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UNIVERCITY OF TECHNOLOGY
Building and Construction Department

Congestion

A Project submitted to the building and Construction Engineering Department in the University of Technology in partial Fulfillment of the requirements of the Degree of Bachelor's

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وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ ﴾

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الى من زرع الصبر وعزز الثقة بنفسي

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الى من غمرتني بحنانها وعطفها

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أصدقائي صدقاً واخلاصاً

Chapter One

الفصل الأول

1.1 INTRODUCTION

Congestion is everywhere. It arises in human activities of all kinds, and its consequences are usually negative. Peak demands for goods and services often exceed the rate at which that demand can be met, creating delay. That delay can take the form of supermarket check-out lines, long waits for a table at a popular restaurant, and after-work crowds at the gym. Automobile congestion has myriad impacts, from wasted fuel and added emissions to frayed nerves, more expensive goods, and elevated crash rates. Its clearest impact is delay, or lost time. **(Reference: McGraw-Hill's HANDBOOK OF TRANSPORTATION ENGINEERING Chapter XX. TRAFFIC CONGESTION Authored by Kara Kockelman, PhD CE, MCP, AICP Professor of Transportation Engineering.**

Baghdad city experienced severe traffic congestion. Especially in the present few years, and this normal in the absence of any modern techniques and traffic management studies to relive or alleviate some of the adverse consequences of congestion mentioned above. In the present research a public questionnaire were made for an educational staff in one of Baghdad universities, some important questions were involved in this questionnaire like the presence of congestion places, time spent in the street, the possible reasons for traffic congestion, the volubility of building new interchanges and tunnels in Baghdad at specific locations, and the recommended remedies and solution for this problem. The analysis of answers shows some important points as follows: the grater participant factor in traffic congestion from their point of view is the military check points that separated over the whole city (i.e. Baghdad), and then the blocking and narrowing of many streets in the capital for safety precautions near governmental institutions, in addition to above

reasons the huge increase in the number of cars in Iraq and especially in Baghdad City after the war in 2003. The main solutions suggested by the sample were concentrating on removing or reducing from these check points and reopening the closed streets and bridges.

1.2 Baghdad City as a case study

The daily problem in Baghdad that facing the majority of Baghdad population is the daily traffic congestion during the morning and evening peak hours when they went to their works at morning and when they get back to their homes at evening. This phenomenon is not clearly visible in Baghdad only but also in other major capitals in the world, but most of these cities tries to alleviate from the adverse consequences through the application of travel demand management measures such as providing park and ride facilities, managing the demand for entering the CBD area, and introducing the modern transportation facilities such as metro lines, high speed trains, proving local buses with high efficiency and an obligatory time tables and supply these buses with any addition like air-conditioning systems, internet, and other means that would encourage and attract more passengers to use this type of transportation mode. Figure (1) gives an idea about the congestion in Baghdad. Figure (2) shows a map of downtown of Baghdad. There is no doubt that there is a tremendous increase in the owners of cars in compared with the increase in the population all over the world as we can see from the following numbers, The world inventory of cars, trucks, and buses has been rising faster in percentage terms than the population of human beings in both developed and developing nations. The total vehicle population just about doubled from 1980 to 2000, from 380 million to 752. In the world as a whole, the number of vehicles per 1,000 persons has risen from 36 in 1960 to 123 in 2000. The U.S. number is 778. If the world had one-half the ratio of the U.S., the total number of vehicles

would be 2.4 billion instead of 752 million. It will be moving towards that level as developing nations get wealthier, if they do! There is a strong worldwide desire of people of all types to own their own private means of mobility. It starts with bicycles, and then moves to motorbikes, then to cars. This results from the superior mobility of all these means to the alternatives of walking or public transit. The share of movement by public transportation is falling throughout most of the world. Because selling private vehicles is a profit-oriented business, it can proceed without regard to the availability of roads. As a result, vehicle ownership and use is growing much faster than road capacity throughout the world, even in the U.S. People buy vehicles in hope that they can enjoy more mobility, without having to pay for roads. But roads and transit systems in most of the world are built by governments, which in most nations have incomes lagging behind overall private incomes. And most governments use some of the revenues generated by gasoline taxes for general purposes, not just transportation. So the total supply of road capacity to accommodate vehicles is rising much more slowly than the total inventory of vehicles. One outcome is pressure to finance new roads privately by using tolls to raise capital, mainly in the developing world. The result is greatly increasing traffic congestion throughout the world, especially in developing countries, where the "gap" between rising vehicle ownership and new road production is greatest. Congestion is an inescapable part of large and growing regions. When a metropolitan area becomes really clogged by congestion, this puts pressure on the forms of development. Development is also influenced by the fact that large numbers of poor people in developing nations are moving into urban regions from rural areas. In all regions, people using all modes tend to travel about 1.0 to 1.5 hours per day. Hence there is a premium on living near where you work, or working near where you live, to reduce commuting time. Yet most people need to be

working during the same hours in order to maintain economic efficiency. In regions where a high fraction of jobs are in or near downtown, this creates pressure for people to live near there. So high-density housing is created near downtowns. But the prices of those units rise and cause their occupancy mainly by high-income households, as in London. So many of wealthy in developing nations live downtown or in near-downtown neighborhoods. (Reference: **Traffic Congestion in Global Cities Speech at the Harvard Conference on Global Cities September 6, 2002**

Figure (1) down town traffic congestion of Baghdad

1.3 The need for such studies

There is great deficiency in performing and preparing an integral study that handling the problem of congestion in Iraq in general and in Baghdad the capital of Iraq in specific. This may belong to the critical security situation in Baghdad and the spread of military check points over the main streets and over the main bridges that considers the main points of delay and congestion as we will see in the present research. In the absence of data required to perform traffic and management studies we used a simple questionnaire form includes some important questions relating to the main locations of congestion and the average time wasted in the streets during their morning and evening trips (i.e. from home to work and vice versa), in addition the main reason of congestion from their point of view, and the value ability of building new bridges and interchanges in specific locations in Baghdad. It's worthy to mention that the sample chosen for this questionnaire consists of educational staff in the University of Technology (one of the major Iraq universities in the present time).

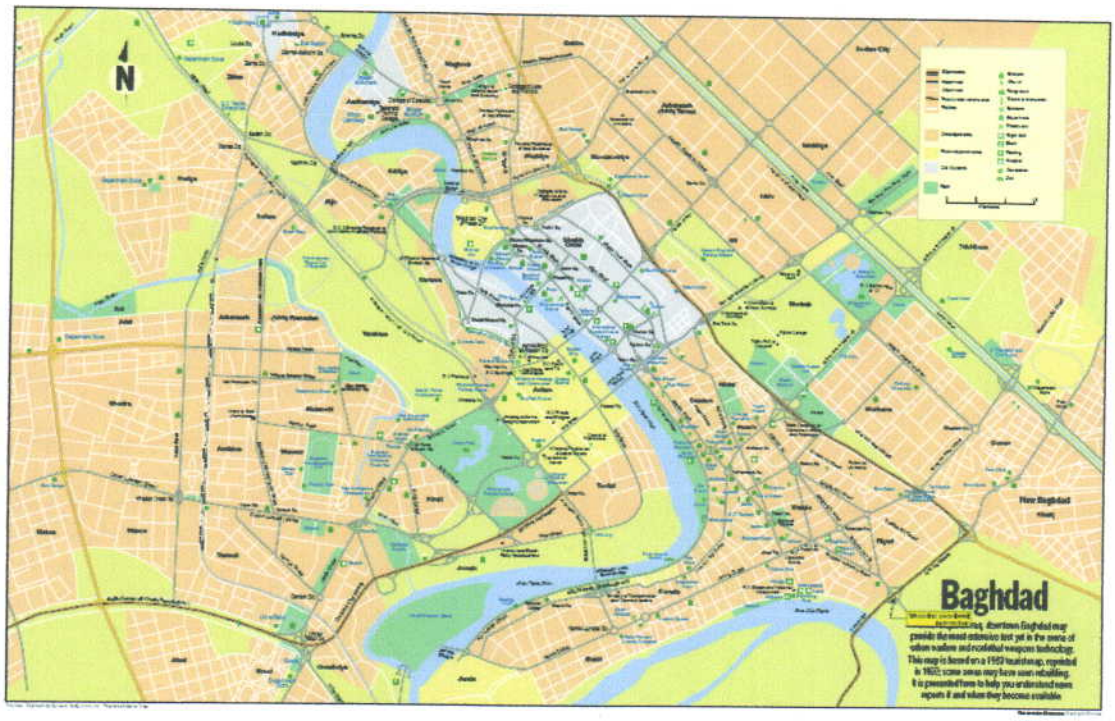


Figure (2) down town traffic Map of Baghdad

Chapter Two

2.0 Introduction

Cities and traffic have developed hand-in-hand since the earliest large human settlements. The same forces that draw inhabitants to congregate in large urban areas also lead to sometimes intolerable levels of traffic congestion on urban streets and thoroughfares. Road traffic congestion poses a challenge for all large and growing urban areas. The full report on which this summary is based aims to provide policymakers and technical staff with the strategic vision, conceptual frameworks and guidance on some of the practical tools necessary to manage congestion in such a way as to reduce its overall impact on individuals, families, communities and societies.

2.1 What is congestion?

There is no single, broadly accepted definition of traffic congestion. One of the principal reasons for this lack of consensus is that congestion is both:

- A *physical* phenomenon relating to the manner in which vehicles impede each other's progression as demand for limited road space approaches full capacity.
- A *relative* phenomenon relating to user expectations *vis-à-vis* road system performance.

Both operational and user perspectives are important in understanding congestion and its impacts. This report does not seek to select one approach to defining congestion over the other; they clearly both have uses when seeking to develop congestion management strategies. Ideally, urban transport policies should be developed on the basis that congestion is related to both:

- The behavior of traffic as it nears the physical capacity of the road system.

- The difference between road users' expectations of the system's performance and how the system actually performs.

2.2 When is congestion excessive?

There are two ways of answering this question.

The first is to say that congestion is excessive when people say it is … but this does not account for what it would cost to bring congestion back down to levels that are tolerable. It may very well be that the cost of reducing congestion to these levels may be much greater than the costs imposed by congestion itself.

A better way of defining excessive congestion is: *when the marginal costs to society of congestion exceed the marginal costs of efforts to reduce congestion (such as adding to road or other transport infrastructure3), congestion is excessive and action to manage it better is warranted.*

2.3 How should congestion be measured?

Measuring congestion is a necessary step in order to deliver better congestion outcomes. However, congestion should not be described using a *single* metric for policy purposes. Such an approach is sure to obscure either the quantitative aspects of congestion or its relative and qualitative aspects. These two aspects cannot be disassociated and progress in managing congestion should be based on sets of indicators that capture both of these aspects. Good indicators can be based on a wide network of roadway sensors but simple indicators based on less elaborate monitoring can sometimes adequately guide policy. What is important is to select metrics that are relevant to both road managers (e.g. speed and flow, queue length and duration, etc.) and road users (e.g. predictability of travel times, system reliability, etc.).

Free-flow speeds should not be used as a direct benchmark to measure congestion policy outcomes. Such an approach implicitly suggests that successful policies deliver free-flow speeds – an unaffordable goal for peak hour traffic in most OECD/ECMT cities

Source: ECMT, 2007.

Urban roads are not built to deliver free-flow speeds 24 hours a day, 7 days a week, 365 days a year. Congestion management policies should not seek to do so either.

Congestion has an impact on both the speed of travel and on the reliability of travel conditions. It is the latter that may be of greatest concern to individuals and businesses. Thus congestion management policies should keep track of travel reliability indicators. These may capture the variance in travel times or, alternatively, communicate the amount of time buffers road users have to include in their travel plans to make their trips "on time". Insofar as these reliability indicators give an understanding of the quality of travel conditions, they are important to policymakers seeking to address the qualitative aspects of congestion.

Equally important, but more difficult to measure, is the task of identifying who is adversely affected by congestion. In cities where citizens have available (and use) quality public transport, *road* congestion may not concern as high a percentage of the travelling public as in cities with low quality alternatives to car use. Congestion can also have indirect impacts not captured by "on-road"-based assessments (e.g. increased inventory holdings by manufacturing and retail businesses in response to increased

unreliability of travel conditions). Many non-road users are also exposed to the negative impacts of congestion. Developing a common framework for measuring the indirect impacts of congestion, the exposure of urban travellers to congestion *across modes* as well as including the impacts of congestion to non-road users remains a significant challenge.

2.4 What should policy-makers know about the causes of congestion?

The proximate causes of congestion are numerous, e.g. too many vehicles for a given road's design or intersection capacity, dynamic changes in roadway capacity caused by lane-switching and car-following behavior.

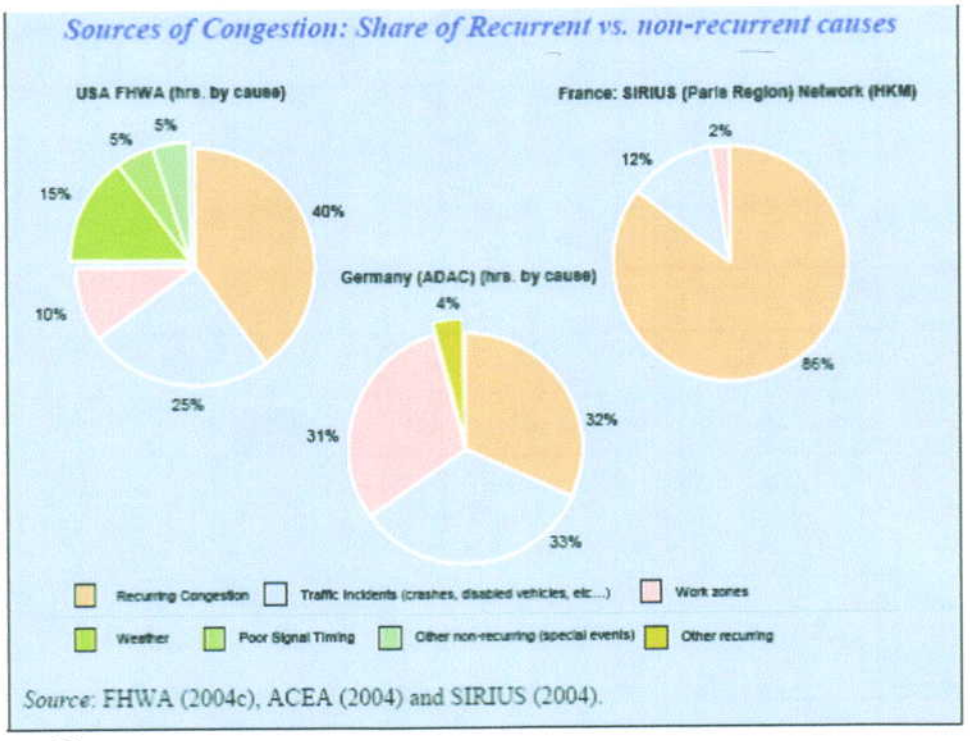
They are also invariably linked to other indirect factors such as land-use patterns, employment patterns, income levels, car ownership trends, infrastructure investment, regional economic dynamics, etc…

Generally, however, we can identify two principal, broad categories of causal factors; *micro-level* factors (e.g. those that relate to traffic "on the road") and *macro-level* factors that relate to overall demand for road use. In this context, congestion is "triggered" at the "micro" level (e.g. on the road), and "driven" at the "macro" level by factors that contribute to the incidence of congestion and its severity. This has important implication for policy since – while congestion takes place on the roads, it is not only, nor necessarily primarily, a traffic engineering problem.

2.5 Congestion is typically categorized as either recurrent or non-recurrent

Recurrent congestion is generally the consequence of factors that act regularly or periodically on the transportation system, such as daily commuting or weekend trips. However, even recurrent congestion can

display a large degree of randomness, especially in its duration and severity. What is also clear from an examination of the causes of "recurrent" congestion across different types of road networks is the extreme vulnerability of traffic to sudden breakdowns as demand approaches the technical maximum throughput capacity on a link or in the network. When roads are operated at or near their maximum capacity, small changes in available capacity due to such factors as differential vehicle speeds, lane changes, and acceleration and deceleration cycles can trigger a sudden switch from flowing to stop-and-go traffic. Likewise, saturated intersections can quickly give rise to queues whose upstream propagation can swamp local roads and intersections.



Source: FHWA (2004c), ACEA (2004) and SIRIUS (2004).

Non-recurrent congestion is the effect of unexpected, unplanned or large events (e.g. road works, crashes, special events and so on) that affect parts of the transportation system more or less randomly and, as such, cannot be easily predicted. The share of non-recurrent congestion varies from road network to road network and is linked to the presence and effectiveness of incident response strategies, roadwork scheduling and prevailing atmospheric conditions (snow, rain, fog, etc.).

2.6 WHAT ARE THE IMPACTS OF CONGESTION AND ARE WE MEASURING THEM ACCURATELY?

Congestion involves queuing, slower speeds and increased travel times, which impose costs on the economy and generate multiple impacts on urban regions and their inhabitants. Congestion also has a range of indirect impacts including the marginal environmental and resource impacts of congestion, impacts on quality of life, stress, and safety as well as impacts on non-vehicular road space users such as the users of sidewalks and road frontage properties. Policy-makers should ensure that cost-benefit evaluations or other policy evaluation methodologies include

an assessment of these impacts as well as take into account broader considerations such as the type of cities people want.

2.7 Conceptual frameworks used to assess congestion and its impacts

There is rarely a uniform conceptual framework for addressing congestion and appraising congestion management policies across the variety and scope of actors involved. Furthermore, there exists a real tension between different conceptual models underlying congestion cost and impact calculations which in turn can influence congestion management approaches. Economic models can lead to the formulation of quite different congestion management objectives from physical models. Generally speaking, ***traditional approaches*** used by road administrations have focused on managing road systems in urban areas in ways that maximize their ability to handle current and expected future traffic demand. Such *flow-based approaches* seek to maximize the physical usage of available road capacity, taking into account other road management goals such as safety. Roads are rated at a set capacity as expressed in flow, density or, synthetically, as "levels of service". Achieving higher flows, higher densities and higher levels of service in keeping with the rated capacity of the roadway has traditionally been seen as performance "improvement". Likewise, street networks are operated with an eye to reaching maximum intersection clearing capacities during peak hour. Such operational approaches are well adapted to identifying the locations where bottlenecks exist. They aim to minimize traffic delays and the associated personal, business and resource impacts including personal and productive time lost, fuel wasted and adverse air quality. They allow administrations to highlight locations where action may need

to be taken to respond to the delays experienced by users on a regular basis. However, approaches that seek to maximize vehicle throughput along major links inevitably take traffic levels into unstable zones and heighten the risks of recurrent and unpredictable congestion.

2.8 Overall costs of congestion

Congestion cost calculations have often incorporated unrealistic assumptions relating to baseline travel conditions. Often, such estimates have sought to determine a total "cost of congestion" by assigning a value to the difference between free-flow travel speeds and speeds actually realized on the transport network – a difference that has alternatively been labeled "lost" time or travel "delay". However, in order to experience such time losses, there must have been a reference situation in which the same volume of travellers undertaking the same activities in the same city could have travelled without any delay at all; including in peak periods i.e. they must have had the additional time in the first place.

2.9 WHAT CAN WE DO NOW TO BETTER MANAGE CONGESTION?

Fully eradicating roadway congestion is neither an affordable, nor feasible goal in economically dynamic urban areas. However, much can be done to reduce its occurrence and to lessen its impacts on roadway users within large cities – congestion is a phenomenon that can be better and more effectively managed. Effectively managing congestion requires both a holistic and integrated strategy that goes beyond the visible incidence of congestion "on the road" and extends to the management of the urban region as a whole. While there are many possible measures that can be deployed to "treat" or mitigate congestion, *there is no single perfect solution*. Congestion mitigation actions are part of the broad and

complex land use, urban planning and general transport master planning process unique to each urban region. Roadway congestion impacts not only road users but all urban inhabitants. Congestion management requires an integrated strategy equal to the scope and scale of the challenge. We would like to mention here three strategic congestion Management principles that should serve to guide policies in this field.

1. Ensure that land use planning, and the community objectives it embodies, is coordinated with congestion management policies.
2. Deliver predictable travel times.
3. Manage highly trafficked roadways to preserve adequate system performance. These strategies will be discussed in the following articles:

2.9.1 Ensure that land use planning, and the community objectives it embodies, is coordinated with congestion management policies.

Many urban regions have found that strongly coordinated transport and land use policies allow them to proactively and beneficially manage the scope and nature of urban travel demand and thus reduce the incidence and severity of congestion. These two fields are quite closely linked in reality – land uses give rise to trip generation and the interplay between spatially distant origins and destinations gives rise to regional trip patterns. However, in practice, many regions fail to co-ordinate long term land-use and transport planning.

2.9.2 Deliver predictable travel times

Congestion has an impact on both average travel speed and travel time reliability – and there is much evidence that the latter may be more important than the former in that people can plan around reliably congested travel but are frustrated by unpredictable travel conditions. Unreliable and extremely variable travel times conceivably impose the

greatest "misery" on roadway users – "misery" which can rapidly be relieved by an increase in the reliability and predictability of travel times and travel conditions. This finding has been supported by studies that have found that the value to road users of reliability is in many cases higher than their values for travel time. Typical measures include planning and coordination of road works, speedy response to defective traffic signals and to disruptions caused by accidents and debris. From the perspective of urban policy-makers, these approaches can be very attractive in that they can rapidly deliver perceivable benefits to road users for a relatively small investment – especially when compared to the cost of new infrastructure whose impacts on overall travel times may not always be perceived by road users.

2.9.3 *Manage congestion on main roads*

At present access to roads is generally unconstrained by everything but congestion itself. Indeed, congestion is a powerful rationing mechanism but one that few would agree is efficient. How might signals of relative road space scarcity other than low travel speeds and unreliable traffic conditions be incorporated into road management and travel decisions? There are many potential congestion management strategies but most falls into one of two categories – those that provide new capacity or free up existing capacity and those that cap, limit or otherwise manage traffic levels on the new or freed-up capacity.

The latter category of measures broadly encompasses three different but related approaches:

- Directly managing the physical access to the roadway through access policies.
- Indirectly managing access to the roadway network and directly influencing road travel to particular areas through parking policies.

• Managing the level of traffic through road pricing policies that target the use of, or access to, roads or urban areas. These approaches are discussed below:

2.9.3.1 Access Management

Access policies seek to restrict vehicle access to certain zones (e.g. historical centers) or to certain road links (ramp metering). In the case of zone-based access restrictions, traffic may be blocked through the use of physical breaks and barriers in the urban road network e.g. through the use of one-way streets and road networks that are structured in such a way as to prevent through traffic) or through traffic bans or permit based systems. The latter require consistent implementation and clear and robust enforcement to bring good results. Traffic restriction zones should be linked to a set of complementary measures to ensure that one single measure does not bear the full brunt of the traffic reduction effort – the provision of high quality public transport, parking controls and pricing come to mind as complements to access restrictions. Access restrictions can be de-facto as in the case where road space is re-allocated for use by public transport and/or public space (e.g. Paris). The reduced capacity serves to deter access to those links or zones.

2.9.3.2 Parking management

Parking management and control is important because it has the potential to modify demand on an area-wide basis yet, despite being readily available to authorities, often seems under-utilized to tackle traffic congestion. Like road-pricing and other demand-side approaches, parking management and control can assist the task of tackling traffic congestion by reducing the demand for travel to the area encompassed. Due to the considerable policy and operational flexibility available, parking control

can also be quite specifically targeted, in the sense that it can be applied on the basis of location and time. Controlling parking may be very effective in restricting terminating traffic demand but any capacity on the roads that is freed-up will likely be filled by through traffic attracted from alternative routes by the improved travel conditions. Parking control will be of little assistance in circumstances where the current demand is to drop off or pick up passengers – e.g. parents taking children to and from school. For these reasons, parking management as a tool for tackling traffic congestion needs to be supplemented by other measures (e.g. access control or pricing) to ensure the desired outcomes. It is also important that clear incentives and dis-incentives exist to ensure the effective enforcement of parking policies

2.9.3.3 *Pricing policies*

Pricing policies include cordon charges such as those implemented in Singapore, London and Stockholm, link-based pricing systems such as have been put in place on certain urban toll ways, and mixed-use toll roads (e.g. HOT Lanes in the United States). All have proven to be effective measures to reduce congestion and manage traffic. While their effectiveness is difficult to question, implementation has proven to be challenging. Equity is a very important consideration. Even if the proceeds of the congestion charges are redistributed to road users, in the form of lower fuel taxes for instance, a congestion charge is likely to benefit people as a function of their values of time. Road users as a group gain but some gain much more than others.

2.10 Deliver predictable travel times

Many strategies can help to improve travel speeds, increase system reliability and mitigate the impacts of congestion. Traditional congestion management strategies can be divided into four broad classes: those that seek to improve traffic operations, those that seek to shift urban traffic to public transport or otherwise reduce the demand for urban road travel, those that seek to modify existing infrastructure so as to increase its capacity and those that seek to provide new infrastructure. Insofar as any of these policies are successful, the practical outcome will be to increase the available capacity of roads (either by freeing up existing capacity or by providing new capacity.

2.10.1 Improving traffic operations

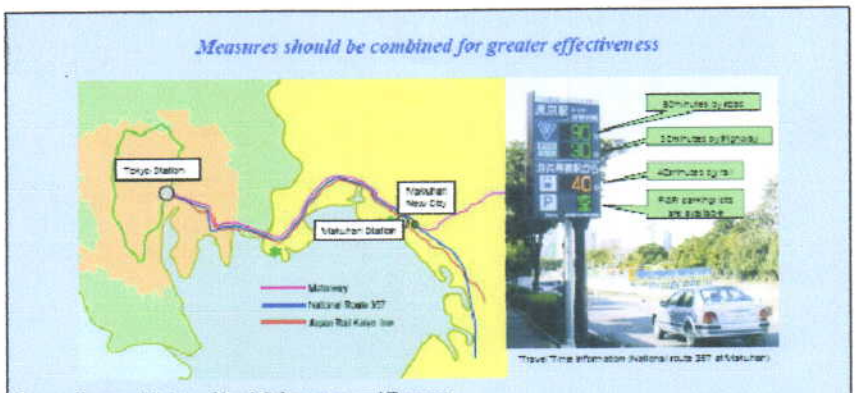
Proactive traffic operations management has much potential. Road traffic information systems, pre-trip guidance, coordinated traffic signal systems and the implementation of dynamic speed and incident management policies have often proven to be cost-effective ways to deliver better travel conditions, allowing users to reschedule their trips away from traffic peaks and /or select other travel modes. These strategies all allow road managers to get more out of roads – e.g. to allow for greater flows than could otherwise be realized. They should not be deployed with an eye to bringing traffic up to the limit of the physical capacity of the roadway as this inherently leads to major instabilities in traffic flow and increased probabilities of sudden breakdowns. In fact, many of these strategies can be helpful in managing traffic such that flows are held below these unstable threshold zones.

2.10.2 *Improving public transport*

Public transport has the potential to transport more people than individual cars for a given amount of road space (in the case of on-street systems such as buses and trams) or without consuming any road space at all (in the case of off-road systems such as metros and surface rail systems). The promotion of public transport remains a fundamentally important congestion management strategy. When public transport provides a quality of service that approximates that which car drivers have previously been used to, it can maintain a high level of access throughout urban areas with a drop in overall car usage.

2.10.3 *Implementing mobility management*

There are numerous mobility management strategies that can, when successful, reduce car use in urban areas. These include ride-sharing,



Source: Japanese Ministry of Land, Infrastructure and Transport.

In the Tokyo region, the combination of ITS, traffic control centres, park-and-ride facilities and public transport allow commuters to make informed decisions regarding their commute options. Here, as travelers approach a suburban commuter rail station and its park-and-ride facilities, travel times by road, motorway and rail are communicated in real-time.

Fig

promoting bicycling and pedestrian travel or supporting mobility management efforts targeting large trip generators such as companies.

2.10.4 Modifying existing infrastructure

There are many approaches that can squeeze additional capacity out of existing infrastructure. These include adding lanes, re-allocating

road space, modifying intersections, modifying the geometric design of roads or creating one-way streets. These approaches can benefit either car users or public transport; however as with operational management policies – these interventions should not seek to bring traffic flows so close to the maximum capacity of the roadway that the probability of sudden traffic breakdowns becomes unacceptable.

2.10.5 *Building new infrastructure*

Building new road infrastructure is often constrained by a lack of space in dense urban cores and is nearly always an expensive proposition even in the outlying peripheries of urban areas. Many cities now view infrastructure expansion only as a last resort. The effectiveness of providing new road capacity as a congestion management "solution" is oftentimes eroded by new traffic demand. However, there are instances where the provision of new infrastructure is an effective policy – especially when subsequent demand for the infrastructure in question is actively managed as in the case of toll roads and HOT lanes.

Chapter Three

3.1 Introduction

As we stated in the aforementioned chapter afield questionnaire was made to get some information about the severity of congestion problem in Baghdad.This questionnaire includes an academic variety with different academic qualification ranges from higher diploma to doctoraldegree. The following articles will emphases on the main out puts from this questionnaire

3.2 The percent of male and females in the sample of questionaire

Figure(3-1) show that % of female is(66.67)% and of males is(33.33%).

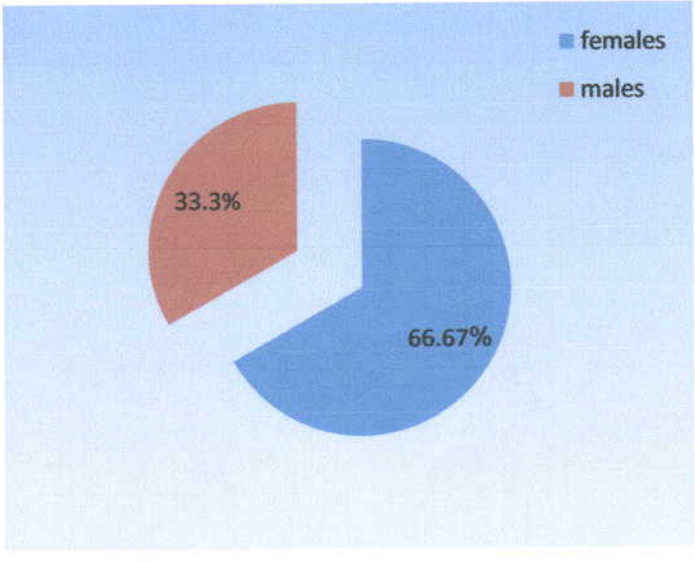


Figure (3-1) Percent of males and females in the sample of questionaire

3.3 Classification of the sample according to their residence location

In order to get more information about the congestion points in Baghdad with respect to their two sides (kharkh, Rusafa). Figure (3-2) show that % of kharkhresident in the sample is(52.38%) and Al-Rusafa resident in the sample equal to (47.60%).

percent

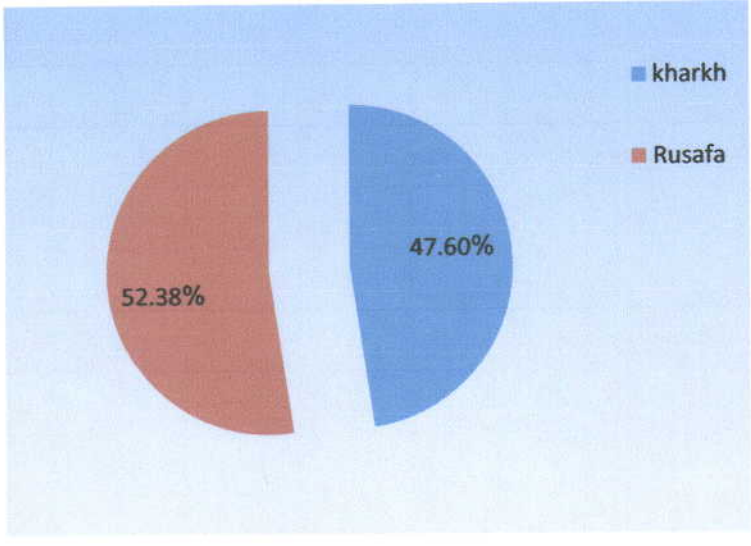


Figure (3-2) Distirbution of the sample according to their residence location

3.4 classification of the questionaire sample according to their work type

Two main types of work were examined in the questionnaire bill which are (governmental, private). Figure (3.3) show the % of each type.

percent

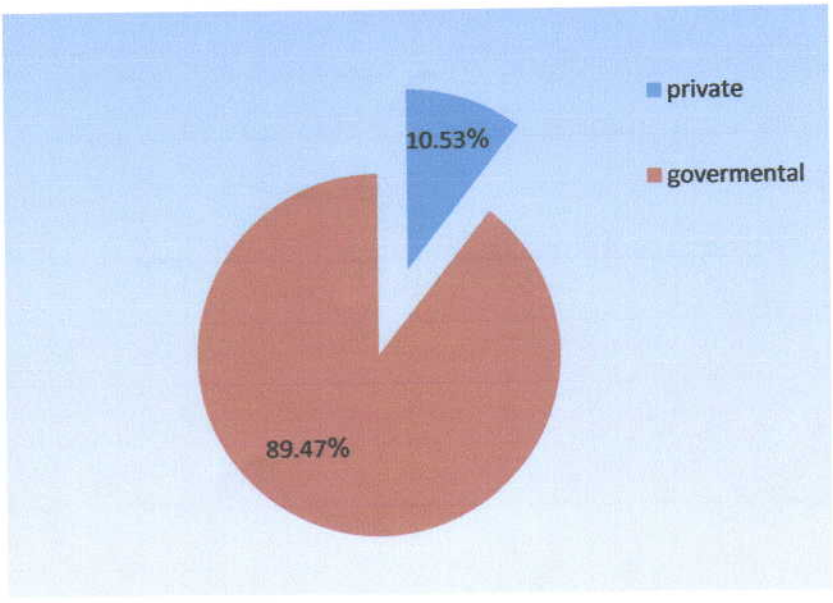


Figure (3-3) Type of work

3.5 Academic achievement

As wementioned above we need to take information from educated people in order to get more ideas that could support the research. Figure (3.4)show the numbers of each degree aachievement

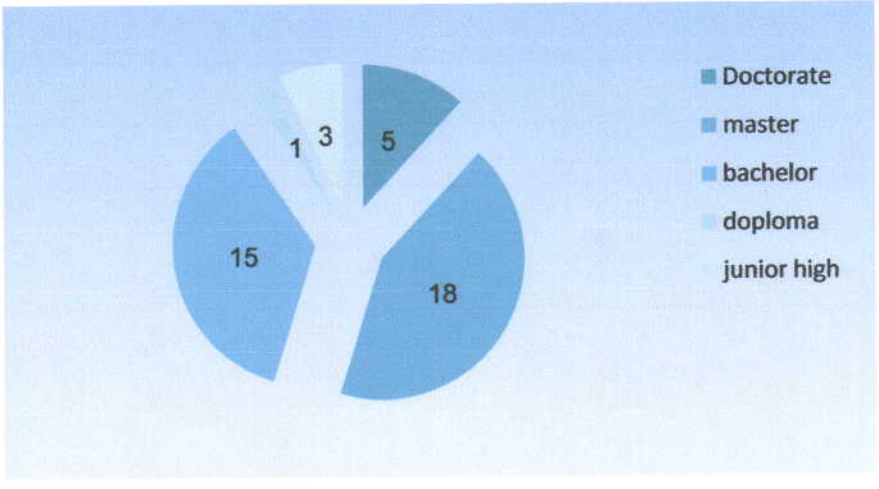


Figure (3-4) academic achievemen

3.6 car ownership

The perat of car ownership was also examinal in the questionaire bill, % of people who was (61.90%), and the % of people dosent have acar was (38.09%). As we can see most samples had at least one car and this belong to the higher income for these categories of citizens.

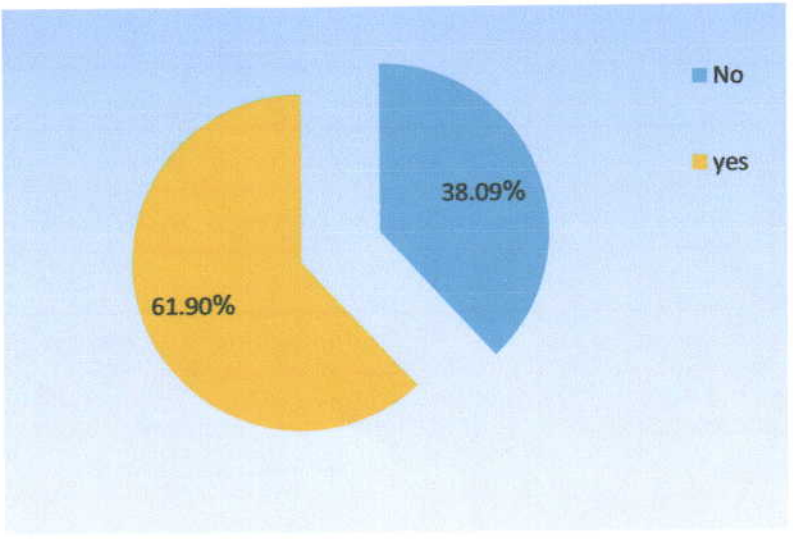


Figure (3-5) car own ship

3.7 transport means used

Figure (3.6) show the distirbution of means used by the questionnaire sample to get to thire jobs daily; we found that % of people who used other mean, such as taxi cars, coaster or buses was (25%).

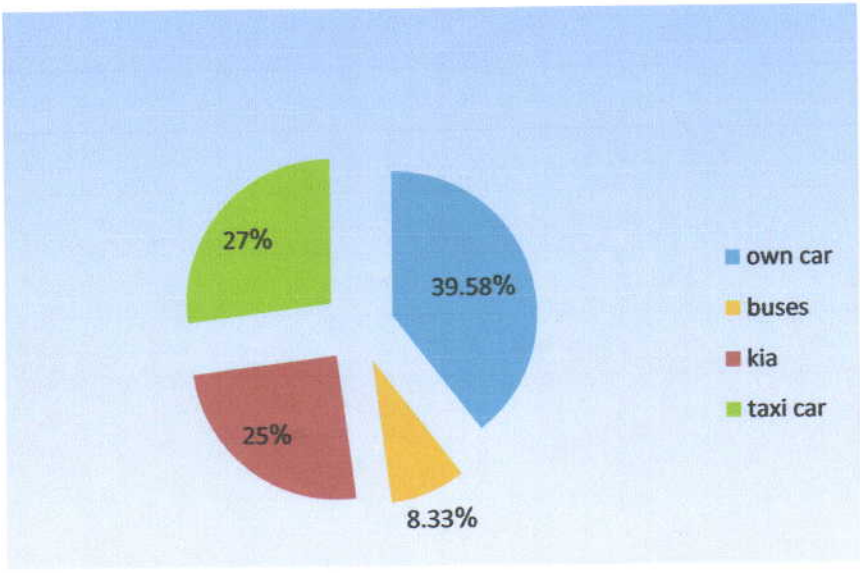


Figure (3-6) Transport means used

3.8 the average time spent daily in street

In the present study it was important to know the average time spent by the road users in the daily trips from home to work in the morning and from work to home in the evening.it is found that % of people need one hour to one house and half was about (40.4%).

percent

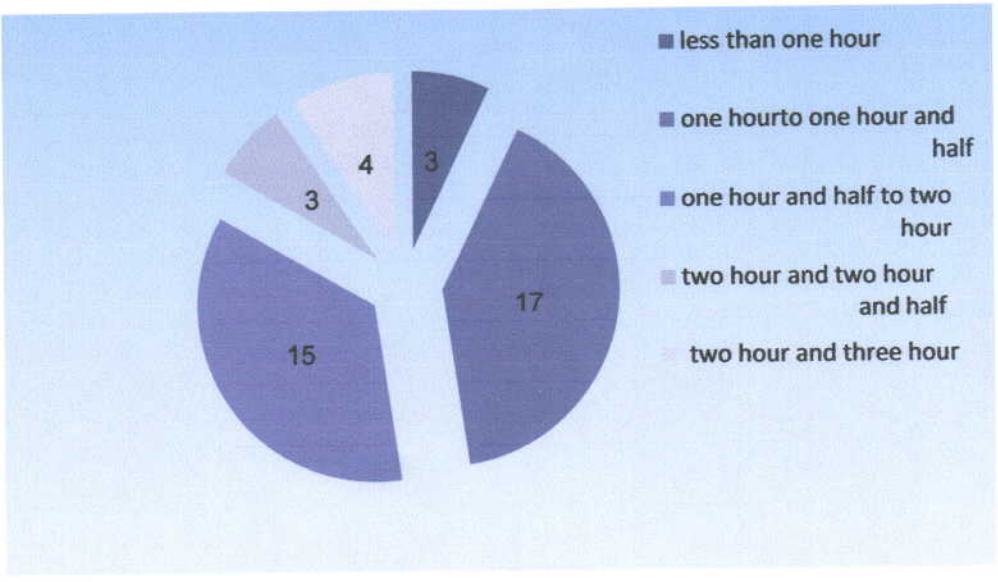


Figure (3-7) the average time spent in street by question asample

3.9the main reasons of congestion

Number of reasons was stated in the questionaire bill and the required by the people is to tick on one or more of the most reasons affecting in the congestion problem. Figure (3-8) show the percent of persons before each reason.

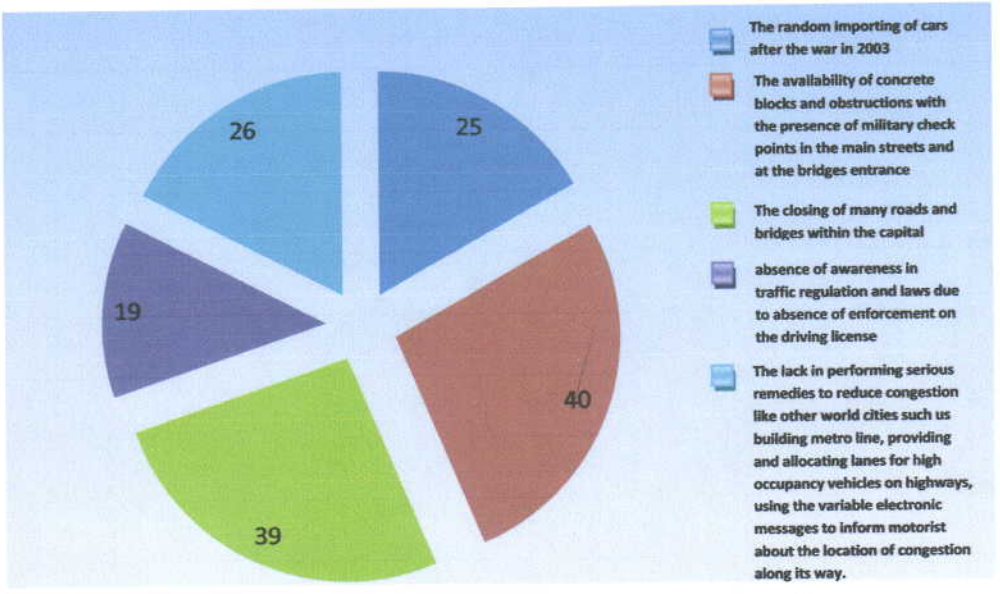


Figure (3-8) Transport means used

3.10 solve the problem of congestion

In the present time alotof interchanges were construction in Baghdad city and there are more them are waiting to be construction in different locations regardless the congestion severity available in these areas. The problem or no. the answer is show in figure (3.9)

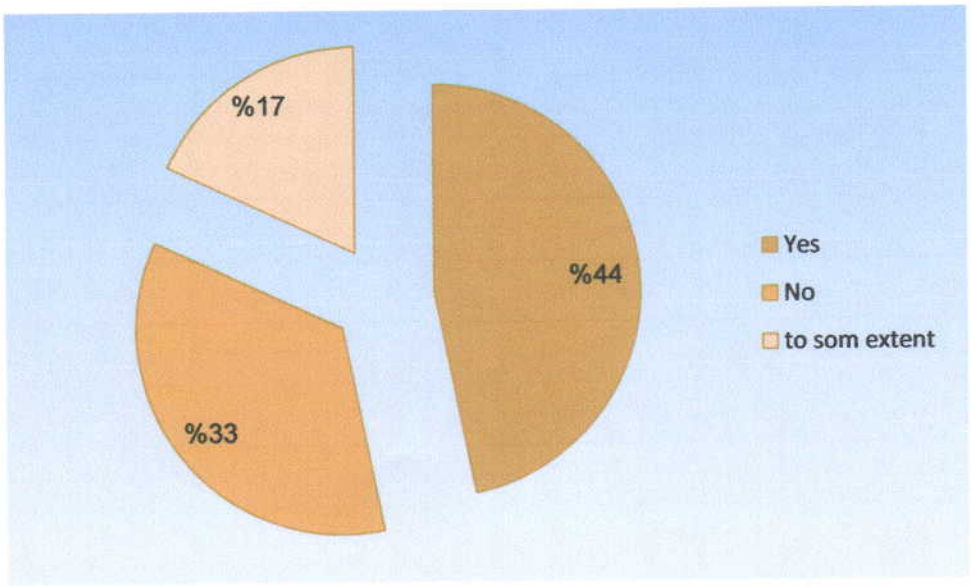


Figure (3-9) does construction the interchanges solve the problem of congestion

3.11 specific locations in baghdad

Some location in baghdad was chosen to take the questionaire sample about the importance of constructing these projects figure (3.10)show the answers of questioun sample interms of (yes,no,to somelegree).

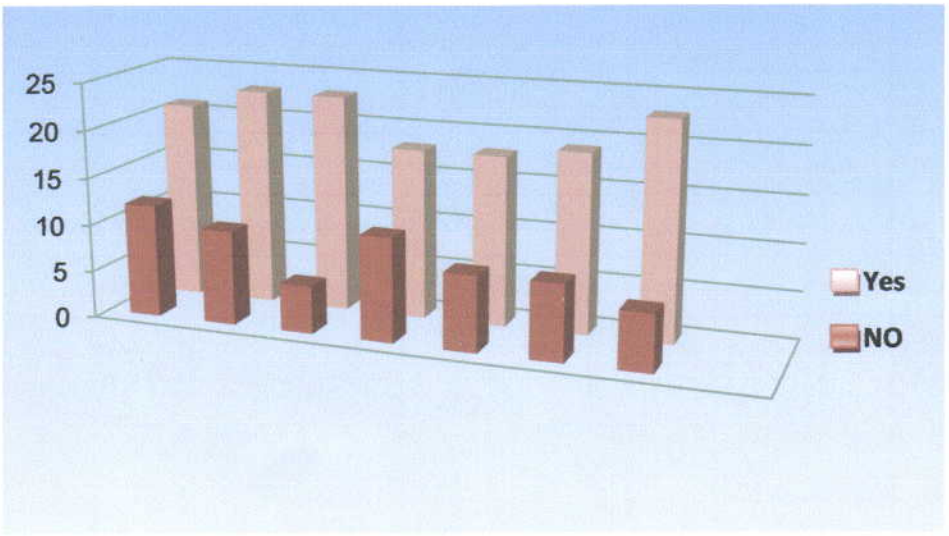
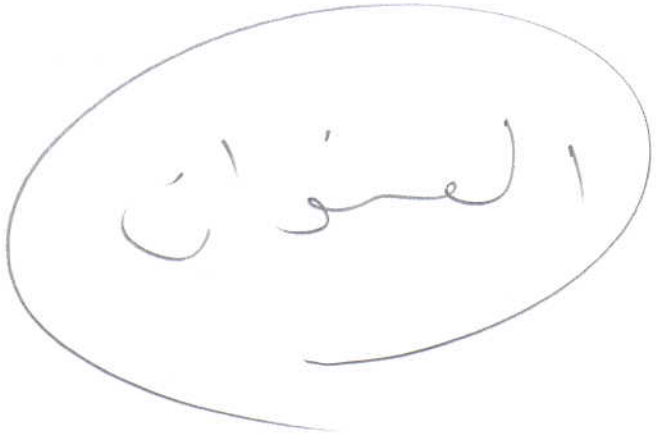


Figure (3-10) the valuability of construction of in terchanges in specific locations in baghdad.

Chapter Four



4.1 Conclusions

The following conclusions can be drawn from the findings of the study:

A. The phenomenon of congestion became the subject no. one in Baghdad citizens daily talking because of its adverse effect on their daily life.

B. There is great shortage by the government towards the transporting of peoples and goods in shorter time as possible with assuring safety, since no major transportation project made in Baghdad since 2003 except some improvement on an existing streets without any serious changes in its geometric features, and starting to build interchanges in some congest d intersection from their point of view (i.e. local government of Baghdad).

C. According to the study the average not less than 40.4 % from the sample for the questionnaire are spending about two hours in the congestion in the work to home and vice versa trips daily, except the additional time when thy go out at evening to get some family visiting or to make some shopping, etc.

D. There is agreement from all the sample of persons that the check point spread in most Baghdad streets is the major factor in wasting time of people and feeling of nervous for most drivers who queuing to leave an existing check point.

E. The absence of modern traffic control systems, and the control on the conflicting movements in an intersection is controlled only by the traffic policeman, he is doing great job in Baghdad intersection equally in the day and night times, though the availability of working traffic signals in some intersections.

F. There is great suffering for employees and students because of this congestion, since they must arrive in specified time, for example the researcher as a case study, my home far about (17 km) from the university I work at, the morning trip takes about one hour and sometimes to one hour and half.

4.2 Recommendations

a) Preparing a transportation studies including all Baghdad streets and districts, this study may get benefit from the ex-studies in this field and may share the universities in putting the plans on both short and long range.

b) Bringing the modern technology in travel demand management measures to reduce the demand on entering the capital in certain times, such as building and construction of park and ride facilities around the outer cordon of Baghdad.

c) The number of cars in Baghdad had increased hugely in the recent years due to opening of Iraq borders for importing hundreds of thousands of cars from different sources by the private sector; this process makes Baghdad sunk in a sea of cars competing everywhere for space or gap intersections and for space in a parking garage if available.

d) The Public transportation is leading the fight against traffic congestion. It reduces the number of vehicles on the road and vehicle miles traveled. To relieve congestion, investment priority must shift toward dramatic expansion of high-capacity public transportation systems, including light rail, heavy rail, commuter rail, bus rapid transit (BRT), express bus services and transit/high occupancy vehicle (HOV) lanes. These improvements must be coupled with targeted investments and better management of the current highway network. Addition of managed lanes,

including high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes. HOT lanes help insure against congestion for those whose trips are highly valued while facilitating full utilization of these special lanes. (Peirce 2003) Fees can rise and fall (for example, up to 40 cts/mile) to keep the HOT lanes flowing smoothly, while carpoolers (HOV users) and transit buses ride free – and fast. Thanks to revenues generated, agencies can float bonds to help cover some of the construction and other costs, or spend the money on other services (such as increased transit service, roving freeway service patrols, and variable message signs with information on traffic conditions). (Dahlgren 2002)

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