

Urban Development and its Future Prospects in the City of Kufa

Dr. Wrood Mohsen Abdul-Katib

Professor, University of Kufa - College of Urban Planning, wroodm.alkateb@uokufa.edu.iq

Abstract: Urban development is a topic of great importance to both developed and developing countries, although developing countries need greater seriousness in caring about development, as the interest has increased day after day, due to its importance in all areas of life, as it is not limited to the economic and social aspects only, but rather makes the human being its starting point and goal and deals with him as the active element in it, as the goal of development is to advance society from a fixed state to a higher and better state, And what it reaches of good to exploit the energies available to it and existing and latent and employ them for the best. Development seeks to expand options and enjoy its fruits in the form of food, clothing, housing, health services, political and cultural freedoms and participation in the environment in which it lives. Accordingly, development enriches social segments at the expense of the poorest groups and disrupts the social and political balance and destroys the environment is the opposite of urban development. The research included the main development indicators represented by health and education as they are main indicators in measuring the level of human development. The research aims to know the reality of urban development in the city of Kufa, and then evaluate the level of this development through its main indicators (education, health, income), in addition to studying the basic services in the city (potable water, sewage, electricity, transportation methods, municipal services) based on planning standards. At the end of the research, the researcher reached a set of conclusions and recommendations that the researcher hopes will achieve some benefit in achieving urban development in the city of Kufa.

Keywords: Development, urban development, Kufa city.

Research Problem: The study problem is represented by the following questions:

1. What are the indicators of urban development in the city of Kufa?
2. Do urban development indicators play a role in the development of infrastructure services in the city?

Research Hypothesis: The study assumes the following hypotheses:

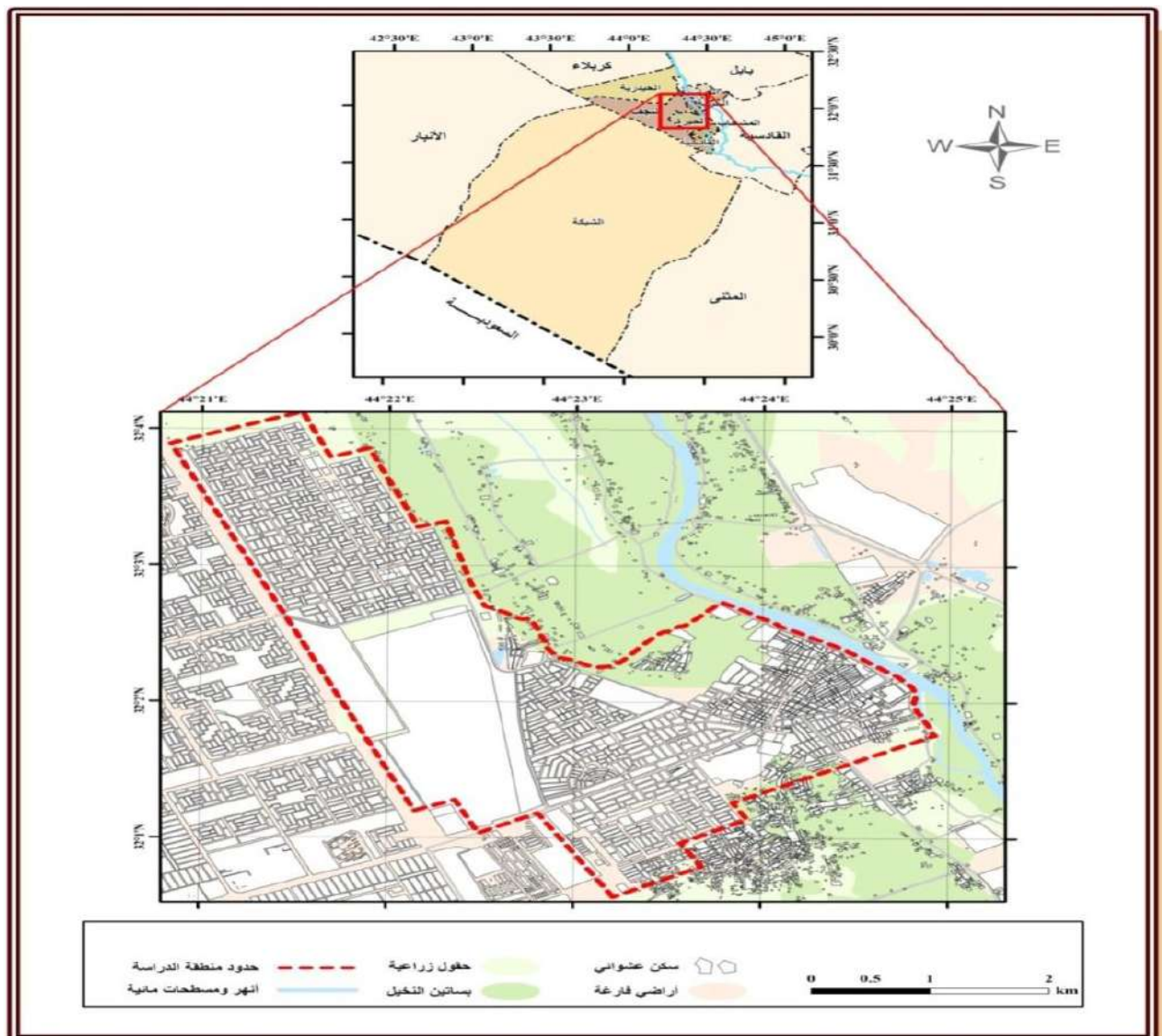
1. Urban development indicators in the city of Kufa were represented by educational, health and income indicators.
2. Urban development indicators have an impact on the development of services in the city of Kufa.

Research objective: - Man is the most sublime being in life, so achieving his requirements and satisfying his needs are among the basics of his life. Accordingly, the study aims to know the reality of human development in the city of Kufa, and then evaluate the level of this development through its main indicators (education, health, income) according to planning standards. In addition to other services represented by the infrastructure.

Research area boundaries: Kufa city is located astronomically at the intersection of longitude (19 - 44) east and latitude (59 -31) north, and in this location it is one of the cities located in the southwestern part of Iraq. The city is located in the northeastern part of Najaf Governorate, and to the west of the Kufa River, which is the important water resource in connection with the city. Kufa is (10

km) away from the governorate center. It is bordered to the north by Al-Kifl District (Babylon Governorate), to the west by Najaf city, to the south by Al-Mundhir District, and to the east by Al-Abbasiya District. Kufa city is considered one of the main and large urban centers in Najaf Governorate, Map (1).

Map (1) Location of Kufa city in Najaf Governorate



Source: Based on the Directorate of Urban Planning in Najaf Ashraf, the master plan for the city of Kufa for the year 2023.

Urban development indicators in Kufa city

First: Educational indicators: Educational indicators are considered necessary and important services because they constitute a fundamental pillar of the pillars of economic and social development in the country and constitute an important educational aspect in the development of society spiritually, morally, emotionally and intellectually through achieving higher human goals.

They eliminate manifestations of backwardness and ignorance in society by building educational institutions that address this task and are in contact with people ⁽¹⁾. Many studies and research have shown that thanks to education and efficiency, many countries have been able to achieve tremendous

(1) Abdul Jaber Zamel. An analytical study of educational services in the city of Kut, Master's thesis (n.d.), Institute of Urban and Regional Planning, University of Baghdad, 2011, p. 67.

scientific progress for their societies in various fields of life ⁽²⁾. Educational services in the city include kindergartens, primary schools, secondary schools and vocational education.

1: Kindergarten This stage is one of the most important stages of education, as it is based on developing the abilities of children at the age of (4-5) years. This age stage is one of the most important stages of growth, formation and reception, in which the features of the child’s personality are determined⁽³⁾. This stage represents the base of the educational pyramid because it is the first institution that places the child in its arms, and through it the solid foundation for moral education is laid, and the child acquires the correct habits and attitudes ⁽⁴⁾. Although the kindergarten stage is not included in the evaluation of the level of human development, it reflects the extent of social welfare and development, through the number of existing kindergartens, as it represents the stage of preparing the child for the primary stage. From Table (1), it is clear that the number of kindergartens in 2023 is (8) kindergartens, which is not within the planning standard (100-170 children/kindergarten), Table (2), meaning that the city needs (2) kindergartens, in addition to the existing number, and as for the number of teaching staff, it is not sufficient to meet the needs of the city’s children and is consistent with the planning standard (16-18 children/teacher). If we look at the number of classes, we find that it has moved away from the standard in a high way, and the reason for this is due to the small area of the kindergarten buildings, which is then reflected in the number of classes, in addition to the increase in the population and the increase in the cultural awareness of the population and the small number of kindergartens that do not suit the increase in the population, Map (2).

Table (1) Kindergarten indicators in the city of Kufa for the year 2023

Need for kindergarten	Child to Kindergarten Ratio	Need for a branch	Child to class ratio	Need a teacher	Child to teacher ratio	Number of The people	Number of children	Number of teachers	Number of kindergartens
2	210	34	51	34	28	33	1678	59	8

Source: Based on: Najaf Governorate Education Directorate, Statistics Division, unpublished data, 2023.

Table (2) Planning and educational standards for educational services

Planning standard	Standard name	Educational stage
16-18	child/teacher	Kindergarten
20-25	child/class	
100-170	Child/Kindergarten	
18-25	Student/Teacher	primary education
25-30	Student/Class	
300-360	Student/School	
18-25	Student/Teacher	Secondary education
29-34	Student/Class	
480-510	Student/School	

Source: Ministry of Education, General Directorate of Educational Planning, Educational Development Plan, 2018.

2: Primary Education Primary education is one of the most important educational stages that must receive special care because it is the base of the educational pyramid and a basic human right. Primary education is also the broad base and ladder on which other educational stages are based and one of

(2) Mathew E. Khan, Green Cities, urban Growth and the environment, Brookings Institution Press Washington, U.S.A, 2006, p.50

(3) Kamil Thamer Al-Kubaisi and Mahdi Saleh Hijris, The effect of enrolling in kindergarten on the verbal output and academic achievement of first-grade primary school students, Journal of the College of Education, University of Basra, Issue Five, 1981, p. 60.

(4) Musaddiq Jamil Al-Habib, Education, Upbringing and Economics, Dar Al-Rasheed for Publishing, Baghdad, 1981, p. 244.

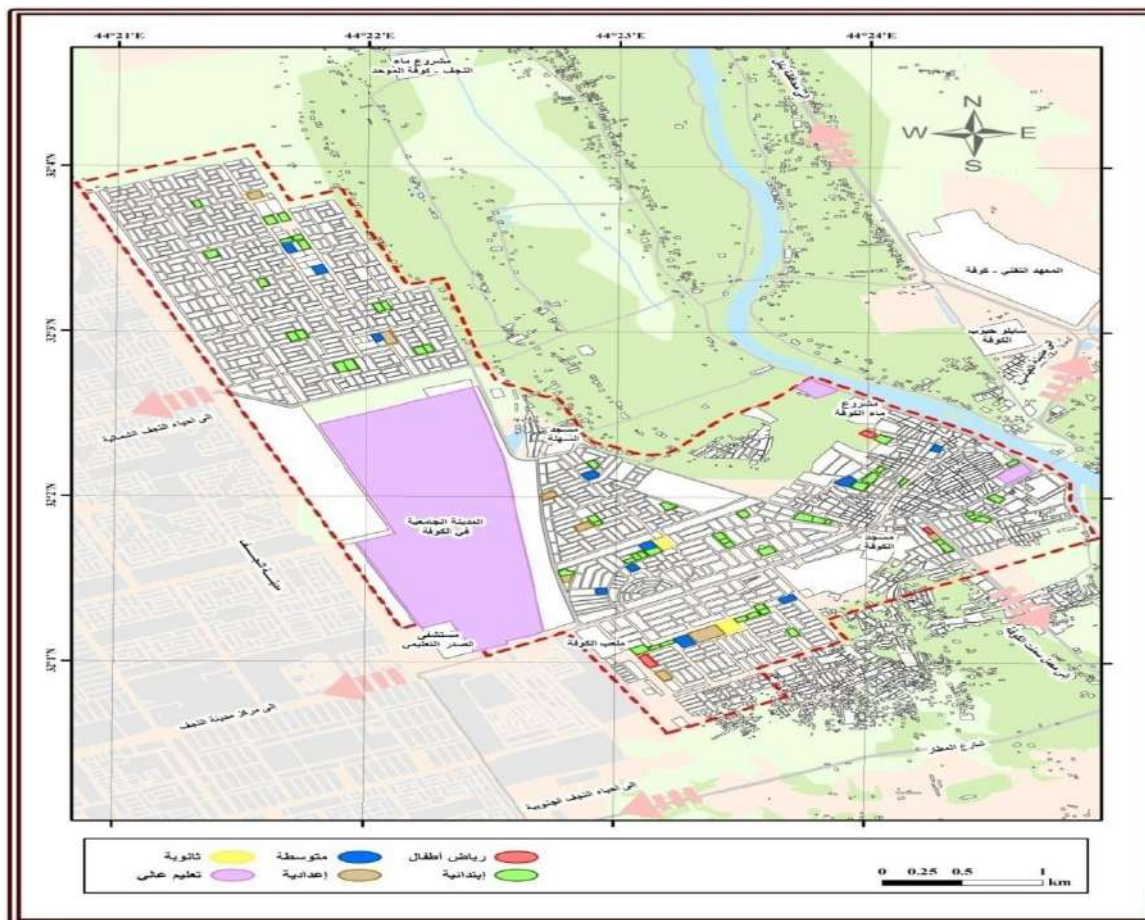
their basic and important pillars ⁽⁵⁾. To clarify the development of primary education in the city of Kufa, it is clear from Table (2) that the primary education indicators were far from the planning standard as they needed to open (42) schools according to the standard specified by (300-360 students/school), which led to an increase in the number of students in each class and did not fill the deficit in the city. Map (2).

Table (2) Primary education indicators in the city of Kufa for the year 2023

Need for school	pupil to school ratio	Need for a branch	Student to class ratio	Need a teacher	Student to teacher ratio	Number of The people	Number of Students	Number of teachers	Number of primary schools
42	496	250	35	2074	433	1584	55032	127	111

Source: Based on: Najaf Governorate Education Directorate, Statistics Division, unpublished data, 2023.

Map (2) Educational institutions in the city of Kufa



Source: Based on the Directorate of Urban Planning in Najaf Ashraf, the master plan for the city of Kufa for the year 2023.

3: Secondary education Secondary education is a complementary stage to primary education, and the focus of study includes education that allows students to discover and develop their abilities, in addition to expanding culture and science and developing human resources ⁽⁶⁾. The secondary stage is the stage that qualifies for colleges and institutes in Iraq, and education in this stage is six years, starting with the first intermediate grade and ending with the sixth scientific or literary grade. After the student passes the central ministerial general examinations, the student qualifies for university studies, and the average is the separator and criterion for accepting students into Iraqi colleges and

(5) Saleh Falih Hassan Al-Hiti, Geography of Primary Education in Iraq, 1st ed., Dar Al-Salam Press, Baghdad, 1979, p. 25.

(6) Malco Giles and others, Development Economics, translated by Taha Abdullah Mansour, Dar Al-Marikh for Printing and Publishing, Al-Riya, 1995, p. 360.

institutes. The number of secondary schools reached (60) schools, and according to the planning standards, the need for secondary schools reached about (11) schools to meet the needs of the population, which is met by an increase in the number of teachers, as it was less than the planning standards, as the surplus of teachers reached about (17) teachers, Table (5). Map (2).

Table (3) Secondary education indicators in the city of Kufa for the year 2023

Need for school	Student to school ratio	Need for a branch	Student to section Ratio	Need a teacher	Student to teacher ratio	Number of The people	Number of Students	Number of Teachers	Number of secondary schools
11	604	191	41	-17	25	874	36212	1465	60

Source: Based on the Directorate of Education of Najaf Governorate, Statistics Division, unpublished data, 2023.

4: Vocational education Vocational education is one of the important stages of preparatory education that aims to prepare intermediate professional cadres necessary to implement comprehensive development programs needed by all economic sectors and their various industrial, commercial, agricultural and service branches. It also aims to graduate professional workers needed by the country to fill the gap in its production institutions ⁽⁷⁾. Vocational education also helps to qualify levels that are compatible with the advanced labor structure in the various types of development fields, as the lack of experience and qualified work is the main reason that prevents the achievement of development ⁽⁸⁾. What concerns vocational education in the city of Kufa is the presence of one vocational school for boys, this is due to the fact that vocational education graduates see their future as vague and unknown and there are no departments that embrace them and benefit from their experiences, which led to students' reluctance to join it. This led to students not accepting it, as the number of students reached (286) students and the number of departments reached (15) departments.

Table (3) Secondary education indicators in the city of Kufa for the year 2023

Need for school	Student to school ratio	Need for a branch	Student to Section Ratio	Need a teacher	Student to teacher ratio	Number of The people	Number of Students	Number of Teachers	Number of vocational schools
0	286	0	24	0	5	12	286	56	1

Source: Based on the Directorate of Education of Najaf Governorate, Statistics Division, unpublished data, 2023.

As for the year 2033, the amount of educational institutions needed is as in Table (4).

Table (4) Educational institutions in the year 2033

(***)High schools	(**)Primary schools	(*)Kindergarten	population
86	173	173	2033

Source: Based on educational standards.

(*) The standard of 2500 people per kindergarten was adopted.

(**) The standard of 2000 people per primary school was adopted.

(***) The standard of 4000 people per secondary school, including vocational schools, was adopted.

Second: Health indicators: Health services are essential services and matters for human life, as a result of their direct connection to it and an indispensable element for the continuity of survival and enjoyment of life. They are also one of the main pillars that the state is keen to provide, finance and manage despite the differences in political systems and economic laws between countries, as they are a true indicator of the progress and civilization of countries. Rather, they are the mirror reflecting the progress and development of societies, because the development of these services reflects the extent

(7) Abdul-Kazem Shandal, The Reality of Vocational Education in Al-Qadisiyah Governorate for the Years (1970-1990), Al-Qadisiyah Magazine, Volume 6, Issue 20, 2011, p. 58.

(8) Youssef Yahya Taamas, Regional Variation in the Distribution of Vocational Education Services in Iraq, Generational Studies Magazine, Issue 504, Teachers Syndicate in Iraq, 1983, p. 36.

of the country's ability to reach both economic and social development ⁽⁹⁾. There is only one hospital in Kufa city, and this was reflected in the high rate of (inhabitants/hospital) as in Table (5). As for health centers, we notice that the rate of (inhabitants/health center) exceeds the standard set at (10,000 inhabitants/health center), Table (6), which means the difficulty of receiving treatment and initial diagnosis in these centers due to their small number and the resulting long distance to reach, as it is natural for the patient not to be able to travel long distances or endure a longer time to obtain this service, which is reflected in turn on the patient's health condition and consequently means a decline in health services and this is reflected in the decline in the level of human development in the city. As for human cadres, some of them exceed the standard, which is negatively reflected in the level of service performance, Table (7). Map (3). In the year 2033, it requires the establishment of (7) hospitals and (34) health centers with (691) beds, (345) doctors, (35) dentists, (17) pharmacists, (691) health professionals, (691) nursing professionals, and (1381) nursing professionals.

Table (5) Health indicators in the city of Kufa for the years 2023 and 2033

Nursing professionals/ Nesma	Nursing professionals	Health professionals/ Nesma	Health professionals	Pharmacist/ Nisma	Pharmacists	Dentist/ Nisma	Dentists	Doctor/ Nisma	doctors	Breeze/ Bed	Number of beds	Nesma/ Foundation	Number of population	number	The institution	Year
366	532	356	547	2667	73	4056	48	1041	187	1014	192	194670	194670	1	المستشفى	2023
												32445		6	المركز الصحي	
-	1381	-	691	-	17	-	35	-	345	-	691	-	345349	7	المستشفى	2033
														34	المركز الصحي	

Source: Based on 1- Ministry of Health, Najaf Governorate Health Department - Planning Department, unpublished data, 2023. 2- Population estimates for the year 2033.

Table (6) Iraqi standards and World Health Organization (WHO) standards for health services

Global / Nesma	Iraqi / Nismah	Criteria
6000/1	50000/1	Hospital / Nesma
----	10000/1	Health Center / Nesma
500/1	1000/1	Doctor / Nesma
20000/1	10000/1	Dentist / Nesma
2000/1	20000/1	Pharmacist / Nesma
100/1	500/1	Bed / Breeze
1000/2	250/1	Nurse / Nesma
-----	500-400/1	Health professionals / Nesma
1/3	1/3	Nurse/Doctor
1/4	1/5	Health Professionals / Doctor
1/6-6	1/6-5	bed/doctor

Source: Ministry of Health, Najaf Governorate Health Department - Planning Department, unpublished data, 2018.

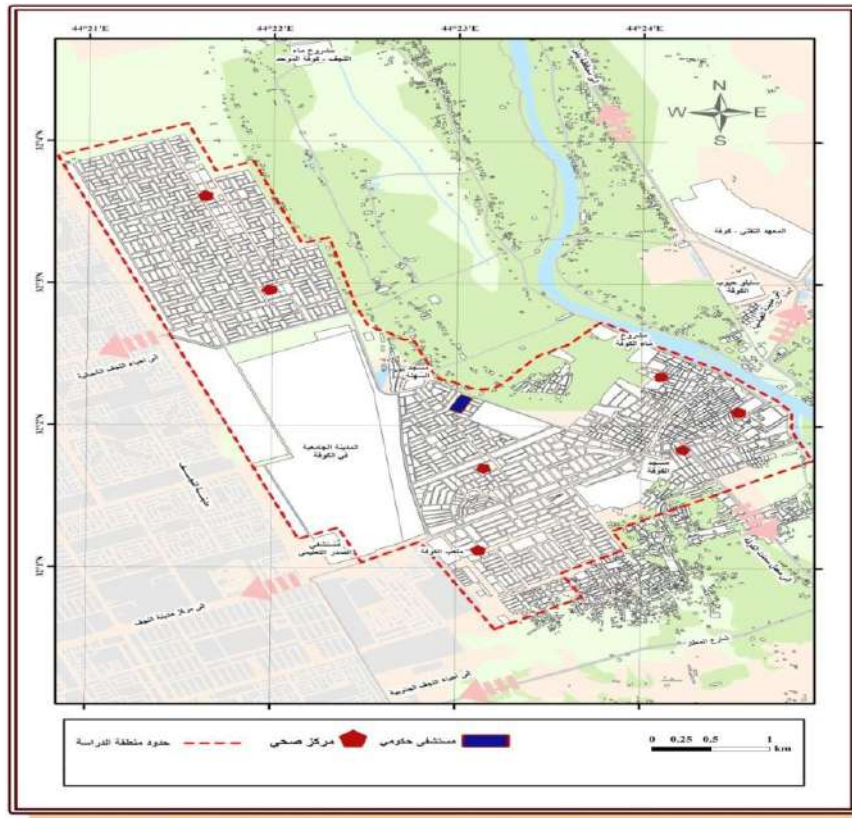
Table (7) The assumed need for health services and the size of the deficit in relation to the population in the city of Kufa for the year 2023

Number required according to criteria								
Their families are healthy	Their relatives are nursing	bed	Pharmacists	Dentists	Doctors	Health center	hospital	Year
389	779	389	10	19	195	19	4	2023
Deficit size (required number - available number)								
Their families are healthy	Their relatives are nursing	bed	Pharmacists	Dentists	Doctors	Health center	hospital	Year
158-	247	197	63-	29-	8	13	3	2023

Source: Ministry of Health, Najaf Governorate Health Department - Planning Department, unpublished data, 2023.

(9) Fatima Fahd Hammadi, Efficiency of Health Services and Some Factors Affecting Them - An Analytical Study in the City of Baghdad - Al-Rusafa and Al-Mansour Sectors, PhD Thesis (n.d.), Institute of Urban and Regional Planning, University of Baghdad, 2005, p. 65.

Map (5) of health institutions in the city of Kufa



Source: Based on the Directorate of Urban Planning in Najaf Ashraf, the master plan for the city of Kufa for the year 2023.

Third: Income Index: Income is considered one of the basic indicators in measuring the standard of living of an individual or family, i.e. it represents one of the main indicators in measuring the level of human development and is closely linked to the education and health indicators and the impact is reciprocal between them ⁽¹⁰⁾. Income is considered the most important factor that an individual seeks to secure in order to continue to secure his daily requirements, as low income, lack of suitable housing, deterioration of health services, limited or non-existent education, high mortality rates among infants, and poor life prospects ⁽¹¹⁾. Poverty means the inability to spend on food, clothing, housing, health, and education. The disparity in income levels among members of society means the disparity in their access to educational and health services. Income disparity also contributes to disparity in other considerations, including human rights, justice, and fairness. Inequality also leads to the emergence of disturbances and instability ⁽¹²⁾. Through the study of the city of Kufa, we found that the amount of income for the family in this city is the average income after conducting a survey of the city's neighborhoods and taking the opinions of families in it. Table (8) shows the range of monthly income of the family in the city. The highest percentage of their income is between 350-600, and in general it appears that the income is average in the city of Kufa.

Table (8) The monthly income of the family according to the residential neighborhoods of the city of Kufa

Is the income sufficient to meet the family's needs?		Monthly income amount				
لا	نعم	أكثر من مليون	من 601-مليون	من 301-600	من 151-300	أقل من 150
42%	58%	9%	29%	35%	22%	5%

(10) Walid Abdul Jabr Al-Khafaji, Human Development in Iraq for the Period (2003-2005), Master's Thesis (n.d.), College of Arts, University of Baghdad, 2007, p. 52.

(11) Michel Torrado, Economic Development, translated by Hamid Mahmoud, Dar Al-Marikh Publishing, Riyadh, Kingdom of Saudi Arabia, 2009, p. 85.

(12) Abdullah Atwi, Population and Human Development, 1st ed., Dar Al-Nahda Al-Arabiya, Beirut, 2004, pp. 24-26.

Source: Questionnaire analysis.

Fourth: Basic services in the city of Kufa:

Services in the city of Kufa are represented by the basic services that serve the city, such as drinking water services, sewage services, electricity, communications, transportation and municipal services.

Drinking water services: The process of providing safe water and its availability for drinking and domestic uses is considered one of the most important elements in protecting society and individuals from the spread of epidemic and infectious diseases ⁽¹³⁾. The process of providing potable water in the housing unit is one of the elements of the acceptability of the housing unit for human habitation, as its availability in terms of quantity and quality is one of the measures of human development ⁽¹⁴⁾, as the availability of water appears at the level of civilization of the society and is considered a basic indicator of development indicators for the importance of water in human life, as a strong link was found between homes provided with clean water and a sewage network or not provided with it and the elimination of infectious diseases or their spread ⁽¹⁵⁾. Diseases prevail in unserved houses. People need large quantities of water and their needs have increased over time. Water is used in urban areas either through direct consumption by people or for domestic purposes or for commercial and industrial purposes in general ⁽¹⁶⁾. The city obtains its water needs from the old Kufa project that was established in 1954 with a design capacity of (12,000,000 liters/day) near the Kufa River in the Saray area. The design capacity was increased in 1970 to (72,000,000 liters/day) operating at half its design capacity, in addition to the new project that reached a quantity of (100,000,000 liters/day). Also, considering that the city of Kufa is a religious city that is visited by visitors from inside and outside Iraq, it needs to provide sufficient water for visitors during the times of large visits. The individual share reached (399 liters/person/day), which is less than the specified standard, and the quantity needed for the city reached (178,000 liters/person/day) in addition to the quantity of water produced, Table (9), Map (6), while in the year 2033 it requires the production of (124,325,640 liters/person/day) according to the expected future population for the year 2033.

In general, water projects in the city of Kufa suffer from sedimentation basin problems and are currently not sufficient to meet the city’s needs, due to the old age of the project. Among the problems that the Water Directorate in the city of Kufa suffers from are the frequent violations of the network in addition to the waste of pure water by some citizens due to lack of awareness and the project’s inadequacy to cover the city. Most of the population depends on mineral water for drinking purposes due to the increase in chlorine added to public drinking water for the purpose of purifying it, and this has an impact on health.

Table (9) The reality of the individual share of water produced in the city of Kufa for the years 2023 and 2033

Quantity needed litres/day	Assumed quantity litres/day	Per capita share litres/day	Amount of water produced by the project in litres/day	Number of population	Year
178000	77868000	399	77690000	194670	2023
-	-	-	124325640	345349	2033

Source: 1- Kufa Water Project Department, unpublished data, 2023. 2- Population estimates for the year 2033.

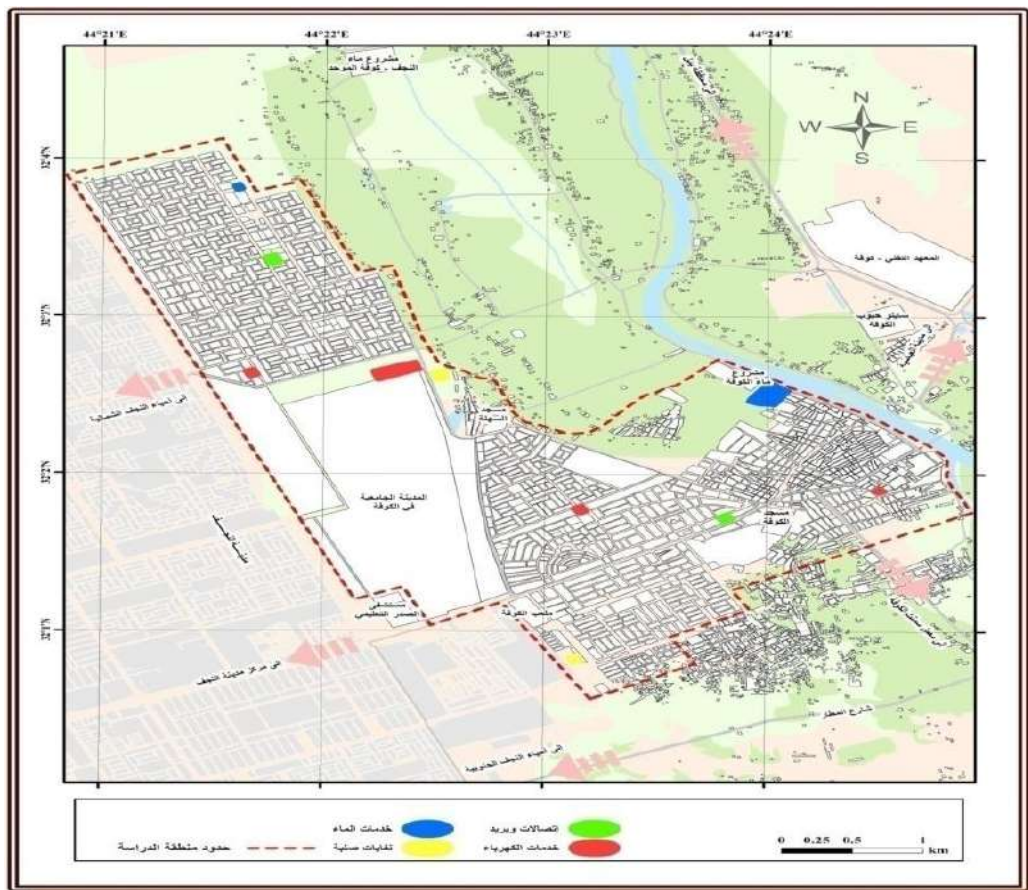
(13) Iraqi Economists Association, Human Development Report in Iraq, 1995, p. 115.

(14) Ali Hussein Hanoush, Environment and Development in Iraq, 1st ed., Dar Al-Diaa for Printing and Publishing, Najaf, 2010, p. 30.

(15) Ismai Ibrahim Al-Sheikh Al-Durra, Housing Economics, World of Knowledge Series, Issue (127), National Council for Culture, Arts and Letters, Kuwait, 1988, p. 30.

(16) Arab Planning Institute, Learning Challenges in the Arab World, research published online www.arab.api.org.

Map (6) The basic structures in the city of Kufa



Source: Based on the Directorate of Urban Planning in Najaf Ashraf, the master plan for the city of Kufa 2023.

2) Sewage network: Obtaining sewage service has many benefits, as the use of improved sewage reduces the infant mortality rate by about a third, in addition to being reflected in improving public health, livelihoods and human dignity ⁽¹⁷⁾. Also, interest in the sewage network and its expansion appear in the health and well-being of people and keeping them away from pollution and diseases transmitted from water ponds inside the city. Most of the neighborhoods of Kufa city are served by the sewage network and rainwater, but there are some areas where there is no sewage service, where the method of storing heavy water is through underground tanks inside the houses, which are built of bricks and concrete roofs, then cars pull this heavy water and throw it randomly inside or outside the city. The number of treatment plants reached (2) plants with a design capacity of (55,000,000 liters/day), and the individual share reached (283 liters/person/day), which is higher than the specified standard (250 liters/person/day) ⁽¹⁸⁾, Map (6), and in the year 2033 the design capacity should be increased to (86,337,250 liters/day) according to the population of the city.

Table (10) The reality of the individual share of water produced in the city of Kufa for the years 2023 and 2033

Design capacity assumed to be used for treatment in liters/day	Assumed quantity litres/day	Per capita share litres/day	Design capacity for treatment in liters/day	Number of treatment stations	Number of population	Year
48667500	48667500	0	0	2	194670	2023
-	-	-	86337250	-	345349	2033

Source: 1- Kufa Water Project Department, unpublished data, 2023. 2- Population estimates for the year 2033.

(17) United Nations Development Program, Human Development Report, 2011, p. 74.

(18) Ministry of Water Resources, Directorate of Water Resources in Najaf Governorate, unpublished data, 2023.

3) Electricity: Providing electricity is one of the requirements of modern life and constitutes an aspect of human welfare, as it contributes to improving the rate of school enrollment and improving the educational level, in addition to the fact that continuous lighting allows for extending the time allocated for study and the arrival of electricity to homes and schools allows children to spend more time in school and allows children and adults more time to read ⁽¹⁹⁾. The presence of electricity in the residential unit is related to the health and educational situation, and electricity is considered one of the indicators of urban development. The total energy required in the city of Kufa reached (111 megawatts/hour), while the equipped load reached (80 megawatts/hour), meaning that there is a deficit of approximately (31 megawatts/hour) that must be available to avoid the electricity deficit, Map (6), while in the year 2033, according to the population, (198 megawatts/hour) should be available in the city.

Table (11) The reality of the individual share of water produced in the city of Kufa for the years 2023 and 2033

Deficit Mica/hour	Required load MK/h	Equipped load MK/hour	Number of population	Year
31	111	80	194670	2023
-	198	-	345349	2033

Source: Kufa Electricity Directorate, Technical Department, unpublished data, 2023.

The instability of electrical energy is a problem in the city of Kufa, as is the case in most parts of Iraq. (98%) of the homes in the city of Kufa are connected to the national grid, but they are provided with unstable energy. The city of Kufa suffers from weak electricity reaching residential areas due to the deterioration of this service due to the wars that the country has gone through, which led to the destruction of the main stations that supply the city with electricity. As the city of Kufa falls within the hours of scheduled power outages, the power outages often reach 6 or 8 hours per day. Therefore, most residents and government departments rely on private and public generators to fill this shortage. This situation adds additional expenses that burden the family, in addition to the fact that the presence of a large number of private generators and street generators has a negative impact on the population in terms of the noise level resulting from them and contributes to the pollution of the city, as these generators burn gasoline or diesel, and this burning of gasoline and diesel contributes to the rise of toxic gases such as carbon dioxide. In the air, it also contributes to higher temperatures.

4) Transportation methods: The road network is the indicator through which we can know the level of development that any region has reached, as it represents the sensitive nerve of all economic activities, and the basic basis for implementing all development projects, as it is considered one of the important infrastructures for development projects ⁽²⁰⁾. The indicators of the density of the road network in the city of Kufa can be explained as follows:

- a) Road density according to the area criterion: The road density index according to the area criterion in the city reached about (868) km/km² for the year 2023, which is less than the global index of (10) km/km² (Table (12)).
- b) Road density according to the population criterion: Measuring density according to the population criterion gives a more accurate and important indication than the area criterion, because the population is the user and exploiter of resources and services and the first and main driver of trade and exchange of goods. The index of paved road density according to the population criterion in the city of Kufa reached about (0.83) km/1000 people for the year 2023, which is less than the global index of (5) km/1000 people ⁽²¹⁾. It is clear that the road network in the city needs (811.46)

(19) United Nations Development Programme, New York, Human Development Report, 2011, p. 54.

(20) Ahmed Yahya Anouz, The Road Network in Najaf Governorate, Master's Thesis (n.d.), University of Kufa, College of Arts, 2010, p. 20.

(21) Najah bin Muqbil Al-Qarawi, The Road Network in the Eastern Region of the Kingdom of Saudi Arabia - A Study in Transport Geography, 1st ed., Al-Tawbah Library, Riyadh, Saudi Arabia, 1996, p. 255.

km/1000 people, Table (12). In the year 2033, the city needs (1726.745) km/1000 people according to the increase in the population in the year 2033.

Table (12) Density of paved roads according to area, population and global index in the city of Kufa for the years 2023 and 2033

Road lengths needed according to the global indicator (population/km)	Assumed road lengths according to the global index (population/km)	Road density/population (km/1000 people)	Road density/area (km/100km ²)	Area/km ²	Total lengths of roads	Number of population	Year
811.46	973.35	0.83	868	18.6431	161.89	194670	2023
-	1726.745	-	-	18.6431	-	345349	2033

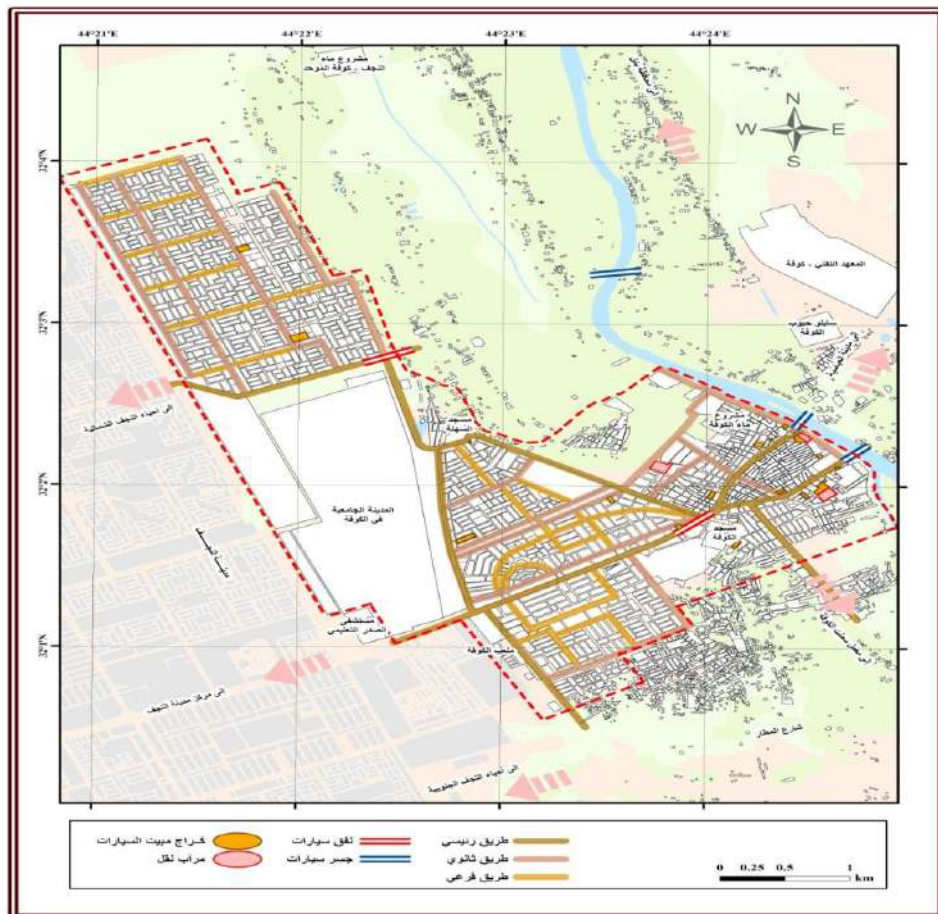
Source: Ministry of Municipalities and Public Works, Planning and Follow-up Division, unpublished data, 2023.

Transportation methods in the city of Kufa take the following forms:

First: Streets

(1) The organic (irregular) pattern: is the pattern in which the streets do not follow a unified, harmonious pattern, neither in terms of direction nor in terms of width, and narrow streets and winding alleys prevail ⁽²²⁾. The old city contains this pattern of streets for historical and social reasons. These streets express the urban pattern and the civilizational stage that the city went through. These streets are found in the areas of Al-Saray, Abu Madi, Al-Rashidiya, Al-Waqf, Al-Suhailiya, and Al-Jumhuriya. The most important thing that distinguishes these streets is that they gain the most shade possible in the summer, the low speed of wind movement, and their retention of cold air for long periods of the day, Map (7).

Map (7) Transportation routes in the city of Kufa



(22) Muhammad Abd al-Sattar Uthman, The Islamic City, The World of Knowledge Series, Publications of the National Council for Culture, Arts and Letters, Al-Risala Printing Press, Kuwait, 1988, p. 157.

Source: Directorate of Urban Planning in Najaf Ashraf, Master Plan for the City of Kufa for the year 2023.

(2) The radial pattern: is the pattern in which the main streets branch off from the city center and head outward in an oblique manner, while other wide straight streets connect them, dividing the city into sectors. This pattern can be observed approximately in the residential streets near the old city of Kufa ⁽²³⁾. It is represented by the bridge street that connects the central commercial area towards Al-Shahristani Square and then reaches the Kufa Mosque. This street extends from the Kufa Mosque to the city of Najaf and is called Kufa-Najaf Street, Map (7). As for the railway street, it connects the city center from the railway side towards Habib Al-Raash Square, and then heads until it reaches the Kufa Mosque and meets the bridge street at the Kufa Mosque, forming the Kufa-Najaf Street. There is a street that connects the bridge street with the railway street from Al-Shahristani Square to Habib Al-Raash Square, called Al-Jumhuriya Street, which is the street that relieves traffic congestion in the city center. The two previous streets play an important role in facilitating the movement of visitors and relieving traffic pressure from the center towards the outskirts.

(3) The regular quadrilateral pattern: This is done by dividing the city's land or part of it into squares, quadrilaterals, or rectangles, because each street in it intersects the other at a right angle and at an equal distance, and it shows the straightness of the streets, main roads, and building facades ⁽²⁴⁾. This pattern of streets appears in most areas of the city of Kufa and dominates the largest part of its streets, as it divides the areas into square shapes that intersect with each other. This pattern represents a third stage of the stages of roads in the city of Kufa and is classified into:

- a) **Expressways:** These are the main streets that connect the city of Kufa to its regions in several directions, including (Kufa-Najaf) Street, which connects the city of Kufa to the city of Najaf, and the factory street that starts from the bridge street towards the Kufa Cement Factory and from there to the Manathira district, and the street that starts from the Mukhtar tunnel, which is at the beginning of Maysan neighborhood and has two directions, the first towards Al-Wafa neighborhood and is connected to the city of Najaf and the other towards (Kufa-Hillah) Street via the Imam Ali (PBUH) Bridge. These streets contained more than one traffic congestion because they are expressways that connect the city to the neighboring areas.
- b) **Main streets:** These streets came in the second stage in the city of Kufa through the density of traffic and include Al-Jumhuriya Street, Al-Sahla Street, Al-Jari Street and the street that starts from Al-Kufa Mosque towards Maysan neighborhood. There are main streets within the neighborhoods that are often separating between the neighborhoods.
- c) **Sub-streets:** These streets are a link between the centers of the residential neighborhoods and are of different patterns in terms of the width of the street and its location. They vary in terms of traffic congestion, representing the link between the parts of one neighborhood and its surroundings, Map (7).

Second: Transport garage

1. The main unified Kufa garage: This garage is located near the Kufa bridge behind the Kaim-Maqamiyah of Kufa and is managed by employees of the private transport company. Transportation is to the following areas: Maysan neighborhood, Al-Hurriya district, Al-Abbasiya district, Babil governorate, Al-Kifl, Tabar Sayyid Jawad, Abu Gharb, Al-Wahhabi) and others.
2. The unified Kufa garage: It is located next to the previous garage and is supervised by the same management of the main garage and transportation is to the following areas: Al-Abbasiya, Al-Issa, Al-Bu Naaman.
3. Al-Zarka garage: This garage is located on the Corniche Street at the end of Al-Sikka Street. Transportation is to the neighborhoods of Kufa city, Al-Buhadari area and Al-Zarka area. (4) Kufa

(23) Muhammad Hamid Abbas Al-Shahabi, Land Uses for Transportation Purposes in the City of Najaf, Master's Thesis (n.d.), College of Education, Al-Mustansiriyah University, 2002, p. 63.

(24) Abdul Razzaq Abbas Hussein, Geography of Cities, Asaad Press, Baghdad, 1977, p. 163.

- Najaf garage: This garage is located next to Al-Zarka garage and transportation is only from Kufa to Najaf and it contains the largest number of cars operating in it, Map (7).

We notice that the road network in general is not planned or follows a specific system, but rather was built to meet immediate needs without taking into account the relationship of the street in question to the city's road network. There is also no clear hierarchy, and most roads lack signs, safety measures, sidewalks, and designed gardens. Important buildings are concentrated along Najaf-Kufa Street, which connects Kufa to the shrine of Imam Ali (peace be upon him). Najaf-Kufa Street in particular has become of pivotal importance in addition to its regional importance as it is an outlet from which other less important streets branch off. Najaf-Kufa Street is also considered an area with high traffic density as it leads to the shrine of Imam Ali (peace be upon him) and because most of the important administrative and educational buildings are distributed on both sides of it.

Third: Parking lots

As for the parking lots for overnight stays, their number is (21) distributed throughout the city, including (8) in the city center, and (9) in the area near the Kufa Mosque, due to the number of visitors who flock to the Kufa Mosque, and (4) in the Maysan neighborhood and two parking lots in the Mitham al-Tammar neighborhood (peace be upon him). It is worth noting that there is no official parking lot, as they are all temporary parking lots rented from the Kufa Municipality to fill the current shortage, Map (7).

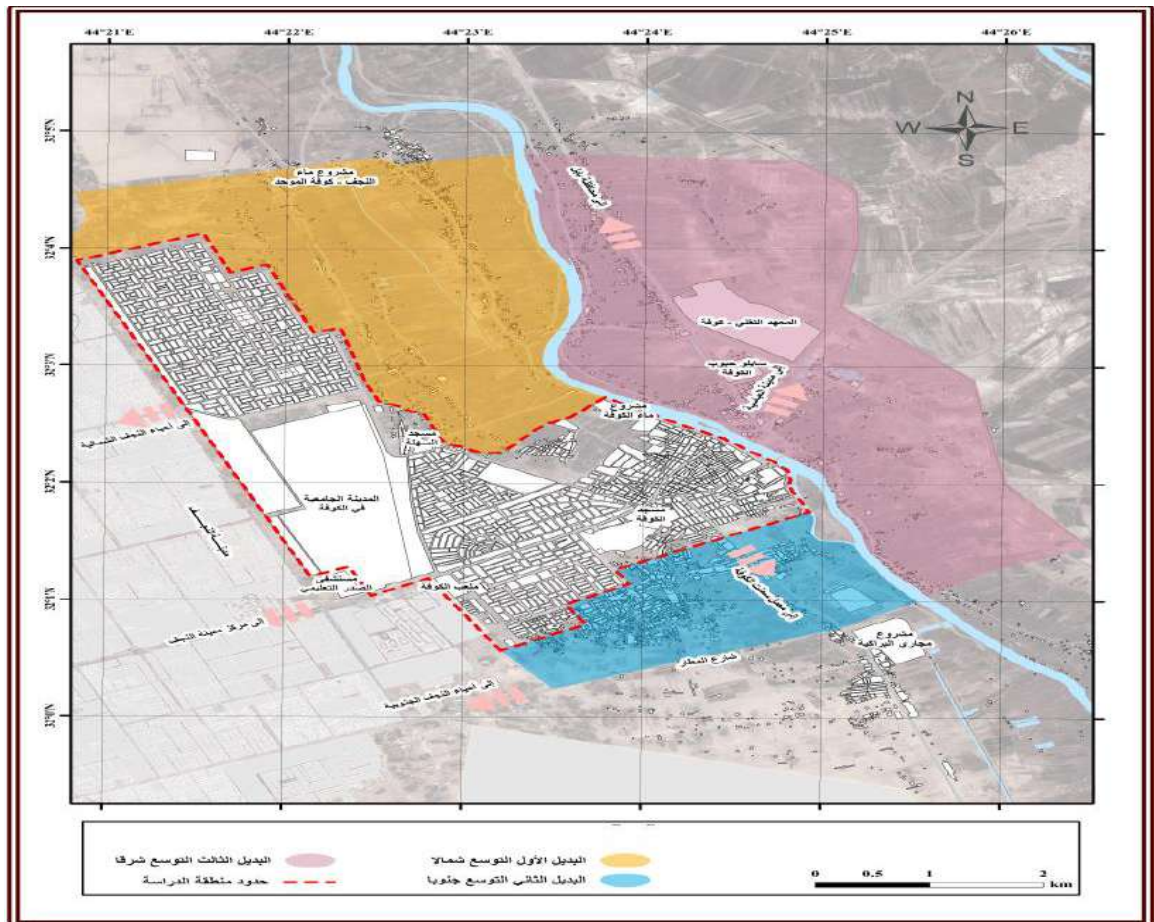
Fourth: Bridges and tunnels

1. Old Kufa Bridge: This Bridge connects the city to the small sub to the Abbasiya district and from there to Babylon Governorate. This bridge was built in (1956).
2. Iron Kufa Bridge: This Bridge is located (500m) north of the old bridge and is one-way, entering the city only. It reduces traffic congestion in the city center. This bridge was built in (2008).
3. Imam Ali Bridge (PBUH): This bridge connects the city from the Maysan neighborhood to (Kufa - Hilla) Street and reduces pressure on the city. The bridge was built in (2010).
4. Al-Mukhtar Tunnel (PBUH): This tunnel is located at the entrance to Maysan neighborhood and reduces traffic congestion, especially for vehicles coming from Imam Ali Bridge (PBUH) towards the city and to the city of Najaf. The tunnel was built in (2013).
5. Muslim bin Aqeel Tunnel (PBUH): The tunnel is located on the (Kufa - Najaf) Street near the Kufa Mosque, starting from the Kufa gas station to the shrine of Maytham Al-Tammar (PBUH). This place was chosen to reduce the traffic congestion that the city witnesses during the days of visits, and it was opened in 2016.

7) Municipal services: Municipal services include service works provided to city residents, as the authorities responsible for the municipal sector in cities provide basic services, prepare appropriate means of living, and provide the necessary facilities for residents to perform their various work and activities by developing basic plans for cities, planning land uses, and constructing public and private buildings, including residential buildings in which residents live and conduct their daily work, in addition to paving streets and roads in the city, as some of the streets in the city of Kufa are not paved with asphalt, and green spaces, as the city is sufficient in the number of its green spaces according to the planning standard (1.2 m²/person). The efficiency of these areas is not good because most of these areas lack many components. The municipality also carries out cleaning, waste and garbage removal, and other works. Map (8) shows the green areas and spaces in the city.

2. The second alternative is expansion towards the south: These are the areas located between the Kufa River and the administrative borders of the city of Najaf, and the beginning of this area is from the Maytham Al-Tammar neighborhood (peace be upon him) and the Al-Safir and Al-Furat neighborhoods towards the Kufa Cement Factory, Map (9), which are within the updated master plan for the city. As these agricultural lands are abandoned and unsuitable for agriculture except in some parts due to their neglect and the sale of large parts of them for informal housing.
3. The third alternative is the expansion towards the east: It is the area located on the other side of the Kufa River and is called the small sub, which is the area extending from the technical institute near the entrance to the Imam Ali (PBUH) Bridge, reaching the administrative borders of the Abbasiya district and to the Al-Issa area, Map (9), which is part of the updated master plan for the city. These are abandoned lands that are not used by any other use except for some agricultural lands, and they are not suitable for agriculture due to the high salinity rate and the high groundwater rate.

Map (9) Future expansion trends in the city of Kufa for the year 2033



Source: Researcher's work.

Conclusions:

1. The city of Kufa suffers from the absence of the planning element in the distribution of educational institutions in terms of kindergartens, primary and secondary schools, which does not suit the population and their distribution in the residential neighborhoods of the city.
2. The city of Kufa suffers from weak health services and the efficiency of the work of institutions, as there is one hospital in the city of Kufa, which serves a population of (194670 people) and (6) health centers distributed randomly that do not conform to planning standards. The amount of hospitals needed is one hospital, meaning the total number becomes (3) hospitals, while for health centers, the amount of need is (13) centers, and the total number becomes (19) health centers.

3. The study area suffers from weak infrastructure services, which are (water, sewage, electricity, roads). Through the study, we note that the Kufa water project has been implemented since 1952 with old capabilities and a production capacity, which is not enough to meet the needs of the residents of the city of Kufa, as the deficit rate reached (178000 liters/day). As for electricity, it is a problem for all of Iraq in terms of the energy produced, the old electricity networks, and the stations that are not prepared to produce electricity. The city suffers from a lack of roads according to the global index of population size.

Recommendations:

1. Addressing the shortages suffered by primary and secondary educational institutions by establishing new educational institutions and distributing them according to the approved planning standards.
2. Raising the efficiency of health institutions in the city by establishing hospitals and health centers and increasing the number of doctors, reducing the rush of visitors and reaching the planning standard.
3. Establishing a sewerage network to drain heavy water to unserved areas and working to raise its efficiency, and working to treat heavy water before discharging it into the Kufa River. 4- Providing potable water projects and the necessity of raising the design capacity of current water projects to avoid the deficit in the individual share, in addition to covering the deficit in roads and electricity services.

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