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## BRIDGED INTERSECTIONS AND ITS ROLE IN SOLVING THE PROBLEM OF TRAFFIC JAMS IN BAGHDAD (ADEN INTERSECTION AS A MODEL)

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**ABSTRACT**

The phenomenon of traffic saturation experienced by intersections and roads leading to those intersections and the areas connecting them, has become a daily phenomenon experienced by road users and intersections. It is a problem that all intersections of the city of Baghdad suffer from because of the suffering of all roads from the problem of heavy roads in Baghdad, which is traffic congestion, a phenomenon that has become part of the life of Iraqi society and as a result of the limited solutions available as a result of the conflict of most of the proposed projects with the infrastructure of the city of Baghdad, in addition to the high financial cost of their implementation, As well as the development of new residential areas and commercial activities in places that prevent the implementation of some of the proposed projects, especially that this phenomenon exceeded expectations and studies devoted to the basic design of the city of Baghdad after the events of 2003 as a result of the development and economic openness that the country witnessed and the resulting increase in the number of vehicles in a disproportionate manner and the absorption of roads for them, in addition To the increase in population numbers and the expansion and emergence of new residential areas and the consequent activities and services that exacerbated this problem. Through our research and the importance of intersections in the flow of vehicles in the roads leading to the intersection and the surrounding areas, the study sought to determine the effectiveness and success of the traffic performance of the intersection after diversion into a bridge, in terms of the ease of vehicle flow, the lack of waiting time for one vehicle, and the organization of movements for the different directions of the intersection.

**Keywords:** *intersection, transportation geography, traffic, Iraqi society*

**RESEARCH PROBLEM**

Because of the importance of the Aden intersection, being a point of convergence and distribution of roads at the same time, and this task requires organization in movement and performance through the flow of vehicles and the time required to wait and avoid traffic accidents, the effectiveness and success of the engineering design prepared for the intersection, and the number of ground lanes needed by the intersection, Due to the fact that the intersection is located on a main road linking north of Baghdad with the northern governorates, as well as being

located in an area with a high population density.

**RESEARCH HYPOTHESIS**

Find solutions that fit the tasks performed by the intersection, to reduce the phenomenon of traffic saturation that Baghdad roads and intersections suffer from, by converting most of the intersections into a bridged intersection, including the Aden intersection, the subject of the study, to alleviate the traffic pressures for vehicles on roads, intersections and traffic yards, and to know the effectiveness and success of these solutions. By converting the intersection

into a bridge intersection, reducing the traffic saturation of the roads leading to the intersection in terms of the flow of vehicles, reducing the waiting time for them, and the flow of traffic to the different directions of the intersection.

### RESEARCH AIMS

Given the importance of the traffic that characterizes the Aden Bridge intersection, as it represents one of the main entrances to the north of Baghdad, and is located on the road linking Baghdad with the northern governorates, as well as the density of the residential area in which the intersection is located and the resulting traffic pressure resulting from the daily movement of residents of the neighboring areas, in addition To the movement of external trips to the northern governorates, for all these reasons it was necessary to know the importance of the bridged intersection in the flow of traffic of the bridged intersection and the extent of its success in reducing traffic saturation in it and the roads leading to it. The study included the following axes:

1. Traffic intersection concept
2. The goal of converting the intersection into a bridge
3. General description of the intersection
4. The importance of the intersection of Aden Bridge
5. Geometric shape of bridge intersection

6. Traffic performance analysis of the bridge intersection, which includes:

- First: the epochs of the cycle
- Second: the energy of the discharging directions
- Third: the efficiency of traffic performance at the intersection

### TRAFFIC INTERSECTION CONCEPT

A traffic intersection is an area where two or more roads meet.

The purpose of converting the intersection into a bridge

1. Provide all necessary safety requirements to mitigate the expected risks from vehicle interference
2. Achieving the ease of all trips that use the intersection
3. Speed control designed for road and intersection
4. Adjust movement direction changes for vehicles used for the intersection
5. Reducing traffic saturation, and their desires are a goal that the responsible authorities seek
6. Reduce the rate of traffic accidents
7. Reducing the waiting time for vehicles
8. Provides a healthier environment for the areas served by the bridge intersection
9. Extending the service life of vehicles

The competent authorities responsible for designing cities have always aspired to make traffic intersections at different levels, one of the most basic conditions for the safety of vehicular traffic and to ensure the smooth flow of traffic. In order to achieve these goals, it is necessary to know the importance of intersecting roads and their degrees in terms of the level of movement and their classification, and the expected future traffic increases on straight roads and winding roads at the intersection, the distances between intersections, and the nature of the land area surrounding the intersection in order to know the extent of flexibility that will be achieved in the future after diverting the intersection to a bridge in the future to solve the problem of future traffic congestion (2)

## GENERAL DESCRIPTION OF THE INTERSECTION

Aden Intersection is one of the main intersections located on the Rusafa side of Baghdad, as it is located within the Shaab area as shown in Figure (1), which is one of the main gates to enter Baghdad, and this explains the importance of the intersection and the traffic pressures it entails, as the number of The vehicles served by the intersection amount to 16 million vehicles annually. And the consequent delay for users of the intersection, and the negative effects on the environment, as well as the large material losses resulting from the delay in work for users of the roads passing this intersection and the consumption of fuel and vehicle parts (decrease in the operational life of vehicles) (3)

The logo for the International Journal of Research in Social Sciences and Humanities (IJRSSH) is located at the bottom center of the page. It features the acronym 'IJRSSH' in a bold, orange, sans-serif font. Above the text is a stylized graphic consisting of several overlapping, curved shapes in shades of green, yellow, and orange, resembling a sunburst or a series of flowing lines.



Shape (1 :) An aerial view showing the location of the Aden bridge intersection in the Shaab area (4)



And because this phenomenon suffers from all intersections in the city of Baghdad and because of the nature of economic activities and the various uses of

the land that intersect with the proposed projects to reduce this phenomenon. In the event of its completion, it would have solved the problem of traffic jams, so that

the movement of vehicles would be on the outskirts of the city and not inside it, and thus alleviate this problem. Accordingly, the Municipality of Baghdad, with the competent authorities from the Projects Department, and in cooperation with the relevant ministerial authorities, sought to find solutions commensurate with the reality of the actual land uses and in a way that reduces traffic jams for a period of (20-30 years), which is the target year prepared for each bridge, so the solutions were to convert all intersections into bridges Or it can be a double bridge and a tunnel together, and this depends on the nature of the intersection, the land surrounding the intersection, and the degree of traffic congestion that it suffers from, which depends on the nature of the roads that connect them and the areas to which those roads are heading, if they are located in the commercial heart of Baghdad or in an area with governmental and educational activity or with a high population density. (5)

### **THE IMPORTANCE OF THE INTERSECTION OF ADEN**

The presence of the intersection on a road linking the city of Baghdad with the northern governorates, and the resulting traffic momentum at this intersection, as this road constitutes the main hub for transporting heavy vehicles loaded with

goods between these governorates, in addition to passenger vehicles. In addition to its location on a main road that represents the northern entrance to the city of Baghdad, as it passes all daily trips for the residents in the areas of the outskirts of Baghdad, such as Al-Hussainiya and Bob Al-Sham and others, heading to the city center or vice versa, through this intersection, which increases the momentum of traffic volumes and throughout the day at this intersection. This intersection with its important location is the first main option to arrive or leave from / to the densely populated Aden neighborhood in the Al-Shaab area, since the eastern direction in it represents the main street of this neighborhood (6)

### **GEOMETRIC SHAPE OF BRIDGE INTERSECTION**

Road facilities design the geometric shape of the bridge intersection in a way that is economically feasible on the basis of the design life and with an annual increase in traffic volumes, thus ensuring that this bridge performs the acceptable role and tasks required during the years of its operational life and with a pre-determined efficiency during the design

For the purpose of calculating the traffic volumes of this intersection, on the basis of which the engineering design of the bridge parts is based, a design life of 20

years and an annual increase in traffic volumes of 3% was relied upon. (7)

We note the big difference in the design of the intersection before turning it into a bridge intersection as in Figure (2) and Figure (3) and after transforming the

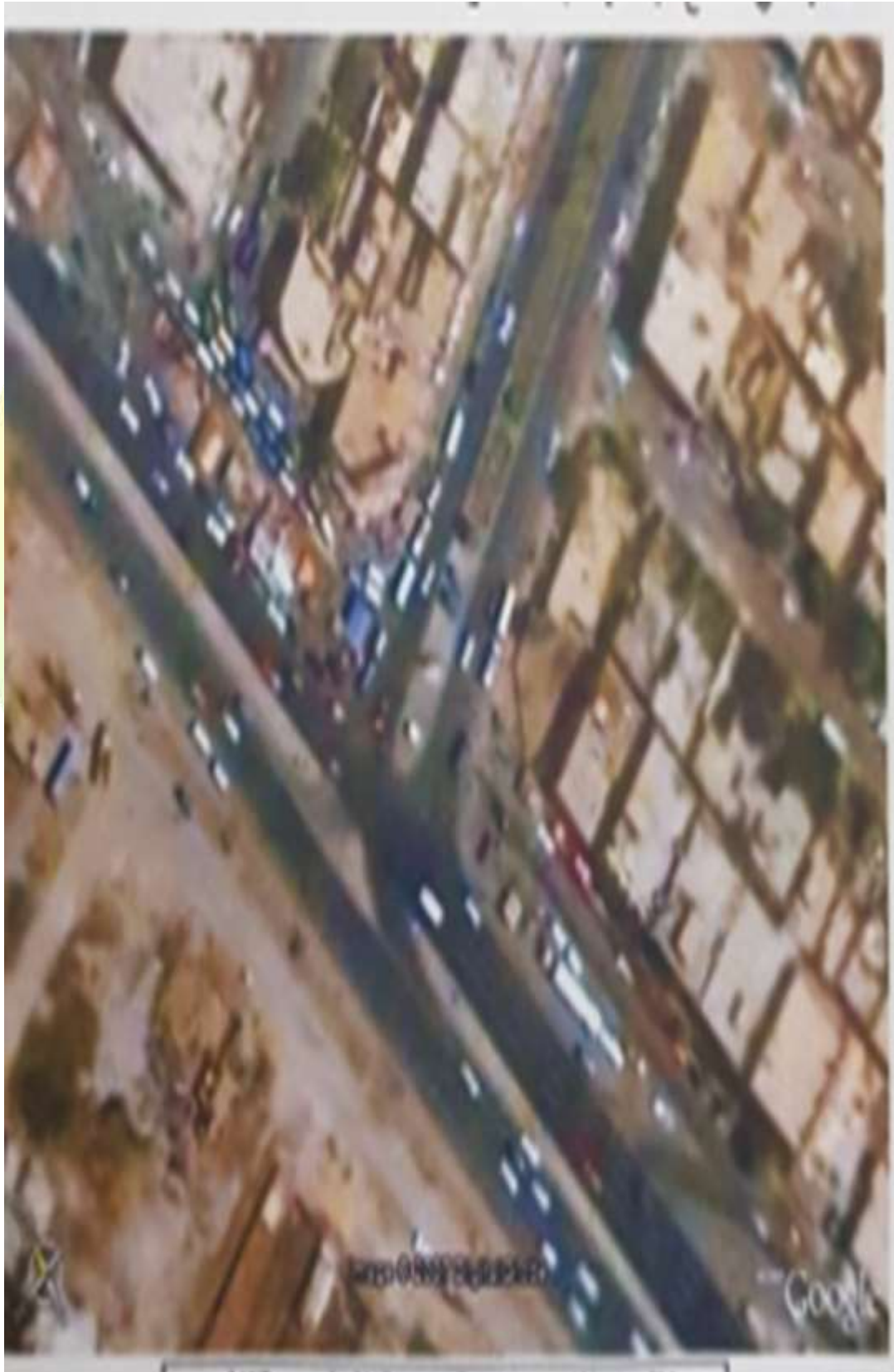
intersection into a bridge as in Figure (4), which created a radical change in the performance of the intersection in terms of the flow of traffic at the intersection and reducing the waiting time in a manner commensurate with the goal assigned to this intersection.

Shape(2)Geometric Diagram Of Aden Intersection Before Diversion Into A Bridge Intersection (8)



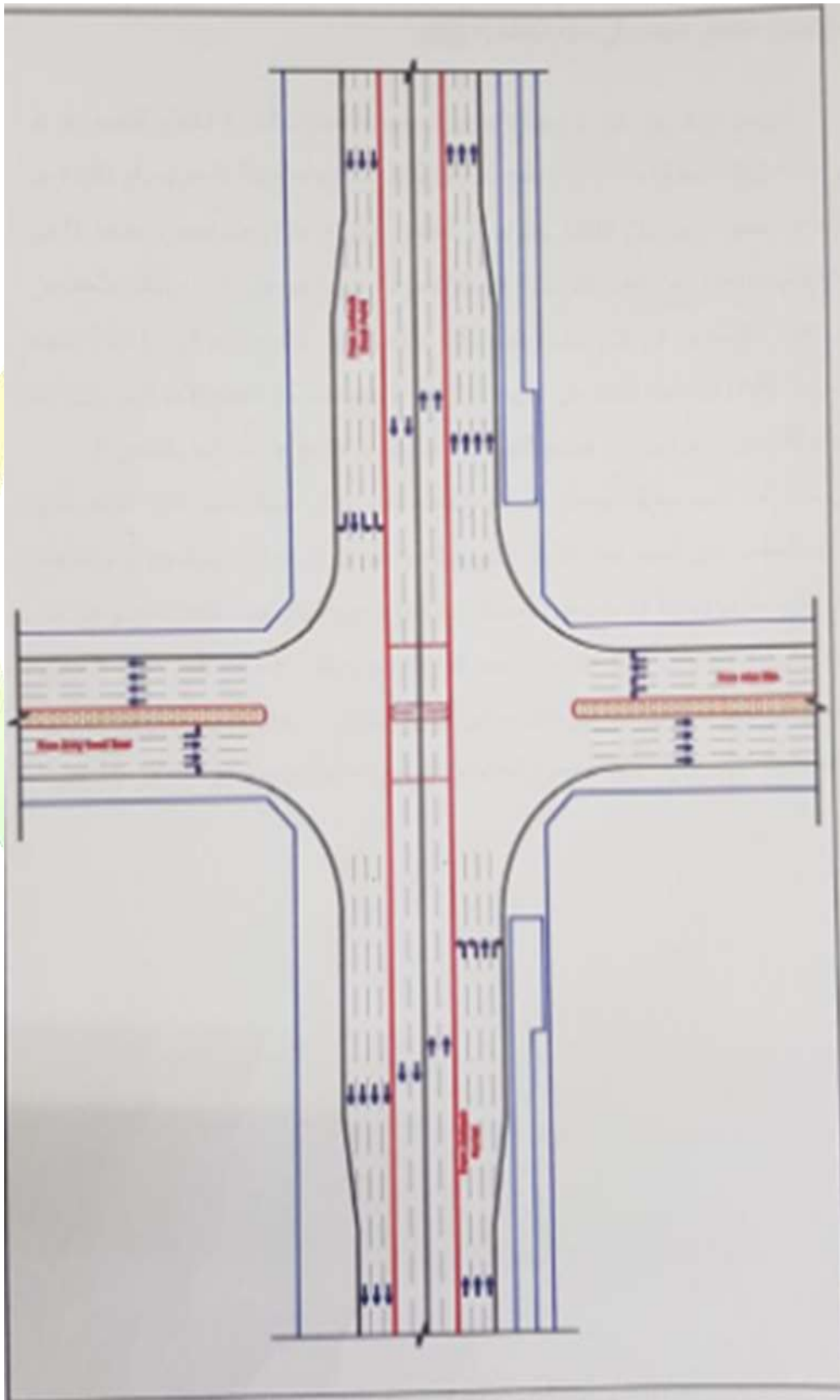


Shape (3 )An aerial photo showing the geometry of Aden Intersection before diversion into a bridge intersection (9)





Shape (4 )Engineering Design of the Existing Bridge Aden Intersection (10)



**TRAFFIC PERFORMANCE ANALYSIS OF ADEN BRIDGE INTERSECTION**

**First: the epochs of the cycle**

The phase is one or more directions for the movement of vehicles within one cycle,

and there are usually from 2 to 6 phases of movement, and the number of phases is mostly 4 for the four-arm intersections and 3 for the three-arm intersections, as is the case in most of the intersections in Baghdad. It gave the lowest average delay time for vehicles.

Striped(1 )The time frames of Aden Intersection (11)

D I A G R A M	Phase I	Phase2	Phase3
movement	From Iden dist	From Alshaab Market Int	From Alshaab Cheek Point
Timing	G=20 Y=3	G=35 Y=3	G=30 Y=3

**Second: the energy discharged to the directions**

The drainage capacity of the various directions at the Aden Bridge intersection as shown in Table (1) on the basis of the drainage capacity of the vehicles, taking

into consideration the number of lanes in one direction, the percentage of heavy vehicles, the width of one lane, bus stops, the presence of parking for vehicles, the type of area and the percentage of vehicles that turn left and right.

Table (1 )Discharge energy of the directions of movement at the intersection of Aden (12)

Discharge power )SMV/hr(	the movement	direction	
2417	Turn right	Coming from the intersection of the markets	North
3658	Traffic forward		

3562	Traffic forward	Coming from the people's control	the South
1532	Turn left		
2469	Turn right	Coming from Aden district	the West
2882	Turn left		

We find from the above table that the intersection discharge capacity has become three times higher than the previous one, which helped to alleviate the traffic saturation that the intersection was suffering from before diverting it to a bridge, and to modify the service level from level F)) which is the highest level of traffic saturation according to international specifications to The service level (D) is a level at which the service reaches good drainage levels that reduce traffic saturation, which helps in the smooth flow of traffic and the positive results that have been reflected on the ground, in terms of the flow of vehicle drainage, avoiding

traffic accidents at the drainage directions of the bridge, accommodating more numbers of vehicles Reducing the waiting time for vehicles.

**Third: the efficiency of traffic performance at the intersection**

After converting the intersection into a bridge, it achieved positive traffic results in the smooth flow of vehicles, and through the field study, we find that the service level of the bridge intersection works with a delay time for vehicles three times less than it was in the past, as shown in Table (2)

Table (2 )Traffic performance indicators for Aden Bridge Intersection (13)

performance level	Delay rate (sec/v))(	green time)sec(	phase	the movement	direction
B	13.2	20	1	Turn to the right	Coming from the intersection of the markets
				Turn left	
C	25.3	25	2	Turn to the right	Coming from the people's control
				Turn right	
C	12.2	15th	3	Turn right	next channel
				forward traffic	
				Turn left	



C	31.1	40	4	Turn right	Coming from Aden district
				forward traffic	
				Turn left	
D	42.7	bridge intersection			

The total cycle time is 120 seconds\*

The yellow time is 3 seconds for each phase, and the time for all red phases is 2 seconds\*

We note from the above table that the bridge intersection achieved the goals to be achieved through the success of the engineering shape prepared for the intersection and in a manner that is commensurate with the uses of the surrounding land, which achieved a high positive in reducing traffic congestion, through the flow of vehicle movement and a waiting rate less than the previous by a

large difference, as well as a difference Distribution coefficient ratios (the distribution coefficient is the ratio of the forward volume that uses the bridge over the forward volume that uses the underpass)As the design of the bridges on the basis of 100% of the passing volume of the vehicles is forward in order for the geometric shape to achieve the desired benefit. As for the number of lanes for the bridged part of the intersection (the direction of the intersection of the markets - Shaab control and vice versa, Abi Talib Road) it is shown in Table (3)

Table (3 )Preparation of lanes for the bridge at the intersection of Aden (14)

Number of lanes required	Maximum Discharge )v/h/lane(	desired level of service	Future traffic volumes (vehicles/hour(	direction
2	1550	C	2889	Coming from the intersection of the markets
2	1550	C	2567	Coming from the people's control

We note from the table above achieving the provision of the lanes needed by the intersection in proportion to the volume of traffic on it, and which helps to provide the

number of lanes as prepared in the engineering design of the intersection, is the provision of road prohibitions surrounding the intersection, which helped

the design success and provide the space required for it, these factors are not available at all intersections as we find some intersections. Despite the importance of its location and the traffic congestion it suffers from as a result of the traffic pressure on it due to the importance of the areas that connect them now, the idea of converting it into an intersection faces great difficulty, due to the intersection of its location with the uses of the surrounding land. Baghdad, there is a current study prepared to make the design commensurate with the uses of the land surrounding the intersection and at lower costs.

## CONCLUSIONS

1. Converting intersections to bridges or double bridges is one of the best current solutions to address the problem of traffic jams.
2. The uses of the land surrounding the site of the intersection and the financial allocations allocated for its construction are among the most important factors that work on the success and completion of the bridge, so that they do not intersect with the engineering form or slow down its completion.
3. Reducing the rate of waiting for vehicles, and this has positive effects on the driver's psyche, in addition to reducing environmental pollution and

prolonging the operational life of vehicles.

4. The timing of the time phases of the bridge intersection coincided, which ensured high efficiency in the smooth flow of traffic volumes.
5. Improving the level of traffic performance at the bridge intersection, if the level of service becomes no less than the level) while in the past it recorded a high level of traffic saturation that exceeded the levels. (D)
6. The traffic performance of the bridge intersection was positively reflected in reducing traffic accidents on the roads leading to it

## RECOMMENDATIONS

1. Developing the land surrounding the bridge intersections and linking them with ring roads to ensure the smooth movement of vehicles and not to return to the first point when the bridge service level reaches the target year, which is 2027.
2. Providing the financial allocations prepared for such projects in order to sustain them and continue their development in order to maintain the level of service they provide.
3. Converting all intersections in the city of Baghdad to bridges or bridges and tunnels at the same time or tunnels,

- according to the location of the intersection and the nature of the surrounding land uses, and the financial allocations prepared for such projects.
- Opening and rehabilitating closed roads to reduce the problem of traffic saturation suffered by roads and the rest of the intersections that have not yet been converted into bridged intersections.

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