figure 2. Transport network, roads, ports and major airports in the Kingdom of Saudi Arabia**



## 2-6 Patterns and dynamics of national and regional development:

### 2-6-1 Administrative boundaries:

The administrative district of Riyadh consists of the city of Riyadh and nine years Governorate: Ad Diriyah, Al-Kharj, Al-Dawadmi, Al-Majmaah, Al-Quwaiyah, Wadi Dwaris, Afaj, Zulfi, Shaqra, Hattah, Bani Matim, Afif, As-Sulayyil, Muzahimiyah, Ramma, Hama, Thadiq, and Ghat .



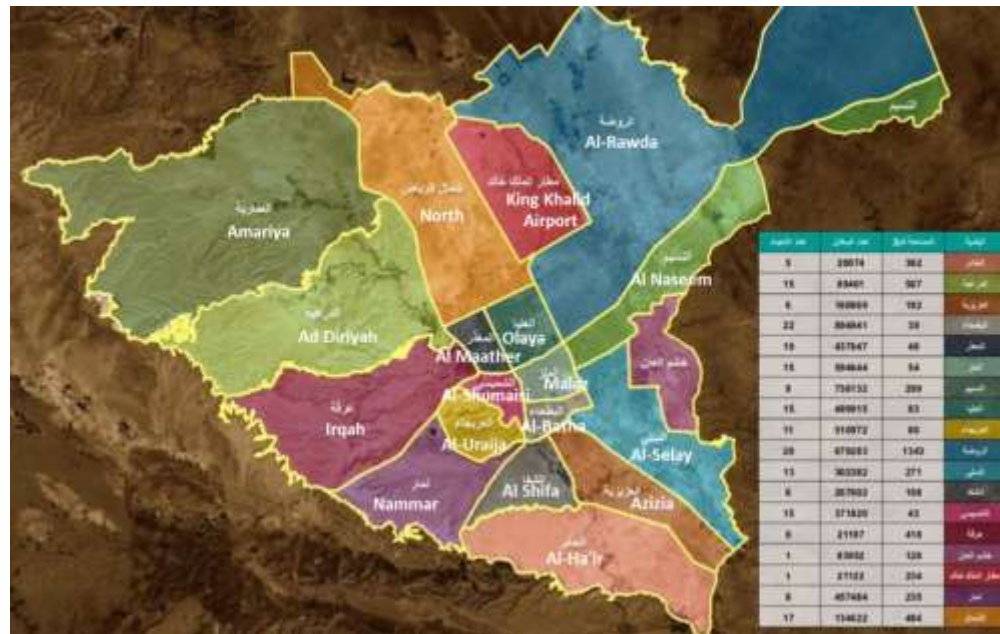
**Figure 3. Governorates of the Riyadh region in Saudi Arabia**

### 2-6-2 Administrative division:

There are several neighborhoods in the north of Riyadh and Al-Olaya, such as Al-Nakheel, Al-Aqiq, Al-Ghadeer and Al-Sahafa, in which the headquarters of Riyadh and Al-Jazeera newspapers are located. Income and recovery is characterized by the urban renaissance in recent years . The development of infrastructure includes the suspension bridge. The southern neighborhoods of Riyadh are Umm Salim, Al-Faisaliah and Al-Aziziyah. Among the most famous streets are the old Kharj Road and the new Kharj road on the eastern side. The center of Riyadh belongs to the municipality of Al-Batha and other of its most famous neighborhoods such as Al-Batha, Manfuha and Khenchelileh .



**The neighborhoods of Riyadh are divided into 16 municipalities:** Olaya , North , Al Maather , Al-Batha ,Azizia , Al-Shumaisi ,Al-Ha'ir,Al Naseem ,Al-Selay ,Malaz ,Al-Rawda ,Irqah ,Al-Uraiija,Al Shifa ,Nammarr and East Municipality. Each municipality has a number of different neighborhoods. For example, Al-Rawda municipality has 17 districts which are : Al-Rawda , Al-Andalus ,King Faisal, Jerusalem ,Hamra ,Shuhada ,Granada ,Cordoba,Al Munsiyah ,Yarmouk ,Seville ,alkhalij ,nahda ,Al-Muayzila,Al-Qadisiyah ,Al-Rimal and Al-Janadriyah District .



**Figure 5. Picture of the capital Riyadh, and the distribution of the governorates. Photo rights reserved for the Riyadh Municipality website**

### 3- Rawdah district:

Al-Rawda district in Riyadh is one of the most famous and vital neighborhoods with various service centers and facilities in the east of Riyadh. The district is characterized by its large area and its organized internal divisions. It is also famous for its abundant real estate, which enjoys elegant modern architectural and decorative designs.



**Figure 6. Districts of Riyadh, the red frame shows the districts of the municipality of Rawda and Rawdah district.**

### **3-1 Location:**

Al-Rawda district is located in a privileged area in the east of the Saudi capital. It is bordered on the north by Abdul Rahman Al-Ghafiqi Street, and on the eastern side by Khalid Bin Al-Walid Street. It is also bordered on the western side by the Eastern Ring Road and on the southern side by Khurais Road. Al-Rawda neighborhood is located between Exits 11 and 12.

#### **3-1-1 It is surrounded by a distinct group of neighborhoods, including:**

1. Al-Rajhi Plan, which is located on its northern end.
2. Al-Urjwan neighborhood, which is bounded on the western side.
3. Andalusia district, which is located on its eastern part.
4. Al-Rawabi neighborhood, which borders it from the southern side.





### **3-1-2 Al-Rawda district is located near many famous places in the east of the Saudi capital, including:**

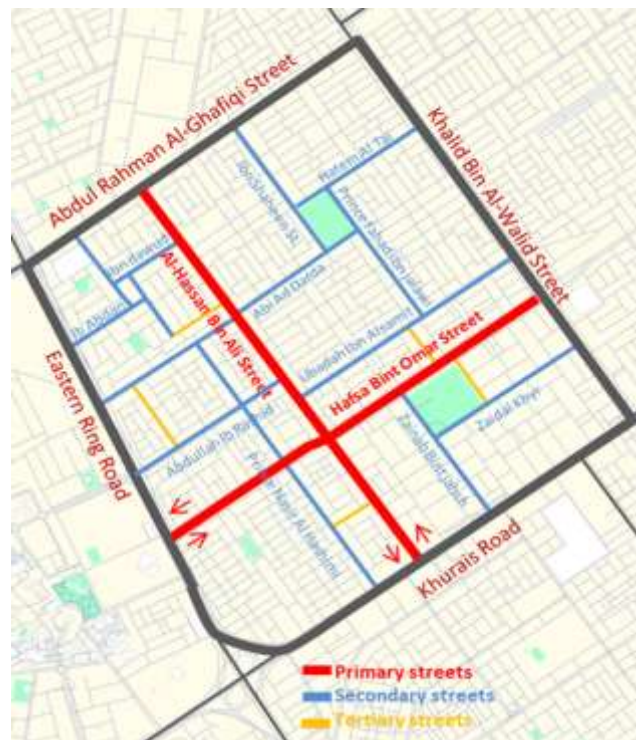
1. General Directorate of Civil Defense.
2. Border guard institute in Riyadh.
3. Ministry of National Guard.
4. Ministry of Environment, Water and Agriculture, new building.
5. Riyadh Mall.
6. Eastern markets.

### **3-1-3 The most famous inner streets:**

1. Hafsa Bint Omar Street.
2. Hassan Bin Ali Street.
3. Ibrahim Algosaibi Street.
4. Al-Mutawakel Abbasi Street.
5. Prince Nasser Bin Abdulaziz Street.



### Figure7. Al-Rawdah district location and its surroundings



**Figure 8. The inner streets of al-Rawdah district**

### 3-2 Services in the Rawdah district:

Al Rawda district includes a variety of service facilities that meet all the demands and needs of its residents and investors. Among the most famous are the following:

**Table 2. The most famous services at Riyadh district.**

service facilities	Mosques	Educational centers and schools	shopping centers	Health centers and hospitals	Banks	Recreational facilities
<ul style="list-style-type: none"> <li>-Al Rawda Traffic Office.</li> <li>-Al-Rawda Municipality.</li> <li>-Information and Documentation Center at the Police Department.</li> <li>-Mosque Architecture Association Headquarters .</li> <li>-Liquidity installment company.</li> </ul>	<ul style="list-style-type: none"> <li>- Princes s Nouf bint Sultan mosque</li> <li>- Omar bin Abdul Aziz mosque</li> <li>- Ali ibn al-Madini mosque</li> <li>- Khalid bin Al-Walid mosque</li> </ul>	<ul style="list-style-type: none"> <li>-Smart edifices institute.</li> <li>-Saudi Academy.</li> <li>-Education Gate International School 2.</li> <li>-Intermediate and secondary school 7 for memorizing the Holy Quran.</li> <li>-Elementary School 103.</li> <li>-Global Indian School.</li> </ul>	<ul style="list-style-type: none"> <li>-Carrefour Mall.</li> <li>-Sania Commercial Center.</li> <li>-Med supermarket.</li> <li>-Athg Al Jazeera supermarket.</li> <li>-National Store.</li> </ul>	<ul style="list-style-type: none"> <li>-Care Center for Family Medicine.</li> <li>-Al Rawdah Health Center for Family Medicine and Consulting Clinics.</li> <li>-Al Haramain Medical Hospital.</li> <li>-Victoria Hospital - Althmiry Clinic</li> <li>- Rawda Al-Aqsa Clinic</li> <li>- Family HealthCare Center</li> </ul>	<ul style="list-style-type: none"> <li>-Riyad Bank.</li> <li>-Al Rajhi Bank.</li> <li>-Arab Bank.</li> <li>-The first bank.</li> <li>-Saudi Fransi Bank</li> <li>-Al-Belad Bank</li> <li>-Al Jazeera Bank</li> </ul>	<ul style="list-style-type: none"> <li>-Al Rawda Park.</li> <li>-Al Rawda Reservoir Park.</li> <li>- Kindergarten Amusement Park.</li> <li>-Al Rawda Walkway and Garden.</li> <li>-Fulfillment garden.</li> </ul>



### **3-2-1 Main Services in the Rawdah district:**

The most important services that must be available within the residential neighborhood are those services that we need on a daily basis. Mosques, schools , supermarkets and parks are the most important of those services. We need some of these services almost daily, some on a daily basis, and others more than once a day. For example, worshipers need to go to mosques times a day, that is, 10 times back and forth from the mosque to the house and back. Students go to school every day except at the end of the week, that is, twice a day, once going and once again. Streets must be prepared so that people can go and return safely and comfortably. There is no need for cars on these daily trips. The inner streets should be prepared to be safe for children going to school on their feet. Umbrellas and chairs should be placed so that the road is comfortable and to avoid sunlight. Adequate lighting must be provided at night. If these streets are designed in a suitable way, this will encourage residents to go on foot, reduce car use, and add dynamism to the area. Also we must ensure that these services are available in each required area for each service depends on the need of it.



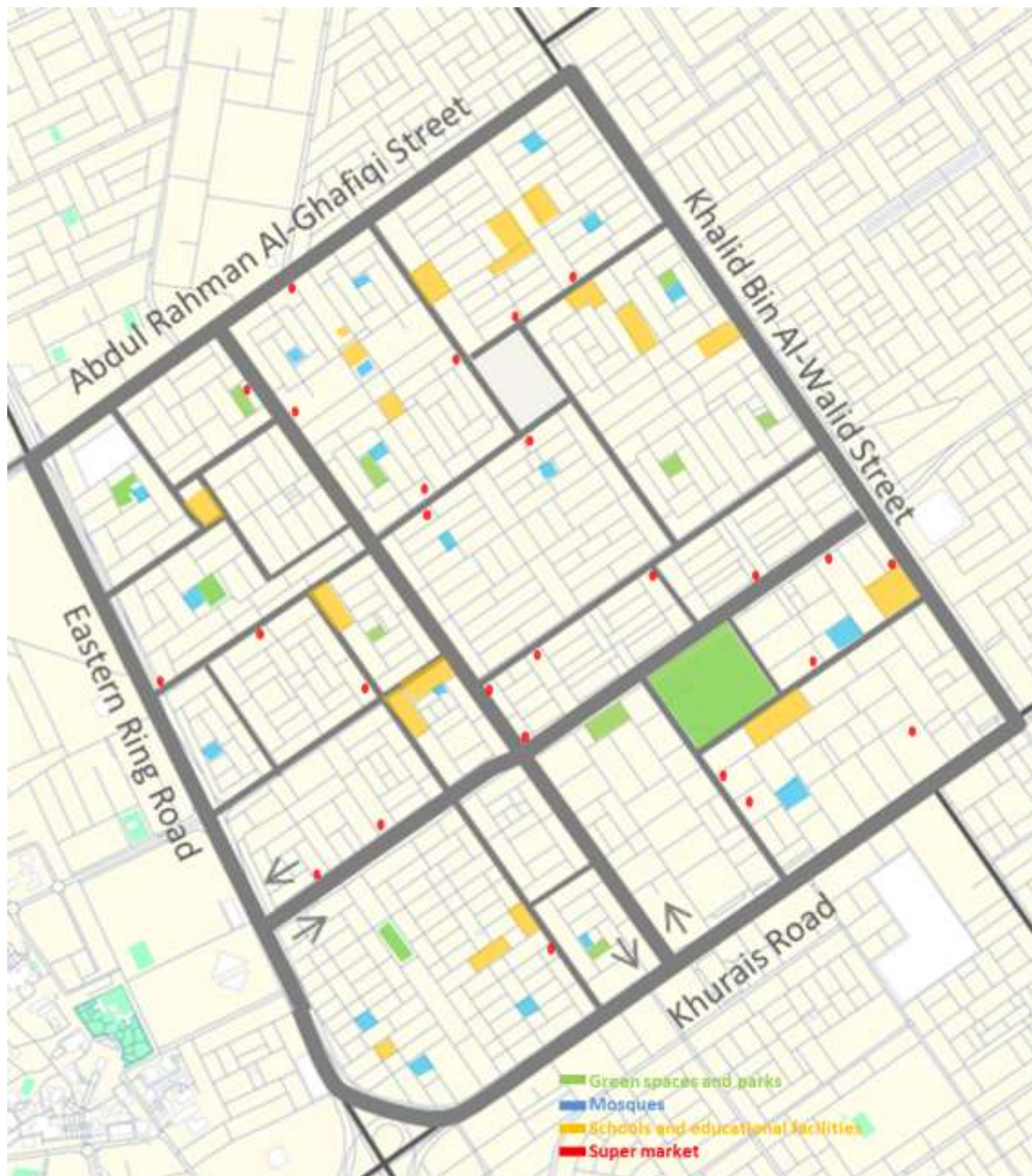


Figure9. Locations of Main Services in the Rawdah district



#### 4- The problems faced by inner urban streets in this area:

- There is a clear lack of services and facilities for the neighborhood, such as squares, playgrounds, etc., which results from the lack of prior planning that keeps pace with growth and development trends.
- The lack of places and paths designated for pedestrians and cyclists.
- Lack of directional panels, shading areas and adequate night lighting.
- There is a problem in schools when students gather while leaving school.
- Lack of clear and safe movement paths for residents and students who go to schools on foot.
- There are no trees and plants in the area.
- Leaving large empty spaces unused.
- Wide, straight streets that is not suitable for the region's climate, as they are exposed to direct solar radiation.



Figure 10. Some pictures that show the problems related to the design of the streets in the study area



## 5- Recommendations:

- The different traffic networks must be integrated with each other to achieve flexibility in accessing the different uses. There should be different choices in selecting the means of transportation from one point to another in order to achieve efficient access, rationalize pollutants and reduce energy consumption.
- Multiple entry points to the site will be better so that the traffic density is distributed over several entrances. It will also be better for pedestrians and cyclists, as the roads will be direct and continuous, more comfortable and safer.
- Attention to the pedestrian and bicycle network so that it is as direct and continuous as possible. It must also be safe and monitored by the buildings overlooking it .There must be elements for afforestation and shading, night lighting and guiding signs. They must connect to the main service sites such as supermarkets, parks, mosques and schools, as well as pass public transportation stations.
- The presence of Shared External Spaces that allow containing a different set of activities such as places to play for children and a picnic area. The space should contain a variety of trees and tree fences to ensure that the space is contained.
- Reducing the congestion of residential areas, increasing their greening, raising the level of cleanliness, calmness and security, and slowing down the traffic movement through them to increase their attractiveness.
- It is necessary to develop a network of green corridors and walkways that connect open spaces with areas of natural vegetation. Improving open spaces to create ecological balance and increase biomass to reduce pollution.
- Having supermarkets that serve the area in line with the trends of sustainable development by shortening the distances to obtain some daily shopping services.
- Designing spaces and open squares in an integrated manner with the surrounding buildings so that the lands and setbacks are not wasted and become mere neglected and untapped appendages in most cases.





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