

The role of river transport in reducing congestion urban transport in the city of Baghdad as a case study

Mohammed Ghazi Abbas¹, Rabee Jameel Al-Shammari², Mohammed Abdul Mahdi Al Fartusi³

¹College of Engineering, Al-Iraqi University

²College of Engineering, Department of Architecture, University of Wasit

³College of Engineering, Department of Architecture, University of Basrah

ABSTRACT

This research focuses on considering transportation in the city as an important field in achieving economic, social, and urban development. The Tigris River is considered the future transport artery of the city of Baghdad. Therefore, attention has been focused on activating the role of river transport to solve congestion problems and develop the urban environment of the city. How to make the river transport sector an important part of the city's components and make it the transporter, nourishing, and financier artery for all the various activities and activities in it. The research is depending the field surveys and analysis to reach a transport policy with standards and laws that meet the goal of research in solving the problem of congestion, as river transport has given smooth access to and from different regions. River transport will reduce environmental pollution, reduce traffic accidents, and save time due to the speed of arrival.

Keywords: Transportation, Congestion, The Tigris River, Land use

Corresponding Author:

Mohammed Ghazi Abbas
College of Engineering, Al-Iraqia University
Baghdad, Iraq
E-mail, mohammed.ghazi@aliraqia.edu.iq

1. Introduction

The improvement and development of transport in the city of Baghdad, which could be to take measures for the development of transport projects and the transport network and create a renaissance will inevitably lead to solving the problem of congestion[1, 2]. The current system of transportation in Baghdad is based on the main road and several secondary roads linking the rest of the centers to each other and with the rest of the region. In the city of Baghdad, the transport sector defects suffered at the level of services that have fallen significantly and began to traffic jams, increasing gradually more than the previous one until it turned in, finally to a real problem, and after the recent war and subsequent events and changes in the composition of Baghdad transport systems, the decline of internal and external transport situation big steps back and hopes and efforts are focused towards the return to his former rather than deliver it to the level of the best. It is, therefore, necessary at this stage, a comprehensive assessment of the current reality and stand on the strengths and weaknesses and develop a clear opinion towards a policy for river transport out of the crisis taking place in Baghdad and this research aims to take advantage of the mistakes of the past and present to establish new formulas for transportation planning and mass transfer and add a new road transport. The problem of this research: It is clear that the deterioration of the transport system in Baghdad as a phenomenon and a real problem of this city is not to consider it as an integrated system cannot be built and upgraded only through comprehensive policies looking at the full flaw in every part of the still valid to mark the solution requirements for each reason hence the research problem (the lack of an active role of the Tigris River in solving the problem of transportation within the city of Baghdad), where the Tigris represents the artery for solving this problem. Where it can be considered as the river transport sector an important part of the components of the city, according to it is the carrier and the artery nourishing and financier of all events and various activities in them. So search application will follow the study of reality and measurement of indicators that will be determined from the theoretical framework and to reach results reinforce the hypothesis of research and solve the research problem of the role of river transport in reducing the momentum in the road transport and solve the transportation problem for the city of Baghdad, and thus achieve the goal of research. The research aims to create a clear policy for the future of river transport that may not be perfect but they are at least a working paper to help promote pursuing ideas if what has been set up

a public policy to create a mechanism for the transfer of the rivers efficient. The most suggested object for this research:

1. Reducing congestion in the city streets.
2. Facilitate the movement as much as possible.
3. The development of transport systems and the speed of citizens' access to their business to gain time

2. Related work

The adoption of certain River transport policy depends on how much they offer benefits vary according to the importance of its elements as necessary. And river transport will reduce the burden on road transport and reduce congestion and traffic congestion and gives a smooth flow of traffic[3-5]. The descriptive method was adopted and descriptive statistical analysis and logical simple to build, evaluate and display some information based on the data and information obtained from the field survey and previous academic research and some of the relevant authorities. The extreme importance of roads and transportation, especially the river and sea, was not the result of urban growth in recent centuries. Rather, since the establishment of cities, it was a major hinge of the city's joints. The roads are the connecting axes and the middle link in urban space design (1, P98) and they give the flow and movement to make the place dynamic renewable and thus acquire urban multiple forms imbued. All works in the city are dependent on the flexibility and efficiency of the movement of transportation and considering it a symbol of the state and a pillar of the personal identity of the place or city, which contributes to determining the intellectual, tourist or heritage character of it[6-9]. The research will focus on the river transport system, which consists of five elements: Modes of transport –the network modes - service facilities - administrative and organizational structures –laws and standards. As the land uses and the socioeconomic characteristics of the sector, the observed traffic properties. Distribution of trips, choose the medium, set the course. This research will assume that river transport will reduce the burden on road transport and reduce congestion and traffic congestion and gives a smooth flow of traffic[10-13]. The center of the capital divided into two parts Karkh on the west side of the Tigris River, and Rusafa on the east of the riverside and in both parts we find modern buildings and on the side of Rusafa there is the Karrada district of narrow streets and the many shops and destination Baghdad residents of the shopping areas of Baghdad.



Figure 1. Al-Ahrar Al-Sinak Bridge

At the beginning of the entry of the small car market mid last century, the streets design capability exceeds the number of vehicles, and that was the era a golden age will not be back concerning the flow of traffic and the convenience of users, it took the number of vehicles growing, that turned in years. a few of the solution to the problem is to add a new problem and the burden of the questions were confusing at hand and since then is how many cars that can be absorbed by the city? What is the growth rate allowed for the preparation of vehicles? (8, P34) Therefore, the trend towards public and river transportation to reduce the increasing demand for private cars has become, and the fact that the massive polarization witnessed in urban centers as well as the bridges that have been established on the Tigris River, has played a role in facilitating the transportation process, gaining great importance, especially when it is linked to main streets on both sides, so the number has increased due to the need of one side. Karkh offered by what commercial center in the Rusafa of goods and services Increased the role of the bridges due to the construction of two bridges fixed two bridge one called Al-Ma'mun Bridge (called now as martyrs) and the Bridge of King Faisal (Al-Ahrar called) in 1935 to activate the commercial movement and spread on both sides of the city, The support of public transport is no longer policy or an important link in the planning, but it became obvious the inevitable cannot be It became the talk now about

public transport policy and within river transport, and how technology and scientifically developed and administratively to rise to the highest possible level, where Pat is one of the faces of the technological frantic race between the developed countries. Source: (11, p32)



Figure 2. Main and subsidiary street network proposed by pool service (11, p32)[14]

2.1. The road network in Baghdad

The reality of networks road in Baghdad is characterized by the following:

1. The expansions got some streets in the period between 1990 and 2003 to increase the number of lanes passage one led to the emergence of congestion in other locations at the end of the expansions.
2. It hasn't implemented service projects to open new streets and expand the existing network, because most of these specific streets on both sides of any building as it is a reality no room to control it.
3. The security situation has added momentum to the road network, as most roads have been closed
4. The traffic momentum throughout the city center led to a decline in the level of service density of roads as a result of traffic, which reached fairly satiated and thus undone highways privacy in a short time because access to them and out of them became requires longer than provided, especially in the Rusafa. As for the dominant characteristic of street surfaces, it is cracks, thinness, and frequent bumps.

2.2. Tigris river

It is one of the two rivers which are going through in Iraq, from north to south in most of the cities of Iraq and illustrates the form of (3) Tigris River path which divides Baghdad into two passes with the most important sectors of the city of Baghdad from the north to the south, where divided sectors important and crowded on both sides of the river, depending on the preparation of the population and of which can be seen the most important sectors of focus and addressing the congestion

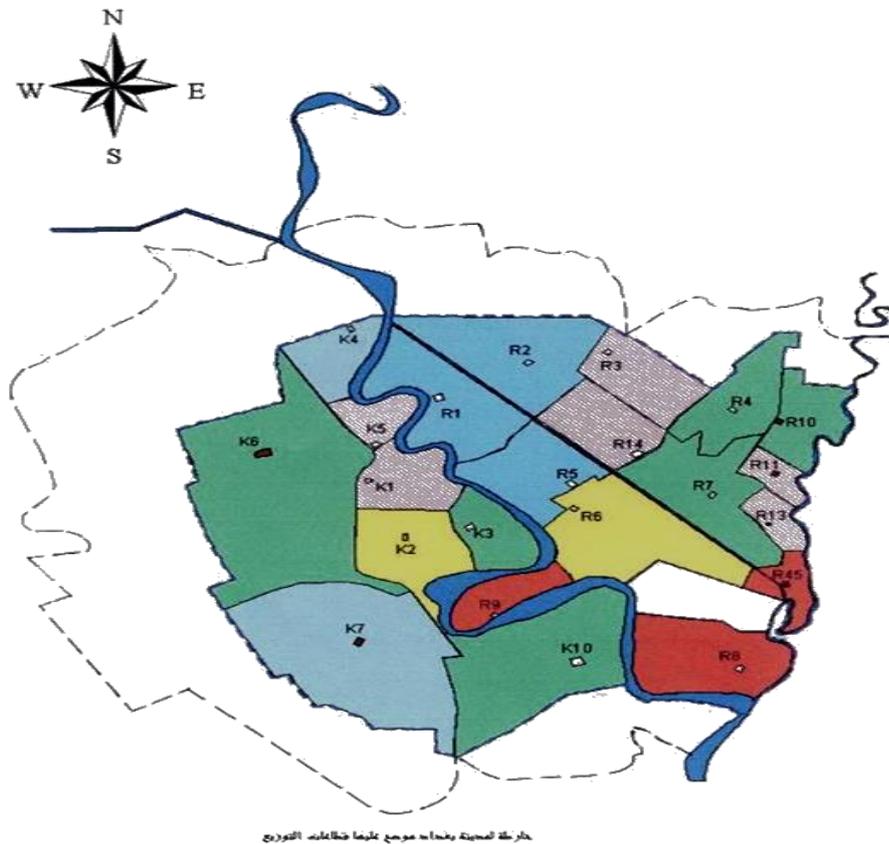


Figure 3. The most important sectors on both sides of the river and the distribution of population in the sectors of Baghdad city on the Rusafa side[15]

The most important sectors on both sides of the river and the distribution of the population in the sectors of the city of Baghdad in the Rusafa

Table 1. A researcher based on device data of the central bureau of statistics and population studies department in 2011

2011 population of	Sectors
843742	Rasafa
670639	Adamaia
1208869	Al-Sadr
869531	Baghdad aljadeda
361515	Karadah
3954296	Total

It is more than the population in the Karkh side and expected the same year, (2484914) million and shown in the table (2) that there is no variation in the distribution of the population in the city.

Table 2. Mention the important items the main and the secondary one was clarified
source: researcher based on device data of the central bureau of statistics statistics and population studies department in 2011

2011 population	Sectors
304612	Karkh
723101	AlKadimiah
523180	Almansour
978396	Aldora
2484914	Total

The Interdependence land has an overlap between transportation and other land uses strong overlap, it can be said that transport is a function of land use Traffic is a land-use function (3, P21). Most transport networks, especially the streets are subject to the movement of a historic change in a relatively less than those exposed to land use for two reasons: -The first reason is that these services are essentially public property which is owned by the state while tracking most of the other privately owned uses. The second reason is that The services provided by these networks are fixed services are primarily to perform the function of transport while leading buildings and other uses multiple functions (4, P27) Therefore, the transportation factor was and still is one of the most important factors that have been affected and affect the creation of new land uses, such as the establishment of residential neighborhoods, commercial activities or industrial activities, and these uses, in turn, increase the traffic of transportation means on the streets that connect it to other parts of the city (5, P17). On the other hand, it is the approved interference between the new methods and new uses, especially residential uses in the periphery, that determines growth axes and directions and draws services behind them, and thus becomes the first factor in the efficiency of dispersion, expansion or centralization in all activities and activities of the city (6, P339). All services are affected and which will be adopted transport policy like any other sector. This vulnerability takes multiple forms that come at the forefront of periods of stability or tension and wars taking place in any country[16], as well as it sets rates for the use of the modes according to the entry-level and purchasing power of the segments of workers[17, 18], employees and other segments. Especially Baghdad, characterized the phenomenon of migration towards accounting for the number of arrivals up to a quarter of the population of the capital sometimes, putting pressure in addition to those cities. Therefore, it is necessary to think of river transport methods that are more responsive to issues of social justice, improving the environment, and solving the congestion problem (7, P51)[19-22]. The urban river transport system consists mainly of five components[12, 23]:

1. River transport modes 2. Networks of these modes 3. Service facilities 4. Administrative and organizational structures 5. Laws and standards. The means of river transportation can be reduced to four types according to what you transfer[24-26]:

1- Passenger transport modes

2. Transport of goods and are addressed in secondary

3. The public and private services media, such as firefighting and ambulance wheels, and other civil defense media or wheels belonging to the municipalities, such as cleaning wheels, garbage presses, and the like, especially such as car lift wheels and construction-related items such as cranes, dumpers, skaters, water tanks or cement transport tanks and mixers ... etc.

4. Means of transportation of fixed services, such as water pipes, fuel, and electric power transmission towers.

All these forms are divided in turn:

A. Interior: What is meant here that it operates within a single city (locally) or the same country. What will talk to him in this regard is the most famous types of modes River transport for people in the cities.

B. External: a regional or international connectivity tools and predominantly commercial and tourist character. It is also diverse and most important types.

2.1. Yachts for public transport

It boats operate on lines similar to regular transport buses work, good work capacity different speeds depending on daylight hours.



Figure 4. France
<http://forum.al-wlid.com/t279736.html>



Figure 5. London
<http://forum.al-wlid.com/t279736.html>

2.2. Water-craft

It is a small motorized boat, including what is special and some of which is dedicated to fare both for transportation or leisure trips and family hiking. And characterized by high speed and be a favorite among the parties to the inhabitants of cities and farmers to market or purchase the needs of transport road transport They cannot like bus modes. That comes to mind its image in the beautiful boats "gondolas" famous in Venice, which is the capital of river transport in the world. These boats can accommodate between 5 to 10 people almost go without a machine manually. In addition, river transport networks

It is areas where traveling modes and include:

- **Navigation channels**

They are rivers and their large and medium navigable branches, and there are two other types of navigation channels are the coasts that use the coasts in cities overlooking the seas and oceans for transportation between cities. But a very small percentage use it for internal transport and it is limited to some longitudinal cities that extend along the coast.

- **Facilities and supplements**

River transportation modes and networks require a lot of facilities and tools that they can't operate directly. All transportation systems must have buildings for the administrative apparatus, starting from the ministry's buildings and ending with the booths and rooms of the monitors in the main garages. Stopping stations: These are small stations or large stations. First used as places waiting for river transport modes are important because they are part of the trip assistant and a factor in the decision to choose the medium type. This is reflected an interest in choosing their first carefully and then choose the shapes and patterns of electronic paintings that indicate the arrival of Alixtat dates according to the numbers and lines using tracking techniques and direct contact. The stations are usually a much wider area than the first parking spaces. It means the process of sustaining maintenance and refueling is no longer a simple matter since their need for services became requires planning and study; To take them into account in the foundation design programs. One of these facilities, most notably is the refueling stations with fuel, in which many aspects to be taken into accounts, such as the compatible distribution of their locations to cover all of the city, location, easy access, and entry and exit and safety requirements in the selection of the site and precautions because of dealing with non-small amounts of fuel in the unloading, storage and distribution as well as isolation from residential areas environmental considerations. Each system must define its controls and reliable standards in construction. These laws and regulations as well as standards are almost universally uniform, but there are details vary and differ from one country to another and from one city to another depending on the demographic characteristics of the city and the constitutive behavior and the general community. It is logical foundations of tables and figures showing ranges allowed or preferred upper values and lower and sometimes optimal for all systems, including the river transport involves two aspects: the first side schematic terms of location and position first (Location and situation) and the number relative to the size of the demand or density (whether population or other) and

absorptive capacity, and beyond that to the number of river traffic police and patrols. The second aspect relates to (the characteristics of the medium or network or origin) self as the number of waterways, dimensions, shape, materials, and methods of implementation, and so forth. The controls and limitations that govern the work of the entire sector, namely the laws:

1. roads and buildings: the road to do the rest of the water uses and regulates land in addition to the acquisition of laws intended for the use of land transport.
2. General Traffic: regulate water traffic and the rights of the road.
3. Other relevant laws that may be in direct contact with the laws of transportation or what matters to it, such as trade or investment laws. It embodied these structures a large pyramid starts with the highest state authorities at the summit and ends with a simple worker at the base and multiple roles between management, planning, control, regulation, implementation, follow-up, coordination, supervision, counseling, statistics, assessment, evaluation, marketing, education, preparation, development, and service. These institutions begin at the Ministry or more to be a link between the trends linking trends transport sector policies with trends of The state directives and coordinates the performance of river transportation in Baghdad and the rest of the governorates. After that comes the role of the directorates of the General Traffic Directorate and the municipalities and their departments and municipal councils at the city level and thus infiltrate and distribute devices between bodies (such as the River Transport Management Authority) and research and advisory centers that include engineering and planning cadres and academic centers such as colleges and institutes of education leadership and modes of transport and the end of the work teams of maintenance and cleaning. In addition to the transportation system that was discussed earlier, planning for transportation operations needs another system of data that explains many of the movement's joints, mechanisms, densities, and spread, and explains the nature and nature of transportation within the city, and the reasons, influences, and motives behind it. And to mathematical models that allow planners to know the priority and importance of these influences and thus build an expected system for a future goal year that depends on the likelihood of their convergence with reality at that time on the accuracy in the diagnosis of these factors and the results of Validity test. It is concerned with studying the current and future characteristics at the level of the entire traffic sector or traffic zone, that is, on the aggregate level. And its relationship with the rest of the sectors.

2.3. Data collection

First, we need to collect detailed information on the distribution of land uses for each sector in Baghdad separately, then their uses for each city, and this is done through the current and future baseline plan, then get to know the social and economic characteristics of the sectors, population density, housing, available and fixed-job opportunities, cultural and social level, and growth rates. Then comes the role of determining river transportation, the level of its services, its speed, its densities, its directions, and its access goals As well as networks, their classifications and characteristics, such as the lengths and travel times traveled between two points in them, the number of stops and interchanges, and their overall proximity to the largest number of housing units and congestion areas (8, P78).

2.4. Data modeling stage

After obtaining the data is entered in a form consisting of four integrated phases to obtain future flight data (in a particular goal). It is the meeting point between the information and physical transportation systems first, and secondly, because it is the stage in which the role of transport planners begins to emerge, and that most often determines the choice of the type of medium. For this, a general classification of trips must be made that explains the reasons for it, as follows: Home Base Trips (HBT):

A- Home Base Work (HBW) business trip

B-Shopping Base (H.B.Sp) Home Base Shop.

C- Social Base Social- Recreation (H.B.S.R.)

D- Home Base Education Trip (H.B.ED).

After knowing the number of expected productive and attractive trips for each sector, these trips are distributed among the remaining sectors to determine the size and nature of their relations with each other. And this distribution process is done in several ways, some of which are based on growth factor methods, Uniform factor, average factor, Furness Method and other methods (59Ipd,) all adopt the principle of Fitting by converting sectors and trips into matrices whose data are identical in terms of the number of attracted and produced trips, in the end by trying and error and for repeated times.

2.5. Stage set the course (Rout assignment): It is the last step that determines which way will cross each transfer mode where knowledge of the total number of future trips

1. The pattern of land use and development in the study area.
2. The social and economic characteristics of the individuals who are doing trips from residents of the area.
3. The nature and degree of effectiveness of the existing transport system in the study area. It is possible to calculate the number of trips generated in three ways the simplest:

A-growth factor: Which imposes the growth rate of the flights will depend entirely on the rate of population growth

B - Multiple Linear Regression Equation Method: -

$$Y = f(X1, X2, X3 \dots Xk)$$

$$Y = a + B1 X1 + B2 X2 + B3 X3 .. + BkXk + u$$

Where it represents (y) the number of future trips and (x) variable affecting the (y) such as the population in the sector or the number of workers per family or other variables. The (a), represents the amount of the effect of that variable associated with it (x) the number of trips (y). Reflect a negative sign and the quality of the positive correlation if extrusive or reverse the advantage that it shows the amount of correlation between the variables and the number of trips (adopted variable) can also find out how much of which random error Representative few important variables or unknowns.

C- method of analysis categories: the latest methods and the most accurate and divide the mini-society sector (zone) into categories depending on the location sector of the city and the number of households and the number of family members, income and percentages for trips and determines the number of trips per household per day and is extracted the total number of flights from knowing the number of flights per the purpose of each family trip multiplied by the number of households within the same category and then combine all categories.

Table 3. The variables included in the linear regression model (resource - field survey)

NO.	Variable	X1	X2	X3	X4	X5	X6	X7
	Trip Expected no.	Family no.	The total person no.	Total person 6 years and more	Boats Expect ed No.	Employer no.	Daily Expected income	Population density person / hectare
1	160	3500	35000	18000	300	600	25000	190
2	140	2400	24000	13000	250	400	35000	160
3	200	3000	30000	14000	290	500	30000	180
4	180	2800	28000	15000	280	480	40000	170
5	250	1900	19000	10000	190	350	50000	140
6	190	2200	22000	12000	220	440	35000	150
7	220	3400	34000	17000	340	700	30000	200

3. Result and discussion

After we had our systems or material and information components competent transport must know the most important methods of evaluation of these systems is divided into two parts: Transport system: in turn is divided into two parts are the other:

Transport media, networks, and accessories: The transportation media, networks, and service facilities such as parking are evaluated, for example, on the basis that they are one system that represents a coordinated traffic system and are evaluated based onFirst: accessibility: in transport studies, this expression is an indication of the distance and time needed to get from one point to another on the individual unit level or sector alike. (64Ipd.). Second: Los (Level of service): It is one of the important tools in the evaluation based on several factors including:

Travel Time: (70Ipd). Frequency It is the time between the departure of other means of transport and other access to the same type.

speed Adjustment: it depends on the speed of the medium and the conditions of the water street (8, p78). Vehicle density (Density): several vehicles on the unit of length in a particular section of the water street.

Capacity: It is the largest number of people possible to transfer a certain distance during a given time under certain conditions of movement without delay or damage or confuse (8, p71)

Y1 depended Variable represents the number of daily trips model year
 X1 first variables (Independent Variable) which represents the total number of households to contribute to the generation of trips per day.
 X2 second variable (Independent Variable), which represents the number of family members generated daily trips
 X3 The third variable (Independent Variable), which represents the number of individuals who could be involved in the generation of trips is 6 years old and more.
 X4 fourth variable (Independent Variable) represents the preparation of compounds generated daily trips.
 X5 V variable (Independent Variable) which represents the preparation of working contributors to the generation of trips per day.
 X6 variable sixth (Independent Variable) which represents the average daily income families to contribute to the generation of trips per day.
 X7 seventh variable (Independent Variable) which represents the density of residential neighborhoods generating trips

The equation will be:

$$Y = a + B1 X1 + B2 X2 + B3 X3 .. + BkXk + u$$

After entering the data as a mathematical model in the SPSS statistical program, the formula for the linear mathematical model becomes to calculate the generation of the required and expected

Daily trips

$$Y = -0.8 + 0.24 X1 + 0.22X2 + 0.23X3 + 0.30X4 + 0.41X5 + 0.10X6 + 0.31X7 \dots\dots\dots (2)$$

R Square (R2) = 91% coefficient of determination for the variance of the dependent variable Y and these numbers represent good confidence limits, as well as the correction factor R, Adjusted (R2) = 87%,

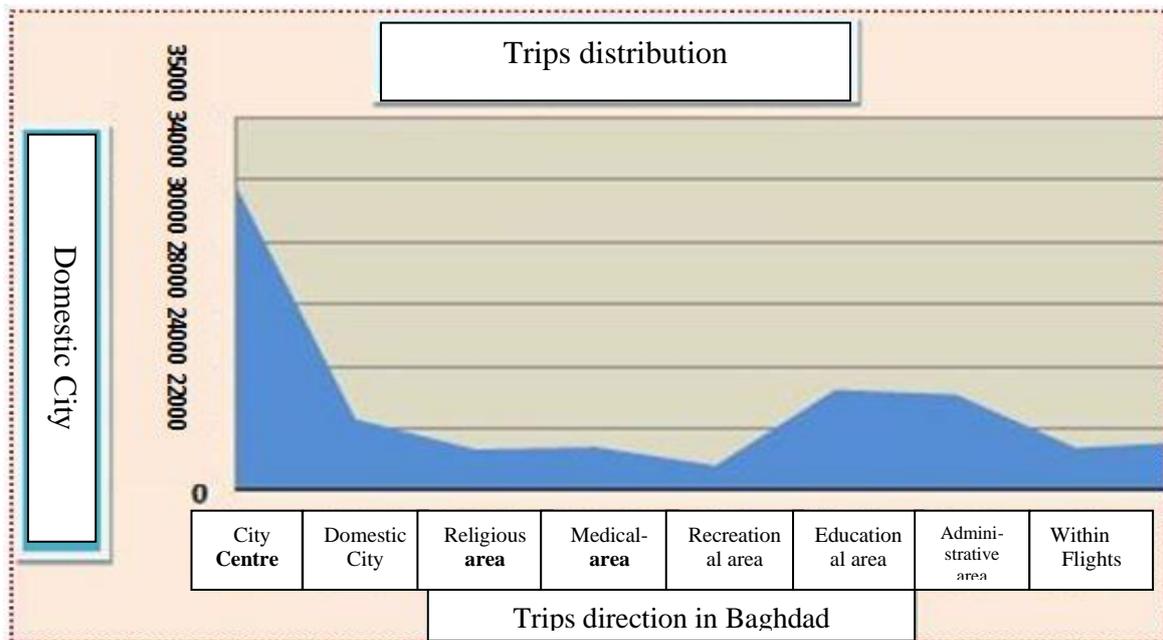


Figure 6. Explain the use of river transport reduces momentum over the rest of the means of transport

4. Conclusions

- 1- As the medium increases (such as river transport, for example), the demand for it increases, and consequently the number of cars on the street decreases, the flow increases, and the process continues.
2. The process of growth and urban development is ongoing so it is necessary to consider the transport policy of the river and the first part is not the last and only within the connected and continuous parts with the continued growth in demand for river transport.
- 3 - As for the choice of course or mediation, an important factor that occurred was the security factor, which had not reached its current levels at the time of preparing this research, and despite that, he imposed himself

strongly on people. As for ease of access, the areas varied for various reasons, including the limited number or frequency of vehicles heading to the area and the distance of the area from the river. 4-it should be the focus on the most crowded areas of Baghdad, which is the Shorja area on the Rusafa side, and you should focus on areas of a religious nature, which are Kadhimiya and Adhamiya, as well as Jadriya near the university, where these areas are considered to have a high population movement.

5 - There becomes a special central body that serves as a mind which is the center of information includes all data on river transport and used in mathematical models and conduct surveys on an ongoing basis and the Center for Management and Coordination.

References

- [1] S. Derrible, *Urban Engineering for Sustainability*. MIT Press, 2019.
- [2] F. L. J. T. U. L. Space, "Books of Note," vol. 19, no. 2, 1987.
- [3] A. Sudmant, E. Verlinghieri, H. Khreis, and A. Gouldson, "The social, environmental, health, and economic impacts of low carbon transport policy: A review of the evidence," in *Traffic-Related Air Pollution*: Elsevier, 2020, pp. 471-493.
- [4] A. Alaidi, I. Aljazaery, H. Alrikabi, I. Mahmood, and F. Abed, "Design and Implementation of a Smart Traffic Light Management System Controlled Wirelessly by Arduino," 2020.
- [5] R. J. Al-Shammari, M. G. Abbas, M. A. M. J. P. o. E. Al Fartusi, and N. Sciences, "The role of event in building the identity of the deliberated language in architecture: Contemporary Iraqi architecture as a case study," vol. 8, no. 3, pp. 1600-1613, 2020.
- [6] Z. Cai, L. Deng, D. Li, X. Yao, D. Cox, and H. J. C. C. Wang, "A FCM cluster: cloud networking model for intelligent transportation in the city of Macau," pp. 1-10, 2019.
- [7] T. Imandasari, M. G. Sadewo, A. P. Windarto, A. Wanto, H. O. L. Wijaya, and R. Kurniawan, "Analysis of the Selection Factor of Online Transportation in the VIKOR Method in Pematangsiantar City," in *Journal of Physics: Conference Series*, 2019, vol. 1255, no. 1, p. 012008: IOP Publishing.
- [8] A. E. Wolnowska and W. J. T. R. P. Konicki, "Multi-criterial analysis of oversize cargo transport through the city, using the AHP method," vol. 39, pp. 614-623, 2019.
- [9] H. F. Khazaal, H. T. S. Alrikabi, F. T. Abed, S. I. J. P. o. E. Kadhm, and N. Sciences, "Water desalination and purification using desalination units powered by solar panels," vol. 7, no. 3, pp. 1373-1382, 2019.
- [10] L. Watkins, S. McGrattan, P. J. Sullivan, and M. T. J. S. o. T. T. E. Walter, "The effect of dams on river transport of microplastic pollution," vol. 664, pp. 834-840, 2019.
- [11] M. Thollon, A. Dosseto, S. Toucanne, and G. Bayon, "Sediment residence time variations in an Alpine river system inferred by uranium activity ratio," in *EGU General Assembly Conference Abstracts*, 2020, p. 6181.
- [12] H. Tuama, H. Abbas, N. S. Alseelawi, H. T. S. J. P. o. E. ALRikabi, and N. Sciences, "Bordering a set of energy criteria for the contributing in the transition level to sustainable energy in electrical Iraqi Projects," vol. 8, no. 1, pp. 516-525, 2020.
- [13] S. I. H. Duha Khalid Abdul-Rahman Al-Malah , Haider TH. Salim ALRikabi, "The Interactive Role Using the Mozabook Digital Education Application and its Effect on Enhancing the Performance of eLearning," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 15, no. 20, pp. 21-41, 2020.
- [14] V. I. Chasovsky, "Investment and Production Cooperation Between the Countries in the Baltic Region: Current State and Problems," in *Baltic Region—The Region of Cooperation*: Springer, 2020, pp. 61-71.
- [15] D. R. Rzaizj, H. J. Al-Jaaf, S. Z. Al-Najjar, Z. T. Al-Sharify, H. H. Al-Moameri, and N. A. Mohammed, "Studying the Concentrations of Nitrite and Nitrate of Tigris River Water in Baghdad and Their Suitability to the Conditions Permitted Internationally," in *IOP Conference Series: Materials Science and Engineering*, 2020, vol. 870, no. 1, p. 012025: IOP Publishing.
- [16] A. M. Williams, "Reliance on Technology and the Increased Cybersecurity Vulnerabilities It Poses to Our Transportation Industry," Utica College, 2019.
- [17] M. A. a. Roa'a, I. A. Aljazaery, S. K. Al_Dulaimi, H. T. S. J. B. o. E. E. Alrikabi, and Informatics, "Generation of High Dynamic Range for Enhancing the Panorama Environment," vol. 10, no. 1, 2020.
- [18] S. Levitsky and L. A. Way, *Competitive authoritarianism: Hybrid regimes after the Cold War*. Cambridge University Press, 2010.

- [19] T. Litman and D. J. I. J. o. G. E. I. Burwell, "Issues in sustainable transportation," vol. 6, no. 4, pp. 331-347, 2006.
- [20] I. A. Aljazaery, H. T. S. Alrikabi, and M. R. J. i. Aziz, "Combination of Hiding and Encryption for Data Security," vol. 14, no. 9, p. 35, 2020.
- [21] E. A. Vasconcellos, *Urban Transport Environment and Equity: The case for developing countries*. Routledge, 2014.
- [22] O. H. Yahya, H. T. ALRikabi, R. a. M. Al_ airaji, and M. J. I. J. o. I. M. T. Faezipour, "Using Internet of Things Application for Disposing of Solid Waste," vol. 14, no. 13, 2020.
- [23] A. M. Saharia, Z. Zhu, N. Aich, M. Baalousha, and J. F. J. S. o. T. T. E. Atkinson, "Modeling the transport of titanium dioxide nanomaterials from combined sewer overflows in an urban river," vol. 696, p. 133904, 2019.
- [24] F. Hjulstrom, "Transportation of detritus by moving water," 1955.
- [25] F. T. Abed, H. T. S. ALRikabi, and I. A. Ibrahim, "Efficient Energy of Smart Grid Education Models for Modern Electric Power System Engineering in Iraq," in *IOP Conference Series: Materials Science and Engineering*, 2020, vol. 870, no. 1, p. 012049: IOP Publishing.
- [26] R. N. Williams, *Return to the river: restoring salmon back to the Columbia River*. Elsevier, 2005.