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**DYNAMIC ANALYSIS OF THE IMPACT OF ANBAR UNIVERSITY ON
INCREASING TRAFFIC CONGESTION IN RAMADI**

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KeyWords: Traffic Congestion, Rush Hour, Ramadi City, Anbar University.

Abstract:

The research aims to study the impact of Anbar University on the daily transport movement in the city of Ramadi and the increase in traffic congestion in it, considering that transportation has become one of the requirements of daily life within cities and has a major role in the success and integration of urban life in the city. The study adopted a descriptive approach and a field survey of traffic volumes through the entrances to the city of Ramadi, with the designation of points for monitoring traffic heading to Anbar University and showing its impact on the city's roads, especially the roads near the university. The research dealt with the description of roads and their categories in the city of Ramadi and the impact of Anbar University on traffic in the city of Ramadi. During the study, it was found that Anbar University has a prominent effect on the increase in transport traffic and traffic jams in the morning, which creates great momentum on the streets. In addition, the eastern entrance to the city of Ramadi is the most accessible to traffic heading to the university. And the intersection of Al-Saramik Street near Anbar University recorded the highest percentage of traffic jams inside the study area.

Introduction:

There is no doubt that Anbar University has a prominent role in the economic and social development of Ramadi and the Anbar Governorate in general, as well as raising the cultural level of the population, as the University of Anbar annually receives thousands of students in its faculties, and this large number of students and employees creates great pressure on services within the city of Ramadi, including transportation services, which represents the backbone of the daily life of the city. The traffic movement has increased very much, which results in a number of problems, such as the difficulty of reaching the destination of the trip, as well as the length of the trip due to traffic jams. Especially, roads in the streets and intersections near Anbar University. Thus, this research is conducted to show the impact of Anbar University on transport traffic in the city of Ramadi. It is an attempt to diagnose traffic jams, especially during work start hours.

Research problem: The study problem deals with the impact of Anbar University on increasing traffic within the city of Ramadi, and what is its role in increasing traffic jams?

The research hypothesis: Anbar University has a major role in the increase of car traffic, especially at peak hours. Where the movement increases with the start of working hours in the morning in the city of Ramadi.

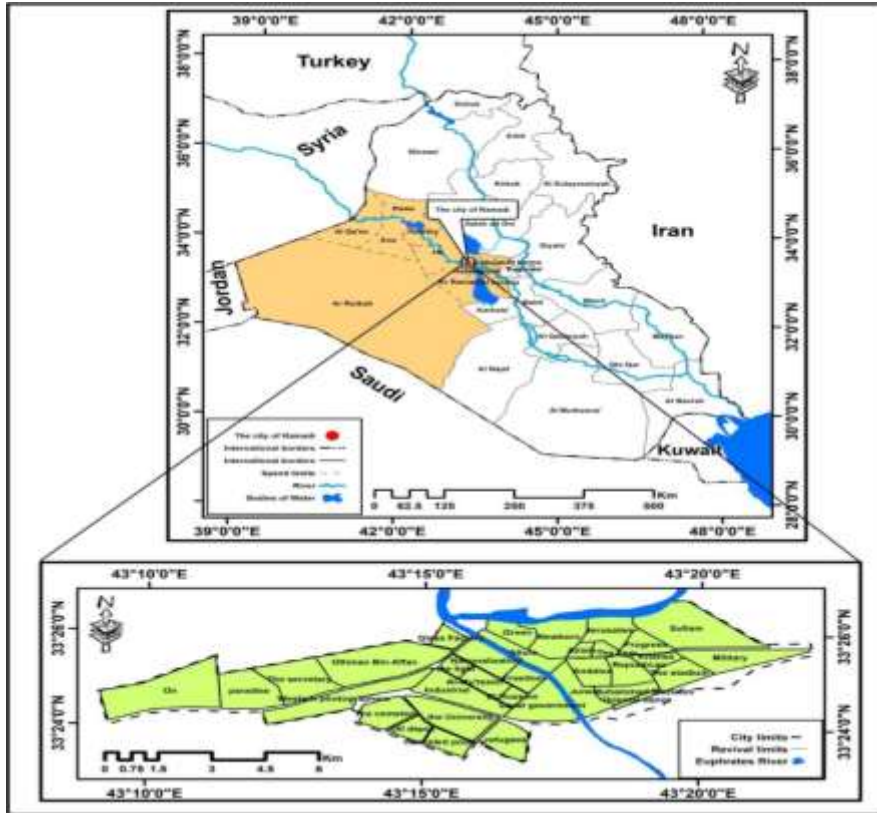
Research objective: This research aims to study the role of Anbar University in increasing the traffic movement within the city of Ramadi and diagnosing the most crowded places and points in the city.

- The city of Ramadi:

The city of Ramadi is astronomically located at latitude 33 north and longitude 43 east. The study area is located in the western part of Iraq in the sedimentary plain area, where it is bordered on the south by Habbaniyah Lake, on the west by the Rutba district, and on the north by the Jazirah region and on the east by the eastern Husaybah side. Ramadi is the administrative center of Anbar Governorate.

The area of Ramadi is estimated at 144,887,057 square kilometers. It has an important geographical location. It is considered a transport intersection for international roads heading to Syria and Jordan on the one hand, and the capital, Baghdad, on the other hand.

Map 1: Showing the location of the city of Ramadi



Source: From the researcher's work

- Roads and their classification in the city of Ramadi

The transportation system is closely related to the land uses within the city, and the land uses reflect the differences in the requirements of economic activities, including the transportation side (1). Transportation is one of the most important uses of urban land in the city it occupies in terms of area, and it takes the second place after residential use. It has a direct relationship with the expansion of the city's area (2).

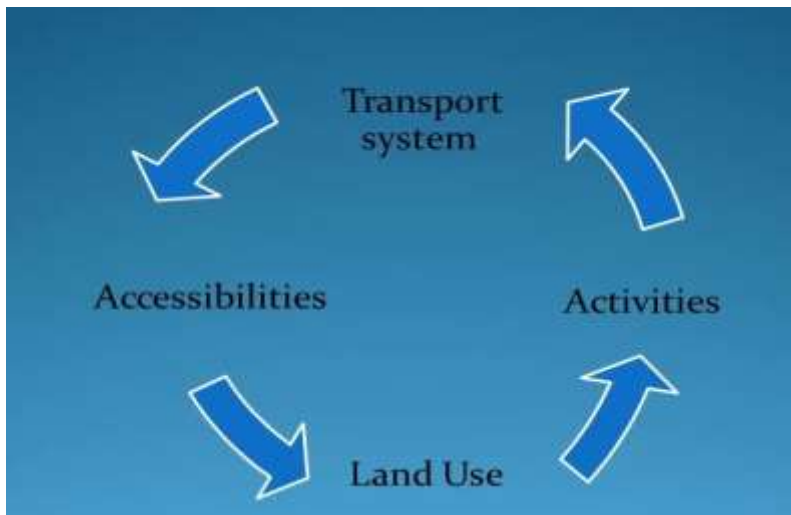


Figure 1: Land-Use and Transportation System interaction in an urban (Wegener, 2004, p130).

The use of the land for the purpose of transportation represents parking lots and gas stations as well as the different types of streets that connect different parts of the city with each other, which in turn increases the process of movement and transportation, which creates exchange and interaction between the places of the city. The road network in Ramadi can be divided into the following types:

(¹) Petersen, Land use international, Germany network enter,2004, p.18.

(2) Abdel Hakam Nasser Al-Qashawi, Geography of Cities, 1st Edition, Modern University Office, Alexandria, 2008, p. 88.

Arterial Road:

These roads are considered the start and end of the external roads, as they turn into main roads when they enter the city. They are large in size and have multiple lanes, for example the city around roads between the north and south of Ramadi. As the total of the longest roads reached 60.4 km, with a rate of 8.8% of the total longest main roads.

Main Roads:

These streets are designed to provide large facilities to accommodate a larger volume of daily trips, and are responsible for linking the parts of the city together, and the main streets of the city appear of varying lengths, reaching 33.3 km in length, with a percentage (4.9%) of the total longest roads in the city. These roads distribute traffic towards sectors without the main roads penetrating these environmental areas whenever possible (3).

Table 1: The length of roads in Ramadi

Type of road	Length km	%
Arterial Road	60.4	8.8
Main Road	33.3	4.9
Secondary Road	114.3	16.6
Local Road	460	67
Railway	18.9	2.8
Total	686.9	100

Source: Ramadi City Municipality Directorate, Towns Organization Division, 2018

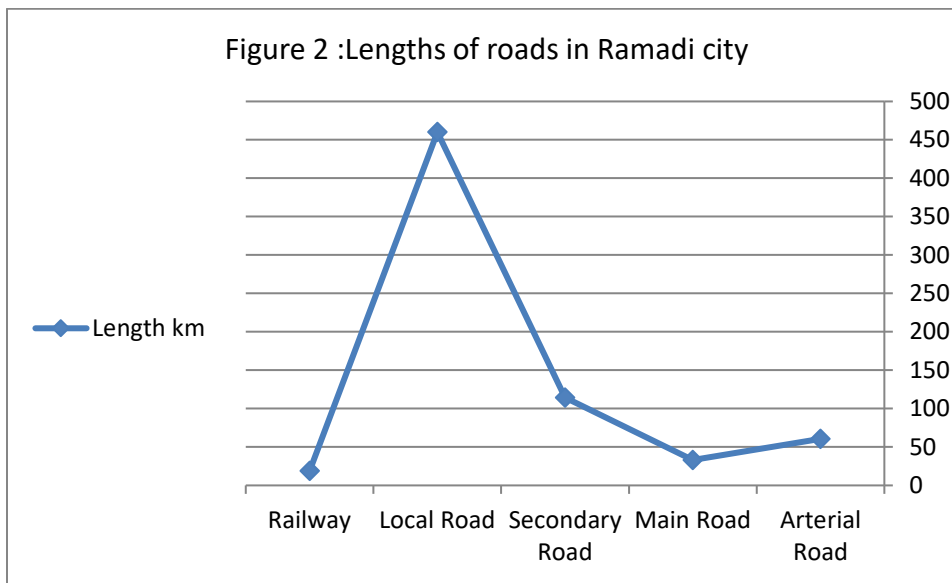
(3) Mahmoud Ismail Muhammad, Planning Features of the Urban Transportation System in the City of Fallujah and a Test in the Efficiency of the System, PhD Thesis (unpublished), Higher Institute of Urban and Regional Planning for Postgraduate Studies, University of Baghdad, 2011., p. 35.

Secondary Road:

Secondary roads have great importance on parts of the city, as they serve the main traffic movement towards the city center, as well as commercial and entertainment services.

This type of road is called Collector Roads because it serves local roads and collects traffic and takes it to the main streets in the city or to local attractions such as commercial centers and others

(4). In the study area, the total length of the roads was (114.3) km, and a percentage (16.6%) of the total length of the longest roads in the city.



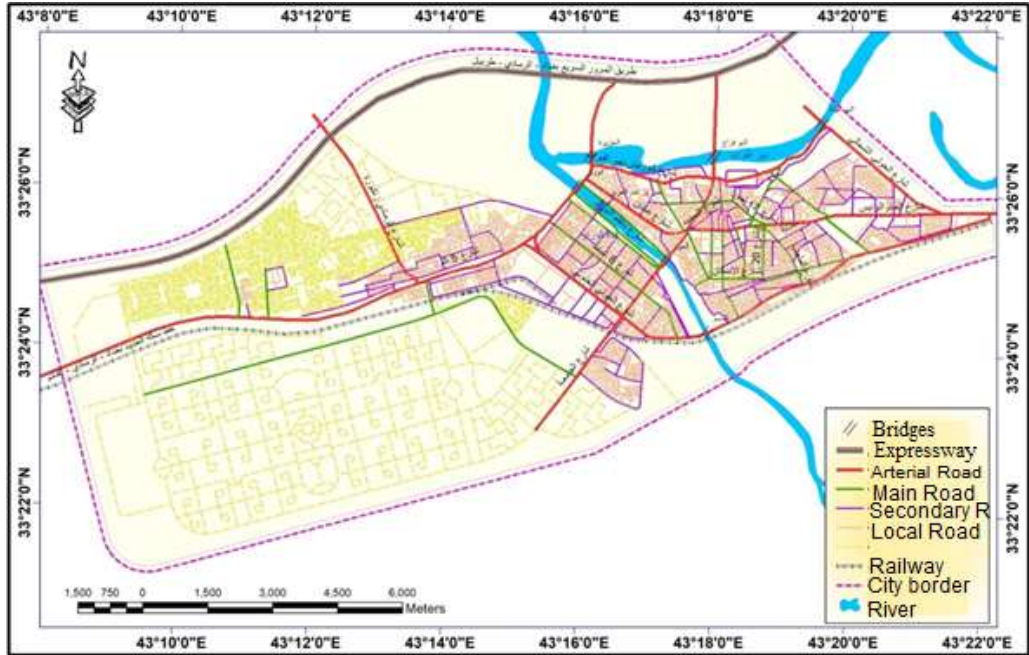
Source: From the researcher's work, based on Table No. 2

(4) Zain Al-Abidin Ali Safar, Urban Planning (General Introduction), National Library, Benghazi, 2004., p.57.

Local Roads:

It is represented by the streets of sub-paved residential areas and within each residential neighborhood and its construction is linked to the establishment of the residential neighborhood, as well as it creates a kind of economic integration within the city characterized by little traffic of up to (800) vehicles per day or less, in addition to pedestrian traffic that can they turn into streets for the passage of vehicles at times of congestion and traffic jams on the main and secondary streets, with a total length of 46 km and a rate of 67% of the total city roads.

Map 2: Of Ramadi Roads 2019



Source: The Republic of Iraq, the Ministry of Construction, Housing, Municipalities and Public Works, the Urban Planning Directorate, the strategy for developing and modernizing the city of Ramadi, the basic design for it for the year 2033.

Anbar University:

Anbar University is located in the city of Ramadi, the capital of Al-Anbar Governorate. The University of Anbar was established in 1987 and included upon its foundation two colleges: the College of Education for Girls and the College of Education for Human Sciences. In view of the increase in development requirements in Anbar Governorate, the university expanded and created a number of colleges to supply the governorate with the scientific specializations it needs, as the number of colleges in it reached 18 colleges with different scientific specializations,

Table. 2: The number of students at Anbar University for the year 2019

The Colleges	No. of Students	
	Male	Female
Computer Science and Information Technology	293	286
Dentistry	164	269
Engineering	522	342
Law and Political Science	327	657
Applied Sciences / HIT	124	135
Islamic sciences	481	531
Sciences	274	856
Medicine	317	389
the pharmacy	126	340
Farming and agriculture	565	310
Education for Pure Sciences	988	1202

Education for the humanities	1679	1450
Education for girls	-	3722
Physical Education and Sports Science	504	40
Basic Education / Modern Education / based	440	590
	93	248
Administration and Economics	1063	569
College of Arts	1266	1051
Total number	9226	12987

Source: Department of Planning and Statistics, Anbar University

Anbar University includes a large number of students, as in 2019 their number reached 23,000 students, which leads to great congestion during office hours towards the university through various means of transportation. Thus, Anbar University has become an important center and a vital point for the movement of means of transport heading to it due to the large number of students, which increased the movement of transportation to it.

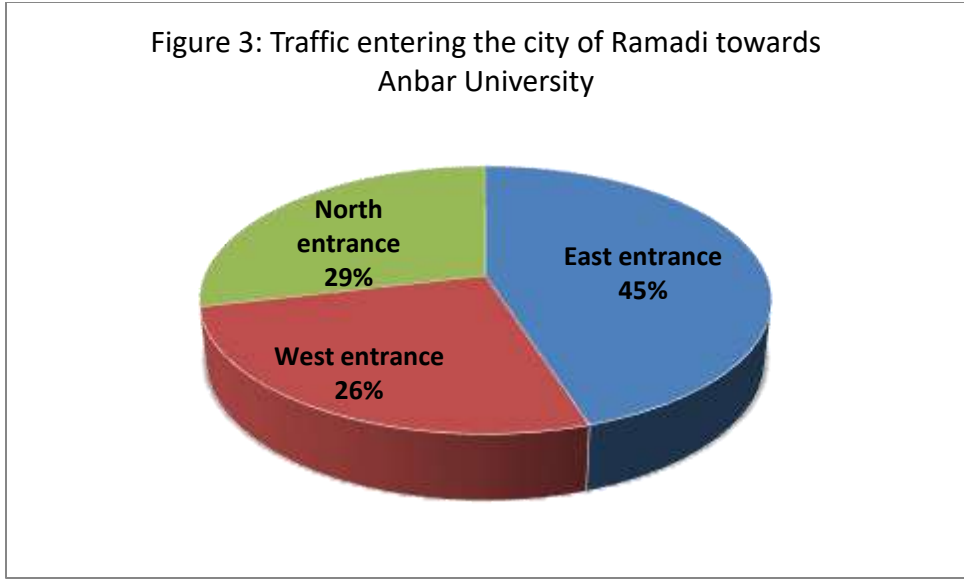
The impact of Anbar University on transportation in the city of Ramadi:

In their next daily trip to the university, the members of Anbar University use various means of transportation, such as Baghdad and other districts of Anbar Province, which in turn constitute additional pressure on the movement of transportation within the city of Ramadi.

Also, the field study of the movement of cars heading to Anbar University during the morning rush hours gives us the role of Anbar University in the movement of transportation and increasing traffic congestion in the city of Ramadi.

In order to know the volume of traffic heading to the University of Anbar and its effects on the street network in the city of Ramadi, the number of vehicles passing through the streets of Ramadi was calculated from eight in the morning until nine in the morning, considering this hour as the rush hour of traffic flow in the city in addition to being the hour of daily work. And the movement of university students towards the university colleges.

As traffic movement heading to Anbar University was monitored at the three entrances to the city of Ramadi. At the eastern entrance, the average traffic momentum reached 2775 vehicles, with a rate of 45% of the total vehicles entering the city of Ramadi towards Anbar University. It constitutes the highest rate in terms of traffic momentum heading to the university and coming from Baghdad governorate and Fallujah, as well as the rest of the districts, which are located east of Ramadi.

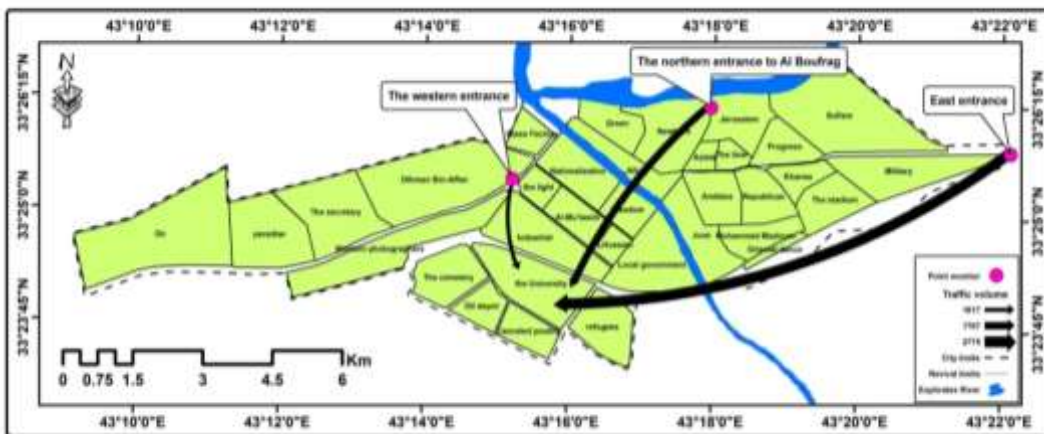


Source: field study

As for the second entrance to the city, it is represented by the western entrance to the city of Ramadi in the area of 5 km near traffic on Street 100 only, the traffic momentum in it reached approximately 1617 cars, with a rate of 26% during rush hour towards the city of Ramadi, and most of the traffic at this entrance comes from the western regions towards Anbar University.

As for the third entrance, it is the northern entrance to the north of the city of Ramadi on the Al-Faraj Bridge, where the traffic movement heading to Anbar University recorded approximately 1776 vehicles, by 29% during peak hours, and the areas of this movement are in the northern areas of Ramadi, as well as the movement coming from the highway towards the city of Ramadi.

Map 3: Shows the traffic flow at the entrances to the city of Ramadi towards Anbar University



Source: From the researcher's work based on the field study.

Thus, the entrances to the city of Ramadi recorded about 6159 vehicles entering during peak hours towards Anbar University. The largest percentage of which was at the eastern entrance. This, in turn, creates a great traffic jam on the streets of Ramadi, and leads to an increase in congestion, especially near the university streets.

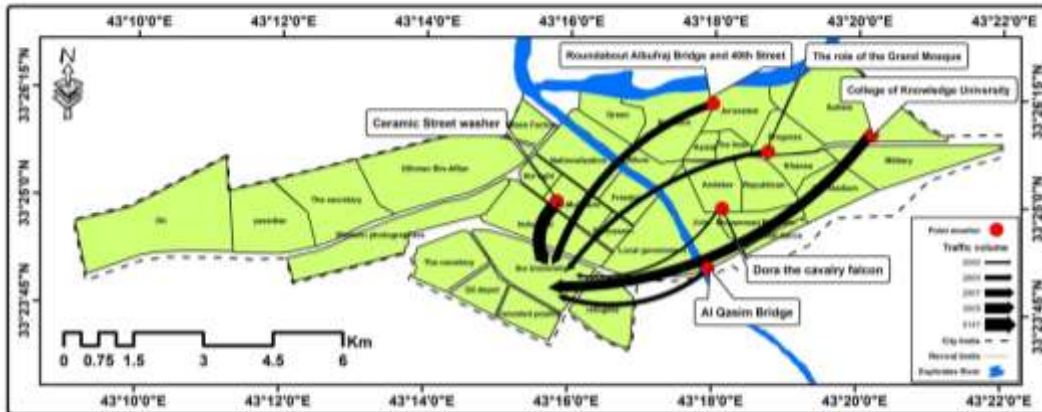
As for the other monitoring points, they were inside the city of Ramadi, represented by the places with the most movement and traffic, especially during working hours and morning rush hours, where the traffic flow towards Anbar University was monitored at the Al-Ma'arif University College, and the number of vehicles reached 3505 vehicles per hour.

On the other hand, field monitoring of the Boufraj Bridge roundabout and Arbaeen Street reached 2907 cars / hour towards the university.

The on-site survey of vehicle movement showed that the traffic volume increased to 2000 cars in roundabout of Al Forsan, which links Al Iskan Street, Al Mustawda Street and Al Maared Street. As for the Games City intersection, which includes the traffic coming from Sufism and the State Mosque, 2,800 cars / hour were monitored.

As for the monitoring point at Al-Qasim Bridge, which is considered one of the important bridges in the southern part of the city and on the southern Hawalli road, it became clear that the traffic volume towards the university reached 2,800 vehicles per hour.

Map 4: Shows the traffic flow in a number of the most crowded places within the city of Ramadi



Source: From the researcher's work based on the field study.

As for the point of most traffic momentum, it was at the university intersection, where the number of cars in rush hour reached 5147 cars towards the university and the Ramadi Center. Thus, registering a turbulent flow intersection and very few speeds close to zero due to the traffic jams resulting from the large number of traffic, which causes delays in arriving and entering The university does not take more than 15 minutes.

Conclusions:

- 1- Anbar University actively contributed to increasing pressure on the roads of Ramadi and the means of transportation inside it, which led to an increase in traffic jams on the roads leading to the university, especially during the morning rush hour.
- 2- The entrances to Ramadi city recorded about 6159 vehicles entering during rush hours towards Anbar University, and this in turn creates a great traffic momentum on the streets of Ramadi and leads to an increase in congestion in the city.
- 3- The field study revealed the most crowded traffic momentum points that can be relied upon for future planning of transportation within the city of Ramadi.
- 4- The eastern entrance to the city of Ramadi had a high rate of traffic heading to Anbar University by a large percentage than other entrances, as it recorded 45% of the traffic at the city entrances
- 5- A number of places and the most crowded and obstructing traffic flow, especially near Anbar University, were diagnosed.
- 6- The study showed high use of small cars to reach the university, which caused a state of bottlenecks at the entrance to Anbar University.

Recommendations:

- 1 - Working to develop transportation routes and modes within the city and activate public transport modes with the provision of large, fast and comfortable buses for the university that transport university students, professors and workers from the university to some major sites in the city and vice versa in order to reduce the number of cars on the city streets.
- 2-Building bridges or tunnels in some locations that suffer from traffic congestion, such as the fagh of Al-Ceramics Street and the Falconess of the Knights.
- 3- Working to reorganize roads in the city of Ramadi, especially near the university, to suit the current and future traffic momentum.
- 4- Moving towards mass transit in order to reduce the number of cars heading to the university, which reduces the rate of traffic momentum.
- 5- Spreading awareness among students and employees of Anbar University about the need to use public transportation, as they can get from the plains of a country

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