# Systematized Traffic Pattern-Solution for Multiple Problems: A case study of traffic pattern at selected roads (Shahrah-e-Quaid-e-Azam) in Lahore.

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**Abstracts**

The rapid growth rate in urban population and flow of technologies has fastened the magnitudes and patterns of urban transportation network. The number of vehicles has increased tremendously in the metropolitan areas of the city. Whereas the traffic control involves the attempts to make the movements as fast, efficient and safe as possible with minimum damage to the local or regional environment. This study will create a relationship among travel patterns (individual behavior), transportation facilities (planning and decision-making processes),sustainable economic growth, social well-being, and environmental context of Lahore that forms the basis of transportation analysis and policy decisions in the governmental agencies.

The real challenge comes from alarming inner city vehicle increases in the country.  Recent years have seen an unprecedented growth of traffic in Pakistan. There are multiple reasons for this rapid increase which is greatly evident in big cities like Karachi and Lahore. This has raised a number of concerns and questions for research and modeling of advanced and efficient traffic patterns.This paper is a detail study of multidimensional traffic pattern of Lahore, its issues, flow and intensity; peak congestion hours and periods of extreme pressure at some of the major roads in the city finally ending at a focused case study (Shahrah-e-Quaid-e-Azam). On the basis of systematically collected quantitative data of the sampled main roads, study provides guidelines and policy measures for the government to control this menace. Keeping in view the geographical limitations and socio economic structure of the city, it also suggests remedies to overcome traffic problems. Paper proposes a researched based practicum model to help set an efficient and sustainable traffic pattern. The rationale of the study is to create Vehicle Density History (VDH) for selected chowks at different times of the day. i.e peak, medium and low hours. Once a comprehensive VDH is created, it can help for integrated planning for efficient traffic flow patterns and management.

Keywords:

## Research question and hypothesis

This paper is a detail study of multidimensional traffic pattern of Lahore, its issues, flow and intensity, peak congestion hours, modes of vehicles and periods of extreme pressure at some of the selected main roads like the Shahrah-e-Quaid-e-Azam (Mall road) in the city finally ending at a focused case study of Town Hall and Chearing Cross chowks. How the traffic pressure is lessen with the existing facilities in metropolitan areas of Lahore. The management strategies can only strengthened the resource use and road structures. The higher the pressure of traffic, greater the need for hourly study of the traffic flow to be systematically done and intelligently used.

## Objectives

1. Study aims at providing an authentic data based analysis of the traffic flow along the selected roads (Shahrah-e-Quaid-e-Azam) in Lahore metropolitan areas.
2. To systematise the traffic flow pattern and will help as a guideline for the government departments and agencies involved to control this menace.
   3. Study will also provide guidelines policy measures for the government agencies.
4. Keeping in view the geographical limitations and socio-economic structure of the city, it also suggests remedies to overcome traffic flow problems. This study proposes a research based practicum model to help set an efficient and sustainable traffic flow pattern for the selected areas.
5. To assess the impact of traffic flow on the environmental quality of adjacent localities.

## Study Area

Lahore is the business hub of the Punjab province as well as Pakistan's second largest city in population and economic activities. Most of the population of Lahore is engaged in industry, trade, commerce and other services. This city has lots of large and small-scale industries producing variety of products, railway carriage factory and workshop, foundries, etc. The city has become a business center of the Punjab because of its centrality and catchment. The overall environment of the city attracts the people from all over Pakistan and from the province of Punjab especially the neighboring districts as shown in the Fig 01. The environment of the Lahore is now in serious threat due to the growing numbers of automobiles and small industries.Traffic congestion is the routine phenomenon and feature of the Lahore's life. Sometime it is bad enough to require drastic

control measures.The population density of Lahore in 2008 was 4796 persons/km2. In the same year the number of vehicles per motor vehicle was 7.65 persons per vehicle. There were 571 vehicles per area km2 at that time. In 2006 there were 865 vehicles per road and, it is important to mention here that there were 6618 persons per road kilometer in the city of Lahore(Punjab Development Statistics, Bureau of Statistics, 2006).The traffic flow situation in the city is very poor and is causing multifarious problems for its inhabitants. If this problem is left uncontrived, it will continue to deteriorate and may become a monster in the near future.
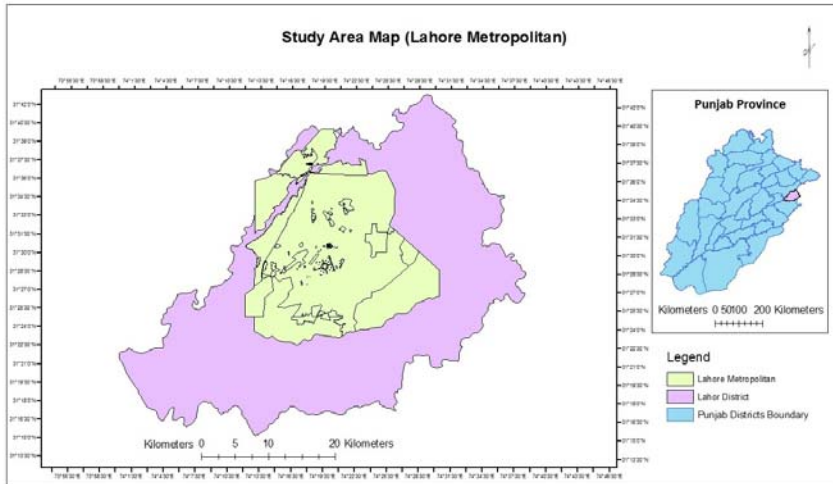


**Figure no. 01. Study area map of Lahore Metropolitan**

Transportation is essential to not only social and economic development but it also improves individual welfare by meeting people's aspirations for greater mobility among places. The high-income countries, which have only 37 per cent of the world's urban population, account for a disproportionately high share of the world's daily vehicular trips in urban areas. Of the 3,400 million vehicular trips taken every day in the cities, over half take place in high-income countries and almost 72 per cent of these are by automobile. The lower-middle and upper-middle income countries combined, accounts for only 21.1 per cent of all vehicular trips and 14.1 per cent of the automobile trips. By contrast, the low-income countries ,which represent 36.7 per cent of the world's urban population, accounts for only 27.2 per cent of the world's vehicular trips and just 14 per cent of its automobile trips in urban areas (Schwela, 1999).Increased motorized vehicle ownership and use is widely viewed as both a source of income growth and enhanced use of this facility asLahore numbers of vehicle data increased.In Lahore motorized transport carries social and economic costs, from simple traffic jams causing irritations and stress to its advance impacts on urban air quality as shown all modes including slow moving in Fig. 03 (a.b).It causes serious public health problems, resulting in 650,000 premature deaths from air pollution in developing countries in 2000 alone

according to the World Health Organization. US and Australian cities are the most extensive in their dependence on the automobiles as compared to European cities which are three to four times less automobile dependent than US cities in terms of automobile use, infrastructure, and land use intensity while Wealthy Asian cities (Singapore, Hong Kong and Tokyo) are eight times less automobile dependent than US cities. However, the Newly Industrializing Asian Cities (Bangkok, Jakarta, etc.) are showing a marked and rapidly growing automobile orientation in their transportation pattern and infrastructure.

As highlighted in Fig. 02that the registered vehicles of all modes showed 13.52% growth with respect to the previous year. This growth rate in registered vehicles of all modes even touched the percentage figure as high as 65.27% in 2003.It is also mentioned that light modes, two and three wheelers are registered in high numbers, which shows maximum numbers of private vehicle ownership in the last ten years. In previous research conducted by Lodhi in 2007 has highlighted that the urban air quality is suffered by vehicle's emission and in that research the diurnal variations of pollutants and traffic density at different geographical locations were monitored during the seasons. The study covered by measuring values on 48 hours basis, one each averaged value for 24 hours and maximum average concentrations were compared with the standard limits. Similarly, such studies also conducted elsewhere, like in Karachi by Arsalan, 2001.
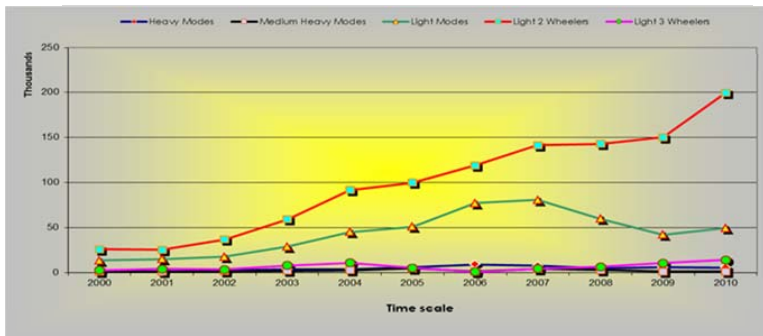


**Figure no. 02.High increase registeredall modes of vehicles in Lahore (2000-2010)**

a.                                                          b.

Figure no. 03.The two wheelers (two stoke engine vehicles) are about half of the total traffic flow of Lahore metropolitan area (a). The slow moving traffic is creating problem for traffic flow during peak hours of Lower Mall Road near Town Hall. This is cause of high amount of emission of airpollutants (b).

## Traffic Flow Counts at Shahrah-e-Quaid-e-Azam (Mall road)

The survey points were allocated (100 meter away from the chowk)for traffic flow counts along the intersecting link roads of the Shahrah-e-Quaid-e-Azam (Mall road) at Chearing Cross and Town Hall. About two to three persons per point were allotted for the counting of each mode of vehicle. The followings are

- Counts were done in 16 hours standard duration. (Peak, medium and low hours)
- Peak Hour implies to the highest traffic flow. School, colleges and office hours.
- Medium hours implies to the business hours and market activities.
- Low hours are the time with relative minimum traffic flow.

## Traffic behavior at Shahrah-e-Quaid-e-Azam(Mall road)

The Mall road is one of the busiest roads of Lahore metropolitan area and generally traffic flow is highest during working/business and school hours. The Chearing Cross and Town hall junctions  are the commercial areas of Lahore, located on the Mall road which links the western part of the city with the newly expanded eastern part. It is also a social as well as services center of Lahore. Educational institutions like University of Punjab (PUCIT), GC University Lahore, National College of Arts and hospitals (Meyo and Ganga Ram) as well as public ( Provincial assembly, Secretariat, Municipal corporation, etc ) and private institutions, shopping center (Anarkali) and banks are located on this road.Shahrah-e-Quaid-e-Azam is two ways with three lanes each and service roads are along both the sides.The road's structure is relatively better whereas the connecting side link roads are two way with two lanes each.

The traffic behavior at Shahrah-e-Quaid-e-Azam junctions in Lahore metropolitan area and following are major findings of the traffic flow count surveys:Total traffic flow counts in Chearing Cross has been observed 478098 vehicles out of which 245417 (51.3%) were fast moving vehicles and 232681 (48.7%) were slow moving vehicles. Total traffic flow counts in Town Hall Chowk have been observed 233946 vehicles out of which 120421 (51.4%) were fast moving vehicles and 113525(48.6%) were slow moving vehicles as shown in Table 01.

| Sr. No | Name of Road | Traffic Volume | | |
|---|---|---|---|---|
| | | Fast Moving Traffic | Slow Moving Traffic | Total Traffic |
| 1. | Chearing Cross | 245417 | 232681 | 478098 |
| 2. | Town Hall | 120421 | 113525 | 233946 |
| **All Roads** | | **365,838** | **346,206** | **712044** |

Table no. 01. Traffic volume at Shahrah-e-Quaid-e-Azam(Mall road).
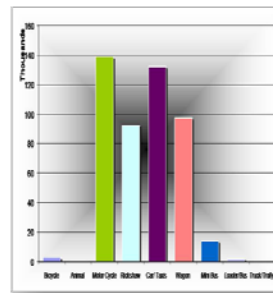
## ChearingCrosss(Upper Mall) traffic flow

Shahrah-e-Quaid-e-Azam is an important road of Lahore which is located in the core area of the city. Its geographical location is connecting the major routes of the city. The Chearing cross is the junction of all the vehicles moving on this road because on this road most of the public and private offices and companies headquarters are placed. So the all modes of traffic are in traffic flow counts are shown in Fig 03 and table 02.

| Location | Fast moving traffic | Slow moving traffic |
|---|---|---|
| Punjab Assembly | 41215 | 38610 |
| Governor's House | 73447 | 70436 |
| Ganaga Ram Hospital | 59441 | 56135 |
| Regal Chowk | 71314 | 67500 |
| **Total traffic** | **245417** | **232681** |

Table no. 02. Traffic flow counts at Chearing Cross.
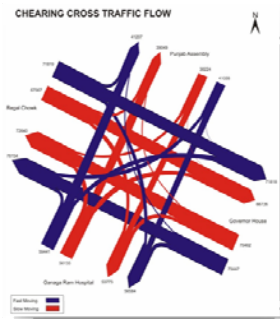


a.                                     b.

Figure no. 04.Motorized and Non-motorized traffic flow (a) and all modes of vehicles at Chearing Crossing (b).

## Town Hall (Lower Mall) traffic flow

Shahrah-e-Quaid-e-Azam is an important road of Lahore which is located in the heart of the city. Its geographical location is connecting the major public and private sector activities of Lahore. The Town Hall chowk is the junction of all the vehicles mostly comprising of all modes as shown in Fig 04 and Table 03. This chowk is located near the commercial as well as educational place of the city. All the public and private offices and companies' headquarters are working on this road, and especially near the Town Hall important public buildings like, secretariat, Lahore Metropolitan Corporation (LMC), Planning and Development office, and some prestigious educational institutions like, GC University, Punjab University and National College of Arts are located.

| Location | Fast moving traffic | Slow moving traffic |
|---|---|---|
| GC University | 33064 | 30539 |
| New Anarkali | 33141 | 32032 |
| P&D Department | 19716 | 18316 |
| Post Master General | 34500 | 32638 |
| **Total traffic** | **90721** | **120421** |

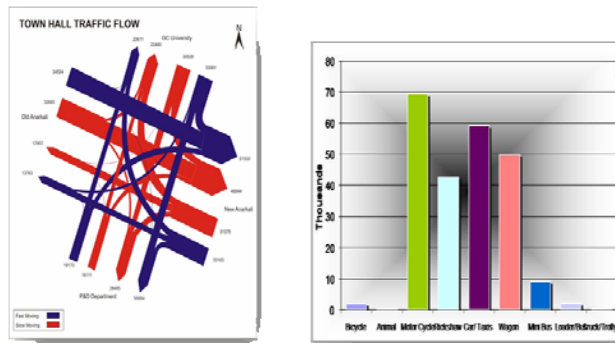**Table no. 03. Traffic flow counts at Town Hall.**



**Figure no. 05.Motorized and Non-motorized traffic flow (a)
and all modes of vehicles at Town Hall (b)**

Transportation is an essential component of a modern society for its demands and desires. There is variety of industries located in the metropolitan area of Lahore and these vary from house hold items to the locomotive. So all the day hours traffic flow remains moderate to highest on the roads.Lahore has witnessed a change on signalized crossings where police has started enforcing lane discipline on major roads. This is a positive step on part of the traffic police, which needs furtherance as to prove to be a specialized body in enforcing traffic regulations, and dealing with violation of sparking laws, and route regulations(Integrated Master Plan for Lahore, Volume II, 2004).The urbanization and industrialization

in Lahore no doubt give incentive to the people in providing jobs and facilities but it causes traffic congestion in the following two ways.

1.  When an industry is established, the employment opportunities are created. People come from various quarters of the city as well as from areas outside the city to earn their livelihood and fill the job opportunities. The population grows in response to opportunities and the tragedy of the less developed counties is lack of proper planning, which causes traffic problem.

2.  Besides this, another aspect of industrialization is that industries and factories need raw material for the production process. After the completion of production process, the finished products are transported to the urban areas. For such transportation of raw material and finished products, vehicles are needed. This increasing number of vehicles of all modes causes traffic congestion.

## Systematized Traffic Pattern

The systematized traffic flowpattern provides all facilities to the community at door step. In this way, the city can produce less damage to the environment by using public transport system, as compared to the private transport (cars, motorcycles, Rickshaws,etc). A systematized traffic flow is facilitating a trip from an origin to a destination taken primarily to accomplish some purpose at the level of the individual traveler or goods movement.The urban mixed land use will receive less pollutants when there will be cluster development compared to urban sprawl. This kind of development of city manage 40 to 50 percent less vehicle movement because it requires less travel for school, work place, or other activities and as a result there will be less vehicle trip and less air pollution.Transportation is the facility for the people and all roads must be laid out in such a way that brings traffic from all quarters to a city central crossing point.In ametropolitan area, transportation is the aggregate of thousands or, in many cases, millions of individual trip-making decisions. These decisions result in vehicle and passenger trips during specific time periods (e.g., peak-hour travel flow).The characteristics of these traffic flows are basic to an understanding of transportation(Meyer, 2001).The traffic flow count survey has indicated that due to the movement of all modes of vehicles; create unhealthy impact on the environmental condition of the metropolitan area of Lahore. The slow moving and private owned vehicles have an impact in the form of gaseous pollutants on the environment as shown in the Fig. 03 and which is dominantly, be contaminated in the air due to the emission of vehicles. The highly concentrated zones are the areas of main road crossings and the hotspots of Lahore. The high contamination of air pollutants is foundwhere the traffic density is highest in the city. Most of the traffic densities are concentrated to the north western, western and south western corridors of the Metropolitan areas of Lahore. The above mentioned major roads are also linking Lahore with the hotspot areas especially Minar-e-Pakistan, BhattiChowk, ChouburjiChowk,

YateemKhanachowkand MutanChughiwhich are the exit and entrance points of Lahore and this road is also links other important cities of Punjab with Lahore city.

## Results

This is beyond the limits to think about the quick solution of the problem. It is time to resolve the issue with environmentally safe landscapes within the city of Lahore.The urban sprawl would be analyzed in regional context, not in local scenario of Lahore. The residential expansion and development, services extension, and social welfare facilities are the future concerns of the metropolitan area of Lahore and these should be managed and planned by all the stake holders both in public and private sectors. All these are linked with frequent and modern network of vehicles or public transport facilities. How we can resolve our problems related to the environmental degradation of the city only by using cleaner technologies for vehicles, managing the resources, cleaner and green fuel for vehicles, aesthetic urban living, green economy and mass transit system in the city. The mixed land use can only be possible by a sustainable management system for every land use pattern. We must ensure our social and political will for taking decisions apart from special interested groups. For example, heavy vehicles (trawlers, oil tankers and trucks) are the major source of air pollution but due to certain political or other pressure groups these companies as not obey the environmental rules and regulations and most important, the time of delivery, because most of them are delivering these items during peak hour of the traffic flow in the city.

- It is observed that almost 50% of the total traffic flow is non-motorized(Slow moving, two wheelers and three wheelers).
- Maximum non-motorized traffic is during peak hours resulted into slow traffic flow.
- VVIP and VIP movements are monitored due to Provisional Assembly, Educational Institutions, Public Places, Parks, Hospitals (public & private), Government departments. Markets, Business offices are mostly along Shahrah-e-Quaid-e-Azam (Mall road).
- This is a place where maximum daily people movement occurs due to the availability of the basic amenities and business services which leads to a higher flow of the motorized and non-motorized traffic.
- Parking is the major issue of Shahrah-e-Quaid-e-Azam (Mall road) and create big hurdle in traffic flow.
- High concentration of the two, three and four wheelers during peak hours of the traffic flow.

## Solutions

1. Mass awareness is needed for traffic discipline and road safety, this will result in an improved road sense among the users. For example, congestion at

intersection could be avoided to a certain level by public themselves if they could restrict and commit themselves to form queuesaway, instead of closer to intersection or right in the middle of the intersection. The proposed routine if exercised would improve the traffic monitoring system of the Lahore metropolitan areas. The culture to follow the regulations be promoted and it should be highlighted to the masses that laws are made for their own safely and convenience. The usefulness of the concept of lanes would not only help the users, but planners as well. For example in the present situation, a planner not applies the concept of queuing theory on our traffic system owing to sheer indiscipline and the nonexistence of the lanes and subsequent vehicular queues.

2.  Traffic flow is just like a stream of water that once discharged into a conduct has to make its way through to the other end. However, unlike water, traffic slows down when its path i.e. the capacity is reduced. This is where the traffic engineering techniques which are the responsibility of the Traffic Engineering & Planning Agency (TEPA) to design a system that aims at maintaining the flow under the given circumstances at optimum operational level.

3.  Separate lanes for slow moving and fast-moving vehicles avoid emission of the pollutants.

4.  It is revealed from the study that the traffic flow has an impact on the environmental condition of the area. It is evident that the maximum polluted areas are the hotspots of the area of metropolitan Lahore.

## Recommendations

## Short Term

- Segregated (systematized) traffic flow on the basis of body type i.e.  Loaders, Delivery Vans, and Mini Trucks should be diverted towards medium or low hours
- Perishable and baking deliveries to be given in the early morning low hours: 4am – 6am
- Regular deliveries (regular supplies: food items, flour, garments, grocery items, medicines small scale factory materials to be done during 10am – 12noon OR during 3pm – 5pm.
- Time differences in educational institution and offices.
- Distanced pick and drop.
- Animal or slow moving vehicles.

## Long Term
- Mass transit system is the only solution for the Lahore metropolitan area.
- Public transport as the major mean should be encouraged.

- Car pool should be encourage at community level.
- Educational institutions/Public hospitals should be encouraged to provide mass transport facilities.
- Public and private institutions especially educational institutions must have their own parking places.
- Over heads and under passes to be constructed on the top congested public crossings/hotspot areas.
- Separate lanes for the non- motorized traffic.
- Phase out gradually private cars carrying smaller number of people.
- Urban planners must consider that educational institutions should be located away from hospitals, public places and the roads with heavy traffic flow.

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