An investigation of factors affecting traffic flow on urban highways in Pakistan and their remdial measures

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Abstract—Congestion free efficient transportation system plays vibrant role in economic development of any country. Significant traffic increase in recent past years has demanded the implementation of traffic improvement plans in major cities of the Pakistan. Pakistan is a country with very extensive and varied transportation system. In past attempts have been made to investigate the factors that causes interruptions to traffic flow in urban environments. As different cities of Pakistan are changing rapidly, they are facing traffic management problems that need to be address and rectified in time. Peshawar is increasingly transformation into a city of congestion and traffic problems due to mushroom vehicular growth along with lack of expansion in the existing roads infrastructure. The impact of poor traffic management in combination with ill planning causes congestion daily on main routes in the city. As compared to freeway networks, urban networks are; defined by shorter links, intersections control delays and levels of service. Besides this, urban highways in Pakistan are highly congested due to various other factors including unauthorized parking, irregular location, use of unauthorized U-turns, use of wrong-way, predominance of three-wheelers, formation of virtual lanes and illegal business spots. This study aimed to investigate the factors affecting traffic flow on urban highways in Peshawar city of Pakistan and the remedial measurements that are to be taken for improvement of better and sustainable road infrastructure.

Keywords- Congestion, Freeway, Level of Service, Sustainable Road Infrastructure, Urban Highways, Traffic Management, Vehicular Growth.

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1 INTRODUCTION

Peshawar is one of the main cities of Pakistan. It is the Capital of Province Khyber Pakhtunkhwa. Its economic growth and environmental sustainability primarily depends upon the transportation system since it has direct impact on economic development. The impact includes, traffic congestion, travel time delays, high fuel consumption, more air/noise pollution, high road crashes for pedestrians and motorbike riders. The adverse effects of these factors can be reduced to certain limit once the factors effecting traffic flow are identified a congestion relief policy can be formulated where remedial measures can be taken to control the negative effects for the development of mankind.

Traffic congestion is a well-known problem particularly in urban and suburban territories. It affects every class of population in terms of more travel time delays. Unlike developed countries Pakistan, do not have a better control on space utilization and control vehicular growth. In addition rapid urbanization brings more public problems which leads towards drastic impacts upon infrastructure development. Due to unavailability of efficient local transportation system in majority of the cities, mostly the masses prefer personal conveyance. This phenomenon on the other hand is further supporting by soft car loans of different banks schemes resulting in more number of vehicles on roads. The ultimate impact is high fuel consumption and production of more air and noise pollution to the environment.

Since early era of civilization, human race is continuously striving for the improvement of better land communication facilities for both commuter and goods. However, due to proliferate growth in human population at major cities has caused turbulence in traffic management. In past many researchers have done similar work, but due to rapid growth in vehicular population demand more space and facilities. In this research, four main urban highways of Peshawar city are been considered. The primary objective is to identify the factors that affect the traffic flow. The three main parameters which are been selected for evaluation are the road geometrics, commuters behavior and vehicular characteristics.

2 METHODOLOGY

To meet the required objective of research both the Primary and secondary data is used. The secondary data is gathered from different concern government departments, the prominent one includes National Highway Authority (NHA), Peshawar Development Authority (PDA) and Traffic Police KP.

The primary data collection was in cross-sectional format from four main urban highways of Peshawar city. They are Ring Road, Warsak Road, Kohat road and Bara Road. The data collection was through questionnaires, personal observations and detailed field survey. The questionnaires data was collected from mass public, public transport drivers and personal vehicles owners to check the impact of various factors presented in table-1. This was conducted in random format with in the

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stipulated time span of three months. Geometric and traffic data (volume, speed and Parking etc) was also collected on these routes in order to perform quantitative highway capacity

3 ANALYSIS AND RESULTS

To perform the highway capacity analysis the passenger car unit method is adopted [4]. P.C.U for each road section has been calculated from the peak hour traffic volumes, which are present in table-1 and table-2.

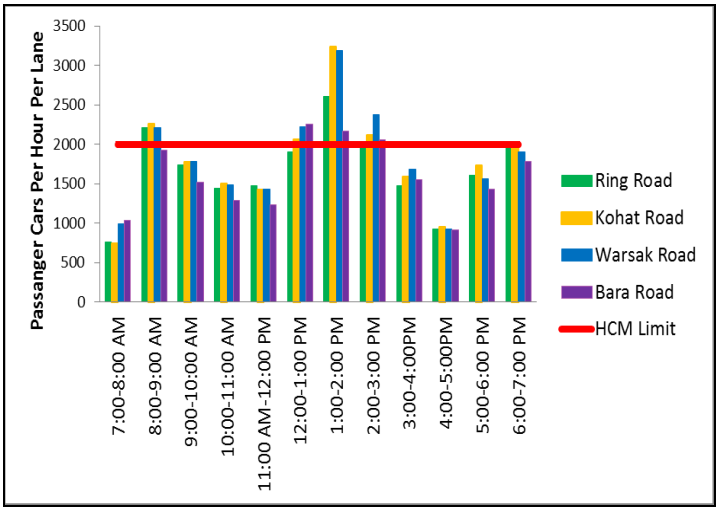
Table 4-1 P.C.U for different vehicle class (HCM 2000)

S.No	Vehicle Class	P.C.U
1	Motor cycle/Rickshaw	0.5
2	Passenger Car/Vane	1
3	Single unit Truck/Bus	3
4	Articulated truck/Trailer	4

Table 4-2 Peak houre volume

Vehicle Type/Road	Ring road	Kohat road	Warsak road	Bara road
Motor cycle/cycle	1600	1440	912	716
Rickshaw/Qingqi	375	200	860	87
Car/Vane/Suzuki	13553	11040	9500	8034
Bus/ Truck	300	290	641	63
Articulated Truck	8	25	0	0
Total No of lanes	6	4	4	4
PC per hour per lane	2610	3233	3185	2167

Figure 4-1 Hourly Traffic Volume



The maximum allowable limit for an urban multilane highway is 2,000PCPHPL by Highway Capacity Manual (HCM2000). It is clear form table-2 and figure-1 that all the four highways have crossed there maximum allowable P.C.U limit in the peak hour.

To check the impact of different factors that affect the traffic flow a detailed survey is conducted. The following observations were recorded with respect to three main domains; they are commuters, road geometrics and vehicular characteristics.

- Traffic Law violation is very common among the young drivers. In many cases they are unfamiliar to the law.
- There is no concept of "right of way" at intersections and roundabouts for turning movements. The formation of virtual lanes is also prominent at intersections.
- The speed limits are not honored by public transport drivers and general public
- There is no concept of pedestrian right to cross the road, furthermore the pedestrians also do not use the overhead crossing bridges and under passing where available, also there is no trend of zebra-crossing
- There is no provision for handicap pedestrians to cross the road.
- In order to make a shortcut to route, the use of wrong way is common specially among the motorbike riders who often cross the road over raised median
- The use of indicator lights are neglected during U-turning movements
- Commercial buses and heavy vehicles are often operated at low speed in the fast lane
- The use of high intensity headlamps beam at night results in enhanced glare effects that limit the visibility range, especially for old and impaired drivers.
- Due to lake of parking facilities the phenomena of on street parking is common, especially near schools, business spots and hospitals that reduces the desired traffic carrying capacity.
- The presence of unauthorized/underage drivers normally causes over speeding and manure sharp cuts in front of other vehicles, which subsequently can lead to road accidents.
- Presence of extremely bad quality public transport provokes car ownership that ultimately results in more vehicles on roads.

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- The surface condition of few road sections are not up to the desired quality, sever distresses are observed on all the highways under observation specially on kohat road where, rutting, potholes, pumping, water ponding and alligator cracking are prominent.
- Due to security reason at police security chick posts mostly a single lane is kept open that also adversely affect the traffic flow
- Except few no separate U-turn lane have been provided for the right turning vehicles
- Narrow lanes have been adopted on few sections of Kohat, Warsak and Bara road with no shoulder clearance
- The drainage system along the highways at certain sections is of inadequate capacity to drain out the precipitation runoff water.
- The U-turns designed are mostly for small vehicles and single unit trucks. There is no intervention for the long articulated truck turning of which cause road blockage
- No proper loading and unloading terminals are available to public transport users
- Blocking of U-turns and roundabouts by traffic police officials for own conveyance
- Mostly the in intersections are un-signalized or with faulty signalization and are manually controlled by the traffic police
- There is no concept of intelligent transportation system that can differentiate the peak hours and peak direction results the commuter frustration.
- There is no control system on over speeding except the use of humps and bumps
- Lake of proper road marking and zebra marking
- Blocking of roads in the name of VIP protocol also results in commuters frustration
- Carrying out the construction activities for road repair work or new buildings also consumes the road area results in narrowing lanes
- The questionnaires data collected from different respondents includes general public, vehicles owners and public transport drivers. A total number of 800 participants were interviewed to rate the most probable factors that causes disturbance to traffic flow.

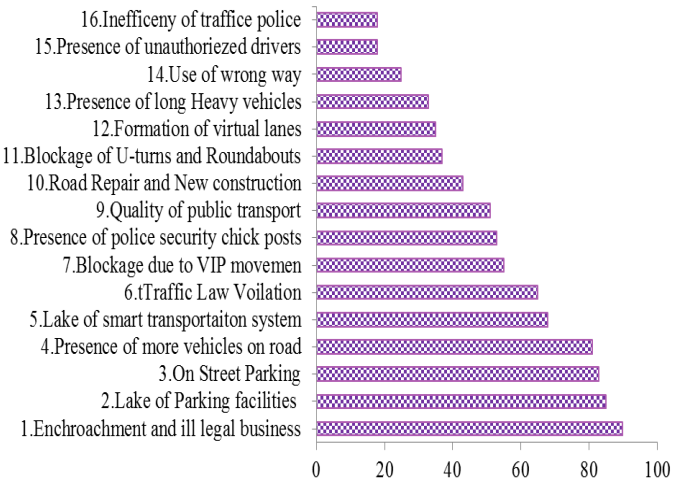

Figure 4-2 Public opinion of different factors that causes disturbance to traffic flow

4 Conclusion

- The highways have crossed the desired limit of traffic during the peak hours due to mushroom growth in vehicular population while no sufficient counter measures are been made in terms of road infrastructure up-gradation to an acceptable level and converting the road user from own cars to public transport system by providing a quality transport system.
- The erratic behaviors of commuters present a unique problem. Disobedience of law, over speeding, wrong overtaking, use of wrong way, formation of virtual lanes, negligence of pedestrians and use of way lane are the common characteristics of commuter's erratic behavior.
- Ill-legal business encroachments, less parking facilities, on street parking, high vehicular population, commuter's law violation, lake of smart transport system and rotting public transport system are the few main factors that disturb the smooth traffic flow.

5 Recommendations

- All the government officials related to transport sector shall be under one umbrella for fruitful coordination and traffic management.
- The government shall discourage car ownerships with heavy-duty taxes and alternatively provide a better public transport facilities.
- Traffic law's implementation agencies shall be empowered with smart system intervention and no interference from political officials.
- Every new commercial building shall be enforced to have its own parking in basement.

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- Educational institutes shall be distributed uniformly through the entire territory.
- Awareness sessions shall be conducted by government officials in collaborations with public and privet institutions.
- Ill legal business and encroachments shall be removed from roads.

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