

## Infrastructure In Najaf And Future Scenarios

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### ABSTRACT

This study examined the reality of the distribution of infrastructure services in general in Najaf Governorate, revealing the effectiveness of these services and the extent to which they are delivered to citizens. The distribution of infrastructure services in the governorate was studied. Understanding the nature of this distribution and its impact on the level of service provision helps identify the locations of services to be established in the future within development plans, to address the current shortage in these services, and to keep pace with the increasing population. Furthermore, the distribution revealed the extent of the deficit at the spatial level and the functional level. For example, the distribution may indicate the complete availability of water supply lines, but it may also reveal the extent of the deficit in treatment and storage units.

**Keywords:** - Development, Population, Infrastructure, Sanitation.

### INTRODUCTION

Infrastructure services are among the most essential service areas for cities and their populations alike. Failure to adequately provide them to the population leads to harm to both people and the urban environment, manifested in all forms of pollution, disease, and epidemics. Conversely, the availability of these services through efficient infrastructure networks enables the city to achieve comprehensive development across all its sectors in a balanced manner.

Infrastructure is also considered one of the most important indicators on the global competitiveness scale due to its significant economic importance. It is based on various frameworks and projects that enhance the growth and development of other indicators, such as job creation, market expansion, and the advancement of multiple technologies. This makes the

infrastructure criterion a key indicator and an essential reference for various other indicators. A developed and efficient infrastructure is critical to ensuring a vibrant economy. It is a key factor in determining the locations of economic activity and the types of activity and sectors that can develop in a country. Advanced infrastructure reduces the impact of distances between regions, unifies the national market, and connects it, at a low cost, to other countries and territories.

Furthermore, the quality and development of the infrastructure network have a significant impact on growth, reducing income and poverty disparities in multiple ways. When viewed from a functional perspective, infrastructure facilitates the production of goods and services, as well as the distribution of finished products to markets, in addition to basic social services, such as schools and hospitals. Chapter One: Theoretical

## Framework of the Study

### First: The Study Problem:

Defining the study problem is a fundamental characteristic in forming the structure and scientific methodology of the study. The scientific method aims to track the phenomenon from all its aspects to solve the study problem—the axis around which the study revolves (Al-Batahi, 1988, p. 48).

The primary study problem revolves around the following question: (The infrastructure in Najaf Governorate faces several challenges, including poor implementation of infrastructure projects and issues in significant projects, including corruption and mismanagement.)

### Second: The Study Hypothesis:

What are the mechanisms for addressing these problems? The study will attempt to answer this question by proposing three scenarios, which are as follows:

1. Reference Scenario: The continuation of the current situation
2. Pessimistic Scenario: The exacerbation of problems and insufficient funding
3. Optimistic Scenario: The decline of the funding problem

### Third: The study's objective:

Most studies and research have addressed the topic of infrastructure. They have also focused on the problem of financing, the poor implementation of infrastructure projects, and the demographic, economic, and social impacts they cause. Our study, God willing, will address the problems and challenges facing infrastructure in Najaf Governorate. We aim to achieve some of our goals, clarify the causes of this phenomenon, and develop proposals that provide practical solutions to address it. We hope we are not the last to write about this phenomenon.

### Fourth: The importance and reasons for choosing this study:

The importance of the topic lies in the general distribution of infrastructure services in Najaf, to reveal the effectiveness of these services and the delivery of services to citizens through their distribution. This calls for a study of the distribution of infrastructure services in the governorate. Understanding the nature of this distribution and its impact on the level of service provision in the governorate helps identify locations for future service establishments within development plans, addressing the current shortage in these services and keeping pace with increasing population growth. Furthermore, the

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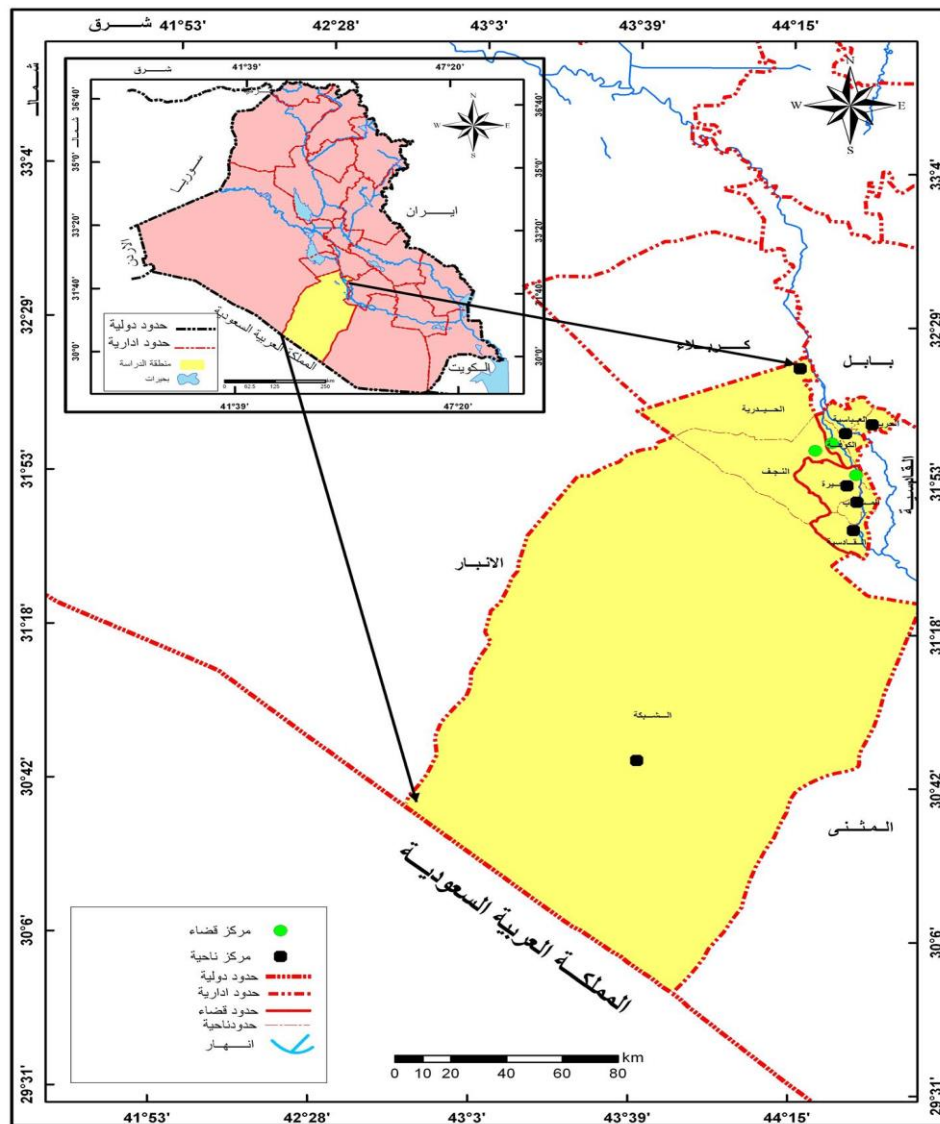
### Fifth: Study Methodology and Approach:

Any researcher must follow a clear and precise scientific approach in their study of a particular phenomenon to achieve their objectives through a set of scientific rules and standards. The study employed two methods: the first was the descriptive approach, and the second was the analytical approach, which was used to analyze data related to the study's subject.

### SASA: Boundaries of the study area:

First: Location and Position: The location of the study area means stating its spatial component and its relationship to the surrounding areas. The location is usually determined as follows:

- Astronomical Location:
- This refers to the spatial location of the latitude and longitude lines. As for Najaf Governorate, it is located in the central-western part of Iraq, between latitudes (40° 50' - 32° 21') north and longitudes (42° 50' - 44° 44') east. Therefore, its shape is more like a rectangle.
- Geographical Location: This is a location associated with geographical phenomena and is considered one of the main natural components of interest to geographers. It is the study of geographical elements, the most important of which are location and position. Their importance lies in understanding the reasons that led to the emergence and development of a governorate. They constitute the cornerstone of the geographical analysis of any political and administrative unit, and they have a significant impact on human life. Their influence has led to the spread of human civilizations, and their influence has influenced the climate of places located within a single latitude. They are responsible for population distribution. Najaf Governorate is one of the governorates of the Middle Euphrates. It is administratively bordered to the north by Karbala Governorate, to the northeast by Babil Governorate, to the east by Al-Qadisiyah Governorate, to the southeast by Al-Muthanna Governorate, to the south and southwest by the political borders of Iraq with the Kingdom of Saudi Arabia, and to the northwest by Anbar Governorate (Al-Badri, 2015, p. 13). Map (1). Map (1) Location of Najaf Governorate in Iraq



Source: Republic of Iraq, Ministry of Water Resources, General Authority for Survey, Location Map of Najaf Governorate in Iraq, at a scale of 1/1000000, Baghdad, 2020.

### Section Two:

The Reality of Infrastructure Services (Water, Sewage, Electricity) in Najaf

The distribution of infrastructure services in Najaf Governorate will be discussed in general, to reveal the effectiveness of these services and the extent to which they are accessible to citizens. This calls for a study of the distribution of infrastructure services in the governorate. Understanding the nature of this distribution and its impact on the level of service provision in the governorate helps identify the locations of services to be established in the future within development plans, to address the current shortage in these services, and to keep pace with the growing population. Furthermore, the distribution may reveal the extent of the deficit at the spatial level and the deficit at the functional level. For example, the distribution may indicate the complete availability of water supply lines, but

it may also reveal the extent of the deficit in treatment and storage units. First: Potable Water Services in Najaf Governorate:

Najaf Governorate relies on the Najaf Water Directorate to secure its potable water needs. This directorate is part of the Ministry of Municipalities and Public Works. It was established in 1979 after separating from the governorate's Municipalities Directorate and merging with the Sewerage Directorate, which was then affiliated with the General Water and Sewerage Corporation. In 1999, the directorate finally separated from the Sewerage Directorate to provide water suitable for human consumption to the governorate's residents. The directorate and its various formations carry out the operations of withdrawing, treating, and sterilizing raw water (from its sources), transporting it, and distributing it to consumers in city centers, districts, sub-

districts, villages, and rural areas within the governorate's borders. This is done through the directorate's operational purification projects and the water collection units spread throughout the governorate. In addition, it transports water via the directorate's tanker vehicles, which deliver drinking water to residential units on the outskirts of the governorate and in remote areas. The directorate also operates and maintains the projects and collection units. The water lines, networks, and associated buildings, as well as the quality control activities, identify and implement various service lines throughout the governorate. This water is purified and treated by specialized government departments and then distributed for various water uses in the city. Approximately 300 liters per person per day are allocated for domestic use. A water quota of 100 liters per person per day is allocated for commercial use, while approximately 160 liters per person per day is allocated for industrial use (Water Resources, 2019, p. 22).

- Pure Water Production Projects and Booster Stations in the City:

Najaf Governorate relies on a mechanism to pump water from the water source to distribution via a pipeline network to ensure potable water service. Given the city's topographical location, adopting this method requires booster stations to maintain evenly distributed pressure across the pipeline network, from its beginning in the north to its end. Section Two:

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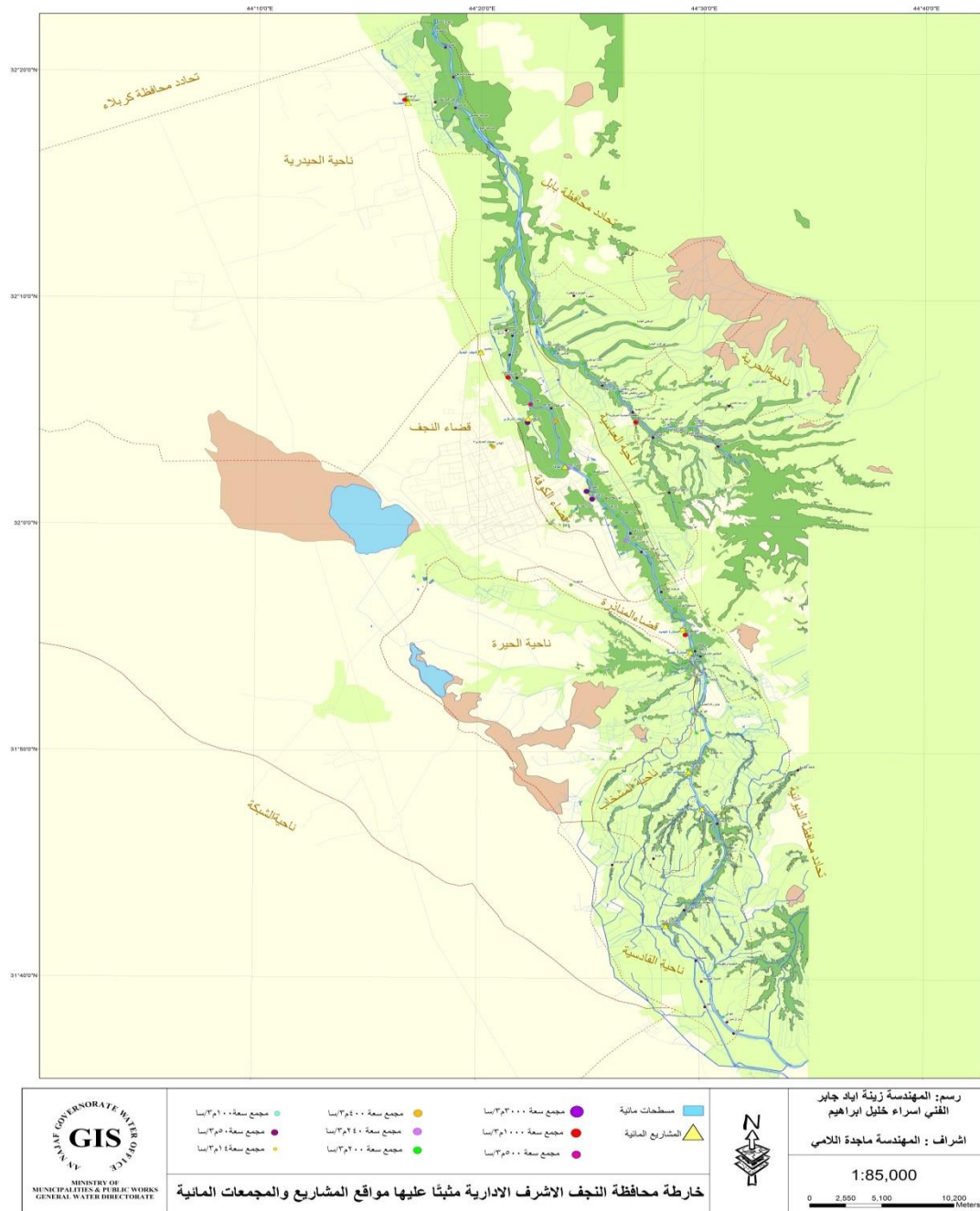
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Wastewater treatment processes seek to rehabilitate wastewater by returning it to a condition as close as possible to its original state before use. Experts strive to develop a series of treatment stages to remove pollutants or convert them into other forms, so that water can be used in agriculture or released into the environment without causing harmful effects on its components, such as valleys, rivers, soil, and air. However, these treatment processes require high material costs to establish and maintain their stations and networks. Geographical factors, such as the nature of the surface, slopes, soil type, and climate, play a significant role in facilitating or complicating these processes. In general, developing countries, and

those in particular, often struggle to finance such projects due to their inability to do so. Now, Najaf can flatten the land and reduce the degree of slope in all parts of it, which helps in extending wastewater networks to stations outside its urban center. Therefore, the natural problem that hinders the extension of network lines means nothing to specialists if projects are available. We now find that a heavy sewage and rainwater network serves 90% of Najaf's neighborhoods. The remaining percentage of the city is The newly developed neighborhoods in the north of the city and its far south in the Al-Ridha district, which are attached to the city and its urban fabric from the south, in light of the pessimistic view, the residents

of the city of Najaf are currently suffering from cracks and lack of maintenance of the sewage network, and even the poor quality of the newly developed network, as it was not in most areas of the required specifications. This is what resulted in many problems during peak days in the winter season. As soon as heavy rains fall, there are areas where houses will be flooded to a height of more than 60 or 100 cm, due to the stoppage of the pumping stations and their deterioration. This means that the residents of these areas will be among the residents with dangerous chronic diseases such as cancer, for example, and this is a result of the overflow of sewage water in their areas and homes annually, which carries with it odors and toxic and carcinogenic gases. Thus, it is a warning of great danger to the city's residents. Accordingly, there must be real and effective treatments, not patchwork, that serve the residents of the city, whose population is increasing unusually, almost like a population explosion, which generates tremendous pressure on the city's sewage services. Therefore, it needs to expand the network, add new stations, and even perform periodic maintenance on all existing ones. As for Najaf's plans for sewage services, it is striving to ensure that this service covers the entire city. It has given great attention to this by establishing complementary projects for most of the city's residential areas, including modern residential complexes that cannot be constructed and completed without the establishment of a sewage network, both for rainwater and domestic waste, before residential construction commences.

This is an excellent step in the process of building modern and contemporary cities that keep pace with progress and development in the field of services. Accordingly, decision-makers and the local city administration must pay attention to establishing treatment plants that serve the city's residents, whether by disposing of waste through the sewage network or by establishing secondary facilities within the treatment plants to produce other materials such as fertilizers and petrochemicals, or even the possibility of exploiting the gases from these plants to generate energy, as in developed countries.

There are four wastewater treatment plants in Najaf (Najaf Sewerage Directorate, 2021): the old Najaf sewage treatment project in Kufa, a compact unit treatment plant for 20,000 people, the new Najaf sewage treatment project in the sea, and the bio-shaft project. These plants focus on treating biological oxygen demand (BOD), chemical oxygen demand (COD), and suspended solids (TSS), in addition to treating other chemicals at specific rates depending on the type of plant and its treatment method. First: The Old Najaf Sewage Treatment Project in Kufa, located in the city of Kufa within the Al-Barakiya area, operates with a design capacity of 35,000 m<sup>3</sup> per day. As a result of the expansion of sewage networks in Najaf Governorate, the incoming water has exceeded this amount, reaching over 40,000 m<sup>3</sup>/day. The treatment method uses biological filters, and the treated water is discharged to the Kufa River. See Figure (1).

**Figure (1): Al-Barakiya Treatment Plant in Najaf Governorate.**



**Researcher based on Google Earth, dated 2018.**

Second: Kufa Treatment Plant (Compact Unit) 20,000 inhabitants: Located in the city of Kufa, in the Al-Barakiya area (10,800 m<sup>2</sup>), it operates with a design and operational capacity of 5,000 m<sup>3</sup>/day. It uses the activated sludge method, an efficient treatment method, and discharges the water to the Kufa River.

Third: Najaf Sewage Treatment Project at Sea: This is the first phase of a four-stage project with a design capacity of 100,000 m<sup>2</sup>/day and uses the activated sludge treatment method.

Fourth: Kufa Bioshaft Project: Located next to the old Najaf project in the Al-Barakiya area of Kufa, it has a design capacity of 50,000 m<sup>3</sup>/day and uses a modern treatment method called the bioshaft reactor.

**Electricity Service in Najaf Governorate:**

Electricity is one of the most critical infrastructures, due to its significant and clear role in managing other services and their reliance on it in their operating mechanism. The world first encountered electrical power in 1882, when the first power generation station was established in the United States (Warner, 1979, p. 85). The world's first project to provide electrical power to the population was established in the United States in 1882 in New York City. The second project was based in London, United Kingdom, in 1882 (Habib, 1980, p. 8).

The project also consisted of a steam-powered power station that generated direct current at low voltage. Electricity is a basic necessity of life in our current era, as electricity plays a significant role in facilitating or operating most of the daily activities carried out by the population. From this standpoint, a power outage in developed countries can be accompanied by a complete disruption of life, as all means of transportation and vehicles are affected. Electricity has become entirely dependent on electricity for booking flights or withdrawing travel money via bank card. Airports also come to a standstill in the absence of electricity, not to mention banking transactions, the circulation of official documents, various communications, and the operation of other infrastructure and sovereign services. This has all become fundamentally dependent on electricity. The COVID-19 pandemic has confirmed this by converting all education to electronic modes. Communication is impossible without electricity. Therefore, the importance of this service is

highlighted by its role in all daily transactions across various aspects of life.

In addition, the provision of electricity plays a significant role in facilitating urban lifestyles, as is the case in the city of Najaf. This is due to the population's reliance on electricity to meet their daily needs. Electricity is the primary supporter of urban life in the modern era, as this service intersects with most human needs, and any deficit in it ultimately impacts most services and life facilities, leading to a shortage in them. Electricity is supplied to the city of Najaf via power plants connected to the city. The city's electricity is not generated from its own power plants, but rather from the national electricity grid by the Middle Euphrates Electricity Directorate via high-voltage lines extending from the north and south of Najaf. The following is a review of the most critical stages of electricity transmission to the city.

The major central power stations generate electricity at 11 kilovolts, which is converted to 132 kilovolts using step-up transformers and transmitted via high-voltage lines to the governorates and major cities. Upon arrival at these locations, the current pressure is reduced to 11.33 kilovolts via secondary stations located there. It is then transmitted to the remaining parts of these cities, where it is subsequently reduced to 220 volts, which is sufficient for direct domestic use.

There are five types of high-voltage lines in Iraq (Muhammad, 1980, p. 60): Partridge, Oriel, Lark, Tel, and Reduit. However, the one connected to the city of Najaf is the Oriel line. Oriel lines: They are characterized by their cross-sectional area of 210 mm<sup>2</sup> and their ability to transfer quantities varying between (23-29) megavolts with little loss. These characteristics made them preferred for transferring energy to cities far from production centers (Al-Kanani, 2010, p. 65). The city of Najaf depends on this type of electrical energy transmission lines for the high-voltage lines in the city.

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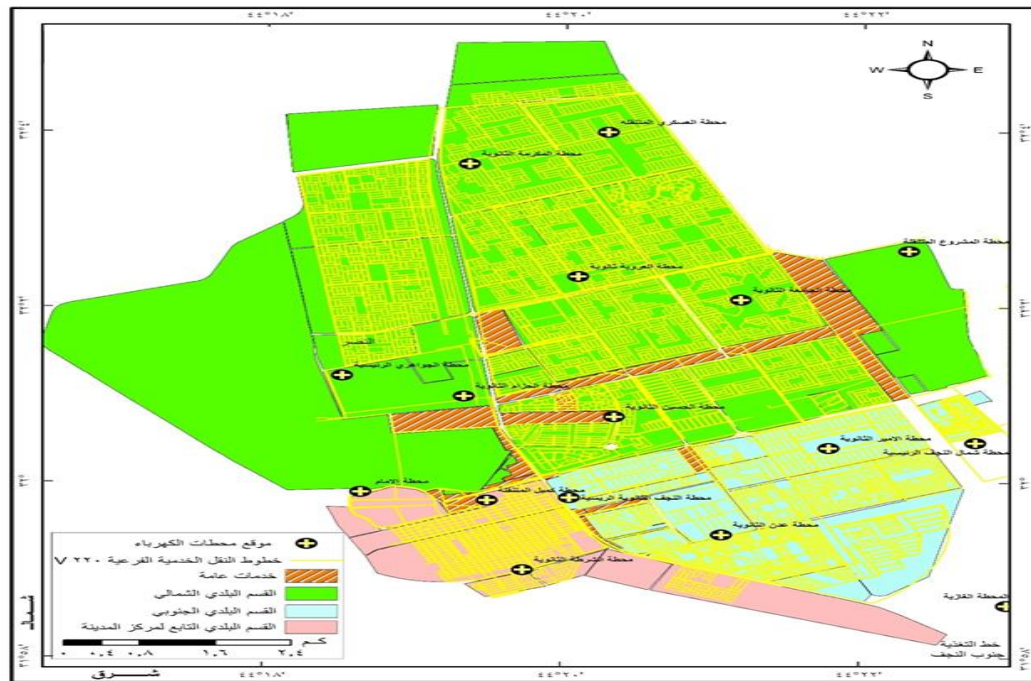
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Spatial distribution of high-voltage lines in the city of Najaf: (Ministry of Electricity, 2021, p. 78) The city of Najaf relies on the national supply network of high-voltage lines extending from the north of the city, then entering the city via a line that accompanies the transport road that connects Najaf Governorate to Karbala Governorate within the municipal borders of Najaf City, and branches out within the main areas of Najaf City, east and west, reaching the south of the city to reach the stations specialized in distributing and reducing electrical energy, since the transmitted electrical current has a capacity of 132 kilovolts. See Map (2). Since the population is the primary consumer market for electrical energy in the city, population concentrations have influenced and controlled the determination of the directions of high-voltage and ultra-high-voltage lines, and they are distinguished by the presence of secondary transmission stations that attempt to reduce the pressure of the current to deliver it to homes for ease of use. Secondary electrical distribution stations (fixed and mobile) with a voltage of 33/11 kilovolts: The number of distribution stations in the city of Najaf Al-Ashraf reached (37) (13) fixed secondary stations with a total capacity of (1,017,182) kilovolts. These stations convert the current pressure from 33 kV to 11 kV. From this location, secondary distribution lines spread to the neighborhoods, followed by branching out of the feeder lines to the streets near the transformers. 33 kV wires are often used between the governorate center and its affiliated districts, while 11 kV transmission lines

are prevalent between the various neighborhoods of Najaf. The number of secondary stations in the city of Najaf is 17, 14 of which are distributed among the communities of the city of Najaf according to the areas they cover. (13) of these stations supply the city of Najaf jointly, and (2) of them operate independently, namely the Water Project Power Station and the Kamil Mobile Station. These stations work to reduce the electrical energy coming from the high-voltage lines and redistribute it throughout the network.

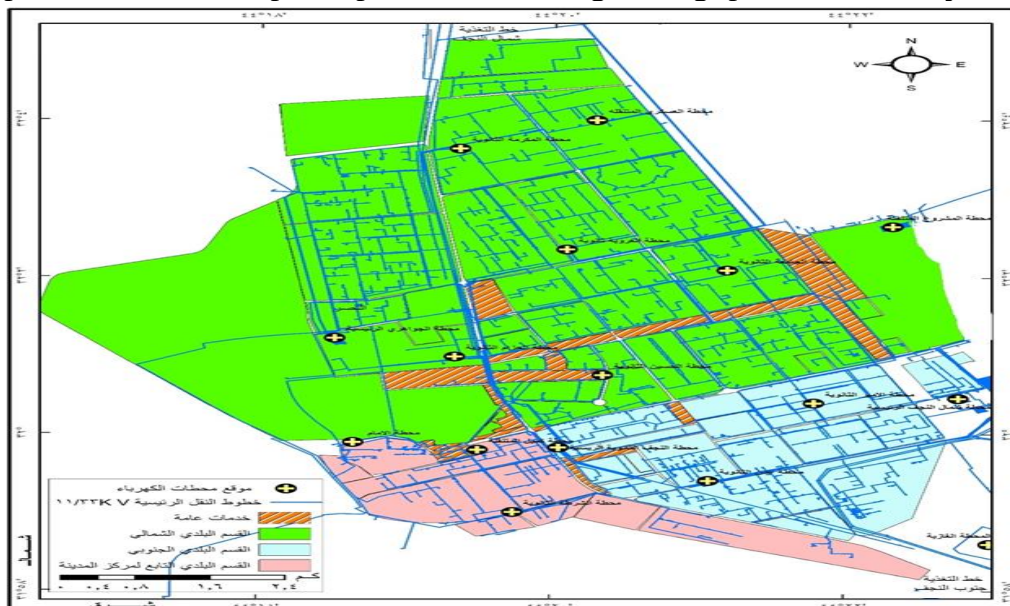
There are three main stations, which are fixed stations that receive electrical current with a capacity of 132/33/11 kV, namely (Al-Jawahiri Station, Najaf Secondary Station, and North Najaf Station). The remaining stations receive electrical current from the main stations with a capacity of 33/11kV. After these stations reduce the power, they send it to the grid and distribute it to be reduced again by transformers to a current of 220V that the consumer can use.

**Map (3) Spatial distribution of stations and networks 220**



power  
service

Source: Based on the Najaf Electricity Directorate, illustrative maps from previous years of Najaf's power plants.  
Map (4) Spatial distribution of power plants and main high-voltage power lines in Najaf Governorate.



Source: Based on the Najaf Electricity Directorate, maps from previous years for clarification purposes.

## Section Three:

**Scenarios for the Infrastructure Services Sector in Najaf Governorate**

By examining the reality of infrastructure services in Najaf, we find a deficit in the provision of these services, and perhaps a shortage of these services in some new areas of Najaf. Given the need to ensure that residents receive the best infrastructure services, practical solutions to these problems are essential. Accordingly, there will be three future development scenarios for this vital sector in Najaf, as follows:

- The first scenario: The reference scenario, which assumes that the current situation in Najaf Governorate will remain the same in the future.
- The second scenario: The optimistic scenario, which is based on improved services and an increased level of equipment.
- The third scenario: The pessimistic scenario, which is based on a decline in infrastructure services with an increase in population size. Therefore, it was necessary to find a clear explanation for each of these scenarios, as follows:

First: The reference scenario for infrastructure

This scenario assumes the following:

1. Infrastructure services will remain as they are for the next thirty years
2. The deficit in providing citizens with potable water, sewage services, and electricity will remain in the coming years
3. The deficit in providing sewage services and electricity will remain stable for the next thirty years

One of the necessities for human life is the provision of potable water, and one of the most essential criteria for potable water quality is its freedom from multiple chemical and physical

pollutants, according to national and international standards. Since drinking water stations in Najaf suffer from weakness and a shortage of modern tools and filtration materials due to limited financial allocations, the stability of the provision of potable water quality is the only option available for the coming years until 2050. Table 1 shows that the deficit in the percentage of the population served in Najaf has reached 1,076,687 people in urban areas and 347,264 in rural areas, with a rate of 97.2% for metropolitan areas and 78.4% for rural areas. This gives the impression that there is a deficit in the proportion of supplies for the population according to the first hypothesis, with the conditions remaining as they are in the coming years for Najaf al-Ashraf, as the total deficit percentage will reach 12.2% of the total population of Najaf al-Ashraf. This is a dangerous indicator if the conditions remain as they are now, as the percentage may increase with the increase in population size, as in Table 2, which shows the rates of population growth in Najaf al-Ashraf for the coming years. Also, the rate of water quantities, if its supply is stable, as the theory assumed with the stability of the general supply quantities in the river and the stability of the supply quantities for the stations for the citizens, then these quantities will remain, as we indicated in Table (2), with a volume of (491,920 m<sup>3</sup>/day) as a total supply for Najaf al-Ashraf. Also, the share of one person according to the population table mentioned above has reached 358 (litres/day). Per capita in Najaf. This also indicates the stability of the supply rate for Najaf and the stability of the per capita share of water in the future, provided that the supplied quantities remain constant, as we previously assumed and as indicated in the two tables below.

**Table (1) Population and their percentage of potable water supply in Najaf Governorate in 2020.**

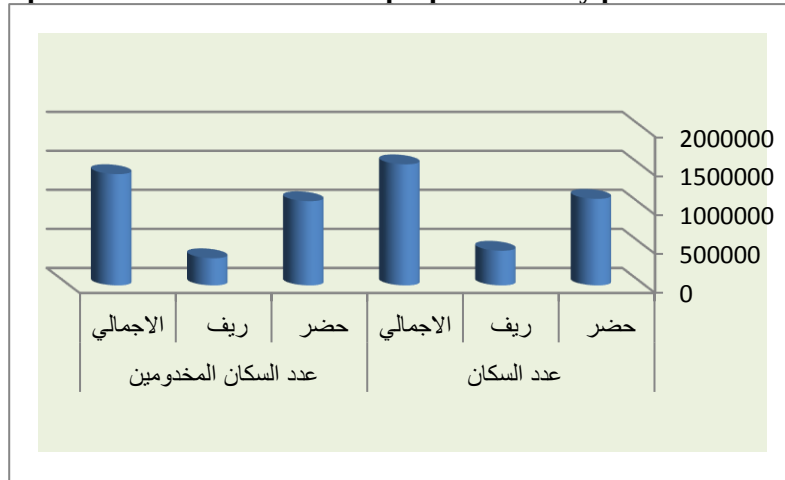
| Percentage of population served |             |                  | Number of population served |             |                  | population |             |                  |
|---------------------------------|-------------|------------------|-----------------------------|-------------|------------------|------------|-------------|------------------|
| Total                           | countryside | civilized region | Total                       | countryside | civilized region | Total      | countryside | civilized region |
| 87.8                            | 78.4        | 97.2             | 1423951                     | 347264      | 1076687          | 1549788    | 442977      | 1106811          |

Source: Najaf Water Directorate, Planning Department, unpublished data, 2020.

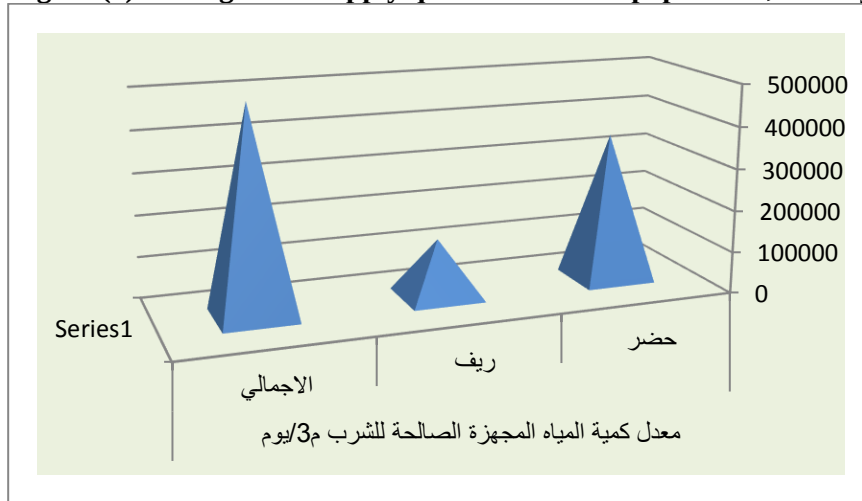
**Table (2): Average quantities of potable water supplied in Najaf Governorate in 2020.**

| Average per capita share<br>liters/day |             |                  | Average quantity of prepared<br>drinking water m <sup>3</sup> /day |             |                  |
|----------------------------------------|-------------|------------------|--------------------------------------------------------------------|-------------|------------------|
| Total                                  | Countryside | Civilized Region | Total                                                              | Countryside | Civilized Region |
| 358                                    | 399         | 344              | 491920                                                             | 137738      | 354182           |

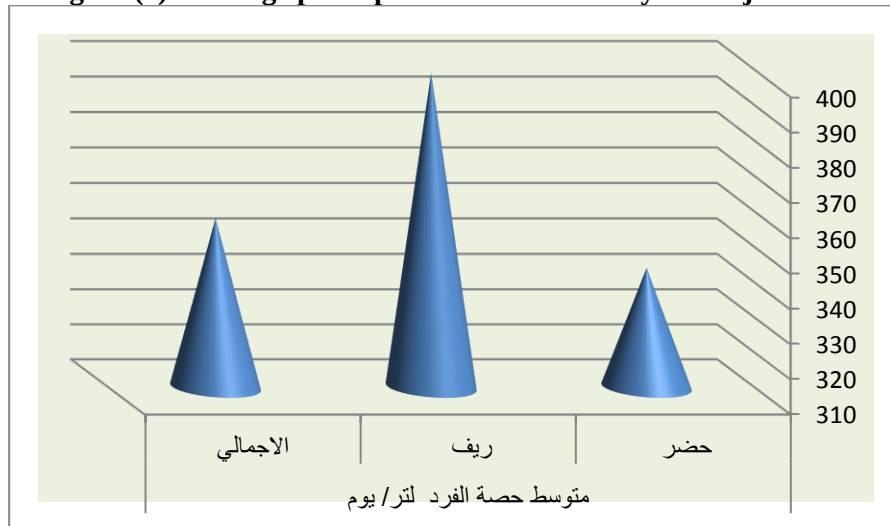
Source: Najaf Water Directorate, Planning Department, unpublished data, 2020

**Figure (1) Population size and number of people served by potable water in Najaf 2020**

Source: Data from Table (1)

**Figure (2) Average total supply quantities for the population, m3/day**

Source: Data from Table (2)

**Figure (3): Average per capita share in liters/day for Najaf Ashraf**

Source: Data from Table (2)

According to the third hypothesis, which emphasizes the stability of the provision of sewage networks to citizens and residential neighborhoods in Najaf, Najaf will remain undeveloped and without new neighborhoods

equipped with this service. This means that the existing neighborhoods in Najaf will remain unchanged, according to the data in Table 4.

The third hypothesis of the reference scenario, which emphasizes the stability of the electrical



power supply rate in Najaf, is represented by a continuous deficit of more than 50% of actual demand, and possibly even exceeding that percentage. This means that Najaf will suffer over the next thirty years. This is a warning sign, given the natural population increase, assuming a stable population growth rate. Second: The Optimistic Scenario for Infrastructure:

The reality of infrastructure in developing countries is progressing at a rapid pace, as people have begun to understand and comprehend the real requirements of life, and citizen awareness has become stronger than before. Therefore, this is a real opportunity to adjust the course of services and infrastructure to serve citizens. This scenario assumes the following:

1. Improvement in infrastructure services in Najaf.
2. Establishment of private-sector infrastructure services.
3. Rapid transformation in the type of services and keeping pace with global developments in this field.

In light of the global trend of rising oil prices, Iraq's economic situation is expected to improve as a result of its increased regional and international representation through improved relations with other countries. This will provide an opportunity to correct internal conditions, including the infrastructure that has caused the population to suffer in the past period. The researcher finds that improving infrastructure services over the next thirty years is the best approach in this field. As for the level of projects that are trying to serve citizens, the researcher finds that some of them have begun to move in the right direction in this field, as large drinking water plants have now spread throughout the city of Najaf in its industrial areas and have begun to compete with imported water. They have even started to export some of their production to neighboring governorates, as the city has a large workforce that helps establish development projects serving the city's residents, including the production of potable water. Therefore, these projects will become the dominant ones in the coming years and may fulfill the purpose of the national network, which is also proceeding with steady progressive steps. After domestic water was cut off for long hours in some areas of Najaf Al-Ashraf, it is now available for most of the year. On some peak days of the summer, there may be interruptions for known and programmed hours for scattered areas due to the increasing pressure on the national water network

from some areas adjacent to the neighborhoods, which are called agricultural housing areas or agrarian land registry areas that have been divided into residential units. They obtain all their water services from neighboring areas, which are often inaccurate, and sometimes cause problems with station malfunctions—the primary focus of these areas. Now, the local government, in its efforts to provide all areas with potable water for domestic use, has sought to establish new stations and increase the capacity of existing stations, which means there will be no future problems in this aspect of infrastructure services in the coming years.

The same applies to sewage projects, which have begun to cover all old neighborhoods, even those under construction. Here, we look at residential investment projects that have integrated infrastructure services. This is a good indicator for Najaf, which will also be a pioneer in this field.

As for the electricity sector, after this progress in equipping the city of Ashraf and establishing stations to relieve congestion, the researcher finds that this service is progressing well for citizens. Consequently, the next thirty years will witness a leap in the provision of electrical energy, in light of the data related to financial allocations for this sector. This means that electricity supply services are on the path to improvement, and the existing deficit may be filled to 100%.

Third: The Pessimistic Scenario for Infrastructure: This scenario is based on the following assumptions:

- 1- The provision rates for infrastructure services remain as they are.
- 2- The continued deterioration of infrastructure and the lack of maintenance in Najaf.
- 3- Increasing pressure on infrastructure services due to the expansion of agricultural land and its conversion into residential areas.
- 4- The continuation of the current state of the country's faltering economy and the irregular provision of services to citizens.

In light of the previous assumptions, the provision of various infrastructure services in Najaf will worsen if the confusion in patchwork solutions for these services, most importantly, the provision of clean drinking water, continues. All these projects, without exception, send water that is not suitable for drinking, as is rumored, due to turbidity and some germs in this water, which is either due to the inefficiency of the station designated for water purification or the deterioration and oldness of the

water distribution networks for the population, which have been established for more than fifty years. This, if it indicates anything, suggests a lack of consideration for renewal in the networks of some areas, which warns of a significant danger to the residents of the city of Najaf if the situation continues as it is in these dilapidated projects. Many diseases have become epidemics today due to the unsuitability of drinking and tap water, even for domestic use, which has helped in the spread of drinking water filtration stations, or what is known as (RO), which are also no longer suitable for drinking, as these stations are not subject to control and health operations. Their spread has begun in places and shops that are not designated for the purpose, and in ways and techniques that are mostly unhealthy, as they use materials for the purpose of purifying this water, sometimes excessively, which warns of a greater danger than the water used for domestic use in government projects, as specialists monitor government projects. The material cannot be used for filtration purposes, as the filtration is larger, but on the contrary, it may be small due to the amount of water pumped to the sub-projects. As for the other private drinking water treatment projects, they are unmonitored and lack ambition. Increasing the quality of the materials used for filtration purposes is more dangerous than the compound toxins. Still, the ignorance of the owners of these projects allows them to act as they please in purifying water and selling it in unhealthy and illegal ways. Therefore, the victim will inevitably be the citizen. This is within the framework of the general and comprehensive view of the current situation, if it continues as it is, from a pessimistic point of view. Given the gloomy outlook on water services, if the current situation continues, with the city's expanding area resulting from encroachment on agricultural land and the encroachment of urban areas, there will be a significant problem in supplying the growing population with potable water. This growing population is using water from neighboring neighborhoods, which is considered an infringement on the allocated amount. Here, we find that neighborhoods from which pipes are being withdrawn to supply the encroachments will experience deterioration in water service. In some communities, this may even lead to the loss of service if the supply line is damaged due to encroachment on the water network. There may also be some problems that will arise later, namely the mixing of water service pipelines with sewage pipelines. This could

complicate resolving this problem in the long term, which will result in significant cases of poisoning or illness among residents due to the unsuitability of the water for drinking or domestic use. In light of the pessimistic view of sewage services, the city of Najaf is currently suffering from cracks and a lack of maintenance of the sewage network, and even the poor quality of the newly developed network, as it was not up to the required specifications in most areas. This has resulted in many problems during peak winter days. As soon as heavy rains fall, there are areas where houses will be flooded to a height of more than 60 or 100 cm, due to the suspension of pumping stations and their deterioration. This means that the residents of these areas will be among the residents with dangerous chronic diseases such as cancer, for example, and this is a result of the overflow of sewage water in their areas and homes annually, which carries with it odors and toxic and carcinogenic gases. Thus, it is a warning of great danger to the city's residents. Accordingly, there must be real and effective treatments, not patchwork, that serve the residents of the town, whose population is increasing in an unusual way that is almost like a population explosion, which generates tremendous pressure on Sewage services in the city. Therefore, it is necessary to expand the networks, add new stations, and even perform regular maintenance on all existing ones. Regarding the provision of electrical power to the population of Najaf, which is characterized by a significant deficit, Najaf is likely to face poor service in the future, particularly over the next thirty years. This is characterized by a shortage in the supply share, a shortage in supply lines, and a shortage in the resolution of bottlenecks. This means that the situation will remain as it is, with electrical power being wasted on houses that have begun to appear in agricultural areas adjacent to official housing in the city. This will place significant pressure on the electricity transmission lines and lead to poor quality of the supplied power due to violations of the main stations. This pessimistic outlook may become a reality in the future, given the lack of oversight and monitoring of the provision of electricity services, in addition to the absence of legal authority over violators. The justification for this is that there is no solution for housing, which has put pressure on services and justifies the failure of administrations, given that areas are spreading and expanding without planning. Results and Proposals:

In light of the previous scenarios, the researcher

believes that the optimistic scenario is likely to be the best option and is expected to be achieved over the next thirty years. This scenario anticipates a renaissance in the services and infrastructure sector in Najaf, as the country is moving toward improving its economic situation and increasing interest in all service sectors due to the improvement in global oil prices. Given that Iraq's economy relies mainly on oil extraction, which possesses large reserves that lead the world, this means that the economy is poised to improve in the future. Moreover, the renaissance in the field of domestic services is also a feature witnessed by cities in general, and Najaf in particular, given that it is the focus of the Islamic world. Increased interest in the services sector is expected in Najaf, as it is a religious center not only locally but also globally. Following the inclusion of the Najaf Cemetery and the Shrine of the Commander of the Faithful on the World Heritage List, Najaf will see increased spending on basic services to keep pace with the progress achieved at the governorate and central levels in particular. The visits of international figures and religious figures to this city are only a result of the improved conditions in the city, both at the security and service levels, which focus on infrastructure. The Pope's visit to the Vatican played a significant role in drawing attention to this city, which is considered a center of the Islamic world, and will therefore witness evident progress.

## CONCLUSION

It revealed the reality of infrastructure service distribution in the province of Najaf, highlighting the effectiveness of these services and the level of service provided to citizens through their distribution. The distribution of the phenomenon of infrastructure services in the province was studied, and knowing the form of this distribution and its impact on the level of service provision helps determine the locations of the intended services. Establishing them in the future within development plans, to fill the current shortage in these services, and to keep pace with the increase in population size, on the other hand. In addition, the distribution may show the extent of the deficit at the level of place and the deficit at the level of functional performance. For example, the distribution may show the complete presence of water supply lines, but it may also indicate the extent of the inability of processing and storage units.

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