ISSN No.: 2454- 2024 (online)

International Journal of Technical Research & Science

CAUSES AND SOLUTIONS OF TRAFFIC CONGESTION OF KABUL CITY

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Abstract- Congestion in big cities has become a headache for transportation and traffic engineers as traffic in the big cities increase drastically than the available infrastructures meet the demand. Congestions affect society in many ways such as development of economic, accident numbers, increased greenhouses emissions, delay, and damages to health of the public. In this paper, intensive studies are conducted to find the causes and their prospective short term, medium and long term solution to decrease the congestion in Kabul cities are presented. The main problems of the congestion in Kabul city are parking illegally, encroachment of main carriageway, insufficient pedestrian facilities, low quality of public transport, mixed traffic traveling on same carriageway, lack of traffic sense, poor traffic control and management, poor maintenance of roads, inadequate drainage facilities, blocking of streets by people, improper placement of advertisements posters, and illegal dumping on roads by different people. The solution of short term, medium and long terms have also been presented in this paper. The application and implementation of these solutions will help to avoid congestions in the Kabul city and make the traffic flow smooth.

Keyword: Congestion, Traffic, Delay, Public Transport, Parking, Traffic Sense.

1. INTRODUCTION

Cities and towns provide comfortable living opportunities to workers in every sector of economy which leads to growing traffic population in the big cities. Employees eager to go by close distance to their working places and try to settle in the proximity of their employments. This trend has created many problems not only the traffic congestion on the roads and the shortages of reasonable living areas but also creating problems for administration to provide them with good quality level of services to the congested population. More often, the urban planners do not consider transport planning while designing the urban planning but when system is going to fail and traffic problems increase, transportation planning arises. Traffic has been increasing in the past few decades in the Kabul city as more and more people have been settling in Kabul city due the worsen security situation in many provinces around the country.

Quick mobility is one of the most important needs of modern society which makes people to use various transportation facilities like private car, bike, bicycle, subways, and so on. However, private car is still the most usable and practical facilities among all city transportation facilities mostly used by people as far as the comfort and accessibility are concerned. In this way, due to population growth in the cities, the number of vehicles in big cities also increases compared to increase in the transportation infrastructures, which pave the way for traffic congestion in the city which become a headache in these days from transportation ad traffic engineers. The congestion creates many negative impacts on the environment such as increasing number of accident, economic impact, and emissions of high amount of greenhouse gases.

2. BACKGROUND

Congestion of traffic on the roads especially in urban areas is a faster growing problem around the globe. In recent years, the problem has often been managed by the managing of the current capacity of the roads instead of the traditional concept of building more and more roads in the cities. This needs capable tools for traffic management and has led to extensive execution of highly developed traffic control systems such as SCOOT, with its many uses for urban traffic management (UTM) [1]. Few cities have extended this means into integrated

systems for the information of traveler and traffic management, such as ROMANSE in Southampton [2]. This can comprise implementation of integrated urban traffic management and control (UTMC) applications [3] such as parking and traffic information, information regarding buses systems and automatic incident detection.

Congestion on the roads of large cities is a headache now for the citizens, which affects the society negatively in many ways [4, 5]. Dealing with mobility issues, people are tended to use Vehicular Navigation System (VNS). Many tools like Google Maps, WAZE, and TomTom are among some VNSs tools providing congestion avoiding mechanism; provide information of fastest routes available for the vehicles [6]. However, safety issues of the drivers and passengers are not considered by those systems, so vehicles may be guided on dangerous routes which may cause robbery, kidnapping, and even murdering [7, 8]. For example, a couple was shot and the woman was killed in the area of Rio de Janeiro, Brazil after being guided by WAZE to avoid traffic congestion [9]. Another example is also has been given in [10] which shows a motorist driving into a street gunfight in Boston, US was the result of the VNS guided system.

Development of an Intelligent Transportation System (ITS) is a proper solution for these problems which flawlessly incorporate various systems, as well as highly developed sensing, processing and communication technologies [11]. To this, Intelligent Transportation Systems works on Vehicle Ad hoc Network (VANETs), which facilitate vehicles to communicate in an ad hoc manner among each other and also with any roadside infrastructure, which can provide Internet access and other special features [12]. VANET enables vehicles to detect unexpected traffic incidents, and warn close by vehicles about traffic risks, guide them on improved way. In other words, VANETs provide sensing and acting platform that paves the way to ITSs delivers their services.

Intelligent Transportation System can detect both mobility and safety issues, enabling them to find out solution for safety and of the drivers and passengers. Unluckily, many ITSs only consider information related to traffic only to recommend their routes [13, 14, 15, 16, 17, 18, 19, 20, and 21] So, These Intelligent Transportation Systems lead to the same safety related problems stated in VNSs.

3. TRAFFIC AND TRANSPORT PROBLEMS IN KABUL CITY

Traffic of Kabul city consists of many types passenger car, slow moving vehicles, animal drawn carts, rickshaws, trucks, bicycles, motorcycles, hand carts and so on running all together in the same carriageway of the city, creates many types of problems. Following are some big problems seen after intensive observation of the Kabul city in the different part and their bad effects on the life of people are discussed. A sample of mixed traffic is given in the Kabul city in Figure 1.

3.1 CONGESTION AND DELAY

As vehicles have been dramatically increased in the last few decades, road space remains almost the same which make most of the roads congested beyond the prescribed level service in standards. Inadequate capacity of roads, heterogeneous traffic, animal drawn carts, hand cart, wrong parking, movement of pedestrians, loading and unloading in the main areas of city, selling on road sides and so on can named as the main causes for congestion. Low operation speed, low level of service, delays on the roads, noise and environmental pollution and many more external and emotional effects are some of the popular and tangible causes of the increased traffic congestion. The current situation of buses transportation is badly affected by the congestion as the scheduling of the buses get worsen. Congestion also increases the energy cost per mile and as well as the operation cost of the vehicles.

3.2 Parking Problems of Parking

Lack of proper parking areas, increased demand for parking in different businesses areas in the city, lack of good parking policy are obstructions to good flow of traffic specifically in the central business areas of the city. Spaces allotted for vehicular movements are currently occupied by the parked vehicles which decreases the width of the road for movement and resulting in the congestion of the traffic, low pedestrian speed, and

increases the accident chances while parking and unparking. Slow moving vehicles most often park near the intersection further complicating the maneuvers for the rest of the traffic. Serious attention is needed for proper parking lots to help in increasing the current situations.

Fig. 3.1 A Sample of Mixed Traffic in an area of Kabul City (Photo courtesy Alamy)

3.3 Encroachment Problems on Carriageways

Occupying the main parts of the carriageway on the urban roads and intersection causes plenty circulation problems for traffic. Stalls and shops use their front areas for commercial activities illegally; buses, vans, taxis, and many more public transport facilities load and unload on the main carriageway; workshops extend the repair areas beyond their rights make problems for smooth movement, and many more kind of encroachments creates bottlenecks situations. Encroachments of main carriageway by hand seller is shown in Fig. 3.2.

Fig. 3.1 Encroachments of Main Carriageway by Hand Sellers

3.4 Insufficient Pedestrian Facilities

Insufficient footpaths pave the way for pedestrian to use the main carriageway of the urban roads exposing them to high risk due to accidents. In many places, roads have widened to some extent by removing or reducing the width of the pedestrian facilities which is not sufficient for the increasing number of pedestrian on both sides of the roads. Even there is a footpath; they are occupied by shopkeepers for their commercial activities illegally. Lack of pedestrian crossing facilities push them to cross the roads unsuitably everywhere on the roads. Conflicts between pedestrians and vehicles in pedestrian crossing places are very dangerous and serious which cause many accidents.

3.5 Bad Quality of Public Buses

The bus fleet operating in the city consists of public and private buses are insufficient and not on schedule which cannot fulfill the demand for the transport of the people. Lack of infrastructures for buses, disordered operation of private buses, lengthy and hectic routes for buses, improper locations of bus stops, and so on are the main problems of the bus transportation system which push the people to use private vehicle and take part in making congestion on the roads. The importance of bus transport is seen in Fig. 3.3.

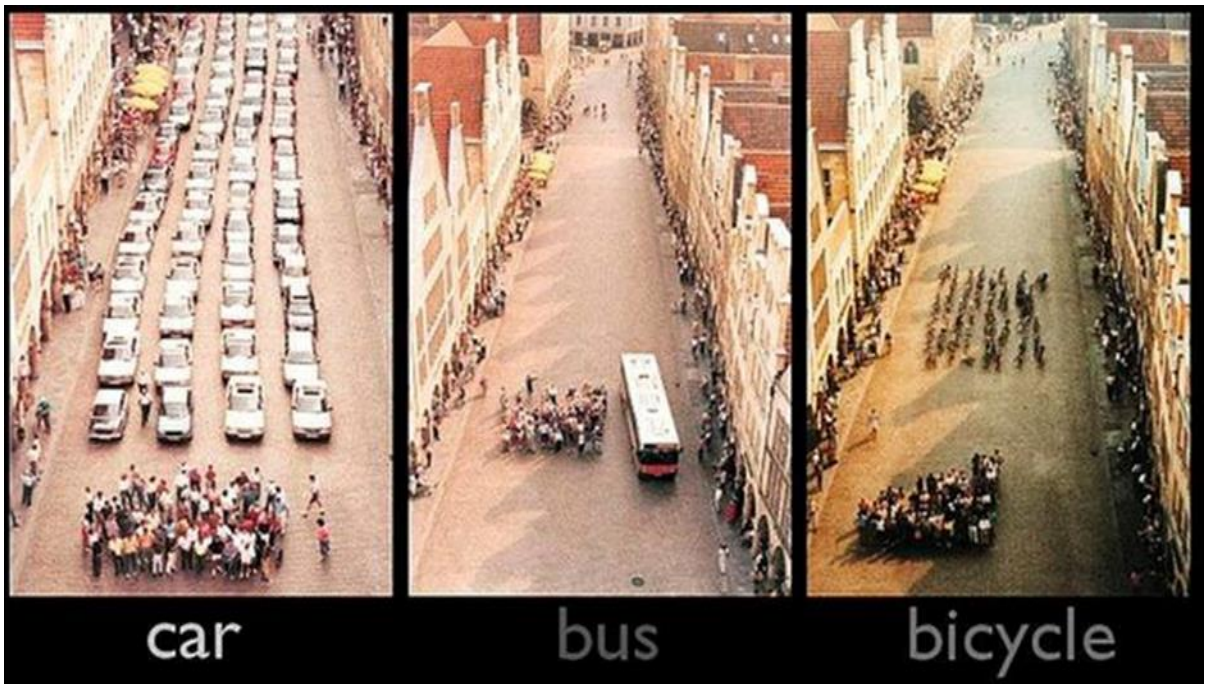

Fig. 3.2 Space Occupied by 60 People for Different Transportation Facilities

3.6 Problems of Mixed Traffic

In many cities and towns, slow moving vehicles and man pulled carts along with rickshaws are of significant percentage in the traffic stream moving on the same carriageway creates unsafe driving conditions for drivers. Slow moving vehicles violate the rules of operation and make the following traffic to slow down their speed and decrease the efficiency of the traffic stream. Large percentage of the population of urban areas is poor and cannot afford private cars and even cannot afford low fares in public transport, they walk or bicycles are used by them between their origin and destination with no separate bicycle track, exposing with air pollution and make them less safe compares to those travel in vehicles. Slow moving vehicles take more time on the road compare to fast moving vehicles which make the facility less efficient and decrease its capacity. Many macroscopic parameters are decreases by the slow moving vehicles in the traffic stream [22].

3.7 Scarcity of Traffic Sense

Drivers and every citizen of a city is responsible to obey the rules and regulation of traffic system but the both the drivers and citizen at all are short of traffic sense. Owner of the vehicles park their vehicle anywhere on the roads side they like and don't care of those people who affect from their wrong parking. Scarcity of traffic sense and knowledge of traffic rules and regulation give birth for many problems in the traffic stream. Violating land driving rules and nonsense driving creates many problems in form of congestion and safety.

3.8 Poor Traffic Control and Management

Undisciplined behavior by roads users, occupying the illegal areas by shopkeepers for commercial activities, wrong parking, and improper crossing everywhere on the roads arises from the lacking of the poor traffic control and management system which affect the road use and safety.

3.9 Poor Maintenance of Roads

The current riding quality condition of the road in many parts of the city is poor and drivers have to decrease their speeds which make the stream less sufficient. Many pavement distresses are clearly visible which seem sever as far as the rating of pavement condition is concerned. Inadequate fund allocation may be one of the reasons which make the current physical condition of the road to remain as it is.

3.10 Inadequate Drainage Facilities

Drainage facilities have not been designed properly in many roads in the city. The effect is clearly seen in rainy days as passenger cars almost get sunken in the stilled rainy water in many parts of the city. The existing drainage system is not sufficient, wrongly designed, or not cleaned by the municipality which paves the way to stand the storm water remains standing on the carriageway of the roads producing many distresses on the pavement surface. Water is considered on the most detrimental factor to the pavement and also dangerous from the safety aspect.

3.11 Blocking of Many Streets

It has been seen in many central areas that most of the streets are blocked by high rank authorities of the government. Poor security situation in the capital make many authorities to block their streets for traffic which decrease the capacity and the traffic has to find another road which increases the congestion.

3.12 Improper Placement of Advertisements

Builders, advertisers often place their commercial posters close to the road, intersections or at the other crucial location of movements which grabs the attentions of the drivers and pedestrians which resulting in many accidents. Attractive posters and sign boards with bright background are dangerous especially in the night and glare vision of drivers can be affected significantly.

3.13 Illegal Dumping on Roads

Many houses located near the road sides dumps their construction waste during construction process and other waste during daily life. These dumps mainly affect the drainage system as most of the drainages are filled with the waste materials and block the way of water to flow, dumps also affects the flow of the traffic as most part of the carriageway is occupied by the waste. There is no agency to penalize such kind of houses though the municipality is responsible for suck kind of activities.

4. USEFUL TECHNIQUES OF TRAFFIC MANAGEMENT SYSTEM (TMS)

Traffic Management System (TMS) techniques are primarily used as the short and medium term solution to improve the efficiency and safety of traffic on the existing roads. TMS helps to maximize the utilization of the existing facilities without negative effect on the environment. These techniques are cost effective. Traffic management involve bringing changes in the elements of geometric design, roads widening, provision of control devices, and imposing restrictions on some movement in some particular locations. Subash C. Saxena presented some useful techniques in his textbook of Highway and Traffic Engineering [23] as follows:

4.1 One-Direction or One-Way Street System

Vehicles move in one direction in One-Way Street System. One direction movement helps vehicle to avoid head-on-collision, increases speed, and reduces delay. This technique is useful in congested areas. The main advantages of the one-way street system are the increasing of the capacity of roads and intersections, avoiding accidents, reduction in journey time, and saving in accident costs. Some disadvantages are also connected with one-way street system like trouble for new drivers to find alternative routes, longer travel distance which increase the fuel cost, increased walking distance for public transport passengers, addition signs of “one way” and “No entry” are needed, and severe accident if happened in higher speed.

4.2 Categorization of Traffic

In order to minimize the conflict and accident of traffic, segregation of slow and fast moving traffic lanes is the best technique to be used. Financial implication and lack of land for widening the road are mostly the problems which prevent the implementation of this technique. Segregation of traffic can be done through one way street, or by providing separate lanes for slow and fast vehicles and as well as for bicycle, pedestrians. Entry of the particular kind of vehicles to be restricted in the particular times can also be the part of the segregation of traffic technique.

4.3 Reversible Traffic Flow

Roads are getting congested in one direction as people are going to job and getting congested back in the afternoon to evening when people are coming back from the jobs. One common solution to this problem is to allocate wider area of the road in the morning for one direction flow and allocate the same area of the other direction in the evening. The allocation of larger area in one direction in the peak hours helps to utilize the capacity of the second direction for the direction which is congested. If alternative way exists for the direction which has less traffic, whole width of the road can be given to the traffic of peak direction.

4.4 Quality Public Transport

Quality public transport is the key factor for traffic management. Improved quality of public transport pushes the private vehicle owners to avoid the using of their vehicles and instead use public transport. Public buses have to be given separate line and good scheduling is needed to maintain sufficient frequency in the stops. In order to grab the attention of people to public transport, it quality can be improved with the improvement of two very key parameters. First, fare of the buses has to be less to be borne by all users. Second, good scheduling is required which make people satisfy and can reach their destiny in their planned time. Beside, separate lane has to be given for bused to avoid them from congestion.

4.5 Streets Closing

In many situations, main roads are joined by number of side lines, creating diverging and merging conflicts thus the movement of the traffic on the main road is affected. It may be in the favor of good traffic flow to close some of these lanes or make the traffic one way, based on suited to the situations.

4.6 Improving Parking Management

Parking on road side is a big problem and must be avoided when vehicle movement on the roads to be given priority. Parking of vehicles should be strictly prohibited on the roads having narrow carriageways. Many measures techniques for parking can be applied in different situations. Time-limit parking during certain hours, long term parking away from main roads, no parking strategy at intersections, action against loading and unloading at main roads, restriction on parking in central business areas, and imposition of high parking fee in congested areas and low fee away from congested areas are some useful measures which can help to reduce congestion.

Apart from the above techniques, driving license should be issued for professional drivers. Traffic signs and traffic signals at intersections are of much importance. Proper design of signalized intersection has to be done to channelized traffic smoothly in rush hours. Sufficient time should be given to the direction having more traffic in peak hours at the intersections.

5. PROPOSED SOLUTIONS

The existing traffic road congestion is mainly caused by the road usage inadequately due to poor traffic management. In order to make the traffic flow smooth and safe and make a maximum usage of road facilities to increase the current capacity as well, appropriate systematic traffic management is essential.

The proposed Traffic management policy and measure will help to achieve smooth traffic flow, decrease the number of accidents, and to make the facilities pedestrian-friendly. The solutions are made in two different stages, first as short term measures, and second as medium and long term measures.

In short term measure, following measures have to be considered to improve the quality of traffic flow.

5.1 Improvement of Bottleneck Intersections

As seen in many intersections exist in built-up areas, it is very difficult to make wider the existing roads. The current traffic bottleneck in the intersections is the major cause of insufficient capacity. It is necessary to increase the current road capacity by maximum utilizing the current facility to decrease delay and long queue during the peak hours. In addition to the traffic signals in intersections, an improvement plan by introducing a widening plan with channelization of traffic is required to mitigate traffic congestion in the most intersections.

5.2 U-Turning and Right Turning Points at Mid-Block

Conflicts between thorough traffic, right-turning traffic, and U-turning traffic make congestion in U-turning and Right-turning points. In order to manage both thorough traffic flow, right-turning traffic, and entering traffic flow, improvements have to be made in the U-turning, and right turning points using traffic signals and other geometric elements.

5.3 Signalization Intersection and Management

As seen in the most intersection, there is no signalized system applied apart from very few though there management has not been done. The traffic sense of the drivers in the Kabul city is very week and it is highly recommended to signalize the intersections in order to avoid congestion in the intersection. Traffic signals management has to be done properly as sufficient time has to be given to the direction which has peak traffic in peak hours. Timing of red and green phases has to be adopted based on the traffic changing on hourly bases.

5.4 Parking Improvement

Most central areas of the Kabul city are densely built-up and many commercial activities take place daily. Due to high concentration of commuters in the central areas in the peak hours, most of the major roads are congested due to business and commercial activities. It seems very difficult in these areas to increase the capacity of roads by widening the roads to meet the increasing demand of the traffic. It is therefore necessary to work on the management of parking systems and their management to allow the commuters to park their private cars safely somewhere aside and to not contribute in making congestion. It is also possible to make two or three stories of newly constructed building as parking if there is not available space in the ground. Private vehicles inflow to the main central business areas have to be restricted using different strategies. Public transport can be given permission in such areas and unrestricted vehicles movement can be limited.

Some other general points to be implemented in short term are given below:

- Driving licenses have to be issued only to professional drivers. Unprofessional drivers can affect the traffic stream badly.
- Traffic regulations have to be taken strictly.
- All drivers have to be notified by different ways to follow the traffic rules and regulations seriously otherwise fines have to be paid by them.
- Stops of and stations of the vehicles and buses have to be constructed and assigned in specific places in order to drop and pick people from there.

In medium and long term plan, two things are very important and will help to solve mangy traffic problems. First is intelligent transportation system and second is quality public transportation system. Both, intelligent transportation system and quality public transport systems have to be given due consideration and sufficient finance resources have to be allotted in order to solve long term traffic congestion and as well as safety problems.

CONCLUSION

Improving the efficiency of transportation systems in the big cities are still a challenging area for researchers due to their complexity level. In this study, most of the congested areas of Kabul city were intensively studied to find the cause of contributions to traffic congestion. Main causes of congestions in Kabul city were found which are named as are parking illegally, encroachment of main carriageway, insufficient pedestrian facilities, low quality of public transport, mixed traffic traveling on same carriageway, lack of traffic sense, poor traffic control and management, poor maintenance of roads, inadequate drainage facilities, blocking of streets by people, improper placement of advertisements posters, and illegal dumping on roads by different people. Short term, medium term, and long terms solution have also been proposed in this article for decreasing the congestion level of the city. Some specific results of the study are as follows:

- Main causes of the Kabul city traffic congestion are parking illegally, encroachment of main carriageway, insufficient pedestrian facilities, low quality of public transport, mixed traffic traveling on same carriageway, lack of traffic sense, poor traffic control and management, poor maintenance of roads, inadequate drainage facilities, blocking of streets by people, improper placement of advertisements posters, and illegal dumping on roads by different people.
- Short terms measures have to be made such as improvement of bottleneck intersections, U-turning and right Turning points at mid-block, signalization intersection and their management, parking improvement, driving licenses have to be issued only to professional drivers, traffic regulations have to be taken strictly, all drivers have to be notified by different ways to follow the traffic rules and regulations seriously, stops of and stations of the vehicles and buses have to be constructed and assigned in specific places in order to drop and pick up people from there.
- In medium term and long term measure, intelligent transportation system and quality public transportation system have to be considered in plan.

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