# TRANSPORTATION SYSTEM OF KARACHI, PAKISTAN

By

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Master of Science in International Cooperation Policy

**Certification**

I hear by certify that this report has been written by me and that I have used citations wherever I have used resources and works of other authors.

NASIM Heraa (51211610)

## Table of Contents

**List of Figures, Pictures and Tables**

**Acknowledgements**

All praise is for Allah (subhana wa ta'ala) Who has given me the strength to prepare such a report. Man is helpless without the guidance of his Creator, and thus I would like to glorify Him and thank Him for His Mercy in making all of this a reality.

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**Abstract**

*In developing countries, rapid urbanization growth has brought a huge pressure on the land use, infrastructure and transportation of the cities and the development has not been very sustainable either resulting in problems in the areas of social, economic and environment. The aim of this paper is to explore the current urban development and transportation system of the city of Karachi, Pakistan. This paper analyses the urban growth, its effects on the transportation infrastructure and the government policies and development plans for the city. Also, the results of environmental degradation have been looked into and the social problems that have been caused due to mismanagement and the problems that are being caused by people to themselves. Some short term solutions that can be quickly implemented within a short time-frame have been given at the end as well.*

# Chapter 1: Introduction

## 1.1 Urban Cities, Transportation, and Sustainable Development

More than half of the world's population now lives in cities, and this proportion continues to rise and is expected to reach 5 billion by 2030 (UNFPA, 2007). Urbanization brings economic growth to countries (ibid.). They offer favorable conditions such as provision of jobs, health care, education, recreational activities, etc to people than rural areas because of the size and proximity to availability (ibid.).

One of the key roles in urban cities is of transportation system as that influences the choices travelers and shippers, consumption of energy and fuel and development of community and economy (Dimitriou & Gakenheimer, 2011). Increase in urban population does not mean increasing environmental problems but that occurs due to inadequate use of resources, production and consumption (UNFPA, 2007) such as in urban cities of developing countries, it is seen that many transportation sub systems are not well coordinated (Dimitriou & Gakenheimer, 2011). This lack of coordination result in growth of private vehicles ownership, rise of energy demands due to heavy motorization, increase in number of trips per person per day and increase in local pollution among many (ibid.).

The International Energy Agency projects that over the next 20 years energy demand growth in transport will be greater than in all other end-use sectors. Transport's share of total energy use will increase from 28% in 1997 to 31% in 2020. Figure 1 shows the share of world's oil consumption by the transportation sector. And Figure 2 shows the forecast in growth of usage of oil for transport by 2020 by developing and developed countries where it can be seen that developing countries are expected to increase their share of consumption by twice.

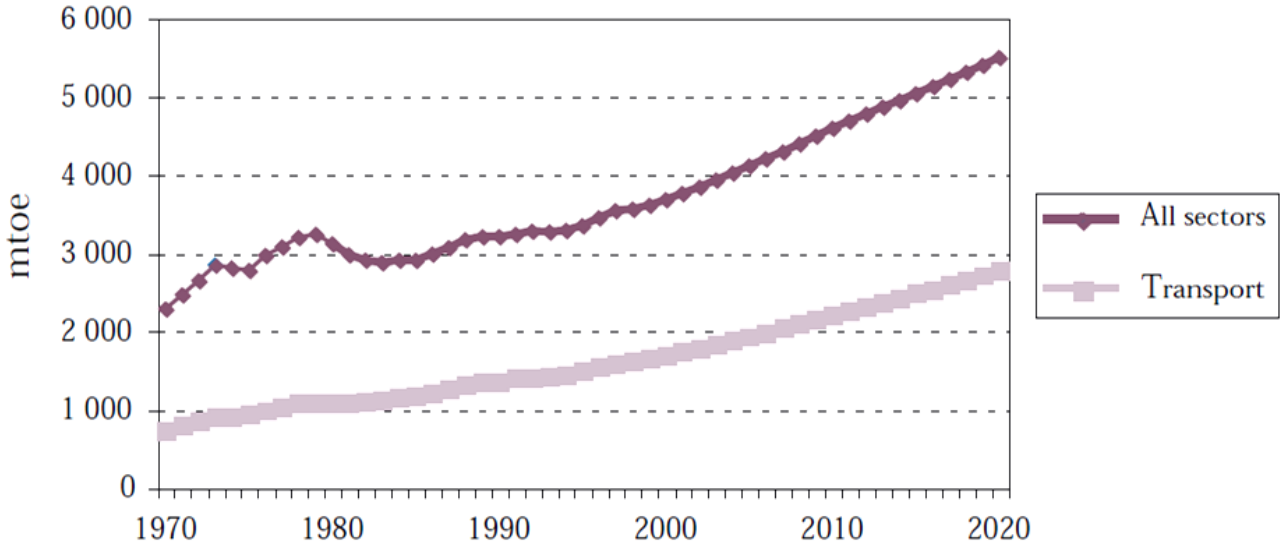



**Figure 1.1: World Oil Consumption: Transport and Total**

**Source: (OECD & IEA, 2000)**

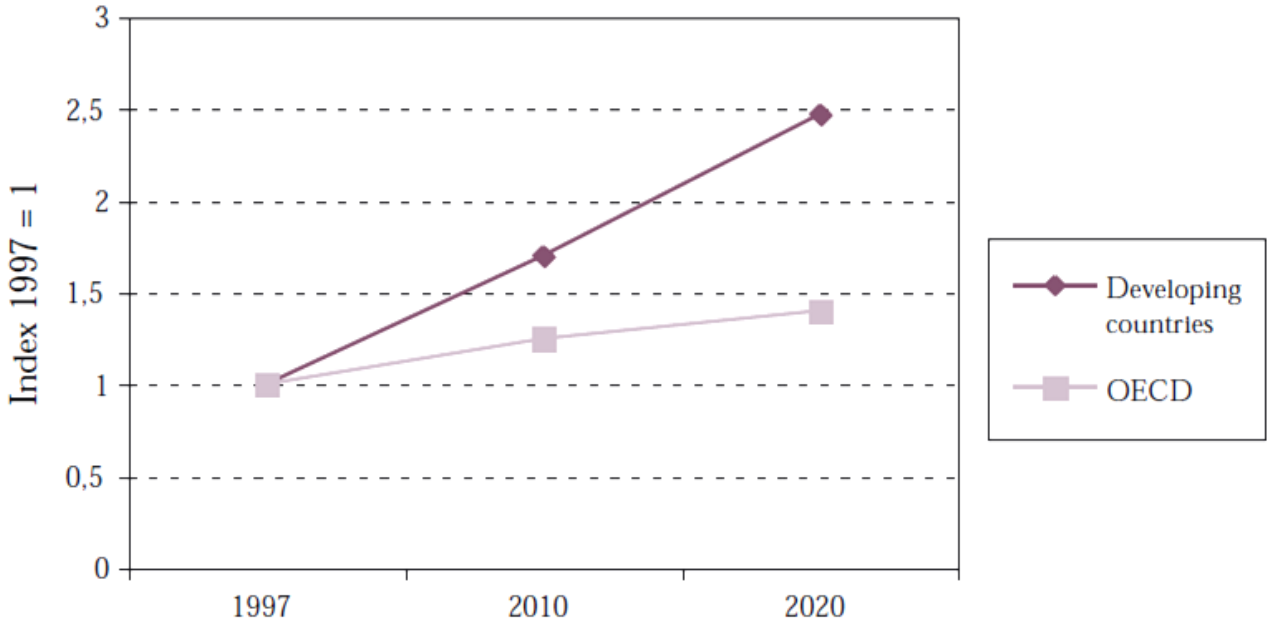



**Figure 1.2: Forecast growth in Oil Use in Transport; Developing and OECD countries**

**Source: (OECD & IEA, 2000)**

Sustainable Development as defined by "Our Common Future" also known as Brundtland Report is *"Sustainable development is development that meets the needs of the present without*

*compromising the ability of future generations to meet their own needs."* (Brundtland Report, 1987).

In the "Guidelines towards Environmentally Sustainable Transport" OECD suggests that the effects of implementing more sustainable transportation systems in the communities are fundamental and can have positive impacts on the city also especially to the disadvantaged social class such as poor, handicapped, women, elderly aged people as they would be able to go about their lives more comfortably (OECD, 2002).

In this paper, evaluation of Karachi which is the mega city of Pakistan will be done. In this study, city's available data will be used to evaluate the transportation system and urban development through history to current times, the current public transportation system will be discussed on which majority of the population rely upon.

## 1.2 Purpose of Study

This thesis aims to look into the current transportation system of Karachi and develop an understanding of sustainable public transportation for a developing city. For this, following are the research questions which will be mainly focused upon.

- How is the current transport system?
- What has been the development pattern of the city and its transportation system?
- Is it in accordance to the sustainable development or the trend is unsustainable?
- If unsustainable, what are the key factors in being so?
- How can it be moved towards a more sustainable system?

## 1.3 Thesis Outline

In order to address the proposed questions, firstly a background of Pakistan and Karachi is presented in chapter 2. Methodology of the research is explained in chapter 3. Chapter 4 explains the government agencies that are responsible for urban planning and transportation and the development that has been done so far and future proposed plans given by the government along with the evaluation of air quality due to current system.

In chapter 5, analysis of qualitative data acquired through interviews is done and the outcomes are explained. In chapter 6, case study is presented on public transportation followed by suggestions, further research and conclusions in the final chapter.

Case-study is presented so that they can be taken as examples to give the reader an opportunity to understand the possibilities of sustainable system's implementation. And a sustainable system approach is taken for the recommendations for long term planning and also some quick solutions are given to fix the problems in the current system as short-term solutions.

## Chapter 2: Background

### 2.1 Facts about Pakistan

Islamic Republic of Pakistan emerged on the map of the world after gaining independence from British Empire on 14th August 1947. Situated in South Asia lying between geographic coordinates of 30 00 N, 70 00 E, it covers an area of about 796,095 sq km with 1,046 kilometres coastline along Gulf of Oman and Arabian Sea in the south. It borders with India in east, China in Northeast, Afghanistan and Iran in west and Tajikistan also lies very near in north separated by Wakhan corridor. (CIA, 2013)

The topography of Pakistan is a mixture of landscapes of plains of deserts in south, mangrove forests in coastal areas, hills and snow covered mountainous regions in North with lowest point of 0m at Indian Ocean and highest K2 (Mt. Godwin-Austen) 8,611 m (ibid). It experiences climate variation from tropical to temperate (Library of Congress – Federal Research Division, 2005). Pakistan is the sixth country in the world for being most populous having more than 190 million people (CIA, 2013).


**Figure 2.1: Map of Pakistan**

**Source: http://go.hrw.com/atlas/norm_htm/pakistan.htm**

Pakistan is a semi-industrialized economy and mainly consists of agriculture, textiles, food processing and chemicals; out of which agriculture is the major constituent with a GDP of 3.7% as of 2012 estimation (ibid.).

## 2.2 Karachi

Karachi is the largest city and most populous city of Pakistan. It is the 11th largest urban agglomeration in the world (United Nations, 2012). *The term "urban agglomeration" refers to the population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries* (ibid).

Karachi is situated in the South of Pakistan along the coast of Arabian Sea and covers an area of 3, 530 sq. Km (KCCI) with approx. 1330 sq.km is built-up area (CDGK, 2007). Karachi is divided between six districts with further division into towns and cantonments.

**Karachi South**

1. Lyari Town
2. Saddar Town
3. Jamshed Town

**Karachi East**

4. Gulshan Town
5. Korangi Town
6. Landhi Town
7. Shah Faisal Town

**Karachi Central**

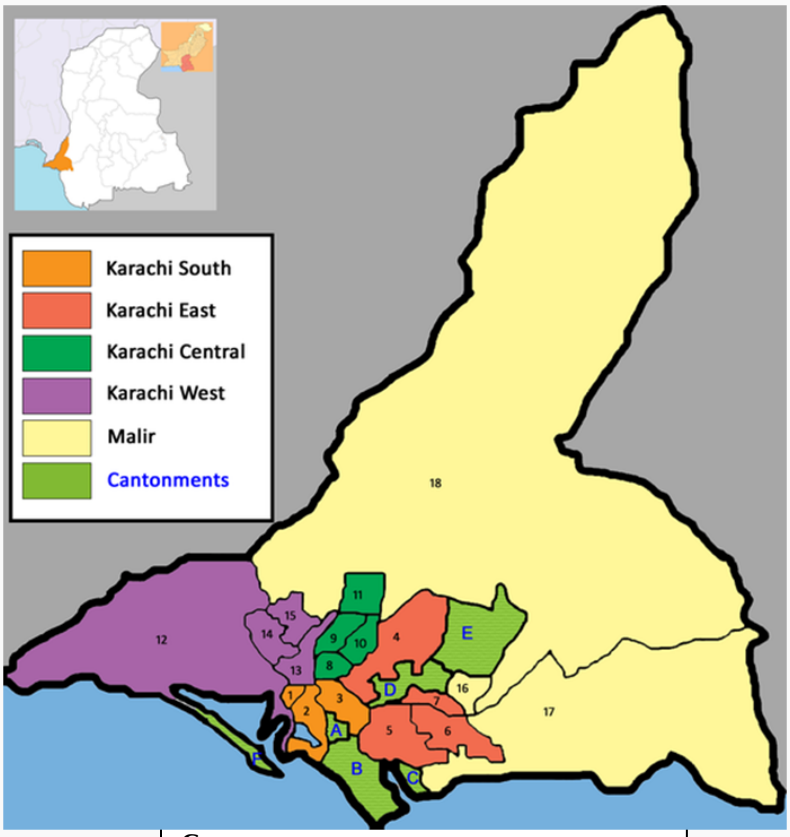
8. Liaquatabad Town
9. North Nazimabad Town
10. Gulberg Town
11. New Karachi Town

**Karachi West**

12. Kemari Town
13. SITE Town
14. Baldia Town
15. Orangi Town

**Malir**

16. Malir Town
17. Bin Qasim Town
18. Gadap Town




**Cantonments**

A. Karachi Cantonment
B. Clifton Cantonment
C. Korangi Creek Cantonment
D. Faisal Cantonment
E. Malir Cantonment
F. Manora cantonment

**Figure 2.2: Town/ District Map**

**Source: (CDGK, 2007)**

### 2.2.1 Economy

Karachi is the economical hub of Pakistan; it contributes approximately $90 billion and 65% of the total national revenue generated (KCCI). The city comprises of diverse industries such as textiles, steel, chemical, machinery, refineries; cement plants etc (ibid.) totalling to 15,000 industrial units in the 5 industrial associations of Karachi ("1-day Strike in.", 2013). In addition it also has head offices of several multi-national corporations, therefore if there is a strike for even a day in Karachi, Pakistan loses Rs. 10 billion (ibid.).

### 2.2.2 Population

Historically, Karachi started with a population of 14,000 inhabitants as a fishing settlement by Baloch tribes from Balochistan and Makran who named it Kolachi (KCCI) which continued to grow and became a village called Koalchi-jo-Goth (The Village of Kolachi in Sindhi) (ibid.). It turned into a trading port village by end of the 18$^{th}$ century (ibid.). After the British Raj conquered Karachi in 19$^{th}$ century, developed it as a military cantonment and a port for exporting goods, which eventually grew the town into a city (ibid.). By the end of the century, the population had grown to about 105, 000 so in 1900, Karachi's first tramway was started as the city had started to have congestion problems (ibid.). After independence of Pakistan, refugees from India and migrants from other parts of the country came and settled in Karachi growing the population of the city by many folds since then making it approx. 21 million as of April 2012 (Khan, 2012). Following is the population growth data collected from various sources as per the survey/census done is shown.

| Year | Population | Increase/Decrease Over Previous Census | Number of Years Between Surveys | Increase/ Decrease (%) | Average Annual Growth Rate (%) |
|---|---|---|---|---|---|
| **1843** | 14,000 | - | - | - | - |
| **1872** | 57,000 | 43,000 | 29 | 307 | 5.0 |
| **1881** | 74,000 | 17,000 | 9 | 29.82 | 2.9 |
| **1891** | 105,000 | 31,000 | 10 | 41.89 | 3.7 |

| | | | | | |
|---|---|---|---|---|---|
| **1901** | 136,300 | 31,300 | 10 | 29.80 | 2.6 |
| **1911** | 186,800 | 50,500 | 10 | 37.05 | 3.2 |
| **1921** | 244,200 | 57,400 | 10 | 30.72 | 2.7 |
| **1931** | 300,800 | 56,600 | 10 | 23.17 | 2.1 |
| **1941** | 435,900 | 135,100 | 10 | 44.91 | 3.8 |
| **1951** | 1,068,500 | 632,600 | 10 | 145.12 | 9.4 |
| **1961** | 1,912,600 | 844,100 | 10 | 78.99 | 6.0 |
| **1972** | 3,515,400 | 1,602,800 | 11 | 83.80 | 5.7 |
| **1981** | 5,208,000 | 1,692,600 | 9 | 48.14 | 4.5 |
| **1998** | 9,802,184 | 4,594,184 | 17 | 88.21 | 3.5 |

**Table 2.1: Population Increase Data**

**Source: (Hasan & Mohib, 2003) and (United Nations, 1988)**

Karachi's urban growth has increased by 115% in the time-frame of 1998 to 2011 (figure 3). This is the largest historical growth rate as compared to other countries of the world and this has put a tremendous pressure on the infrastructure and public transportation systems among others (Cox, 2012). Karachi is mostly a mono-centric city with over 70% of the business being located in the central region of the city (Qureshi and Huapu, 2007).

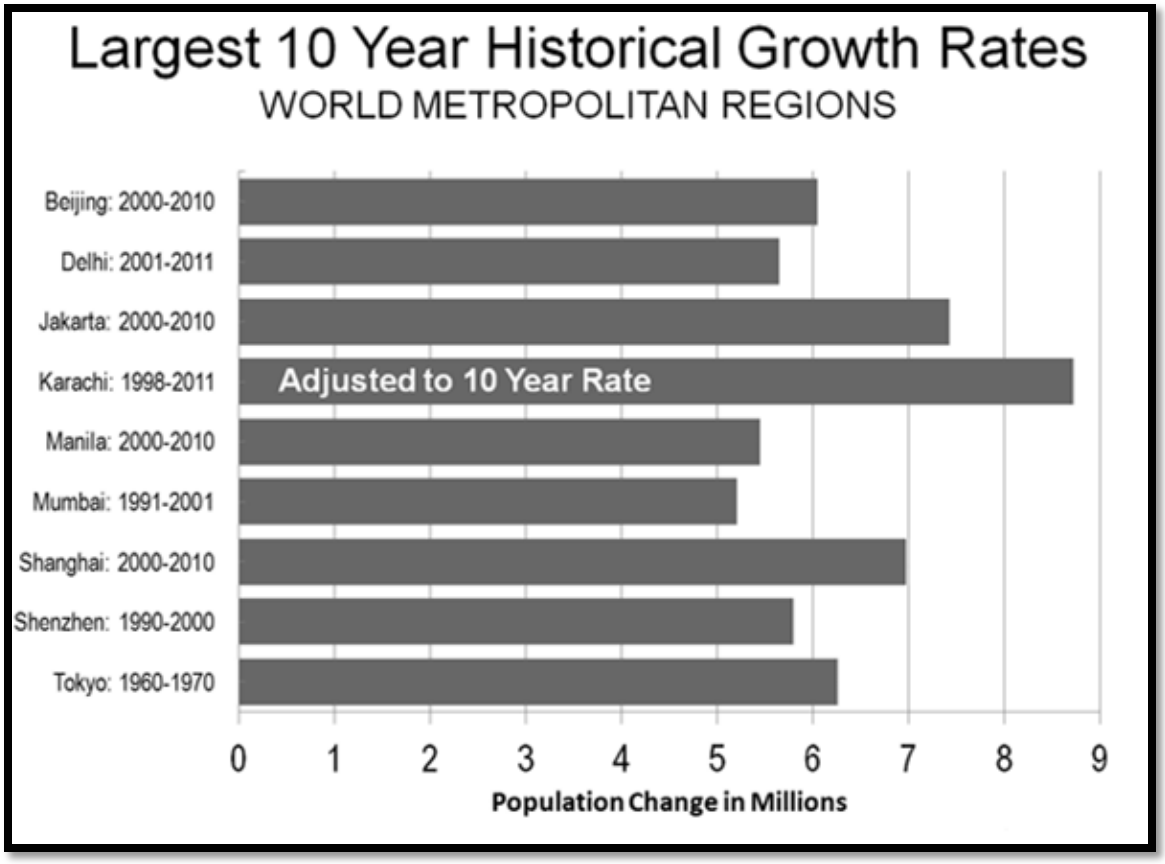



**Figure 2.3: Population Growth of Karachi**

**Source: (Cox, 2012)**

## Chapter 3: Methodology

This thesis is a work of qualitative collection of statistical data and reviews of scientific journal articles, books on transportation systems, municipal government's official documents, and NGO's research documents, market surveys, newspapers articles and other media resources. In addition to these, to get a deeper understanding of the system, interviews were also conducted with the residents of Karachi.

The interviews conducted were focus groups based (Appendix 1 contains the key questions and structure followed in the interviews).

"A focus group is a series of discussions intended to collect participants' perceptions, set in a 'permissive, nonthreatening environment'." (Krueger & Casey, 2000)

Focus group is a type of qualitative research with focus group being interviews conducted in group (Morgan, 1988). These interviews are not based on the successive change from one thing to another i.e. between researcher's questions and the participants' answers; rather the researcher or the person asking questions act as moderator and the responses depend upon the interaction within the group members (ibid.). There are no right or wrong answers, everyone doesn't require agreeing with all the responses but all of them are required to listen carefully (Krueger, 2002). There are preferably 6-8 people in one group with similar type of people (similar on certain characteristics that are relevant to the research problem) and are guided by a moderator into sharing their ideas, experiences, observations, feelings etc regarding the topic (ibid.). It is very important to give an overview of the topic at the beginning by the moderator (ibid.). The keys to obtain good results from focus group interviews are to ask open-ended questions, avoidance of dichotomous yes-no questions, using of questions that can encourage participants to share their experiences instead of talking about future, conversational questions, technical terms should be avoided as not everyone has a technical background, and questions should be asked as "What led to or what prompted to...?" rather than simply asking Why (ibid.). Another important aspect is to manage the discussions by asking a variety of questions and sequence should be such that it goes from general to specific to depth and personal context (Morgan, 1988:54).

Any type of qualitative research and in particular, focus group interviews generate large amount of raw data and descriptive statements (Rabiee, 2004).

The people were chosen by the author coming from various backgrounds in terms of income level, areas of Karachi and age groups. The author also tried to include people who only use

private transportation, both public and private and only public means to commute within the city; this was done to understand the mind-set, behaviour, perceptions and demand of different people. The objective of the interviews was to understand both the negative and positive aspects of the transportation system for public as well as private users. The people who were part of the groups knew the author before-hand as due to time restriction, it was not possible to select entirely randomly. The purpose of the interview was made clear at the beginning and the interviews were conducted in an environment where everyone could feel comfortable and be conversational and give unbiased responses. As, author has been a resident of Karachi for 12 years, so also the observation of the buses, bus-stops, drivers, bus-users and private users from all these years were also incorporated.

### 3.1 Limitations

The interviews were conducted only with the users as due to the dangerous situation of the city, reaching to operators was difficult.

The sources for the updates on government organizations, policies and future plans were mostly news articles from leading newspapers of Pakistan and Non-profit organizations database especially Urban Resource Centre (URC).

This paper does not give a cost analysis of the proposed recommendations due to the broad scope of paper but it could be incorporated in future research work for public transportation.

## Chapter 4: Transportation and Infrastructure Systems

In order to understand the transportation system of Karachi, it is necessary to understand the different government bodies, agencies, and the proposed, planned and existing urban development plan of Karachi.

### 4.1 Government Bodies and Organizations

Urban planning and transportation system design go hand in hand. In Karachi there are many different public departments that are responsible for this planning and work. The number of these departments has become a big issue in terms of inter-coordination.

Since, author is also a resident of the city; she has observed the lack of coordination between different departments over the years such as if a new road is being laid down, a week later it's all excavated by another government body e.g. Water and Sewerage board to lie down or repair pipes. But the reason of this miscommunication is due to several reasons. The land planning and control is divided between several different authorities and the Karachi metropolitan corporation (KMC) formerly known as City District Government Karachi (CDGK) only has power to about 31% of it as shown below. There are about twenty federal, provincial and local agencies (CDGK, 2007). Figure 6 shows the distribution of land use control in Karachi.

In addition to this, when it comes to transportation there are many other direct and indirect bodies (both public and private) involved.

The following are the bodies that are directly linked with transportation sector;

- Transport Department Government of Sindh.

  This department has some attached departments to it as well;

  - Sindh Road Transport Corporation (SRTC) (Defunct)
  - Karachi Transport Corporation (Defunct)
  - Karachi Urban Transport Company (KUTC) (Founded, 2008)
  - Provincial Transport Authority (PTA)
  - Karachi Public Transport Society (KPTS) (Govt. of Sindh)
- Excise and Taxation
- Karachi Metropolitan Corporation
- Traffic Engineering Bureau

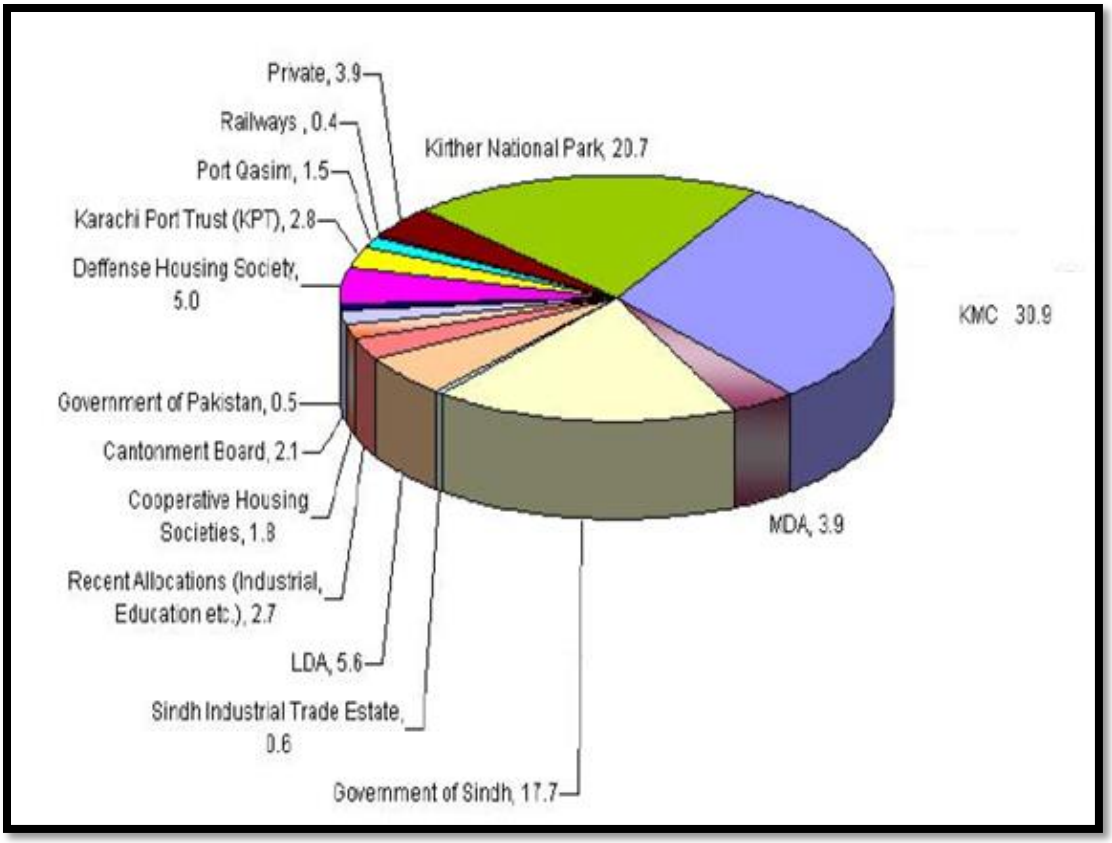



**Figure 4.1: Land Control in Karachi**

**Source: (CDGK, 2007)**

And in addition there are about 25-30 other public bodies linked such as finance and support, housing and planning, industries, labour associations, women development department, army etc (Sohail, 2000). And last but not the least there is private transport association that consists of representatives from all transport operators and is extremely powerful. Any plan for city transport without private sector inclusion is impossible because of their monopoly not only in terms of providing service but this association also has its "other ways" (ibid.).

## 4.2 Overview of Transportation System Development

An overview of transportation system can provide a detailed insight of how the development happened, the key factors that pushed towards that development reaching to the current situation and future directions that should be taken. This section gives a brief history of the development of transport system and the factors that influenced it.

### 4.2.1 1947 - 1968:

After independence of Pakistan in 1947, Karachi was made the capital and during the first ten years, the population increased by many folds as indicated in Table 1 that from 1941 to 1951 the city's population increased by 145%. The migrants settled both within and outskirts of the city, resulting in increased demands of transportation system for people to commute between work place and settlements (Sohail, 2000). As, Karachi was the capital, many foreign embassies and federal government offices were setup making Karachi to be a high-density and compact city (Hasan & Mohib, 2003)

In 1958, martial law was declared in the country and later, it was decided to shift the capital to Islamabad (current capital) and among various development plans, "The Greater Karachi Resettlement Plan" was developed (Hasan, 2009). As a part of this movement; the population of the squatter settlements were moved 20 km away from the city centre to two satellite townships; New Karachi and Landhi-Korangi (Hasan & Mohib, 2003.). These areas are shown in Figure 7 marked by circles.

The main idea was to establish these two towns as industrial areas and provide employment opportunities to the refugees by building 45,000 one-room houses in the initial phase and more for 300,000 families in next 15-20 years time period (Sohail, 2000) but that did not happen, consequently making the people to travel long distances to the port, city centre and SITE areas for work and this situation initiated the need for proper long-distance transportation system (Hasan & Mohib, 2003.). This also degraded the central area called Saddar as it became a transit area to commute between Landhi-Korangi and Northern Karachi and turned a high density city into a low density sprawl (Hasan, 2009). This went contradictory to the GKRP as the plan was shelved due to no industrialization which maybe did not realize then because of not very positive outcomes (Sohail, 2000).

The military had demolished the squatter settlements of the city but with the unofficial help of some government officials, people settled in squatter settlements (Katchi-Abadi) on the roadsides of the roads connecting to townships (ibid.). In this time period, the military introduced green revolution technologies and emphasized on industrialization and gradually it started to take place but did not carry out on planned industrial sites. The industrialization resulted in more migration of people from different parts of the country and they started to settle in squatter settlements near these industries that resulted in the expansion situation more haphazard (ibid.).

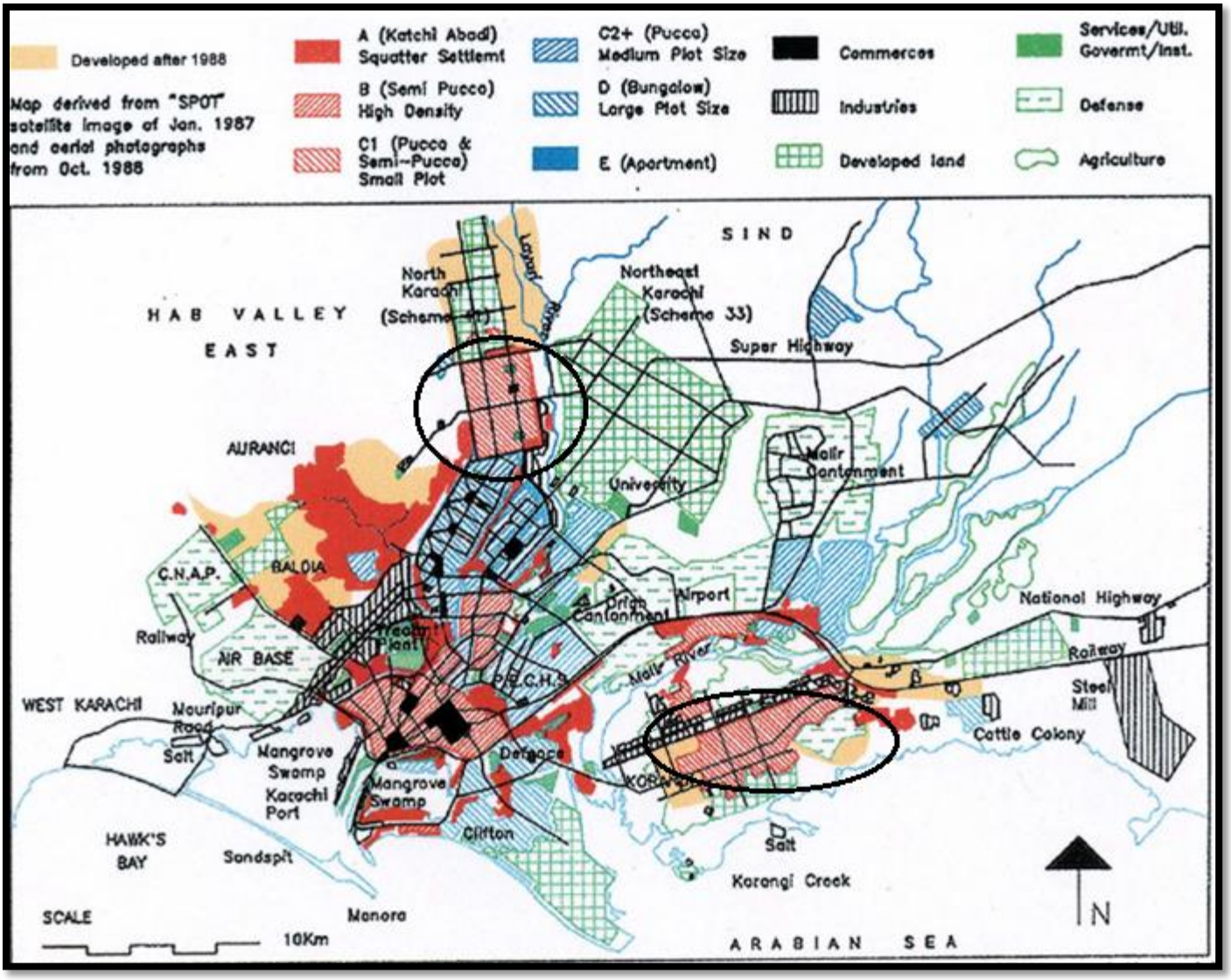



**Figure 4.2: Karachi Housing Settlements**

**(This map shows many other areas in the city as it was developed after 1988)**

**Source: (Hasan & Mohib, 2003)**

## Karachi Circular Railway:

However, as a response to the increased transportation demand, Karachi Circular Railway (KCR) was established in 1964 (Sohail, 2003). It made a trip every half an hour and a total of 104 trips per day in 1970s but due to ill-maintenance of the train engines and tracks by the government, the service began to decline around 1979 (ibid.). The number of daily trips was reduced to 93 by

1985, and in addition, ticketless commuters also started to increase, resulting in loss of Rs. 12 million per year. By 1998, when the population of Karachi had increased to 9.8 million, the trains' daily trips reduced to 12 and Karachi railway was losing Rs. 6 million per year resulting in the complete closure of KCR in next couple of years (ibid.).

### 4.2.2 1968 - 1978:

By the end of 1960s, Karachi contained 45% of all motor transport of Pakistan with 900 buses and 1800 mini-buses, 10,000 taxis and 12,000 auto rickshaws (Sohail, 2000). By that time the private cars ownership had grown to 100,000 and motorcycles to about 75,000. At that time, Karachi's transportation system was consuming 33% of the country's fuel allocated for motor vehicles (ibid.). 58% of the citizens used mass transit systems for commuting in which 95% of the share was with buses and mini-buses and 5% with railway (ibid.).

In, 1971, after the war with India ended and Bangladesh got independence, a new government was formed in Pakistan that introduced mini-buses and handed out permits simply based on favour to those who were not from NWFP as, in 1960s; people from NWFP had become dominantly involved in transportation sector (ibid.).Most of these permit holders, operated the buses by operators on monthly salaries but later on, they changed the policy and offered the operators to purchase the bus by paying for the bus on monthly instalments and interests, this gave the permit holders the opportunity to earn more and started to form a bus-mafia (ibid.).

**Master Plan 1975-1985**

After the failure of first master plan GKRP, government, with the help of UNDP started to prepare another Master Plan for Karachi in 1968 (Khuhro & Mooraj, 1997). A department known as Karachi Master Plan (KMP) was formed to develop it (ibid.). After the 1971 war ended, approximately 350,000 refugees arrived (ibid.) that increased the squatter settlements population to 131,000 (Sohail, 2000) so the new master plan was developed with keeping this fact and the problems that it had given rise to (ibid.). The key plans in this master plan included development of road networks, housing and infrastructure development of squatter settlements, water supply, land-use management plans for recreational activities, industrial areas, environmental improvement, transport terminals and expanding the service (Hasan, 2009). It was also included in the plan to construct by-passes (Southern and Northern) to diverge the heavy

traffic from Saddar and expansion of rail network to provide accessibility to new settlement areas (Sohail, 2000).

However, the plan in the end was not able to be implemented except for water supply, development of road network, bridge on Lyari and Southern by-pass was partially built. The road network did help in reducing the congestion in Saddar to some extent (ibid.). The reason for failure of this master plan was due to political conflicts and another martial law imposed in 1977 (Hasan & Mohib, 2003).

Non-implementation of the master plan resulted further growth of squatter-settlements and informal growth of industry and employment (Hasan, 2009). This informal growth occurred as a result of encroaching or corruption (Sohail, 2000). The areas marked for depots and terminal were given away and industry was expanded but as by-passes were not completed, this informal expansion further increased the traffic and congestion problems (ibid.) and degrading the environmental conditions of the central city (Hasan, 2009).

#### 4.2.3 1978 - 1988:

After the military control in 1977, Russia invaded Afghanistan in 1979 that resulted in addition of about 200,000 refugees to the city's population and consequently the Kutchi-abadis (Sohail, 2000). Along with refugees came drugs, guns, and most importantly mafias. All of this combined with the dictatorship cased ethnic violence, political disorder and corruption (ibid.). This era also saw the formation of transport mafia (ibid.). After 1978, 5000 mini-buses were added to the fleet by giving out loans to operators. The system of the vehicle owned by the transporter and paid by the operator by working to buy the bus carried on from the last decade (ibid.). There were no former agreements made between the operator and the transporter, therefore the existence of labour rights were also non-existent and the operator had to work-off to free him from this bondage (ibid.). Due to heavy corruption in the government officials the transport mafia gained political and economic power so much so that in 1985, government was forced to agree with transporters that if someone is killed my mini-bus, the driver would only be charged with section 304-A i.e., accidental death and not under section 302 i.e. murder or 304 i.e. causing death not amounting murder sections (ibid.).

### 4.2.4 1989 - 1999:

In late 1980s, government again with the help of UNDP developed a Master Plan known as Karachi Development Plan 2000 (Hasan, 2009). This plan however, was had finished developing in 1990 but at that point of time most of the provisions of citizens were taken care by informal sectors and this important factor was not taken into consideration (Sohail, 2000). Monitoring and information systems were made an important part of the plan but the plan never got officially approved due to lack at the government's end (ibid.). As, KDP was also not able to be implemented, the city was left to grow into chaos, with increasing population, transportation problems, along with increasing power of formal and informal real estate bodies (Hasan, 2009). This destructed the formal transportation sector prospective completely and now was handed to the transport mafia. At this time due to weakening of government bodies in the city, ethnic politics also increased (ibid.).

## 4.3 Current Situation

The haphazard urbanization of Karachi led to a great boost in number of vehicles in the city and as there are not even provision of bus-terminal, workshops or facilities for the drivers and conductors public transport sector is in complete shambles.

As the public transport was unable to keep up with the demand, private car ownership began to rise especially by the end of 20$^{th}$ century. Figure 4.3 shows the trend of the growth rate of vehicles from 1990 to 2002. After 2002 the private car ownership started to increase at a greater rate as banks started to give loans for cars. In 2004-2005, the number of cars registered per day increased to 415 (Hasan, 2009).

Figure 4.4 shows the division of the types of vehicles in the city in 2011 according to which motorcycles half of the total number of vehicles in the city and 38% of them are cars.

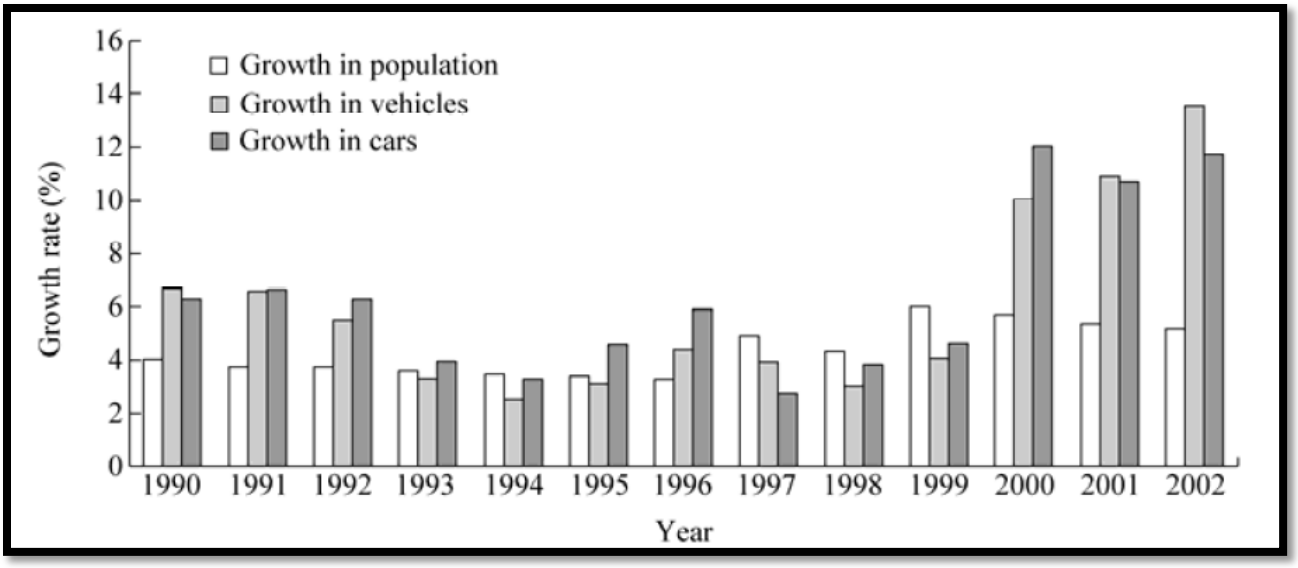



**Figure 4.3: Growth Trend of Vehicles and Cars versus Population**

**(Qureshi & Huapu, 2007)**

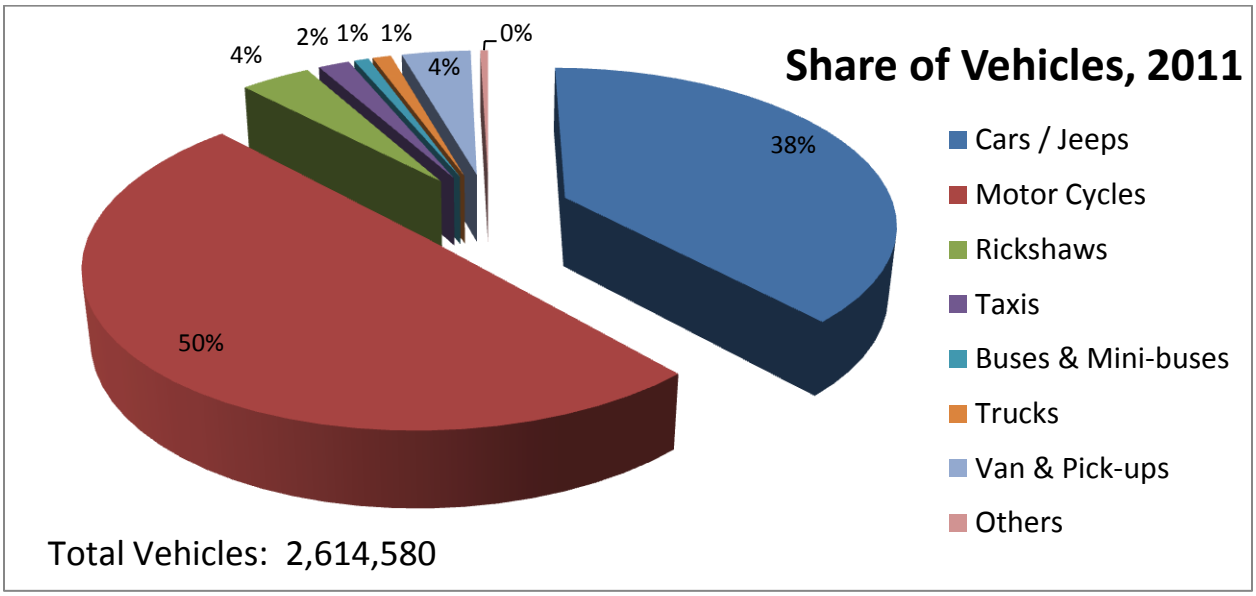



**Figure 4.4: Share of passenger vehicles, 2011**

**Source: (URC, 2011)**

According to another researches, the number of is expected to reach 3.4 million by 2030 (Raza, 2013)

Karachi accounts for 45% of Pakistan's vehicles and has a road network of 9.444 km. Also, 54% of the city's land is utilized for transportation (CDGK, 2007). This individual ownership of vehicles has led to a great commute time within the city and the most affected is the central region of the city. The average travel time in Karachi is more than 45 minutes (Qureshi & Huapu, 2007). In 2007, there was the last master plan till date was presented and was called "Karachi Strategic Development Plan 2020". This plan was given after a very long gap and recognized many of the development needs. Following is the analysis of some of the projects done and proposed in this plan and how they helped in solving the traffic problems.

This plan presented various plans related to transportation, but again it was not able to be implemented and according to the officials it was due to lack of funds. One of the projects that could change the face of public transportation of Karachi was induction of CNG buses.

In 2009, federal government had proposed to import 8000 CNG buses within four years out of which 4000 were for Karachi and the rest for other cities of Sindh province (Ali, 2013) to improve the air quality due to traffic and give better services to people. The government had reserved Rs. 500 million for this scheme but only 75 gas fuelled buses were able to be bought and then the project got shelved (ibid.) Out of those 75 buses, two were burnt down in riots while 35 went out of order (ibid.). The project could not materialize due to political conflicts.

Currently, there have been talks of reviving the Karachi circular railway that is indeed a dire need for Karachi.

On June 8th, 2013, the chief minister announced to revive the project of Karachi circular railway. The project would cost $2.6 billion. The project would be connected with Bus rapid systems in various parts of the cities and would operate every 5 minutes and would be able to increase the commuters who use public transportation from 700,000 to three million ( TheNews, 2013).

### 4.4 Environmental Degradation

Epidemiological studies show that pollutants such as to NOx (nitrogen oxide and nitrogen dioxide), Particulate Matter (PM), lead (Pb) and Carbon Monoxide (CO) are closely associated with health problems and are major components of urban air pollution mix (Majid, Madl & Alam, 2012).

**Particulate Matter**

*Particulate Matter (PM) consists of airborne particles with an aerodynamic diameter less than or equal to 10 microns – also called PM10, whereas PM with an aerodynamic diameter less than or equal to 2.5 microns is grouped as PM2.5* (ibid.).

According to a study carried by World Bank in India and Bangladesh, it has been found that most of the fine particulate emission is occurred due to two-stroke vehicles (Pakistan Environmental Protection Agency, 2013). Previously, in Karachi, auto rickshaws were also two-stroke but it has been banned due to excessive pollution (ADB, 2006).

According to the WHO standards maximum recommended PM10 concentrations are 50 μg/$m^3$ (24-h average), whereas for PM2.5 it is 25 μg/$m^3$. In a recent study by using an optical particle counter documented 24 hour average PM10 concentrations of 461 μg $m^3$ for Karachi and the corresponding 24 hour average PM2.5 concentrations were 185 μg $m^3$; both of the concentrations are 7-9 times higher than the recommended concentrations (Alam, et al., 2011). The PM concentrations are not solely from transport vehicles but there is a contribution of transportation especially to PM2.5 particulates however the percentage due to vehicles hasn't been determined yet (ibid.).

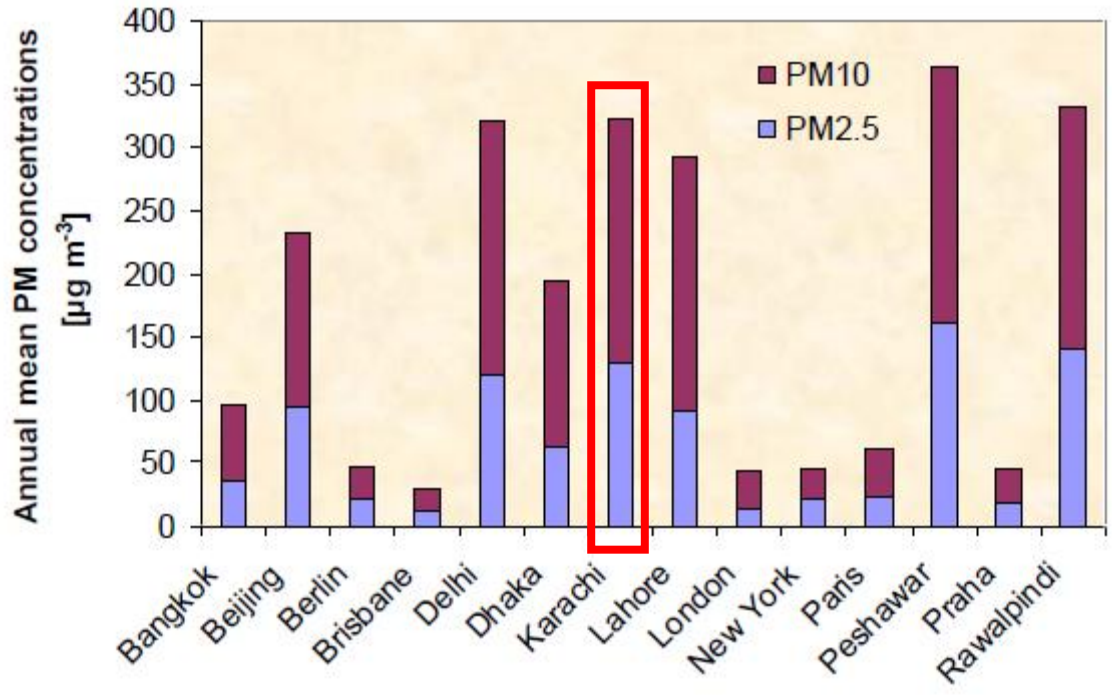



**Figure 4.5: Annual mean PM concentration in selected world cities**

**Source: (Majid et al., 2012)**

The particle mass concentration peak was recorded due to heavy traffic and it turned out to be 573 μg m-3 at M. A. Jinnah Road in Karachi and that coarse particles were 2-5 times higher than the fine particles concentration (Alam et al., 2011).

**Heavy Metal Concentrations**

Various heavy metals such as Aluminium, Barium, Copper, Iron, Lead, Zinc, can be found in exhaust emissions and those cannot be destroyed (Majid et al., 2012). However, these can become airborne and can be accumulated in body and can be toxic if go beyond a certain level (ibid.). It has been found that the concentration of heavy metals is 20-40% more than the WHO recommendation (ibid.).

**Health Impacts:**

According to a study conducted by Pakistan EPA and the World Bank showed, PM causes approximately 22,000 pre mature deaths among adults and 700 among children annually (ADB, 2006). In 2002, another research found that the impact of pollution caused by vehicles severely impacts the traffic policemen as they work amidst the traffic for 10 hours daily (ibid.). 80% of the 1000 policemen were found with Ear-Nose-throat (ENT) problems, 40% showed signs of some sort of lung problem such as tuberculosis or asthma (ibid.). Due to standing for such long hours in smoke and noise of horn, 90% showed signs of irritation and 45% from the age of 35-50 showed symptoms of hypertension (ibid.).

However, in order to reduce the impact of pollution caused by vehicles, government has been promoting the use of CNG which has resulted in conversion of 2 stroke rickshaws to CNG or LPG and conversion of private owned cars making Pakistan to be the third-largest country with natural resources vehicles (ibid.).

## Chapter 5: Analysis

This chapter analyse the problems from two interlinked perspectives; one is the lack at government's end and the other from the user's perspective. As already mentioned in the methodology chapter, interviews were conducted in focus groups; the focus groups are divided by the income classes to understand the problem of each separately and also to derive the similar problems. Therefore the interviews were highly verbal and were narrative to get the knowhow of the different types of issues. The income classes that were interviewed were the following and each consisted of residents of Karachi aged between 18-50 yrs.

a) Low income class: this class uses public transport for long distances while for short distance, either motorcycle, bicycle or walk.
b) Middle income class: It varies between the genders, now many males have started to switch to the option of motorcycles but this class is mostly dependent upon public transport. Some also use private cars.
c) High income class: This class use cars for both short and long distance.

In addition, the author is also a resident of Karachi so personal observation has also been input.

### 5.1 Outcome of the Interviews

After the compilation of the discussions done in the interviews, these were the common issues that are faced by the commuters of all income classes.

- **Rush Hour:**
  - This is time of the day when most of the people travel. In Karachi there are three rush hour time slots; morning between 8 am to 9:30 am at which both office going people and students travel, 1:00 pm to 2:00 pm, this is the lunch break hour as well as, it's the closing time of schools, so the roads become congested due to school buses and guardians' cars to pick up the children. Another reason for the roads to become congested during this time is the lack of designated parking areas near to the schools and hence one lane of the road is covered by parking cars and sometimes even double parking can be spotted. Also, the restaurants near the offices become very crowded during lunch hours and the problem of designated parking persists in this case as well. The third peak time is between 5:00 pm to 7:00 pm. This is when

people get off from work and become stuck in traffic. Following is the picture of everyday situation at Shahra-e-Faisal which connects city centre to other parts of the city.

**Picture 5.1: Traffic Jam in evening at Shahra-e-Faisal**

**Source: http://www.pakimag.com/tourism/shahrah-e-faisal-karachi.html/attachment/shahrah-i-faisal-karachi-with-traffic-jam**

- Buses are too small to accommodate the large public transport commuters of Karachi. Therefore, sitting at the rooftop for men is common. The reason people cannot boycott is due to the small number of buses. This is a common site especially at peak hours.
- During these traffic jams, air emissions are also extreme due to bad maintenance of cars and buses, black smoke can be seen coming out of the engines and headache is a norm for the people.
- Some private car owners reported that they deliberately get off from work late so that they don't have to go through the pain of traffic jam every day.
- Have to walk to other bus stop in the hope of getting a seat to sit in the bus or many people try to leave the house earlier in the morning.

**Picture 5.2: A common sight of an overcrowded public bus in Karachi**

**Source: http://blog.travel-culture.com/2009/02/01/bus-in-karachi/**

❖ **Routes:**

There is quite a difference between the number of classified routes and operative routes. The total number of routes classified minibuses and buses are 403 while the operative from them are 219 making the operative ones 54% of the total (Qureshi & Huapu, 2007).

- The operative routes are not well constructed. Hence, commuters have to change the buses more than once to reach the destination.
- Due to lower number of operative routes, some settlements do not have direct access and people have to walk a long way to the nearest bus stop.
- The bus drivers do not always follow the routes properly. Especially at night time, when there are less number of passengers, they change the routes without announcing or when there is a traffic jam, drivers divert from the defined route to short cuts to reach the time keeper.

❖ **Timetable:**

- There is no fixed timetable followed by the buses. The buses usually start to operate at 6 am in the morning on some routes but some can have different schedule as well and buses stop to operate between 10 pm to 11 pm. Due to early closure of public transport, taxis and rickshaws ask the travellers for double to triple amount of money.
- Since, at the bus stops there is no schedule given, usually people have to commute by common knowledge for the difference between two similar route buses or during peak hours have to wait for long time for a bus to get on with a place to stand in.
- Even if there is an introduction to time schedule for each bus stop, it would be difficult to be followed as people do not like to get off or get on at the bus stops rather nearest to their destinations. Hence, strict rules would be greatly required.

❖ **Fares:**

The fares for the minibuses in Karachi are Rs.10 for 5 km, Rs.15 for 10 km and Rs.17 for 15 km distances. In case of buses the fares for 5 km, 10 km and 15 km categories are Rs.10, Rs.15 and Rs.16 respectively and for coaches there are no 5km and 15km categories and the fares are Rs. 17 and Rs. 18 for 10km and 30km distances (Tanoli, 2012).

- Rickshaws and yellow cabs do not have a distance meter and charge according to their wish. One has to bargain before getting on any of them. They charge more at night or in monsoon seasons because no other option is available for the commuter and the drivers take advantage of it by sometimes asking for double or triple the actual fare.
- These fares are very high especially in comparison to the quality of service catered to the people and also a good percentage of the salary is spent on transportation. Low-income people earn Rs. 200-250 per day in Pakistan (The World Bank) and middle income earns about Rs.1400/day with an average of 6 persons per household ("Is the middle," 2012).
- Also, as mentioned before, due to unorganized routes, many people have to change 2 or 3 buses. The people interviewed spent Rs.54 or more per day on transportation.

❖ **Duration of travels:**

After interviewing different focus groups, a common factor found was most of the people spent a big chunk of time in travelling. It should be kept in mind that all the people interviewed live in

different areas of Karachi and also commute to different areas so the common factor found is not branded for one specific location. It was also understood that the reasons for long commuting hours are mostly due to lack of availability of public transport means, huge number of vehicles on the road. There are some clustered jamming areas where many people pass through at the same time, with no other diversion options and the routes defined for buses are not appropriate. Different situations were extracted from the interviews and some are presented below as examples.

- The interviewers of both public and private transport spend a lot of time in travelling. For example one of the travellers' who commutes by car to his office which is 23 km away from his home, takes 45 minutes to 1 hour in the morning and he tries to either get off a little earlier or by 7 pm to avoid traffic jam in central region of Karachi in the evening and then reaches in 25-30 minutes and in case he gets stuck in traffic jam then it can also take him up to 1.5 hours to reach home.
- A student interviewed spent 1.5 hours to reach Karachi University from Kimari in the morning and would change 2 buses at least, totalling to 3 hours spent every day only going to and from the university.
- A college going student told that her college is 11 km from her home and it takes about 20 minutes in normal conditions to reach there by car but as there is no direct route available to reach her college she has to change 3 buses and hence 1 hour is consumed each in the morning and afternoon.
- For another student coming from Nazimabad no.4 to NED University of Engineering and Technology, it takes approx. 50 minutes in the morning and 1 hour in the evening to go back.

❖ **Environment of Buses/Coaches/Mini-buses:**

- The smoke and smell inside the buses is so much that light coloured clothes become dirty in a day from the smoke and dirt inside the buses. Hygiene is a huge problem; hands become black while holding the poles inside the bus.
- Overcrowding makes it suffocating inside the bus.
- A barricade inside the bus to separate men and women section due to which even though the buses have two doors, only one door is used by each gender making it difficult to get on and off and often people topple or fall from the buses.

**Picture 5.3: A typical mini-bus/bus interior in Karachi**

**Source:http://tripwow.tripadvisor.com/slideshow-photo/bus-interior-by-travelpod-member-redheadgrrl-lahore-pakistan.html?sid=12263232&fid=tp-14**

- Excessive decoration inside the bus makes it look as gloomy and gaudy as shown in the picture.
- After the maintenance of the buses, oil is left on the floors of the buses which stains the clothes of people and also the seats are generally dirty and the concept of cleaning the interiors for people in non-existent altogether.
- A doctor among the interviewees reported that she has to change her coat everyday if she forgets to take it off before getting on the bus as the white turns almost to black by the time she reaches home due to smoke and dirt and sometimes grease and oil from the rods and footboards.

❖ **Behavioural Issues:**

There are some social issues also that are faced by the public transport users.

- Sexual Harassment inside the buses; men intentionally brushes through women or try to touch them unnecessarily, many a times it has been observed that men would try to touch women from next row seats.
- Sometimes, conductors do not return the exchange money to the passengers and also same applies to people that sometimes they also try to steal money and try taking a free ride.
- Unhygienic people also travel; it becomes so smelly inside the bus because of perspiration smell.
- People eat Pan (It is made with filling of tobacco or other flavourings in Betel Leaf) and Gutkha ( Gutkha is paste or powder made by mixing of crushed betel nut, tobacco, catechu, paraffin, slaked lime and flavourings ("Anti Gutkha Campaign,"). Both these have very strong smell and after eating teeth become red which looks so disgusting.
- Drivers start racing with each other with passengers on board and leave the bus lane and overtake from wherever they wish.
- Drivers usually play loud and vulgar music in the buses that can be both embarrassing and disturbing to people.

❖ **Safety:**

- As mentioned above, at rush hours, people have to travel either while sitting at rooftops or standing on footboards which is extremely dangerous.
- Due to overcrowded buses, it can be seen that buses are leaned on one side.
- It is very common for the drivers to apply brakes suddenly and the people standing inside the bus fall or also the people sitting on the rooftop or standing on footboards can fall.
- Due to signal free roads, and very high cross-over, it is very difficult for old, pregnant women, disabled and also people suffering from acrophobia try to cross in heavy traffic.
- It is a common practice for the drivers to not drive in bus lanes except for a few well known and high security roads and do over speeding to reach the time keeper (mentioned in section 4.4).
- Bumpy roads make it extremely difficult for standing passengers to keep standing safely.
- Many buses drip during rain as the roofs are fractured and in some cases, one can see the sky or even the road due to poor condition of the vehicles' frame.

- Interviewees reported that many of the buses have nails coming out of the doors and there are sharp rusted corners present as well. One of them injured his wrist while getting off with a big nail coming out of the door. And another's pant was torn due to a sharp corner in a seat.

❖ **Elderly, Women and Disabled:**

- There is no facility for elderly, women or disabled people. Women feel they get cramped in the front and there small partition area is also invaded by the males at peak hours.
- The footboards are too high to get on the bus comfortably even for a healthy adult, hence back pain is common.
- Pregnant women or disabled people cannot commute by buses due to obvious reasons and if they due especially the low-income class, they do it at a high risk of safety.
- The total number of designated seats for women in a bus is maximum 10 in which two are exactly behind the driver so one has to face to the opposite direction of the flow of traffic while sitting on it, and it is extremely uncomfortable and low height seat. 1 seat is by the side of the driver without anything to hold on to and without anything to lean to at the back and is also facing the opposite direction to the flow of traffic.
- The four normal seats are sometimes taken by men in peak hours or sexual harassment from the male seats behind them is also common.

❖ **Bus Stops:**

- At bus stops, the buses do not wait and many a times people have to get on the bus while it is still moving or the driver starts driving while people are getting on or off the bus (due to time factor and lack training to drivers).
- Harassment at bus-stops is very common and all the women interviewed and author experienced it almost once every day. It is commonly observed that cars stop and offer lift to women or/and men from the car or standing nearby stare at women, and also try to approach by verbal means.
- With regards to the problems of bus stops, there is a problem on both sides. Commuters do not want to get off at the bus stops, and every few meters someone would call out to stop the bus which increases the commuting time.

- The distance between bus stops is not adequate, that is also a reason bus stop rule is not followed. People stand anywhere on the road and wave hand to stop the approaching buses.
- The distance between two bus stops should be made adequate and then strict rule should be applied that buses would only stop at the stops. Then only instead of stopping every 50-100 meters buses would be able to maintain constant speed and travelling time could be reduced.

❖ **Private Vehicle Owners:**

- There is a lack of proper parking places in shopping districts but another reason is public awareness is severely required. In all major shopping and business districts, people want to park the cars as close to the shops or restaurants as possible and double parking is frequently sighted, so that one whole lane is taken up by illegal parking as shown in the picture below.


**Picture 5.4: Shalimar Shopping Centre View-Tariq Road**

**Source:**

**http://www.pak101.com/c/forum/topic/14555/General_Talks/Tariq_Road_Bazar_Shopping_Market_Photo_Tour_Karachi_Pakistan**

- Single drivers in a car are common especially at peak hours which also make the number of vehicles increase and congest the traffic unnecessarily.
- It has been observed that the unlike developed countries, people want to avoid walking to a store, and rather want to stop in from of their destination, one of the reasons for this behaviour could be related to safety reasons as gun-point snatching has become increasingly common and another apparent reason is the concept of highly comfortable life-style.
- Motorcyclists in Karachi remove the side view mirror or when is broken do not replace it and then change the lanes blindly and are often seen riding in the fastest lane hence, making it difficult for cars and cause traffic jams. Motorcyclists also take u-turns from footpaths or a small gap to save petrol.
- It is a common site to see whole families riding on one motorcycle with only the driver wearing a helmet and drive rashly making it highly unsafe for everyone.
- Other than few high security areas, cars and motorcyclists do not necessarily always follow the traffic signals which doesn't only make it dangerous but also cause severe traffic jams.

❖ **Pedestrians:**

- There are no walking paths at the sides of the roads and where they are, either they are in poor condition, or people park their cars on them or vegetable and fruit carts cover the space.
- The existing footpaths for both young and old people are very uncomfortable because of their unequal heights and also mostly the new ones in the middle of the roads are so high that old people cannot even get on them easily to cross the roads.
- Since, the inauguration of signal free corridors, it has become difficult for pedestrians to cross the roads as over-head bridges are available at great distances from each other and these bridges are not convenient in general for anyone especially for elderly, pregnant women or women with little children, disabled and people suffering from acrophobia.

According to a report, around 100 fatal and 30 non-fatal accidents occurred in 2013 from January till mid of April due to whom the victims were mostly either pedestrians or motorcyclists (Perwaiz, 2013). The report says that accidents occurred due to over-speeding of buses, mini-buses, oil and water tankers and dumpers and some by over-speeding cars that claimed the lives of pedestrians (ibid.). The accidents caused the lives of 54 motorcyclists, 38 pedestrians and 19 other road users with about 74 people got injured in non-fatal accidents (ibid.).

❖ **Traffic Police:**

- The corruption in the traffic police department is common in Karachi. And it has become a norm to do the so-called "document check" by the traffic police. They do this anywhere by interfering in the flow of traffic. On the name of document check, the intention is to take bribes. People are forced to do this otherwise they just try to find a problem with their document or accuse them of driving improperly and fine or take the vehicle's papers from the driver. This sort of behaviour has been observed for all types of vehicles, except the vehicles with government number plates.

In general, the concept of corruption on all levels is wide-spread. Those people, who can, use their political or monetary connections and law-enforcement accepts those connections and helps such "privileged" people of getting rid of the laws the find inconvenient.

## 5.2 Some Initiatives Taken by Users

Due to the problems with public transport system, people have taken some initiatives by themselves.

- **Car Pool-in:**

Many office workers now try to find car pool-in solution for long distances to save time and to go to their workplaces comfortably. They all gather at a point and go to offices together. Many companies also encourage the workers to do this in order to decrease the quantity of vehicles on the road and discourage the use of one car per person approach.

- **Private Pick & Drop Services:**

There are now many individuals who have started a business by offering private pick and drop services, these services either uses air-conditioned cars or vans. This type of service is used by both students and office-workers and has become extremely popular among the women as this type of service is safer and comfortable alternative to public transportation although a little expensive.

- **Taxi-Pool-in:**

Taxis have started a business of their own by offering commuters to pool-in one taxi service to go to specific areas after the buses stop to operate example from NIPA Chowrangi to University Road. This has helped those people who get late from getting off work and instead of paying a

lot to individual taxis or rickshaws they simply pool-in. But this service is only used by men due to security reasons.

These initiatives are not enough for the population of Karachi and not all the people can afford pick and drop services either due to its expensive nature. As for the Car Pool-in, the promotion of such campaign by a handful of companies cannot be effective unless the government doesn't promote it as well and most importantly strive to make positive changes to the public transportation sector.

### 5.3 Government Rules and Regulations

By looking at the public transportation system, government does not have much say and is all operated by the private sector resulting in their own monopoly. There is a general existence of mistrust between the three key stakeholders of users, operators and government (Sohail, 2000, 137). The government although has made policies to upgrade the quality of service for the benefits of the public but no implementation has been done yet and if it comes to the dialogues between the operators and government on issues of provision for users such as low fares, better quality, etc, it usually ends against the users end or else because of operators' monopoly, strikes and shutdown of operation occur (ibid.). They have this monopoly because the government hasn't still been able to implement a framework that can break it and provide alternatives to the users and instead of individual ownership of transportation system, promote companies' to invest in the system and operate.

Due to frequent changes in governments, the policies keep on changing with the new government coming into power and often old departments become defunct as mentioned in chapter 4. The author found two websites both by the name of Transport Department Government of Sindh but different URLs. Now, it is difficult to say which one is defunct and which one is working. Hence, the author analyzed policy documents available on both websites. For transport rules and regulations, one document that is provided on one of them is by the title of "AS AMENDED BY PROVINCIAL MOTOR VEHICLES (AMENDMENT) ORDINANCE, 1978". Although it was amended in 1978, but it is definitely outdated, for example the document in chapter 6 which is about the construction, equipment and maintenance of motor vehicles its clause 74 states that the government 'may make' rules regarding the matters such as periodical inspection of vehicles, emissions, reduction of noise, brakes and steering gears and use of safety

glass etc (PROVINCIAL MOTOR VEHICLES ORDINANCE, 1978, 81). This law which should have been made long ago by the government was never made, therefore, vehicles currently in use are although remain in control of the driver but are complete safety hazards. One of the interviewees reported that he saw a woman going for a about a week to drop her kids in her car with one of the front doors missing. Similarly, many buses have cracked windshields, no door at the driver's side and rear window glasses are altogether missing in most of them as shown in the Picture


**Picture 5.5: Buses without safety**

**Source: http://www.3quarksdaily.com/3quarksdaily/2010/07/karachi-photo-journal.html**

There are many rules that are present in the document but are simply not practiced for example clause 89 in the document states about the Pillion riding and states **"**No driver of a two wheeled motorcycle shall carry more than one person in addition to himself on the cycles and no such

person shall be carried otherwise than sitting on a proper seat securely fixed to the cycle behind the driver's seat" (ibid, 86) but it is common to see whole families travelling on one motorcycle. All in all, on one hand where it is needed to amend the ordinance, on another, strict implementation of the existing rules is also required.

The other document found on another website with the same name and functionality and more or less with the same information (except the names of the chief minister and transport minister) has a document by the name of "Transport Policy (2011)". This document identifies various policies that are required such as environmental pollution, mass transit systems etc, and rights for women, handicapped, and pedestrians and gives an overview of the pilot projects, their commencement dates and completion. This document also talks about the maintenance and inspection of motor vehicles but till the date this paper is being written, no such rule has still been implemented. This policy document although is not a complete amendment of the 1978 ordinance and has a different structure as well but it does contain several aspects and points of it too which are in a way amended as of 2011. After reading the documents, the author has come to the conclusion that a definite framework is required to integrate all the aspects of transportation and most importantly meet the implementation deadlines instead of simply publishing documents without bringing them into practice.

## Chapter 6: Case-Study

Case studies of different cities with more or less similar situation of public transport can be considered and part of the solutions can be adopted such as bus rapid transit (BRT). Also, these case-studies can help in calculating the probability of success of implementation of different possible projects. Such case-studies from around the world can be good examples of integrating different systems to move towards sustainable development.

### 6.1 Public Transport Reform in Seoul, South Korea

Bus Rapid Transit (BRT) networks are being developed in many cities now. Among them is Seoul, the largest and the capital city of South Korea. (Strompen, Litman, Bongardt, 2012, 19). Seoul has a population of more than 10 million and area of 605.33 sq. km. (Visit Seoul, 2013).

In order to battle the growing problems of pollution, overcrowding, traffic congestion, health issues etc., Seoul's mayor Lee Myung-Bak and his team at Seoul Development Institute utilized various innovations (Strompen et al. 2012, 19). Among them was a new BRT system; the core of which is formed by 5,000 high quality buses and 107 km median lanes especially for buses called bus ways (ibid.). As the name suggests, only buses can travel on these lanes and an important point to consider is that these bus ways were designed to complement the existing subway system instead of competing with it, thus special attention was paid towards integrating the two (ibid.).

The new bus routes were marked by different colours and buses were colour according to the route they were travelling on to make it easier for passengers to identify the buses travelling on their required routes (ibid.). Around 400 bus routes were restructured to integrate them with the subway system. The level of integration is such that the same ticket can be used for both bus and subway and no extra ticket is charged for intra modal transfer thus making a single integrated transportation network instead of two separate networks independent of each other (ibid.). Of course for this level of integration, it was necessary to match the schedule of buses and subways according to route linkages (ibid.).

Before this system, the bus transport was very informal, however, now the focus is on improving the service. Consequently every bus has been equipped with GPS and attention is being to misconducts such as speeding, missing the stop sign, driving with open doors is penalized (ibid.).

As a result of this system, improvements have been noted in the overall level of customer satisfaction, number of bus accidents and number of people using the bus service. The downtown area experienced reduction in pollution and traffic congestion. On the three initial BRT corridors, bus speeds experienced an improvement of 85% and 99% during morning and afternoon rush hours respectively (ibid.). Effectiveness can be gauged form the observation that the buses travelling on BRT lanes were able to transport six times more passengers than cars travelling on the same roads but on different lanes in the same time frame (ibid.). These reforms were implemented in 2004. By 2010, the number of people using buses and subways increased by 12.8% and serious injuries and fatalities due to bus accidents dropped by 95% and 45% respectively (ibid., 20).

From 2004 to 2008, decrease in traffic congestion was noted since increased usage of buses and subways lead to a decrease in use of private cars (ibid.) Use of private cars went down by 2.8% and 6.57% in entire city and city centre respectively (ibid.). Bus share as mode of transport increased from 26% to 27.8% and that of subway increased from 34.6% to 35.2% while share of automobiles went down from 26.9% to 25.9% (ibid.).

Convenience that the new system introduced in the bus system for its users was one of prime factors for its success. The colour coded routes, revision of rates based on distance travelled as compared to old system of flat rates, smart card usage, introduction of a system where one ticket for a trip is issued that can be used across several buses instead of buying a new ticket for every bus are some of the ways convenience and customer satisfaction were provided (ibid.). A survey revealed that this integrated fare system where one ticket can be used across buses and subways is the most popular since it reduced fare prices (ibid.).

Before the bus reforms of 2004, the bus system was owned by private companies and government had no say in the system apart from regulating fares. In order to maximize revenues, companies focused on decreasing costs which lead to low maintenance of buses and overcrowding in buses as companies encouraged operators to load as many passengers as possible (ibid.). Of course this decreased level of service quality meant only those people used buses who could not afford an alternative mode of transportation leading to a decrease in number of passengers; this in turn prompted companies to reduce costs even more (ibid., 21)

After reform of 2004, Seoul Metropolitan Government converted the system to a semi-public one by taking control of schedules, fares and bus routes (ibid.). The government also introduced an

incentive system where the private bus companies were reimbursed for operation costs and a profit margin based on the vehicle/km travelled instead of passenger trips (ibid.). This gave the incentive to companies to focus on increasing service quality instead of reducing cost and increasing number of passengers per bus (ibid.). Another Government check is that a profit margin is only distributed top 70% best performing companies based on a service measuring system. This ensures that companies maintain a certain quality of service (ibid.).

Seoul also carried out a road space restoration known as "Cheonggyecheon River Project" that started in 2003 (ibid, 32). There existed elevated highways on the river which was used by approximately 168,000 vehicles in 2000. The conversion of highway was a bold project but was done despite the predicted fear of having negative impact on local business but instead as the previously hidden river under the elevated highway was uncovered the business in this area increased and this development attracted tourism as well and most importantly improved the air quality of the area (ibid.). 3.6°C temperature drop occurred along the river side and 30 % reduction in $NO_2$ pollutants and 11% reduction in $PM_{10}$ concentration (ibid.).

## Chapter 7: Steps towards Sustainable Development

Mostly, sustainable development is defined as something related to resource depletion, ozone layer depletion, and air pollution but defining it in this way tend to overlook many coordinated possibilities and sustainable development is not a limited approach (Litman, 2006). Rather sustainable development is a combination of different aspects Environment, Society and Economy through which multiple objectives can be reached (ibid.).
Transportation systems also have its share of impacts on sustainability as listed below.

| **Economic** | **Social** | **Environmental** |
|---|---|---|
| Traffic Congestion | Inequity of impacts | Air and water pollution |
| Mobility barriers | Mobility disadvantaged | Habitat loss |
| Accident damages | Human health impacts | Hydrologic impacts |
| Facility costs | Community interaction | DNRR |
| Consumer costs | Community liveability | |
| DNRR* | Aesthetics | |

DNRR*: Depletion of non-renewable resources

**Table 7.1: Transportation Impacts on Sustainability**

**Source: (Litman, 2006)**

Previously it was believed that increased number of vehicles is an economic benefit but carefully calculating different aspects, it has been understood that there is a link between the three such as with increased number of vehicles, there are economic losses due to environment and society (ibid.) for example the cost for health care due to emissions and accidents. Focusing on a single system cannot achieve sustainable development. In order, for a developing country as Pakistan, development in a sustainable manner is a must. To achieve this, it is of uttermost importance that an overall systems thinking approach is taken into consideration by including various aspects together such as infrastructure and land use planning, alternative options for transportation, energy, educational trainings, safety etc. Sustainable transportation system should provide accessibility to all citizens in an economically affordable, impartial and with minimal impacts on environment (Litman, 1999). It should be given *higher priority to public transit, or other means*

*of non-motorized transport that are available to almost all the citizens* (ibid.). There are a few recommendations included that can be initial steps towards the sustainable transportation system. Full research would be required to implement each or combination of them. One way can be to start by designing pilot projects and analyze the outcomes. Rather than only focusing on huge and long term projects such as Karachi Circular Railway or BRT which would take a few years to be fully realized, parallel smaller projects can also be focused upon to reduce the existing issues and relatively in shorter time period.

## 7.1 Traffic Demand Management

Building Traffic Demand Management (TDM) strategies can be good solution to manage the current traffic situation of Karachi. For TDM strategies that can be implemented depending on the desired objective for example congestion is required to be reduced at peak hours or all day, reduction in exhaust emissions, time saving and increase in travelling time reliability, energy use, increasing accessibility etc (Seattle Department of Transportation, 2008). Mostly it is a combination of different objectives that lead to design the strategies accordingly (ibid.). A TDM strategy along with parallel mixture of other strategies is developed together (ibid.). There can be many possibilities that can be researched out of which a few of them are suggested below;

### 7.1.1 Congestion Management

Traffic congestions are normal in Karachi and people often complain about the ever increasing commuting time in the city especially at peak hours. Traffic congestion can be referred to as: *"A physical phenomenon relating to the manner in which vehicles impede each others' progression as demand for limited road space approaches full capacity"* (OECD, 2007) or *"A relative phenomenon relating to user expectations vis-à-vis road system performance"* (ibid.). Speed harmonization can be a solution to reduce this phenomenon along with the possibility of reducing primary incidents (Mirshahi et al., 2007) such as crashing of cars with each other due to being too close to each other. In speed harmonization, travel data is collected and monitored and whenever the traffic reaches the threshold limit set by the experts and speed is slowed down congestion starts to occur (ibid.). This system has been implemented in many European countries and also has been adopted in United States to reduce congestions (ibid.). In Netherlands, the motorway control system provides speed limit signs at every 500 meters to slow the traffic before work zones, queuing of vehicles etc (ibid.). Another strategy that can be used in

combination of speed harmonization is to provide information to use an alternative route so that bottle neck is not generated on one specific route.

### 7.1.2 Inspection and Maintenance Policy

Currently, only policy for annual payment of taxes on vehicles is in practice and a tax sticker is pasted on the windshield. Similarly, there should be an inspection and maintenance policy implemented to ensure that the motor vehicles comply with the regulations of safety, operation of vehicle components and exhaust emissions. This inspection can be carried out periodically depending upon the age of the vehicle. Different countries have rules for it and can be considered while implementing in Pakistan. After a vehicle is passed after the inspection, a sticker similar to tax sticker can be pasted on the windshield. The inspections should not only be for four-wheeled motor vehicles but also be carried out for motorcycles and rickshaws.

### 7.1.3 Alternative Transportation Means

People should be able to commute efficiently and in a dignified manner. Instead of limited options for commuting, such networks should be made that alternative options can be produced. One of such alternatives that in recent years have been almost forgotten is use of bicycle and walking. Currently, the mindset of the people is to avoid walking but that is due to several reasons such as improper pathways and accessibility and most mindset of people as many consider cycling and walking to be the means of very poor. However this can be improved if a proper campaigning for promotion is done by explaining the benefits of walking and cycling such as healthy lifestyle and weight loss, promotion of health walks and organizing groups walks for children to make it a routine of their lives. But before such promotion, proper pathways and street networks for pedestrians, cyclists and disabled are required which is possible as already the footpaths exist, and would need minor changes in the structure to make them proper as the current ones are unequal in height making the routes bumpy and leaving no space for cyclists.
As the number of motorcycles in the city is more than the cars and the trend is increasing, promotion of green motor bikes should also be considered, their operational costs are 25% of the petroleum motorbikes being marketed and sold currently in Karachi. They also do not cause air and noise pollution (Hassan & Raza, 2011).

### 7.1.4 Alternative Work Scheduling

Alternative work scheduling is also known as flexible work scheduling; these are policies for work hours and consist of three categories namely flex time, compressed work weeks and staggered work hours (U.S. Department of Transportation, 1992). In flex time, employees are given flexibility in work hours for their arrival to work and departure within specified limits (ibid.). Compressed work weeks means, employees can work more hours per day than the defined 8 hours per day schedule and then can take a day or two off in rest of the week (ibid.). And in staggered work hours, the timing of arrival and departure is changed by the employers to reduce the number of employees arriving and departing at the same time. However in this type, the employees do not have control over their shifts and the shifts can be from 15 minutes to 2 hours depending upon the employer ("Alternative Work Schedules"). Another option that can be provided by the employers is to do home-working once or twice a week.

These alternatives can provide various benefits to personal, community and environment. The peak hour congestion would be reduced and traffic would be distributed between different time frames. The air quality due to vehicle emissions can be improved as everyone would not be commuting everyday to work and at the same peak times. Those who use personal vehicle everyday due to overcrowded public transportation can switch their mode of commuting to public ones or ride sharing.

### 7.1.5 Parking Management

Parking Management refers to the strategies that can make the parking facilities efficient (Litman, 2012). Most of the parking related problems arise when the parking is free and plenty as commuters prefer to use their own motor vehicles instead of considering other options such as car-pooling, walking or public transport (Seattle Department of Transportation, 2008). The old approach was to provide plenty of parking space and free of cost but this has resulted in more parking space demand with the increase of vehicles (Litman, 2012). The parking management approach is to be able to supply optimal parking facilities with adequate pricing and management (ibid.). If the parking pricing is set too low, the problem of "everyone can pay" occurs, and if too high, too much empty slots would be left causing high cost bearing and the problem would remain as it is (ibid.).

One of the major problems in Karachi in main shopping and work districts is that people have to circle the same roads over and over in search of parking which has resulted in double parking in most shopping districts. Double parking covers one extra lane that hinders the flow of traffic and congestions are commonly seen.

There can be various solutions to it such as provision of shared parking spaces among destinations; this can be especially applied to shopping and recreational districts where one parking space can be shared by for example, theatre and restaurant and shops (Litman, 2012). Similarly, conversion of the free on road public parking to paid ones and development of off-street paid municipal parking plazas can help in increasing the efficiency of flow of traffic and reducing parking demands (ibid.).

### 7.1.6 Pedestrian Signals

Karachi does not have pedestrian signals and as mentioned in chapter 6, people have to cross roads in between the traffic, cross-over bridges and zebra-crossings whose marks with several monsoon seasons passed, almost all the marks are gone. And most importantly few want to follow zebra crossing rule to stop for the pedestrians. A good solution for this would be to install pedestrian signals along with closed-circuit-television (CCTV) cameras to monitor if someone violates red light signal and also for Karachi these cameras can be helpful in serving the security purpose.

The pedestrian signals should also be installed in signal free corridors because for the pedestrians it becomes difficult to cross the road since cross-over bridges are at great distance from each other and they are not feasible for everyone to use them either. Although, this step would make the purpose of smooth flow of traffic by again putting signals on those corridors, but would be helpful in reducing the pedestrian accidents that occur while try to crossing the roads amidst heavy traffic. To ensure that installing signals do not affect the flow in major roads, different types of pedestrian signals can be installed at major and minor roads depending upon the density of pedestrians that cross a particular road (Koonce et al., 2008). Pedestrian push button signals along with audio instructions for the disabled can be installed at major roads and as Pakistan already has energy problems, an option of installing solar signals can also be considered. Example of a type that can be installed is shown in the following picture.


**Picture 7.1: Pedestrian Signal**

**Source: http://www.nyc.gov/html/dot/html/pr2006/pr06_04.shtml**

To ensure the success of pedestrian signal crossings, it is necessary to implement strict laws for the following of the rules of traffic signals. As, it has been commonly seen in some areas of Karachi that people try to either not follow the traffic controller or signals and break them causing traffic jams and safety hazards.

### 7.1.7 Public-Private Partnership

In longer run, to make the air quality of the city cleaner, to deal with the health problems due to smoke and emissions, reduce energy demands and also to encourage public transport, investment in public transportation is severely required. As most, of the public passenger vehicles are more than 20-25 years old, not only that they emit huge emissions but also have turned into highly uncomfortable means to travel with. In such a case public-private ownership business opportunities for small to medium sized enterprises should be introduced. The approach should be to work with companies rather than the current practice of working with individual operator.

Bank loans already exist for cars and motorcycles; similarly if the opportunity for business ventures in public transportation is be well marketed, bank loans for upcoming entrepreneurs would become possible to contribute to the improvement of public transportation.

### 7.1.8 Support Team

A support team can be helpful for a city as large as Karachi to provide information to citizens about the different road networks, traffic situation and safety (due to general instability of the city). The team would be responsible for collecting data for fault reporting of traffic signals, maintenance of pedestrian cross roads and bridges etc through periodical inspection checks, and customer complaints. Through such centralized fault reporting system, areas requiring maintenance and repair information can be passed down to relevant departments and as all the fault reporting would be done to one support centre, the different urban planning and transportation departments would be able to work in coordination and develop a better communication.

The support team can also work in providing information of on-going road-works and alternative routes to commuters for example by radio broadcasting. And last but not the least can also support in designing of bus-time tables, bus maps for both inter and intra-city travel, ride passes, ticket information; this information can be made available on one web-site for easy and efficient access and of course a call-help line can also be helpful for the citizens.

### 7.1.9 Safety Education

A department is required that can be dedicated for outreach programs and public awareness programs for children, senior citizens, and all citizens to educate by campaigns and training programs regarding different aspects of the road safety precautions to be taken while commuting from wearing seat belts to speed to using indicators while changing lanes. The safety education can also be introduced to students of different age groups through educators.

The public campaign can also include introduction of stickers pasted to indicate various special cases such as senior citizen driving, child in car, new learner and so on so that other people can be considerate while driving around them. Such laws already exist in many developed countries and can be adopted according to the needs of Karachi. There should also be safety workshops for motorcyclists as the number of motorcycles is more than cars in the city and their lenient behavior often leads to accidents.

## 7.2 Further Research

A further research could be done into the cost analysis, social, environmental and economical impacts of the recommendations presented in this paper. As, the current public transportation system is all bus based, an interesting research could be to analyze BRT system based on renewable resources for Karachi and how much environmental and health impacts could be reduced if implemented.

## 7.3 Conclusion

Karachi is a huge city and will continue to grow, along with the increase of its urban issues. The report evaluated the urban development, transportation system and policies. The trend of the development pattern analysed showed that the city did not develop sustainably and the political unwillingness or lack played a key factor.

The overall impression of the transportation system turned out to be extremely negative and in a critical crisis. In order to move to a more sustainable path, the city needs to implement solutions such Bus Rapid Transit and revive Karachi Circular Railway along with short-term solutions such as the ones presented in this paper but the key role remains with the government bodies to be played.

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## APPENDIX 1

Focus Group Interviews Structure
(Translation from Urdu-local language to English)

**Welcome Note**

Thank you all for coming here today and agreeing to participate in my research on the transportation system of Karachi.

Since, it is a research to study the current problems faced by the commuters everyday to go around the city, in this session you all should openly share your thoughts and discuss the transportation system and rather than being hypothetical, sharing the personal experiences would be considered best.

This session is being recorded, however, no one needs to be worried as I can truly understand the fears due to unstable situation of the city these days and the recording would remain confidential and would only be used for analyzing the data for the research. If you have any questions, feel free to ask in the break or after the session is finished.

The questions usually asked in the focus-group interviews were generated after listening from one argument to another but the basic questions around which the interviews were conducted are as follows:

- For how long have you been living in Karachi?
- What is your profession?
- What type of transportation system do you use to commute? Do you use public transportation?
- What is your image of public transportation of Karachi?
- How many times do you commute and what is the normal distance and time to travel?
- Do you find the public transport comfortable?
- If you use private car, is that comfortable in the mornings and in the evenings?
- Do you think the fares are fair for the quality you get?
- What have been your personal experiences while travelling in Public transport?

THANK YOU FOR ATTENDING!