**Chapter 1: Introduction** 

- 1.1. Background
- 1.2. Aim & Objectives
- 1.3. Study Area Delineation
- 1.4. Data Base
- 1.5. Primary Surveys

# **1. INTRODUCTION**

# 1.1 Background

Transportation is the backbone to the development of urban areas. It enables functioning of urban areas efficiently by providing access and mobility. Passenger transport has an overriding influence on the functioning of the city. With growth, the mobility needs increases. People's personal choices and freedom get expressed in increased ownership and use of personalized vehicles. The public agencies operating public transport systems often fail to restructure service types to meet with the changing demand pattern. As a result public transport becomes financially less viable, speeds reduce, congestion levels increase and the transportation becomes a source of environmental problem. According to a study (World Bank, 1996), 70% of the world's urban population breathes unsafe air. It is also estimated that more than one billion people live in cities with unhealthy levels of suspended particulate matter. Every year millions of people die or suffer serious health effects from air pollution. As per a WHO study (2000), an estimated 3 million people die each year because of air pollution; this figure represents about 5% of the total 55 million deaths that occur annually in the world. Vehicles are major sources of urban air pollution and greenhouse gas emissions. There are economic consequences as well. As per a recent study of the World Bank<sup>1</sup>, the costs to society due to air pollution in large cities of India, a part of which is direct productivity loss, was found to be nearly as high as one-tenth of the income generated in these cities from all economic activities.

The trends appear similar in most third world cities. The city of Ahmedabad, largest among all cities of Gujarat state, accommodating about 5 million people, has a registered vehicular strength of 1.4 Million. The rate of growth of vehicles has been about 9 to 10% per annum. Public transport situation has deteriorated rapidly over the past decade. The end result is visible in terms of increasing congestion on the city streets and the worsening of air quality.

Recognizing these problems areas, the State and the City governments have initiated a series of measures to improve urban transport situation in Ahmedabad. The significant efforts of the recent past are:

- 1. Integrated Public Transit System project by GIDB (1998-2002),
- 2. Sub-urban Rail System by AUDA & GIDB (2004),
- 3. Metro Rail Transit System by GIDB (2004),
- 4. Introduction of CNG buses by AMC (2005), and
- 5. Comprehensive Road Improvement Plans by AMC and AUDA (2004-5).
- 6. Bus Rapid Transit System (BRTS) initiated by GIDB with AMC and AUDA. (2005).

<sup>&</sup>lt;sup>1</sup> Kseniya Lvovsky, World Bank, Economic Costs of Air Pollution with special reference to India, World Bank

The present initiative to develop BRTS is in recognition of the fact that no single mode will completely serve the mobility needs of the city, and the bus system, both in its basic form and rapid transit form, makes it a critical and major component in an integrated transit system of any mega city.

These efforts receive further fillip due to the fact that the state government has declared year 2005 as an Urban Development Year and concerted efforts are being made to improve the condition of urban areas.

# 1.2 Aim and Objectives

The aim of this ongoing effort is to prepare a BRTS project development report for Ahmedabad. The detailed terms of reference have been annexed to this report. (Annexure-1: TOR).

This submission titled 'Corridor Identification and BRTS Concept design Report' attempts to:

- Present an overview of socio-economic and physical conditions of the city,
- Present an assessment of the existing transportation system in the city,
- Identify and analyze corridors as potential BRTS corridors, and
- Phase-out implementation of identified corridors, and
- Recommend a corridor for development in phase-1.
- A conceptual design of the system has also been attempted.

It has been suggested that subsequent work is expected to carry the design process to Detailed Project Report level. TOR is being revised accordingly.

# **1.3 Study Area Delineation**

A series of studies have addressed the issues related to transport sector in Ahmedabad. The study initiated by GIDB 'Integrated Public Transit System for Ahmedabad' in the year 2000 carried out extensive filed survey and suggested a framework. The study carried out by LB associates also collated secondary information.

The study area having approximately 3000 sq.Kms has been initially divided in to major subregions such as Walled City, AMC east, AMC west, AUDA, GUDA and other villages. These sub-regions have been further divided into 427 traffic analysis zones (TAZ) based on the ward boundaries, census zones, village boundaries, district boundaries of the study area including major highways, railway lines, natural watercourses, land use and population density. For the purpose of better consistency and detailed analysis smaller zone sizes have been considered as detailed below. However the study will focus on contiguously developed areas around Ahmedabad.

As indicated above, the following four major areas were considered for zoning system. Those are:

- Zones within AMC limits
- Zones outside AMC but within AUDA

- Zones outside AUDA but within IPTS study area
- External Zones

#### Zone System within AMC limits

Depending upon the type of land use and other guidelines the total area of AMC was delineated into 196 traffic analysis zones (TAZs).

#### Suburban and Rural Zones

AUDA has identified 150 villages in the revised Development Plan (August 1997) within the study area and these villages were grouped into 4 sectors (growth centers). These growth centers are Kalol, Sanand, Dehgam and Mehmedabad. These sectors had been identified and taken as 145 traffic analysis zones. Gandhinagar is not part of AUDA and hence LB study divided Gandhinagar urban portion into four TAZs.

#### External Zones

Entire Gujarat State and Rest of India, connected by National highways (NH8 & NH8A) and State highways have been divided into twelve external zones.

SI. No	Area	No. of Zones
1	AMC (Urbanized)	196
2	Gandhinagar	4
3	Suburban (East & West) Areas	61
4	Rural Zones/ AUDA	74
5	Four Growth Centers	10
6	Gandhinagar Rural	24
7	Remainder of IPTS Study	58
8	External Zones	12
	Total	439

Overall zones of the study area are as under:

The detailed of the Zone System has been presented in Table.1. below

	Table 1-1:	Study	Area	Zone	System
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Sub Area	TAZS
Walled City	1-34
AMC (Outside Walled City)	35-196
Peripheral Area West (contiguous)	197,270,277-78, 287-89, 291-97, 299- 316, 320-22
Peripheral Area East (contiguous)	199-204,223 - 24, 226-230,234, 237-41,243, 256- 57,262, 270-71, 273
Gandhinagar GNA	341-344
Rest of Gandhinagar	339,340,345 -347,349-55 360-61,363, 408-416
Kalol (M) / Saiz (VP)	329-331-332
Mehmedabad	250,251
Dehgam	211,212

Sub Area	TAZS				
Sanand	283-286				
Rest of AUDA (Rural)	198,205-10, 213-222, 225, 231-33,235, 236, 242, 244-249, 252-255, 258-261, 263-269, 272, 274- 276,279-282, 290, 298, 317-319, 323-328,330, 333- 338,373				
Remainder of IPTS Study Area	348,356-59, 362,364-372, 374-407, 417-427				
External Zones	427-439				

# Map 1-1: Zoning Map



Source: GIDB/LB (2000) 'Socio-Economic & Land use Studies

The details of the zones names with their numbers have been annexed to this report.

(Annexure 2 - List of Zone numbers with their names).

# 1.4 Data Base

The study is envisaged to base its recommendations mainly on available data from various reports. Few critical surveys have also been envisaged. Details of these have been summarized below.

#### 1.4.1 Earlier Studies

GIDB initiated studies:

- 1. IPTS Study undertaken by LB Associates (2000)
- 2. Ahmedabad Metro and Regional Rail System study by DMRC and RITES (2004-5)

#### AMC /AMTS Studies:

- 3. Ahmedabad Traffic Management Study (1997)
- 4. Strategic Plan for Public Transport System in Ahmedabad (1992) by CEPT
- 5. Traffic Management Plan for Ahmedabad (2003) by CEPT
- 6. Ahmedabad Municipal Transport Service Structure and Strategies (1996) CIRT
- 7. Ahmedabad City Development Strategy (2003) by CEPT
- 8. Ahmedabad Urban Transport Study (1995) by RITES
- 9. Walled City Revitalization Plan (1999) by EPC

#### AUDA Studies:

- 10. Development Plan 2011
- 11. Metro Techno-Economic Feasibility Survey (1985) by RITES
- 12. Sub-urban Rail Study (2004)

#### CEPT Studies:

- 13. Bus way Transit for Ahmedabad (1995)
- 14. CNG Plan for Public Transport System in Ahmedabad (1994)
- 15. Rationalization of Ahmedabad Municipal Transport Routes (1995)
- 16. Accident Information System: A case of Ahmedabad (1998)
- 17. Privatization of Public Transport: Can we innovate? (2000)
- 18. Planning for Bicycle Traffic: A case of Ahmedabad (2000)
- 19. Privatization of Public Transport System in Ahmedabad (2003)

Report also draws lessons from publications of GTZ<sup>2</sup>, the World Bank, Transport Research Board, Transport Research Laboratory, Institute for Transport Development & Policy, and CUTR, Florida.

# 1.5 **Primary Surveys**

The year 2000 was when public transport supply was the highest in the history of AMTS high with the organization having a record number of buses (942 buses) serving 7.5 lakh passengers as a daily average. It would be safe to expect that such a level expectation of patronage is achievable in 2007. <u>Hence the analysis in this report extensively uses LB data collected in the year 2000 for the purposes of assessment of corridors.</u> Wherever necessary, updating has been done to reflect current situation.

In addition the following primary surveys have been envisaged as part of this effort. The status of each of these has been presented below. In addition, certain additional surveys will also be undertaken to prepare a Detailed Project Report.

SI. No	Survey Details	Purpose	Current Stage
1.	Corridor Rapid Inventory - Visual Survey	To assess potential of road as BRTS Corridor Identification of corridors	Complete
2.	Home Interview Survey within influence zone of priority corridor Total 1000 households selected as per earlier LB Study format	To Elicit travel pattern and inputs to estimation of potential transit demand Update LB Survey results	Completed Preliminary findings presented
3.	Traffic Volume Survey On potential BRTS Corridor	Traffic Intensity & Mix of Vehicles	Partly Complete
4.	Turning Movement Survey Important Junctions of Priority Corridor	Traffic Movement pattern to decide junction design aspects	Junctions identified/DPR stage
5.	Journey Speed Survey	Estimation of speeds with & without BRTS Economic Assessment	Planned
6.	Topographic Survey (Sample sections)	Detailed design for estimation of block costs	Complete
7.	Parking Survey (Priority Corridor)	Parking Demand estimation	Planned
8.	Land Use Survey on potential corridor	To Assess potential Land Use development	Complete
9.	Engineering Investigations	Detailed Design and Specifications of the Project	DPR stage
10.	Topographic Survey for entire corridor	To assess feeder network plan	DPR stage

Table 1-2: Details	of Surveys
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<sup>&</sup>lt;sup>2</sup> GTZ – Deutsche Gesellschaft fur Technische Zusammenarbeit GmbH – A German Overseas technical assistance agency

2.1. Introduction

#### 2.2. The City

- 2.3. Location and Climate
- 2.4. Demographic Trends
- 2.5. Land use
- 2.6. Traffic Generating Activities
- 2.7. Employment Distribution
- 2.8. Summary

# 2. THE CITY AND ITS GROWTH

# 2.1 Introduction

Demand for transportation is a derived demand. Population characteristics such as size, concentration, income, vehicle distribution, economy in terms of location of employment, education and entertainment activities etc., determine travel demand. These aspects have been described in this chapter.

# 2.2 The City

The city of Ahmedabad was founded in 1411 AD as a walled city on the eastern bank of the river Sabarmati, now the seventh largest metropolis in India and the largest in the state. The urban agglomeration (UA) population has increased from 3.31 Million in 1991 to 4.5 Million in 2001. Ahmedabad is the commercial capital of the state. Known as the textile capital of India, it is also a major industrial and financial city contributing about 14% of the total investments in all stock exchanges in India and 60% of the total productivity of the state<sup>3</sup>. It lies in the cotton belt of Gujarat, 552 km north of Mumbai and 96 km from the Gulf of Cambay. It has good air, road and rail links with Mumbai and Delhi and an international airport. Historically Ahmedabad has been one of the most important centers of trade and commerce in western India. The city was once famous as the 'Manchester of India' on account of its textile industry. It had as many as 66 mills employing a workforce of over one hundred thousand persons. It has three major industrial estates within its municipal limits. Thermal power plant in the city is operated by a private company. It is the home of several scientific and educational institutions of national importance. The city has a great architectural tradition reflected in many exquisite monuments, temples and modern buildings.

# 2.3 Location and Climate

Ahmedabad City lies between 22° 55' and 23° 08' North Latitude and 72°30' and 72° 42' East Longitude. The city is devoid of any major physical features except for the river Sabarmati, which is a perennial river cutting the city into two parts: eastern walled city and western Ahmedabad on either side of its banks.

The Ahmedabad-Mumbai Golden Corridor has long been recognized to be an important development axis in western India. The city acts as a terminal, rather than as an intermediate node in this linear influence. It has seven major roadways, one expressway

<sup>3</sup> Reena Lazar, Increasing Resources to Local Government in Ahmedabad, India. Local Strategies for Accelerating Sustainability: Case Studies of Local Government Success. ICLEI Study, Canada, May 2002

and five rail networks. A new corridor between Ahmedabad and Pune has recently emerged, connecting the city to four other metropolitan cities of Vadodara, Surat, Mumbai and Pune. All these factors have resulted in the axial growth of the region.

Ahmedabad has a tropical monsoon climate which is hot and dry, except in the rainy season. Summer days are very hot with mean maximum temperature of 41.3°C while, nights are pleasant with mean minimum temperature of 26.3°C. The mean maximum and minimum temperature in winter are 30°C and 15.4°C respectively. The average annual rainfall of the area is 782mm, although there is a considerable variation from year to year. It occurs generally during the months of June to September. The average relative humidity is 60% which ranges from 80% to 90% during rainy season.

# 2.4 Demographic Trends

The Greater Ahmedabad Urban agglomeration covering an area of about 4200 sq. Km is an amalgam of:

- an area of 190 square kilometers under the jurisdiction of Ahmedabad Municipal Corporation (AMC)<sup>4</sup>, and
- 150 villages in the periphery of the city under the jurisdiction of Ahmedabad Urban Development Authority (AUDA)<sup>5</sup>,
- \*\* Municipalities in the periphery of the city under the jurisdiction of Ahmedabad Urban Development Authority (AUDA),
- Gandhinagar and the surrounding villages,
- Chatral, Bhopal and other surrounding villages adjoining AUDA limits

<sup>&</sup>lt;sup>4</sup> The city is governed by Ahmedabad Municipal Corporation (AMC), established in July 1950. It is a huge organization with over 40,000 employees. It provides a number of urban services such as water supply, roads construction, sanitation, medical services, primary education, Solid Waste Management, city transport, public health centres, etc. The Ahmedabad Municipal Transport Service (AMTS) is the body of AMC. AMTS is expected to perform on self-financing basis.

<sup>&</sup>lt;sup>5</sup> The Ahmedabad Urban Development Authority (AUDA) was constituted under the Gujarat Town Planning and Urban Development Act, 1976 in 1978 to regulate and monitor the development in the periphery of the corporation limits and the adjoining 300 villages and 9 municipalities. The major functions of the authority is to undertake the preparation of the development plan, town planning schemes, regulate the development and charge the development charges in the area of its jurisdiction.

#### Map 2-1: Greater Ahmedabad

Source: GIDB/LB (2000) , Socio-Economic & Land use Studies



The area within the Ahmedabad Municipal Corporation limits consists of:

- the traditional city center within the fort walls with relatively high-density development, large concentration of commercial activities and narrow streets,

- the eastern sector accommodating large and small industries and low income residential areas, and
- a well planned western sector with wide roads accommodating major institutions and high-income residential areas

The population in the AMC limits increased to 35.15 lakh in 2001 from 28.77 lakh in 1991. The population of AUDA area in 1991 was 38.75 lakh. The Ahmedabad Urban Agglomeration (AUA) housed 23.25 % of the State's urban population in 1991, which has gone up to about 25% in 2001. Compared to metropolises in India Ahmedabad has a lesser degree of primacy and urban population is spread evenly across other metropolitan and class I cities in the State.

The AMC area is spread over 190.84 sq km, the AUA area is about 350 sq km and AUDA area is 1330.08 sq km. Spatial distribution of this population within the city over the decades shows that up to 1981 most of the new population added to the city was concentrated within the old AMC limits itself, especially in the eastern part. Expansion of the peripheral areas began in the 1980s and has continued. Earlier only the eastern parts especially the eastern periphery registered faster growth rate, but since the 1980s even the western periphery has grown rapidly.

Spatial Unit	Population			
opatial offic	1981	1991	2001	
1. Ahmedabad Municipal Corporation (AMC)	2159127	2876710	3520085	
		(2.9)	(2.0)	
1.a Walled City	476138	398410	372633	
		-1.8	-0.7	
1.b. East AMC	1122073	1902868	2521013	
		5.4	2.9	
1.c West AMC	463922	575433	675362	
		2.2	1.6	
2. A.U.D.A.	2721925	3756246	4709180	
		3.3	2.3	
2.a East AUDA	101144	128999	202494	
		2.5	4.6	
2.b West AUDA	204923	457271	701424	
		8.4	4.4	
2.c AUDA (Rural)	209826	246560	274391	
		1.6	1.1	
3. Kalol	78407	92550	112013	
		1.7	1.9	
4. Mehemdabad	22309	26103	30768	
		1.6	1.7	
5. Dehgam	24868	31378	38082	
		2.4	2.0	

# 2.4.1 Spatial Patterns of Population Growth

Table 2-1: Population Growth – Greater Ahmedabad

Snatial Unit	Population			
opatial offic	1981	1991	2001	
6. Sanand	22465	25674	32417	
		1.3	2.4	
7. Other areas outside AUDA	264555	309871	334531	
		1.6	0.8	
8. Gandhinagar	199353	280234	373663	
		3.5	2.9	
8.a. Gandhinagar (GNA)	62443	123359	195926	
		7.0	4.7	
8.b. Rest of Gandhinagar	136910	156875	177737	
		1.4	1.3	
GREATER AHMEDABAD	3185833	4346351	5417374	
		3.2	2.2	

Source: Respective Census Documents

Note: Figures in parenthesis indicate annual compound growth rate

The greater Ahmedabad area has grown at a moderate rate. Growth rates have declined from 3.2 and 2.2 percent compounded per annum during the past two decades. However, the rates vary across different spatial units. The population within the AMC limits appears to approach stabilization level. The areas adjoining AMC, falling within AUDA limits have shown rapid growth. Gandhinagar is also experiencing relatively high rate of growth.

As stated above the population growth in the peripheral areas is more rapid than the areas within the city limits. This is partly due to the saturation of population within the city area and the consequent large-scale housing development in the peripheral areas. The contrasting spatial patterns observed in the eastern and western areas of AMC have extended into the peripheral areas in the same manner. The western part is experiencing more rapid growth than the eastern part. Rapid growth in the form of ribbon development along the Sarkhej - Gandhinagar highway is being witnessed during the 1990's. These trends are likely to intensify further in the coming decades. It is also a note worthy feature that the spatial expansion of Ahmedabad is largely contiguous and relatively compact.



#### Map 2-2 Ahmedabad Growth pattern

132' Ring Road and Naroda - Narol Highway have seen a higher level of physical development in the last few years. From the map below it may be seen that most of the eastern part and few parts in the southwest and northwest have higher densities. Bus routes along these are likely to receive greater patronage.



# Map 2-3: Population Density

Derived from GIDB/LB (2000) , Socio-Economic & Land use Studies

Spatial Unit		Persons/Hectare		
	1981	1991	2001	
1. Ahmedabad Municipal Corporation (AMC)	113	151	184	
1.a Walled City	716	599	560	
1.b. East AMC	79	134	178	
1.c West AMC	109	135	159	
2. A.U.D.A.	11	61	77	
2.a East AUDA	6	7	11	
2.b West AUDA	13	28	43	
2.c AUDA (Rural)	12	14	16	
3. Kalol	27	31	38	
4. Mehemdabad	19	22	26	
5. Dehgam	11	13	16	
6. Sanand	6	7	9	
7. Other areas outside AUDA		9	10	
8. Gandhinagar		7	9	
8.a. Gandhinagar (GNA)		47	75	
8.b. Rest of Gandhinagar	4	4	5	
GREATER AHMEDABAD	12	16	20	

#### Table 2-2: Population Density

Source: Respective Census Documents

# 2.4.3 Population Forecast

Incorporating AUDA proposals, the GIDB study (2000) carried out by LB estimated the population of the entire study region (AUDA and surrounding area) as below.

SI. No.	Year	Population (Million)	Approx. Area (Ha)
1	1981	2.5	19000
2	1991	3.4	23000
3	2001*	4.6	30000
4	2011	6.0	40000
5	2035	10.9	50000

Table	2-3:	Popu	lation	Forecast
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Source: GIDB/LB (2000) 'Socio-Economic & Land use Studies

Table	2-4: I	Popul	ation	Distribution	1
				<b>D</b> -	

Spatial Unit	Popu	Growth Rate	
Spatial Unit	2001	2011	2001
1. Ahmedabad Municipal Corporation (AMC)	3520085	3680016	(2.0)
1.a Walled City	372633	318532	-0.7
1.b. East AMC	2521013	2496108	2.9
1.c West AMC	675362	865376	1.6
2. A.U.D.A. (Including AMC)	4709180	5406798	2.3

Spatial Unit	Popul	Growth Rate	
Spatial Unit	2001	2011	2001
2.a East AUDA	202494	10454	4.6
2.b West AUDA	701424	1416395	4.4
2.c AUDA (Rural)	274391	299933	1.1
3. Kalol	112013	124652	1.9
4. Mehemdabad	30768	41639	1.7
5. Dehgam	38082	48086	2.0
6. Sanand	32417	36017	2.4
7. Other areas outside AUDA	334531	412977	0.8
8. Gandhinagar	373663	490506	2.9
8.a. Gandhinagar (GNA)	195926	267238	4.7
8.b. Rest of Gandhinagar	177737	223268	1.3
GREATER AHMEDABAD	5417374	6560675	2.2

Source: Based on AUDA, GIDB/LB report

# 2.5 Land Use

Spatial arrangements of activities determine the travel pattern in the city. This section briefly describes the land use pattern of the city.

The Ahmedabad Urban Development Authority is responsible for land use planning within its jurisdictional limits. As stated above, the area under AUDA may be seen as various subunits depending on the administrative jurisdictional limits and extent of development. Of this area delineated as Ahmedabad Urban Complex consisting of AMC, outgrowth adjoining AMC and area likely to develop in the ten years has been designated as Ahmedabad Urban Complex.

It is this area, which is the focus in this study.

# 2.5.1 Land-use in AUDA area

Of the total AUDA area of 1294.65 sq. km, 50 percent is built up area. Water bodies and wastelands cover 12 percent and 17 percent of area respectively. Industries cover 9 percent of the area. As per the State Government Policy, no major industrial development within 24 kms of AMC limit is permitted in AUDA area. Considering existing development conditions certain area for industrial use is designated for



Fig 2-1 Land Use of AUDA area (1997)

light industry as well as for general industry, along with

existing industries at Vatwa, Naroda and Odhav (all lying within AMC), which forms nearly 10.38 percent.



#### Map 2-4 : AUDA Land-use map

Source: GIDB/LB (2000) , Socio-Economic & Land use Studies

AMC & AUDA

#### 2.5.2 Land Use in AMC area

As per existing land use (1997), more than one third (36%) of the total area is under residential use, followed by 15 percent of the area under the industries. Large tracts of land (23.44%) are lying vacant, mostly in the newly acquired area of the AMC. Only 9.5 percent of the total area is under transportation network as against the norm of 15-18 per cent. as specified by UDPFI norms.





Fig 2-1 Existing land use of AMC area (	(1997)
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Fig 2-2 Proposed Land Use of AMC area(2011)

	Existing land use for AMC area (1997)			Proposed land use for AMC (2011)			
Sr No	Use/ Designation	Total Area (Ha.)	% Of Total Area	Use/ Designation	Total Area (Ha.)	% Of Total Area	
1	Residential	6664.44	34.92	Residential	8340.22	43.70	
2	Commercial	472.64	2.47	Walled City and Village Sites(Gamtal)	645.56	3.38	
3	Industrial	2932.78	15.37	General Industrial	2006.51	10.51	
4	Open / Vacant Land	4473.36	23.44	Special Industrial	786.72	4.12	
5	Village Site / Gamtal	895.59	4.69	Commercial	263.06	1.38	
6	Education	344.19	1.80	Agricultural / Recreational / Open Space / Gardens	1643.60	8.61	
7	AMC Plots	467.18	2.45	Education	387.30	2.03	
8	Hospitals	98.36	0.52	Area Under Reservations now designated as special development area	1955.37	10.25	
9	Burial Ground / Grave Yard	86.54	0.45	Roads and railways	2117.67	11.10	
10	Water bodies	850.55	4.46	Water bodies (including rivers)	937.97	4.92	
11	Roads	1426.65	7.47				
12	Railway land	372.00	1.96				
	Total	19084.00	100.00	Total Area	19084.00	100.00	

Table 2-5: Existing	and Proposed	Land use	of AMC area
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Source: Revised Draft Development Plan of AUDA – 2011AD Part I, Vol 2

Exi	Existing Landuse of AUC Area (Excluding AMC Area) (1997)Proposed Landuse of AUC Area (Excluding AMC Limit): (2011 A.D)					cluding AMC	
Sr. No.	Land Use	Total	% Of Developed Area	Sr. No.	Particulars	Area in Hect.	%age of Developed Land
1	Residential include Gamtal	3559	38.99	1	Residential, Roads, Public and Semi- Public		
2	Public ; public	572	6.27		Type 1 (old residential area)	9938	34.523
3	Commercial	276	3.02		Type 2 (new residential area)	4624.92	16.066
4	Industrial	647	7.09	2	Commercial	1071.92	3.724
5	Railway/ Roads/. Airport	406	4.45	3	Industrial	987.58	3.431
6	Water way and tank	3625	39.72	4	Public Activity Area	552	1.918
7	Garden open space and P.G	41	0.46	5	Public and Semi- Public	243	0.844
	TOTAL	9126	100	6	Recreational	6300	21.885
				7	Treatment Plants (AUDA, AMC)	745.16	2.589
				8	High flood hazards	524	1.820
				9	Agriculture	3800.42	13.202
					Total area	28787	100

Table 2-6: Existing and Proposed Land use of AUC area (Excluding AMC)

Source: Revised Draft Development Plan of AUDA – 2011AD Part I , Vol 2

# 2.5.3 Future Development Area

The Proposed Land use Plan of AUDA envisages the development by 2011 as shown in the figure.

# Proposed Land use

The Development Plan 2011 proposes an increase in residential areas from 35 percent to 44 percent. No significant change has been proposed in Industrial area due to the State Government's restrictive policy. Though 23 percent of the area exists as open, the city lacks adequate number of gardens and parks. It is proposed to develop 8.6 percent area as gardens. Huge areas (77.75 ha) of closed Gujarat State Textile Corporation Mills in Eastern Ahmedabad lying unused is proposed to be developed, slight increase in area under transportation from 9.5 percent to 11.1 percent is envisaged.



#### Map 2-5: AUDA Proposed Land Use 2011 Plan

Source: Revised Draft Development Plan of AUDA – 2011AD Part I , Vol 2





Source: City Development Strategies, Ahmedabad, CEPT University, 2001

# 2.6 Traffic Generating Activities

The nature and location of economic activities in relation to houses determine the travel demand in a city. Nature and location of these within AMC have been presented below.

The city of Ahmedabad has had great importance in the economy of Gujarat owing to the large concentration of economic activities and their high growth rates and productivity. Ahmedabad accounts for 7% of the state's total population and around 20% of its urban

population. In 1995, with 7 percent of the total population, Ahmedabad contributed to 17 percent of the state income (4).

Ahmedabad has a strong industrial base of traditional manufacturing, especially textiles, plastics, machinery and basic metals and alloys. Ahmedabad city accounts for 21.5% of factories in the state employing 18% of workers (2000). In 1981, before the textile crisis, Ahmedabad city used to account for 19.3% of factories and 27.7% of workers in the state. During the 18<sup>th</sup> and early 19<sup>th</sup> centuries, Ahmedabad was one of the most important centers of trade and commerce in western India. The economy of Ahmedabad has passed through various phases of transformation over the years. A gradual shift has been noticed from manufacturing oriented industries to services oriented economic scenario. The tertiary sector is gaining, in terms of share which includes business and commerce, transportation and communication, and other services.



Map 2-7: Maps showing Various Activities



Derived from City Development Strategies, Ahmedabad (2003)

# 2.7 Employment Distribution

The major employment zones in the study area are primarily located in the industrial belts of Naroda, Odhav and Vatva. Old city continues to be a major trading area. C.G. road and Ashram road have emerged as important commercial hubs in the city. Now SG highway and 132ft ring road have started showing similar development trends.

# 2.8 Summary

The Ahmedabad Urban Agglomeration has a population of 45 lakhs (2001) of which 78 percent of the population is residing within the municipal area. Ahmedabad has been the primate city of Gujarat, being the largest in terms of the population size. It presently holds 23 percent of state's urban population and holding sixth position in the entire country in terms of population size (2001). The city continue to be relatively compact. Some industrial activity has spilled over to the periphery. Containing sprawl tendency is a necessity. Transit oriented development needs exploration. Central and eastern zones have lost employment opportunities. Focus on these areas would be an additional contribution.



# Map 2-8: Job Distribution in Study area

# **Existing Transportation System - Vehicles Facilities & Performance Chapter 3**

- 3.1. System Components
- 3.2. Vehicles
- 3.3. Facilities
- 3.4. Public Transport
- 3.5. System Performance

# 3. EXISTING TRANSPORTATION SYSTEM - VEHICLES, FACILITIES & PERFORMANCE

# 3.1 System Components

Ahmedabad city is well connected by an expressway, several national and state highways, the broad-gauge and meter-gauge railways and an international airport. The city transportation system is predominantly dependent on roadway systems. Vehicular growth has been rapid. The network is experiencing heavy congestion. Consequently air pollution has become severe.

The information below provides an overview of the existing transportation system in terms of road network, vehicular growth and composition, performance of the system and its impact. A detailed analysis of public transportation system performance has been presented separately in the next chapter.

# 3.2 Vehicles

At the time of formation of the state of Gujarat, in 1961, there were only 43000 vehicles registered. This figure has risen to over 70 Lakh vehicles by the year 2004, recording a rise by 160 folds in four decades. In the recent past, annual additions have been high and

increasing. During the years 2001 to 2002, the increase in the number of vehicles registered was 4.3 lakh. This has risen to 5.1 and 5.7 during 2002 to 03, and 2003 to 04 respectively.

Ahmedabad district has a total number of 14.9 Lakh motor vehicles registered in the year 2004. Of this 73% were two The wheelers. district. which 11% accommodates of the state population accounts for about 21% of the vehicles registered in the State<sup>6</sup>. This high density and rapid growth of vehicles have worsened the transport situation to a significant extent.





The graph shows the composition of

<sup>&</sup>lt;sup>6</sup> Ahmedabad Agglomeration accounts for 78% of the total district population

vehicles in Ahmedabad. Table 4.2 indicates the decadal growth of motor vehicles at the level of Ahmedabad with a comparative presentation of national and state level growth. Currently vehicles are growing at the annual rate of 13%, which is quite high and indicates towards a greater vehicular population in the future.

	India		Gujarat		Ahmedabad	
Year	Total	Decadal	Decadal Total Decadal Total		Total	Decadal
	Total	Growth	Total	Growth	lotai	Growth
1961	665000		43230		N.A.	
1971	1865000	180%	147967	242%	62922	
1981	5391000	189%	522451	253%	165620	163%
1991	21474000	298%	2052391	292%	538182	225%
2001	54991000	156%	5576040	172%	1210278	125%

Table 3-1: Total number of vehicle registered and decadal vehicular growth pattern in India,Gujarat and Ahmedabad

Source: MoRTH, Gujarat

The annual growth rate of the vehicular population of Gujarat is even higher than the national growth rate because the state economy has been continously doing better than many other states for the past many decades.

Table 3.2 shows the growth pattern of various segments of vehicle in Ahmedabad in the last three decades. Two stroke engine vehicles (two wheelers & three wheelers) and public transport vehicles have a significant influence on urban air quality. Ahmedabad has one of the highest growth rates of two wheeleres and three wheelers.

Table 3-2: Total motor vehicle growth and growth of two/three wheelers and AMTS buses in					
Ahmedabad (1961-2001)					

Year	All Vehicles		Two Wheelers		Three Wheelers		AMTS Buses	
rear	Total	Growth	Total	Growth	Total	Growth	Total	Growth
1971	62922	-	21702	-	4865	-	525	-
1981	165620	163%	86550	299%	16741	244%	610	16%
1991	538182	225%	361372	318%	38359	249%	756	24%
2001	1210278	125%	863003	139%	65868	72%*	886	17%
Total Growth (71-2001) 1823% 3877%		125	3%	69	9%			

Source: Transport Department, Gujarat, Ahmedabad, 2004

Note: Sudden reduction in growth rate is due to the restriction levied by the transport department

Fig 3.2 presents the graph of two wheelers' growth in Ahmedabad. Ahmedabad experienced 18 times growth of vehicular population in last four decades (1971-2001) with almost 39 times of growth in two wheelers population.



#### Fig 3-2: Growth of Two Wheelers in Ahmedabad 1990- 2003

Source: Transport Department of Gujarat, Ahmedabad, 2004

The growth rate of two wheelers was the highest in the 1970's and in 1980's because of three possible reasons.

- A large number of lower middle class and middle class population supported by favourable income levels.
- Economic liberalisation and automobile revolution in the country.
- The stagnation of Ahmedabad Municipal Transport Service. A large number of autorickshaws were registered in neighbouring districts and being operated in Ahmedabad city.<sup>7</sup>

Figure 4.4 shows the comparative data of vehicular growth rates in all major metro cities in India. Ahmedabad, Bangalore Hyderabad and Chennai have recorded a higher growth rate than Delhi, Mumbai and Calcutta. If vehicular growth continues, very soon these cities will also have the vehicular population similar to major metros. In the year 2002 Ahmedabad has recorded the highest per capita motor vehicles in India (Figure 4.5).

<sup>&</sup>lt;sup>7</sup> As per the estimate currently 10000-15000 such autorickshaws are operational in Ahmedabad.



#### Fig 3-3 : Growth rate of vehicles in major Indian cities (1990-2002)





Source: MoRTH 2003

# 3.3 Facilities

# 3.3.1 Road Network

The study area roadway system is approximately 3478 Kms. Other than the National Highway Authority, which maintains National Highways and the State Roads and Buildings Department, the two urban local bodies; AMC and AUDA, are responsible for developing, operating and maintaining road infrastructure.

Road widths in Study Area							
No. of Lanes Length % of Total Length							
1 Lane	2106	61%					
1.5 Lane	522	15%					
2 Lane	411	12%					
2.5 Lane	12	0%					
3 Lane	48	1%					
4 Lane	299	9%					
6 Lane	46	1%					
8 Lane	34	1%					
Grand Total	3478	100%					

Table 3-3: Distribution of Roads by Width (No. of lanes)

Source: Based on LB Study

#### General Form of the Network:

The street network in Ahmedabad evolved historically may be classified as ring-radial form. There are about 20 well-defined radials; 12 in the west and 8 in the east, Ashram road, running along the river Sabarmati also functions as a north-south radial. As the need to connect these roads to facilitate cross mobility arose, a series of rings / orbital were added to form ring roads. As defined by AUDA, there are at least four complete rings within the AUDA area. Even one ring is not complete as two proposed bridges across river Sabarmati are yet to be built.

The Ahmedabad Municipal Corporation manages a large road network of 1272 km, of which 93% are surfaced roads (*Refer Table 3-4*). Recent efforts at better management of the road network in the city have resulted in effective widening of the main corridors of the city. It is to be noted that a bye-pass road has been built as an alternative to old NH 8 as the road has become a part of the city road network. The share of area under the roads constitutes only 7.5% of the entire city area as against the desired level of 15-18 per cent<sup>8</sup>. This translates to an average road width of 12m. The road density is 6.66 per sq.km of area. Once the work on bye-pass is complete, the road (NH-8) section passing through the city is expected to be handed over to AMC. The road network in the central area (walled city of the AMC) is narrow and encroached upon by adjacent activities for parking as well as informal activities.

<sup>&</sup>lt;sup>8</sup> As per Urban Development Plan Formulation and Implementation (UDPFI) Guidelines, Ministry of Urban Affairs and Employment



Source: AUDA Development Plan

Parameters	1997-98	1998-99	1999-2000	2000-2001		
Surfaced roads (km)	1118.9	1149.6	1189.01	1187.1		
% black topped	90.66	92.25	93.50	93.34		
Un-surfaced roads (km)	115.3	96.6	84.6	84.64		
Total length of roads (km)	1234.2	1246.2	1271.7	1271.74		
Length of roads per sq.km	6.47	6.53	6.66	6.66		
	ALLC Chatiation	0.411- 0000 0004				

# Table 3-4: Types of Roads in AMC

Source: AMC Statistical Outline, 2000-2001

Given the overall network based on width, continuity and functional role performed, the following roads may constitute as major roads.

Table 3-5: Road widths of Major Roads

Sr.No.	Road Name	Average Road Width
1	Ashram Road	30.48
2	Gandhi Road	12.19
3	Tilak Road	18.29
4	Astodia Road	19.81
5	Mirzapur Road	15.24
6	Gheekantha Road	12.19
7	Circular road along fort wall	24.38
	<ul> <li>a) Gandhi bridge to Tilak road Junction</li> </ul>	
	<ul> <li>b) Tilak road Junction to Sardar Bridge</li> </ul>	
8	Chandola road	24.38
9	Shyama Prasad Vasavada Road	24.38
10	Rakhial road	18.29
11	Stadium road (To sola village)	18.29
12	Satellite road	60.96
13	Sarkhej road	30.48
14	Circular Road (Sardar bridge to Gandhi bridge via Law Garden)	24.38
15	Circular Road (Usmanpura to Paldi)	36.58
16	Circular Road (New Vadaj to Sarkhej Road NH8)	40.28

Source: Report on Ahmedabad Transportation Study, CRRI.



#### Map 3-2 : Showing Roads Widths

# 3.3.2 Bridges and Flyovers

There are eight bridges, which make it possible to traverse east west across the river Sabarmati. There are two additional bridges proposed of which one in the south is under construction. In addition, there is one more bridge proposed between Subhash bridge and Gandhi Bridge.



# Map 3-3 Showing all the bridges across River Sabarmati



Sr. No.	Name of Bridge	Carriageway	Year of Construction
1	Indira Bridge	4-lane	-
2	Subhash Bridge	4-lane	1973
3	Gandhi Bridge	4-lane	1943
4	Nehru Bridge	4-lane	1963
5	Vivekanand Bridge	4-lane	1892
6	Sardar Bridge	4-lane	1942

Sr. No.	Name of Bridge	Carriageway	Year of Construction
7	Proposed (Vasna-Pirana Bridge) - Under Construction	-	-
	Narsinh bhai Makwana Bridge		
8	Shastri Bridge	4-lane	-
9	Proposed Bridge (Between Subhash Bridge and Indira Bridge)	-	-
10	Proposed Bridge (Between Gandhi Bridge and Subhash Bridge)	-	-

# Ð vili

# Map 3-4: Existing/Proposed Flyovers

Within the study area, 106 Km long B.G. line and 126 Km long M.G line pass through the network. There are 8 flyovers / rail over-bridges existing in Ahmedabad and 5 under-passes built across railway line. Another 11 flyovers are proposed by AMC and AUDA.

Code No.	Location	Carriageway	Road		
1	Existing Flyover/Rail Over-	Bridges			
i	Tavdipura (ROB)	4-lane	Rajasthan Hospital Road		
ii	Asarwa (ROB)	4-lane			
iii	Kalupur (ROB)	2-lane	Kalupur - Naroda Road		
iv	Kalupur (ROB)	2-lane	Odhav Road		
v	Cadilla (ROB)	6-lane	Old NH-8 Narol Naroda		
vi	Prabodh Raval	4-lane	132' Ring Road		
vii	Chimanbhai Patel (ROB)	4-lane	132' Ring Road		
viii	Shyama Prasad	4-lane	132' Ring Road		
2	Proposed Flyovers/Rail Ov	er-Bridges			
1	Naroda Railway Crossing	-	Old NH-8, Naroda Approach Road		
2	Thakkarbapa Nagar	-	Old NH-8 Nikol Road		
3	Soni Ni Chali	-	Old NH-8 Odhav Road Intersection		
4	CTM Cross Roads	-	Old NH-8 Narol - Naroda		
5	Ghatlodia	-	Ghatlodia Village Railway Crossing		
6	Sattadhar	-	Near S.G.Highway		
7	Thaltej Cross Roads	-	Drive In Road-NH 8C Intersection		
8	Fun-Republic	-	Satellite Road-NH 8C Intersection		
9	AEC Crossroads	-	132' Ring Road and Sattadhar Road Intersection		
10	Memnagar Bus Depot	-	Drive-in Road - 132' Ring Road Intersection		
11	Shivranjani Crossroads	-	Satellite Road-132' Ring Road Intersection		
12	Shreyas Crossing (ROB)	4 lane	Shreyas Railway Crossing to Anjali Cinema Crossroads		
3	Existing Underpasses	•			
Α	Shahibaug	4-lane	Road to Airport		
В	Akbarnagar	4-lane	132 ft Ring Road		
С	Income Tax	4-lane	C.G Road to Income Tax		
D	Town hall	2-lane	Near Gujarat College		
E	Usmanpura	4-lane	Road from Sardar Patel circle to Usmanpura crossing		

Table 3-7: Characteristics of Flyover/ROB/Underpasses
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# 3.4 Public Transport

In the city of Ahmedabad, AMTS has been providing public transport facilities. AMTS, a municipal body, operates the services with about 550 buses of which only about 350 are on road every day. They service about 250,000 passengers per day. The service has deteriorated significantly over the years. A detailed account of the same has been taken-up in the subsequent chapter.System Performance

# 3.4.1 Traffic Volume

The Western part of the city has developed as a mainly residential area and the eastern part has the industrial estates. Because of this, the traffic flow is very heavy from west to east in the mornings and vice-versa in the evening, which causes serious traffic congestion and frequent traffic jams on the city roads during morning and evening peak periods. Lately, road widening of the major radial roads has been undertaken which has helped ease the traffic flow to some extent. Traffic volumes on major roads has been presented in the map below. As may be observed, volumes far exceed capacities at many places.





Derived From: Interim Report on 'Traffic Management Plan for Ahmedabad', School of Planning, CEPT University: 2001,

The results of Traffic Volume count survey conducted at eleven locations on the potential corridor as part of this study is presented in Table 3.8.

Location	Traffic Volume (16 hrs)	Traffic Volume (in PCU), 16 hrs	Peak Hour Traffic (No.)	Peak Hour Traffic (in PCU)
MB-01: Airport 'T'/Hotel Taj Residency-Umed	38905	31470	3700	3071
MB-02:Kotarpur W/Works. Nr N H 8	9644	9306	1123	1046
MB-03: Naroda ST Workshop on Kalupur- Naroda Rd	58837	48787	4581	3530
MB-04: Krishnanagar	53676	48389	5531	4447
MB-05: Chamundanagar	67278	52747	6785	5200
MB-06:Jivan Park	57040	53781	5381	5244
MB-07:Prabodh Raval Bridge	71705	49160	8276	5441
MB-08: Akhbarnagar U/Bridge	66826	47260	8097	5418
MB-09: Sahajanand Complex	67057	44272	6806	4191
MB-10: Andhjan Mandal to Nava Vadaj	59732	41028	5877	3795
MB-11: Nr Someshwar Bunglows	66380	43769	6771	4170

#### Table 3-8: Traffic Volume at different locations

Source: CEPT Survey, 2005

The survey was conducted for 16 continuous hours (06:00 to 22:00 hrs) on pre-designed proforma manually. The mode wise traffic volume have been converted to equivalent passenger car unit using PCU factors. The analysis of traffic composition reveals more than 70% two-wheeler and around 10% cycles which is a reflection of the almost non-existence for public transport on corridor.

# 3.4.2 Network Speeds

No systematic data is available on network speeds. The study by SAC (ISRO) lists the speeds on major roads as below.

Sr.No.	Name of Road	Speed (Peak Hour) - (km/hr)
1	Airport road	24
2	Naroda road	20
3	Thaltej road	18
4	Sarkhej road	18
5	Gujarat University road	16
6	Manav Mandir road	16
7	Drive-in road	16
8	IIM road	16
9	Vastrapur road	16
10	Odhav road	16
11	Amraiwadi road	16
12	Gurukul Road	16
13	C.G.Road	16

Table 3-9: Speeds on Major Roads

Sr.No.	Name of Road	Speed (Peak Hour) - (km/hr)
14	Satellite road	15
15	Danilimda road	14
16	Ankur road	14
17	Sola road	14
18	Ghatlodia road	14
19	Sola road	14
20	Rakhial road	13
21	Ashram Road	12.5
22	Gomtipur road	12
23	Civil road	12
24	Shah Alam Road	11.5
25	Kalupur	10
26	Gandhi Road	10
27	Relief Road	9.5

Source: SAC, ISRO

# 3.4.3 Accidents

In Ahmedabad over 2600 cases of road accidents are being reported in the year 2001 alone. About 160 to 200 persons get killed in these accidents. Some reduction in number of accidents has been observed in the recent past.

Table 3-10: Population, Vehicles and Accidents in Ahmedabad City

Year	Population (lakhs)	Vehicles	Accidents	Fatal Accidents	Accident Rate (Per 10,000 Vehicles)	Fatality Rate
1961	12.6	N.A.	643	38	N.A.	5.91
1971	17.6	45,268	866	73	191.31	8.43
1981	23.8	120,514	1676	144	139.07	8.59
1991	29.5	431,783	2,931	192	67.88	6.55
2001	37	1,005,870	2718	162	27.02	5.96

Derived From: Safe Traffic Advocacy Cell, School of Planning, CEPT University,



Fig 3-5: showing Number of Accidents Year wise



# Map 3-6: Accident Rate in Ahmedabad

Derived From: Safe Traffic Advocacy Cell, School of Planning, CEPT University,



![](_page_41_Figure_2.jpeg)

 Critical (3.0-5.0)	High (1.0-2.0)	 Low (0.5-1.0)
 Very High (2.0-3.0)	Moderate (1.0-1.5)	 Very Low (0.5-1.0)

Sr.No.	Road Stretch	Total Accidents (1995-2002)	Length (km)	Total Accidents/ Km (1995- 2002)	% of Total Accidents	Fatal accidents (2002)	Fatal accidents / Km (2002)
1	Vasna to Sarkhej	783	3	261	5.3	14	4.7
2	Narol to Naroda (NH 8)	2365	15.5	153	16.1	40	2.6
	Ankur to Naranpura Railway						
3	Crossing	330	1.5	220	2.2	3	2.0
	S.T. Geeta Mandir to Shah						
4	Alam Tolnaka Chandola	423	2.5	169	2.9	4	1.6
	Prem Darwaja to Gandhi						
5	Bridge	359	2	180	2.4	3	1.5
6	Mirjapur to Vijali Ghar	261	0.75	348	1.8	1	1.3
	Bhairavnath to Shah Alam						
7	Tolnaka Dakshini Society	459	2.5	184	3.1	3	1.2
8	Narol to Vasana	205	7	29	1.4	8	1.1
	Kalupur to Police Comm.						
9	Ward Boundary	435	3.5	124	3.0	4	1.1
10	Commerce College to Thaltej	635	4.5	141	4.3	5	1.1
	Subhash Bridge to Visat						
11	Petrol Pump	458	3	153	3.1	3	1.0
12	Sola to Naranpura Bus Stand	516	4	129	3.5	4	1.0
	Police Commissione Office to						
13	Shahibag Subhashbridge	132	1	132	0.9	1	1.0
14	Juna Vadaj to Chandlodia	273	3.25	84	1.9	3	0.9
15	Shahibag Railway Crossing to Gymkhana Indira Bridge	892	4.5	198	6.1	4	0.9
16	Vasna to Juhapura Bus Stand	144	2.5	58	1.0	2	0.8
17	Parimal Garden to Mithakhali	331	1.5	221	2.3	1	0.7
18	Ambavadi to Jodhpur	529	4	132	3.6	2	0.5
19	Incometax to Commerce College	592	2	296	4.0	1	0.5
20	Jodhpur to Nehru Nagar	249	2.25	111	1.7	1	0.4
21	Paldi to Vasana	393	2.5	157	2.7	1	0.4
	Sarangpur to Police Comm.						
22	Ward Boundary	382	2.5	153	2.6	1	0.4
	Soni-ni-Chawl to Police	004					
23	Comm. Ward Boundary	294	2.5	118	2.0	1	0.4
24	Laldarwaja to Pachkuva	196	2.5	78	1.3	1	0.4
25	Jamalpur to Police Comm. Ward Boundary	301	6.5	46	2.0	2	0.3
26	Dargah to Paldi	203	3.5	58	1.4	1	0.3
27	Paldi to Subhash Bridge	899	7.5	120	6.1	2	0.3
28	Vejalpur to Police Comm. Ward Boundary	116	11	11	0.8	0	0.0
20	Vijali Char to Manilal Manajan	164	2 2	00 0	1 1	0	0.0
29	Actodia Danyaja ta Kalunur	274	2	196	1.1	0	0.0
21	Astodia Darwaja to Elliabridan	170	2 1 75	001	2.0	0	0.0
20	Delbi Darwaja to Defenera	270	1.75	90 112	1.2	0	0.0
JZ	Denni Darwaja tu Dalahala	213	<b>∠</b> .0	114	1.9	0	0.0

Table 3-11: Accident Ra	ate along major	roads of Ahmedabad
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AMC & AUDA

Sr.No.	Road Stretch	Total Accidents (1995-2002)	Length (km)	Total Accidents/ Km (1995- 2002)	% of Total Accidents	Fatal accidents (2002)	Fatal accidents / Km (2002)
33	Kankaria Round Road	338	2.5	135	2.3	0	0.0
	Usmanpura Circle to Sardar Patel Colony's Vijay Char						
34	Rasta	218	2.25	97	1.5	0	0.0
	Total	14697	122.25	4772	100.0	116	

Derived From: Safe Traffic Advocacy Cell, School of Planning, CEPT University.

The stretches along Vasna-Sarkhej and Narol-Naroda highway accounted for almost 50% of the total fatal road accidents that occurred in Ahmedabad. These roads have higher travel speeds (**Refer Map 3-6**) and a higher composition of regional traffic, which consists of trucks and Light Commercial Vehicles. An analysis of causes of fatal accidents (**Refer Fig 3-6**) indicates that trucks accounted for causing about 15 per cent of total fatal deaths in the city. The pedestrian traffic accounts for causing about 18% of total fatal deaths in the city, and there is a high level of pedestrian traffic along the Narol-Naroda Highway at certain locations, but lack of proper pedestrian facilities such as footpaths and zebra crossings.

![](_page_43_Figure_5.jpeg)

Fig 3-6: Causes of Fatal Accidents

Source: Safe Traffic Advocacy Cell, School of Planning, CEPT University

# 3.4.4 Effects on Air Quality

The city of Ahmedabad has seen a rapid growth in two wheeler population in the last two decades, which has also resulted in rising pollution levels in the city. Vehicular pollution generally accounts for 60-70 per cent of total pollution loads of a city. The root cause of air pollution in Ahmedabad is the two-stroke two wheelers and auto rickshaws, which contribute to the pollution load. The city has been identified as one of worst with regard to Air pollution by Honorable Supreme Court Committee

![](_page_44_Figure_2.jpeg)

SPM Levels

The permissible SPM and RSPM levels as per National Ambient Air Quality Standards (NAAQS), have been consistently high for the past decade in industrial and residential areas.

Source: Gujarat Pollution Control Board