IDENTIFICATION AND ANALYSIS OF A SUSTAINABLE SYSTEM OF ROAD TRAFFIC PATTERN IN LAHORE CITY

A. I. Mirza, S. J. H.Kazmi[1] and S. A. Shirazi[2]

Department of Geography, GC University, Lahore
[1]Department of Geography, University of Karachi, Karachi
[2]Department of Geography, University of the Punjab, Lahore
Corresponding Author E-mail: iqtadarmirza@yahoo.com

ABSTRACT: Rapid growth in transport sector increases energy consumption which led to greenhouse gases emissions in major metropolis cities of the world. In Pakistan the transport sector is growing fast with the increase in urban population while in the city of Lahore the urban transport traffic has one of the highest growth rates in the country. The city managers have to plan transport strategies and design programs to manage the increasing urban dweller's transport demand, traffic flow, and a systematized traffic flow pattern. This research has conducted a study on sustainable traffic pattern of one of the busiest road of the Lahore metropolitan area keeping in view of the major problems of the city e.g., high density in population, traffic bottle necks, and hotspots of air pollutants. The data available in the relevant departments are not fully analyzed and managed. The purpose of the study is to conduct traffic count surveys and to monitor the existing situation of the hotspot areas of the Lahore metropolitan a case study of Multan road. The resultshavehighlighted the road capacity in the context of western corridor of the Lahore metropolitan area and to assess the effect of slow moving vehicles on the local environment. The problem is further multiplied with the inefficient, incorporated, and poor policy management system in the government agencies. The study has highlighted that a thorough transport monitoring system based on regular traffic counts of the hotspot areas of the city must be installed. In order to achieve the sustainable urban system, the transport system must be developed to shape the sustainable condition of the city of Lahore.This study will develop the guiding principles in urban transport network system, modes of vehicles and their impact on theenvironmental quality of the city.

Key words: Urban Transport,Sustainable strategies, Traffic pattern, Traffic flow counts, Bottle necks, Modes of vehicles

INTRODUCTION

Transportation facilities has revolutionised our life in a number of ways but on the contrary it carries social and economic costs, as well as environmental imbalances. The three primary drivers leading to increases in the world's vehicle fleets are population growth, increased urbanization and economic improvement. All three trends are up, especially in developing countries (McGranahan and Murray, 2003). Increased motorized vehicle ownership has led to the emergence of complex traffic patterns leading to congestion and problem to the population of the city. The transport system of Pakistan is extensive and varied, with considerable investment in the transportation infrastructure in recent years with unprecedented growth of traffic. National Highway Authority has been developing a network of modern motorways that connects nearly every major city in Pakistan. Road transport is the backbone of Pakistan's transport system. Over the past ten years, road traffic – both passenger and freight - has grown significantly faster than the national economy. The most serious concern in Pakistan is air pollution that is mostly emissions from road traffic. There is growing recognition that the sustainability of economic growth is closely linked to the efficiency of its transport system especially roads transport. To support sustained growth and increase competitiveness, all the stake holders should take a strategic and holistic approach to the transport sector.

It is important to note that cities with a consistent policy of transit improvement, such as in Toronto and Edmonton during certain time period, increased their riding habits in spite of their low population densities and high auto ownership rates. The influence of good transit service on ridership attraction is obvious (Vuchic, 2005). The number of car manufacturers in Pakistan have also increased with Mercedes-Benz, Chevrolet, Nissan, Toyota, Suzuki, Mitsubishi and Honda showrooms springing up in the city of Lahore. There are about 9 million cars in use in city according to Excise & Taxation department Lahore and all vehicle modes engines using mostly petrol, LPG, CNG and diesel as fuel (GoP, 2007). The congestion in the junctions or hotspots of the Lahore metropolitan areas especially in Multan road create environmental problems and causes vehicle exhausts, noise pollution associated

with road vehicles and above all the damage for physical landscape, all make it necessary to manage the traffic patterns of vehicles of all type in urban areas. Motor vehicles propelled by engines using petrol, petroleum gas or diesel as a fuel emit a wide range of gaseous and particulate materials some of which have a potential to be harmful to human beings, the amount of the pollution depending on the condition and type of the engine and on operating condition (Salter, 1989).

The impact of urbanization, modernization and industrialization is always being on the urban traffic flow. The global vehicle fleet has tended to be dominated by the highly industrialized areas of North America, Western Europe and Japan. By 2030, based on current trends, the regions of Asia (excluding Japan), Eastern Europe, Africa and Latin America will represent 28 percent of motor vehicle registrations compared with 20 per cent at present, although per capita growth rates will remain low (Schwela *et al*, 1999). The hotspot areas mostly consist of main activity zones. The motor cycle and scooter population is also growing in Asia; however the benefits of these traffic modes have been at least partially offset by excessive pollution and the adverse health and environmental effects that result from air pollution. The Chouborji and Yateem Khana Chowks are hotspot areas of not only Multan road but also the Lahore metropolitan with traffic volumes and flow patterns. The main purpose of the this study is to evaluate the traffic volume and intensity of the Multan road which is important for its exit and entrance points, different adjacent land use characteristics and traffic compositions of the city. So the results of the research study are truly verified by the ground realities itself. Overall planning purposes, comprehensive land use and transport studies traffic census and surveys are required. They will provide information for planning the future transport requirements of the town, including the future network, and for ensuring the adequacy of individual projects (Bhatti, 1994).

MATERIALS AND METHODS

In present study,most of traffic flow counts cover, themain road crossings, residential, industrial, commercial and educational sites of Lahore metropolitan area. The Multan road-the case study- is one of the busiest road of Lahore with all its land use characteristics and above all a major exit and entrance of the city. The bottlenecks of the Multan roadare the hotspot areas of the city and also the intersections leading to the core area of the Lahore metropolitan. The traffic counts were undertaken at two important junctions of Multan road which is the western corridor of the Lahore. The count of all the modes of vehicles was taken with twelve hours durations, from 7 am to 7pm, and the traffic classified into 09 vehicle types: 05 fast moving vehicles, and 04 slow moving vehicles.

As mentioned earlier, that the traffic flow counts surveys were conducted for 12 hours (07:00am-19:00pm) with peak, medium and low hours characteristics of a day keeping in view of land use pattern of the city e.g., main road crossings, residential, industrial, commercial and educational institutions junctions. Meanwhile selection of the days (Tuesday, Wednesday and Thursday) were also very important in the conduct of the traffic count surveys because the center of the week mostly have maximum activities of the city. The traditional traffic counts methodology was adopted during the survey of the hotspot areas of the Lahore metropolitan. During the survey the traffic flow of the relevant Chowk was monitored by16-24 numbers of people, covering the whole junction as well as all the modes of traffic flow. Sometime physical conditions (weather), human resource, and other limitations were involved during the survey.

The manual counting techniques were also employed with the help of pre-designed data collection forms used by one enumerator. There were 3-4 enumerators who were deputed for in-coming traffic and 3-4 for out-going traffic flow on each count station. The 12-hour traffic flow counts were completed in 2-3 shifts. Before starting the survey of the traffic counts, the enumerators were given appropriate training in the techniques of the survey and also in using the data collection forms. The flow of the traffic is a relationship between speed, width of the road, encroachment, adjacent land use and the modes of vehicle. One cart with animal drawn vehicle is equivalent to eight passenger car units (pcu). The scale was 1:100,000 units. The slow moving vehicle has an impact on the fast moving vehicles.

RESULTS

The monitoring of traffic flow on the Multan road, all traffic count surveys were conducted for the measurement and quantitatively added to estimate the risk areas according to their intensity. A better coordination of land use planning and transportation investment is required as well as regulation, pricing, education, management and planning is needed to improve existing modes of urban transportation (Weigelt *et al*, 1973). The two busiest junctions of Multan road surveys carried all types and modes of vehicles. There are varieties of composition of the traffic modes between the sites from motor car to animal drawn; buses to *tongas*, trawler to rickshaws, bicycles to motor cycles, etc.As traffic censuses and surveys are very important to determine traffic volumes and composition on roads and junctions (Bhatti, 1994). The traffic counts highlighted the flow pattern of the Multan road regarding fast moving vehicles (Four or more than four wheelers), slow moving

vehicles (animal drawn and 2-3 wheelers) and the mode of vehicles. The Table 1 has shown that about 60% of the total share in traffic volume consisted of fast moving vehicles at selected junction of Multan road Lahore. This study has also highlighted in Fig. 1 that at Yateem Khana Chowk the fast moving traffic share in traffic volume is 22.85 % of the total traffic, whereas at Chouborji Chowk it is 27.15% of the total traffic as depicted in Fig.3.During peak periods for truck or heavy traffic tend not to correspond with peak passenger traffic. In fact, many urban goods providers try to avoid congested locations and times. Thus, in many cities, heavy traffic activities are most intense right after the morning passenger peak and just before the evening rush hour (Meyer *et al*, 2001).

Table 1. Volumes of Fast Moving Traffic at some selected junctions of Multan Road,Lahore

S. No.	Name of Junctions	Vehicles		Share in Total Traffic (%)
		Fast moving vehicles	Total	
1.	YateemKhana Chowk	110354	182791	22.85
2.	Choburji Chowk	131129	222103	27.15
3	Samanabad	34582	25333	7.16
4	Scheme Mor	41197	22971	8.53
5	Bund Road	34575	24133	7.16
6	M.A.O College	43429	34209	8.99
7	QartabaChowk	30412	22116	6.3
8	Samanabad Chowk	57288	34649	11.86
	Total traffic	**482966**	**568301**	100

Source: Field data collected by the author

Fig. 1: Traffic behavior at Yateem Khana Chowk

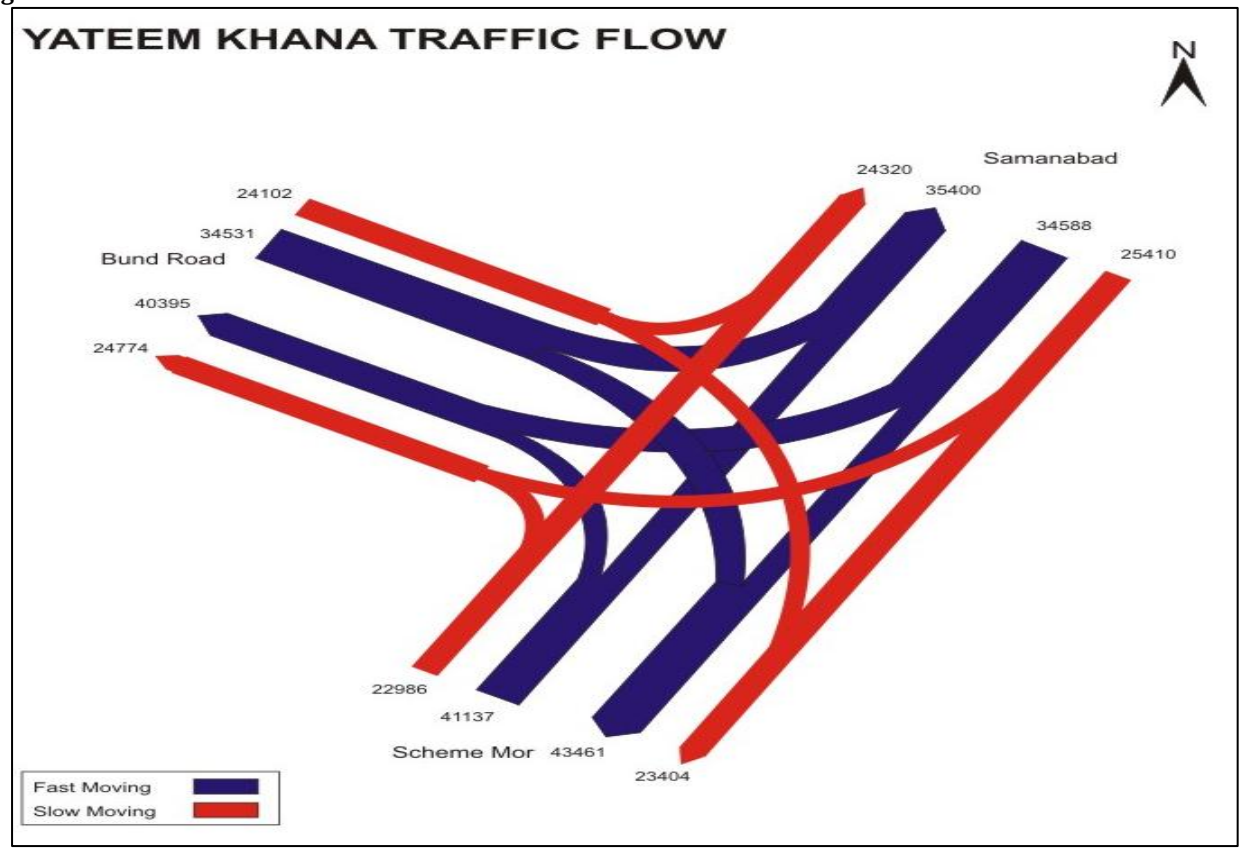
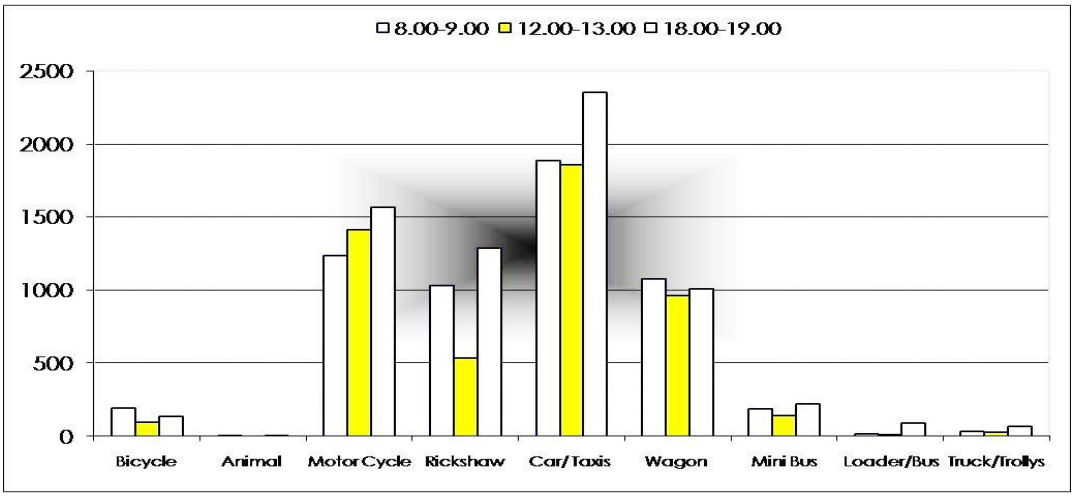
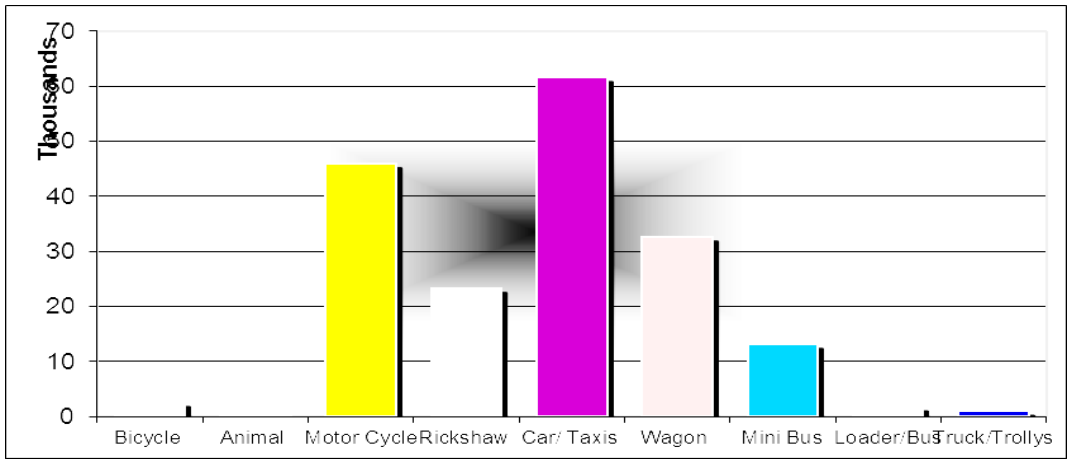


Fig. 2: Traffic volumes at *YateemKhana* (a) Vehicle modes at *YateemKhana* Chowk (b)





(a) (b)

Fig. 3: Traffic Behavior at *Chouborji* Chowk

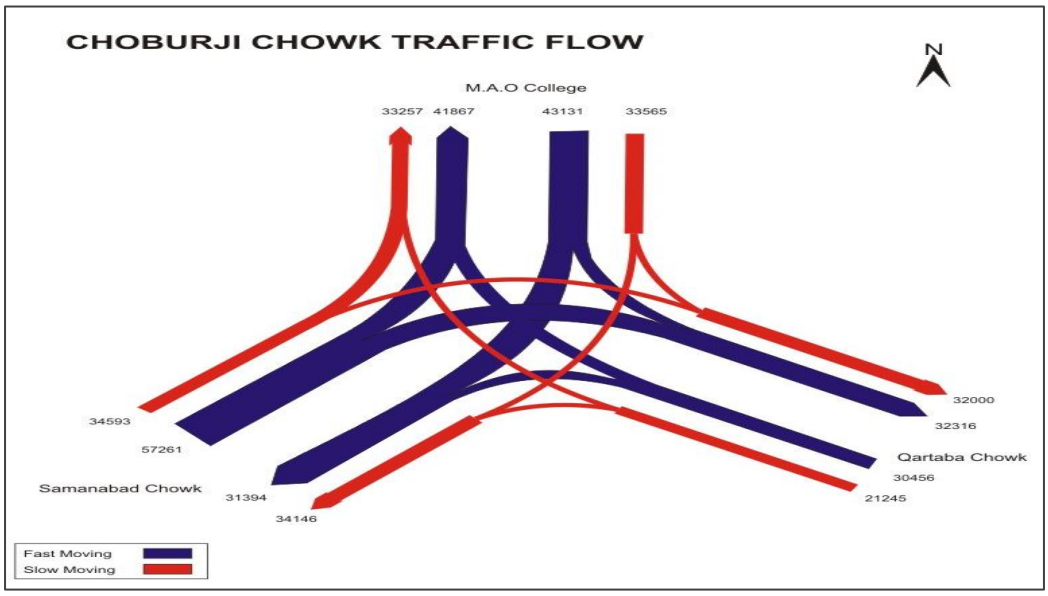
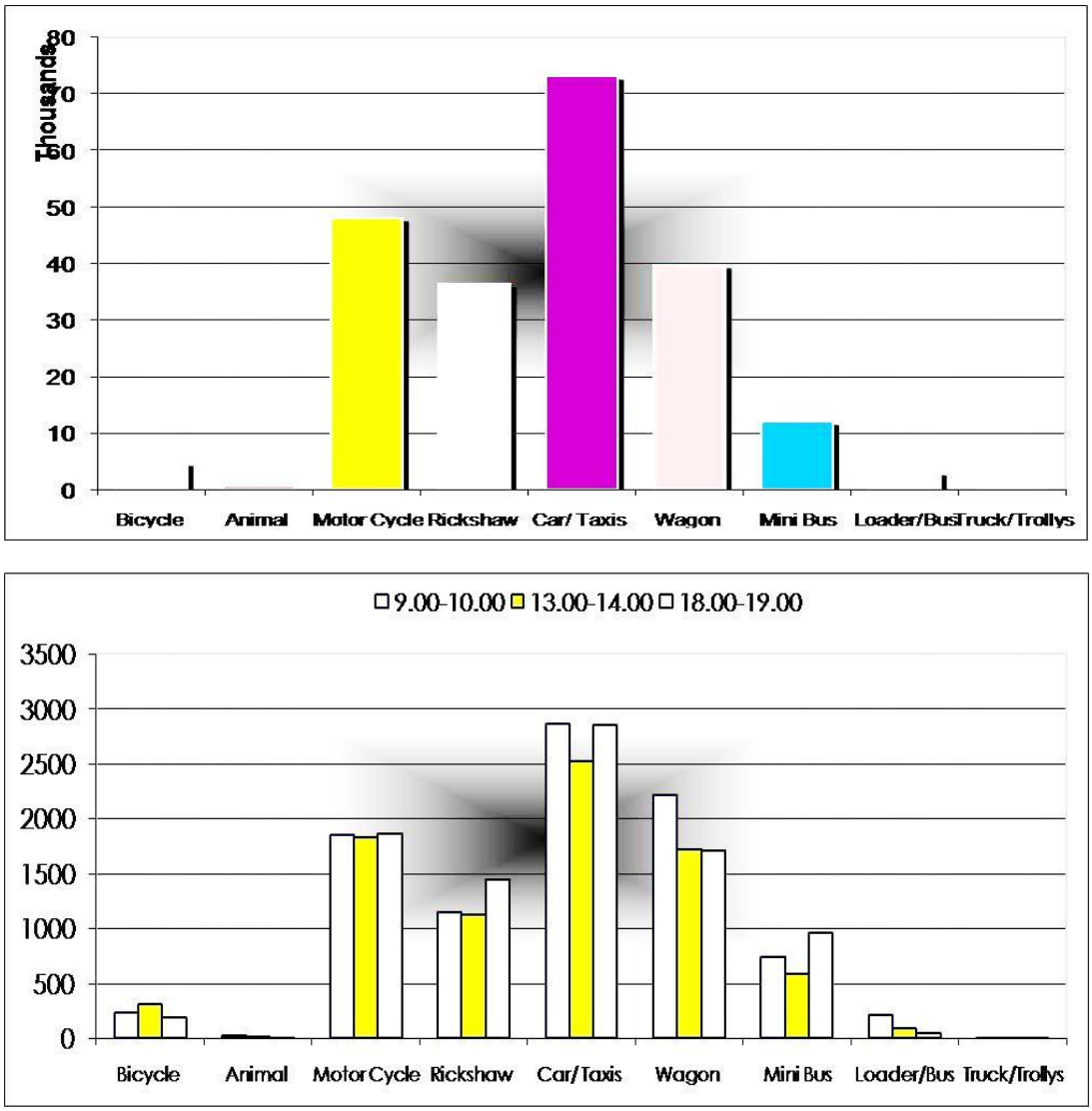


Fig. 4: Traffic volumes at *Chouborji* Chowk (a) Vehicle modes at *Chouborji* Chowk (b)



(a) (b)

Recommendations: Following are the recommendations of this study:

- Encourage all the stakeholders of the Multan road e.g., whole sellers and retailers to regulate parking facilities to first provide short-term parking for users, and secondly, to use demand management to minimize the amount of employee parking required.
- Implement educational programs that promote transportation choices and safety for all modes of travel and that recognize the need for developing and maintaining a comprehensive transportation system that supports freight as well as passenger movements.
- Allow street vacations and develop street pattern so the functional purpose of nearby streets will be maintained. Other opportunities like the need for a bikeway, walkway, or other transportation use when considering vacation of a street.
- The pedestrian way and bicycle facilities are needed on the Multan road because of an active business area.
- The entry of vehicles (Oil tankers, Trucks, Trawlers) to certain areas at certain times could be prohibited by administration.
- Parking facilities (Plazas, spaces) should be arranged and rules strictly be applied for the use of parking regulations.
- Road pricing be regulated. This is a form of tax for road users as this would be charged according to the distance travelled or the time spent on the road. In a way road pricing should

be treated as welfare services like parking facilities, Public rest rooms (toilet facilities) along the road, etc. these are financed out of taxes, treated as public utility services.

Conclusion: The results of this study indicate that the total road capacity is not fully utilized, especially on the Multan road. The half of the total width is effectively utilized by the traffic flow. This situation is present in places where slow moving, two and three wheeler vehicles are more than half of the total movement especially at Yateem Khana Chowk as given in Fig.2 and Chouborji Chowk as shown in Fig.4.The slow moving vehicles slow down the traffic flow and create hurdles for the fast moving vehicles. This is the major cause of emission of certain pollutants that contaminate the local air and the environment of the city. The study has also revealed that public transport is only the twenty percent of the total motorized traffic. This showed that private owned vehicles are mostly occupying the traffic flow of the Multan road. In this study the objective is to analyze the traffic flow behavior, intensity and its impact on land use patterns especially on the residential areas of the Multan road. The frame work of this study not only emphasized the current scenario but involving the future land use studies, traffic flow, air quality, and their linkages with other relevant areas. The friendly environmental future population growth and development in public and private sectors can only be possible through adoption of laws, green technologies, emission standards, traffic management system, planned mix land use patterns, etc. The traffic flow has an impact on the environmental quality of adjoining areas of the Multan road mostly consisted of residential area. The ambient air has been contaminated due to the vehicle emissions of the certain gases nitrogen dioxide, sulphur dioxide, carbon dioxide, etc. This study will be helpful in determining the future environmental road map and for any mega transit project of the Lahore. It will also be useful for transportation planning in LDA, Punjab Housing and Town Planning Agency, Lahore, TEPA, Excise & Taxation Department, Lahore and for the academic and research areas.

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