Surat -2046 Comprehensive Mobility Plan

Final Volume 1 Technical Report

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Acknowledgements

The Comprehensive Mobility Plan 2046 for Surat covers the in-depth analysis of base year travel patterns, travel demand modelling and future scenario evaluation. All this would not have been possible without the help, co-operation and key inputs from our stakeholder organisations.

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- Metrolink Express for Gandhinagar and Ahmedabad (MEGA)
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- Surat Traffic Police (ATP)
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Foreword

With a growth rate of about 4.9 per cent, Surat is one the most dynamic cities in India. Surat is in the midst of a period of great change and is growing both in prosperity and population. This also means that the city is in a phase of constant evolution and the pace has only enhanced in recent years. With the growth of the city, there are also growing infrastructure and transportation requirements that need to be met. The city corporation has realised that investment in the road sector alone is not enough to overcome the challenge of mobility that will accompany the growth of Surat. A systematic plan of action is required in order to cope with the growing transportation needs of all sections of society. To meet the city's diverse transportation demands and to avoid peak-loads, a Comprehensive Mobility Plan for Surat has been prepared.

The plan will pave the way for a people-centric, environmentally sustainable and efficient mobility plan for Surat, which will help the city overcome its mobility challenges and complement its high growth potential. It is a holistic plan with a simple concept that will enable informed decision making and design of new activities from a demand-responsive approach. It manages to present a way to integrate various opportunities and innovations within the fabric of Surat.

The vision for Surat 2046 - 'SARAL' Mobility in Surat - speaks for itself in terms of the aspirations of people and their expectations from the plan. 'SARAL' stands for Safe Accessible Reliable Advanced and Low carbon mobility, and it primarily emphasises on providing Surat smooth and well-integrated mobility options. ITS technologies will form the heart of the plan by ensuring that the citizens have a safe, accessible, reliable system of transportation, which will result in low carbon emissions and improvement in the overall quality of life of its citizens.

The plan focuses on forming a complete mobility picture which is socially, environmentally and economically sustainable for the people of Surat. It makes sure that it provides equitable preferences of transport for all. It emphasises on formal as well as informal modes of transport which includes motorised and non-motorised vehicles and attempts to integrate all the options as one whole system. Within the system, modes like public transport, paratransit, walking and cycling remain the backbone and it is essential that these systems be unified.

From being a city with virtually no public transportation in 2007, Surat has come a long way in the last decade. Apart from structuring the urban road network, the city is now investing in procuring city buses, developing a Bus Rapid Transit System (BRTS) over a network of 102 km and planning for a metro system. Besides, an Integrated Operations Plan is also in place to boost the public transport share in the city by integrating city and BRT services.

The Comprehensive Mobility Plan is designed to sustain and enhance Surat as one of the most liveable cities in India. The plan provides a foundation to achieve strategic priorities of the city, namely being more vibrant, safer, healthier and prosperous. The plan recognises how people move around in the city and provides innovative transport strategy for urban upliftment. It also

balances the initiatives of land use planning of the city by creating a strong connect between residential and commercial communities that are sustainable and affordable.

The Centre for Excellence in Urban Transport, CEPT University, Ahmedabad, with its talented team of researchers and consultants, has been instrumental in delivering a mobility plan for Surat city which will help to shape the future of city transportation. The plan reinforces the need for effective monitoring and planning within the city and makes sure that Surat is ready for the forthcoming transport challenges. The consulting committee has examined all aspects of transport and pressed for improvements on behalf of Surat. We are truly grateful to CEPT University for the guidance and direction in fostering the future of urban transport in Surat.

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Municipal Commissioner

Mayor

Chairman, Standing Committee

Preface

The Comprehensive Mobility Plan for Surat 2046 is prepared to provide a people-centric plan for Surat Municipal Corporation, focusing on inclusive mobility and enhanced connectivity for the people of Surat. The plan provides for efficient mobility in the region by connecting the upcoming nodes in the vicinity of Surat with Integrated Transit Systems. The success of this approach will lie in the fact that the connectivity within the region, both for the movement of people and goods, is enhanced by strengthening the study area network. The focus of the same is, however, on public transport, with strategies like 'transit ready streets' and 'bus priority network' being identified as an integral part of the plan. It also impacts the income levels, land values and the environment and, hence, plays an important role in determining the quality of life in the area.

The Comprehensive Mobility Plan (CMP) prepared is for the entire Surat Urban Development Authority area. The base year for the plan is 2016, with a planning period of 30 years until 2046. The CMP preparation involved analysing the present travel characteristics, forecasting travel demand for the planning horizon, integrating transport options with land use structure, developing alternative scenarios for sustainable transport, working out a mobility plan that is economically, socially, environmentally and technologically sustainable and in sync with the development plan, and suggesting an implementation framework for the proposed projects/interventions.

The CMP for Surat gives priority to integrated public transport infrastructure, be it the higher order road network which is proposed to be developed as 'transit ready streets' or the bus route roads with median bus stops with bus priority at junctions. The plan also provides for improvement in the pedestrian facilities by promoting TOD (Transit Oriented Development) as a concept around transit areas to improve walkability and create a public realm. The concept of mobility management as a part of the CMP specifically emphasises managing demand through a set of tools that encourage change in behaviour and, in turn, travel patterns in favour of sustainable modes of transport. The demand management tools include information and communication strategies as well as economic instruments such as parking fee, congestion charges and levy of surcharge that make car use expensive etc. and thus achieve reduction in car use.

Owing to the dynamic nature of the city, a multi-modal transit system is proposed as a part of this plan. Interchanges are proposed to enhance connectivity in the region. The plan also identifies the corridors for future rapid transit system; the decision on the mode selection for the same can be taken at a later date through the alternative analysis framework. Another aspect of the plan is to focus on pedestrian network and leverage the TOD framework along the transit network to create walkable streets and use place making as a tool to provide people-friendly streets. Surat being an important manufacturing hub for textile and allied industries in the region also results in a huge amount of freight movement within the city. Therefore, this plan also tries to address the issue by providing for a textile corridor along with parking regulations for the same. Fiscal tools like land value capture, environment improvement tax and parking

charges would not only provide alternative sources of funding but also disincentivise people from using private vehicles.

'Planning for Desirable Outcomes' is a strategic planning approach, which was a starting point to identify the desired level of improvements in the quality of life defined as 'desirable outcomes' and works backwards to build different sets of strategy-mixes to achieve the same. This approach is also called 'Scenario-building and Back-casting Approach'. The present study proposes to adopt this approach while developing the CMP for Surat.

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Abbreviations

AFCS Automated Fare Collection System

AMTS Ahmedabad Municipal Transport Service

ATCAG Automated Tracking and Control of Green Assets

ATCS Air Traffic Control System

AVLS Automatic Vehicle Locating system

BAU Business As Usual

BBMP Bruhat Bengaluru Mahanagara Palike

CAGR Compound Annual Growth Rate

CBS Central Bus Station

CCTV Closed Circuit Television
CES Centre for Economic Studies
CMP Comprehensive Mobility Plan

CO Carbon monoxide CO₂ Carbon Dioxide

CPCB Central Pollution Control Board
CRRI Central Road Research Institute
CSPL Chartered Speed Private Limited

CT Census Town

CTTS Comprehensive Traffic and Transportation Study

CVC Classified Volume Counts

DCR Development Control Regulations

DF District Factor

DFC Dedicated Freight Corridor

DIMTS Delhi Integrated Multi-Modal Transit System

DMIC Delhi Mumbai Industrial Corridor
DMRC Delhi Metro Rail Corporation
DOT Development-Oriented Transit

DP Development Plan

DULT Directorate of Urban Land Transport

ECMT European Conference of Ministers of Transport

ECS Equivalent Car Space
E-E External—External
E-I External—Internal

EM Enrolment Memorandum ERP Electronic Road Pricing

ETMS European Territorial Monitoring System

FMCG Fast Moving Consumer Goods

FOSTTA Federation of Surat Textile Traders Association

FSI Floor Space Index

GACL Gujarat Alkalies and Chemicals Limited

GCC Gross Cost Contract
GDP Gross Domestic Product

GHG Green House Gas

GIDB Gujarat Infrastructure Development Board
GIDC Gujarat Industrial Development Corporation

GIS Geographic Information System

GoG Government of Gujarat

GPCB Gujarat Pollution Control Board

GPMC Gujarat Provincial Municipal Corporations

GPS Global Positioning System

GSRTC Gujarat State Road Transport Corporation

HBE Home Based Education
HBO Home Based Others
HBW Home Based Work

HCV Heavy Commercial Vehicle

HH Household

HMC High Mobility Corridor
HSR High Speed Rail
I–E Internal–Internal
IEM Internal–External

I–I Industrial Entrepreneurs Memorandum

INA Industrial Notified Area

IPT Intermediate Public Transport

IPTS Intermediate Public Transport System

IRC Indian Roads Congress

IRSDC Indian Railway Stations Development Corporation

IT Intelligent Transport

ITMS Intelligent Transport Management System

JCB Joseph Cyril Bamford

JnNURM Jawaharlal Nehru Urban Renewal Mission

KRIBHCO Krishak Bharati Cooperative

KUDA Khajod Urban Development Authority

L&T Larsen and Toubro LAP Local Area Plan

LCV Light Commercial Vehicle

LoS Level of Service

LPG Liquefied Petroleum Gas
LVEF Land Value Escalation Factor

M Municipality

MATA Multimodal Affordable Transport Authority

MAV Multi Axle Vehicle

MCV Medium Commercial Vehicle

MDR Major District Road MMF Man-Made Fibre

MMTH Multi Modal Transport Hub

MoHUA Ministry of Housing and Urban Affairs
MoUD Ministry of Urban Development

MRTS Mass Rapid Transit System

MSME Micro, Small & Medium Enterprises

MURP Master in Urban and Regional Planning

NE National Expressway
NH National Highway

NHAI National Highway Authority of India

NHB Non-Home Based

NMT Non-Motorised Transport NMVs Non-Motorised Vehicles

NO₂ Nitrogen DioxideNO_x Nitrogen OxidesNR Non-Residential

NUTP National Urban Transport Policy

OD Origin and Destination

OECD Organisation for Economic Co-operation and Development

OG Out Growth

ONGC Oil and Natural Gas Corporation

ORR Outer Ring Road
PBS Public Bicycle Sharing
PCTR Per Capita Trip Rate
PCU Passenger Car Unit

PGI Parking Guidance and Information
PHPDT Peak Hour Peak Direction Traffic

PM_{2.5} Particulate Matter
PPH Persons Per Hectare
PPP Public Private Partnership
PRT Personal Rapid Transit

PT Public transport

PTAs Public Transport Authorities PWD Public Works Department

R&B Road and Building

RDA Regional Development Authority
RIL Reliance Industries Limited

RoB Railway over Bridge

RoW Right of Way

RSI Road Side Interview

RSPM Respiratory Suspended Particulate Matter

RTC Rapid Transit Corridor RuB Railway under Bridge

SARAL Safe Accessible Reliable Advanced and Low-carbon mobility in

Surat

SEZ Special Economic Zone

SGCCI Southern Gujarat Chamber of Commerce and Industries

SH State Highway

SICSL Sachin Industrial Cooperative Society Limited

SIR Special Investment Region

SLAs Service Level Agreements
SLB Service Level Benchmark
SMC Surat Municipal Corporation
SMMTH Surat Multi Modal Transport Hub

SO₂ Sulphur Dioxide

SPM Suspended Particulate Matter SPV Special Purpose Vehicle

SUDA Surat Urban Development Authority

SURSEZ Surat Special Economic Zone

SVNIT Sardar Vallabhbhai National Institute of Technology

TAD Transit Adjacent Development

TAZ Traffic Analysis Zone
TDA Transit Development Area
TDM Travel Demand Management
TDR Transfer Development Rights
TEO Traffic Enforcement Officers
TJD Transit Joint Development

TLFD Trip Length Frequency Distribution
TOD Transit Oriented Development

TOZ Transit Oriented Zones

TP Town Planning

TPUD Town Planning and Urban Development Act

U.A. Urban Agglomeration
UBS Urban Bus Services
ULB Urban Local Body

UMTC Urban Mass Transit Company

VCR Volume Capacity Ratio
VHT Vehicle Hours Travelled
VKT Vehicle Kilometres Travelled
WPR Work Force Participation Ratio

WTS Willingness to Shift WWF World Wildlife Fund

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Executive Summary

Introduction

The Comprehensive Mobility Plan 2046 for Surat is a strategic transportation plan prepared to address the future mobility needs of the city. It presents a long-term vision and a road map for moving towards an integrated and sustainable transport system in the year 2046.

The plan has been developed by the Surat Municipal Corporation in close collaboration with the SUDA and other stakeholder agencies and the involvement of Surat's residents through an online forum and public consultation process. The plan document is in line with the CMP guidelines of the Ministry of Housing and Urban Affairs, Government of India.

The Key Challenges

Surat is a major industrial and trade centre in the state of Gujarat. It is the 8th largest city in India. The city of Surat has a strong and vibrant economic base and is a major destination for employment seekers in the country. This may be seen in the fact that the city recorded decadal growth rate in excess of 60% consistently over the past five decades. The growth trends continuing the city is likely to face significant challenges on mobility front. The key challenges are:

- Doubling of population from the current 60 lakhs 2016 to 125 lakhs by 2046
- 2.9 times increase in personal vehicles (2-wheelers and cars) on roads from 18 lakhs in 2016 to 72 lakhs in 2046
- 2.3 times increase in passenger journeys from 54.64 lakh passenger trips to 125 lakh passenger trips.
- Increase in congested network from 14% to 57%
- Reduction in network speeds from average 28 kmph to below 18 kmph
- 2.6 times increase in the average travel time of Surat's residents from 13 minutes to about 34 minutes
- 2.8 times increase in accident probability
- 2 times increase in GHG emissions

Stakeholder Perspectives

A series of stakeholder consultations were carried out to involve the people in Surat in the plan-making process. Apart from meetings with the stakeholders involved in the transportation

sector, the public was consulted through an online forum wherein they expressed their views on the most pressing issues faced by Surat and their expectations from the plan. Congestion, safety and inadequate public transport were the major issues cited by the people and safety, efficient mobility and seamless connectivity were outlined as key expectation areas. Apart from this, a city-level consultation was also conducted on the 22 January 2018 in which the Draft Plan was presented to the citizens and inputs on priority areas and the Draft Plan were received. Reducing congestion and air pollution along with managing parking areas emerged as the priority areas, along with focus on public transport systems, safety and walkability.

Vision, Strategic Goals and Policy Directions

Keeping in view the focus areas and expectations of people from the plan, CMP 2046 vision is drafted as

'SARAL – Safe Accessible Reliable Advanced and Low-carbon mobility in Surat'



Strategic Goals & Policy Directions

In line with the vision of 'SARAL Mobility 2046', five strategic goals for the plan have been outlined as:

- Improving the quality of life of the people by providing for a Safe and Sustainable transport system.
- Supporting economic growth in the city by enhancing *Accessibility for people and goods* to major activity centres.
- Ensuring efficient connections by providing Reliable multi-modal travel options.

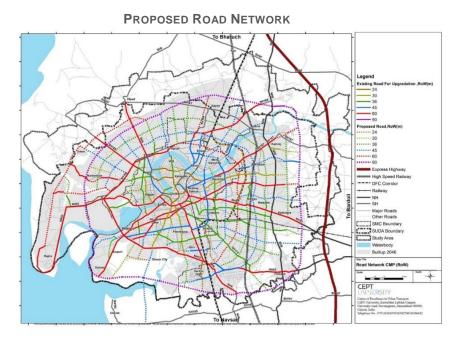
- Optimising transport system operations and enhancing the travel experience of the people through Advanced technological applications in transport.
- Contributing to the environment by promoting Low carbon mobility.

Proposals for CMP 2046

To translate the above-mentioned strategic goals and policy directions, the following are proposed as a part of the plan.

1. Road Network Proposals

In view of future mobility challenges, the road network proposals are developed to ensure connectivity, enhance accessibility and improve efficiency. The ring radial network proposed as a part of the CMP takes the DP 2035 proposed network as its base and tries to resolve the issues identified above by completing the network, improving hierarchy and adding the second and third level networks. As a result of this, 513 km of new network is to be added to connect new development areas while 308 km of the existing network is to be upgraded. To complete the network, seven new river bridges and 37 new Rail over bridges/Rail under bridges have been proposed. Keeping in view the vision of the plan, the highlight of the proposal is to develop all 30 m and above roads as 'Transit Ready Streets', with the median lane reserved for mass transit services, while the road widths ≥18m wide have been proposed as 'Bus Priority' corridor with central bus stations and priority given to buses at the junction. In the case of road widths <18m, only mini/small buses are be allowed to ease congestion and facilitate easy turning movement for buses.



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2. Integrated Multi Modal Public Transport System

The focus of the plan is on an integrated public transport system to provide seamless connectivity across various modes. In this regard, 240 km of strategic network was identified, which connected the main city to the upcoming regional nodes based on the road hierarchy and continuity of the network. This was further put in the model and demand assigned to come up with the potential Metro and BRT corridors. The process of alternative analysis was carried out using the following process:

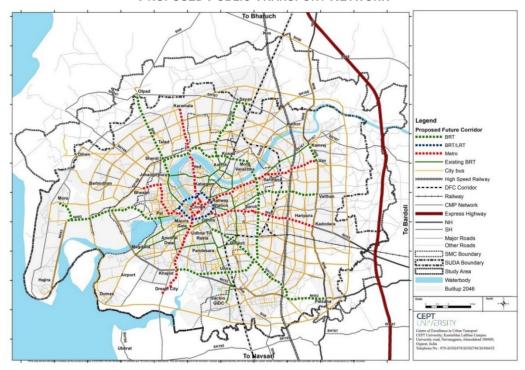
ALTERNATIVE ANALYSIS APPROACH

Identification **Assessment** of Rapid Transit Corridor (RTC) Screening Selection Potential MRT **Identified MRT** network based on the time **Proposed Corridors** Road MRT/BRT network saving and **Based on PHPDT** congestion assigned demand reduction 3. Connectivity to future Nodes

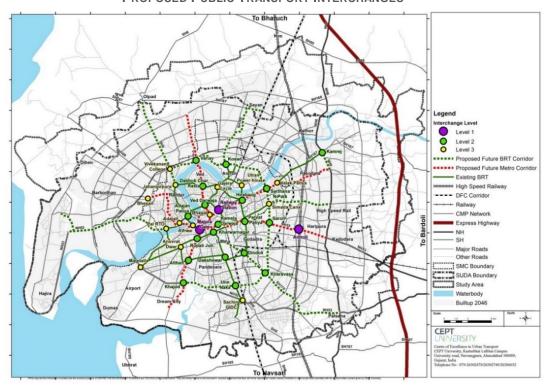
Around 73 km of Metro and 99 km of BRT network has been identified as a part of this plan. Along with this, 12 km of LRT/BRT is proposed along the inner ring road as the high mobility corridor. The plan also identifies 36 interchanges for seamless transfer through physical integration, with Surat Railway station, Majura Gate and High Speed Rail station being the major ones. In addition to the existing 450 km of bus network, around 264 km of bus priority network has also been identified for the future and an additional 5000 buses need to be procured to meet the demand and adhere to LoS 1.

Intelligent transport systems such as automated fare collection, automatic vehicle locating system, passenger information system, vehicle scheduling and dispatch system, depot and incidence management system etc. will act as the backbone of the system to ensure the efficiency of the system.

PROPOSED PUBLIC TRANSPORT NETWORK

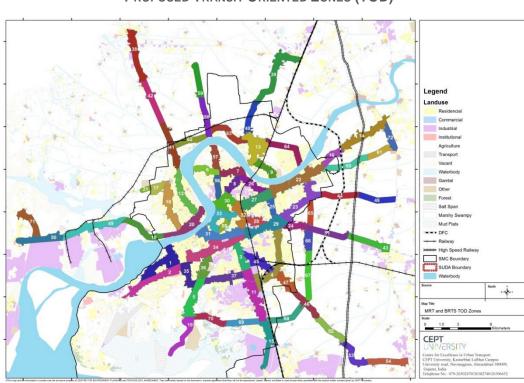


PROPOSED PUBLIC TRANSPORT INTERCHANGES



Transit Oriented Development

Surat already has a very high population density. However, there is a need for improvement to maximise the number of people who can benefit from public transport infrastructure and to maximise the ridership of public transport. This requires a sensitive Local Area Planning that will incentivise redevelopment within. TOD allows value capture from the increased development potential and improves the existing street network and infrastructure to be able to accommodate more residents and employment within the area, with improved environment and quality of life. The focus of this plan will be to improve walkability in the transit area to encourage the use of PT. Considering TOD corridor width of 200 m on either side of public transport, this will bring about 140 sq. km of area within 72 TOD zone. This means that with proper Local Area Planning of the TOD zones, approximately 140 sq. km of area will fall within 2.5 minutes' walking distance from the public transport corridor. FSI 4 (1.8 base and 2.2 chargeable FSI) is proposed in the transit zones in Surat. It is estimated that between 20,000 to 30,000 crores will be generated through TOD by 2046.



PROPOSED TRANSIT ORIENTED ZONES (TOD)

3. Focus on Pedestrians and Cyclists

This plan recognises the need for encouraging non-motorised modes of walking and cycling in the city. The planning approach for pedestrian and cycling network is based on the following:

- The roads along which footpaths are to be added or widened are selected based on priority. Accident-prone areas and streets with high pedestrian volumes are to be identified as high priority.
- The existing wide footpaths in the city are to be renovated. The plan proposes provision of footpaths and bicycle lanes along all PT routes.
- Bicycle sharing systems are to be introduced in the city.
- Awareness campaigns and initiatives that help propagate the idea of walking and bicycling in the city are to be undertaken by the city government. The involvement of concerned NGOs in this regard is to be encouraged.

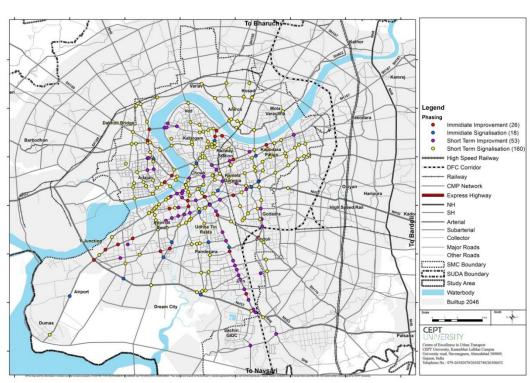
As a part of the proposal, 488 km of footpaths above 1.8 m and 288 km of cycle network are identified with lane marking. The idea is to develop transit streets as walkable streets, with public plazas with priority given to pedestrians. Apart from this, two 'Public Bicycle Sharing' scheme are proposed: one in the old city with 40 bike docking points and over 1100 cycles and the second in the educational area of SVNIT with eight major docking stations and over 500 bikes. Apart from this it is also proposed to develop walkable streets with public plazas to enhance walkability and cultural life in the city.

Proposed Cycling Network Proposed Pedestrian Network

4. Accident Management

As a part of the mobility management measures proposed, accident management is one of the key ones, safety being one of the main areas of concern for the city with high fatality rates. To improve the situation, the following strategies have been suggested

- Design improvement and Junction Signalisation: A total of 257 junctions have been identified (79 for improvement and 178 for signalisation). Apart from these, road infrastructure improvements are also suggested along the critical accident prone corridors.
- 2. **Setting up of speed limits for the city:** To reduce road fatalities, it is proposed that National Highways have a speed limit of 65 kmph whereas in the case of urban city roads, all major roads will have a limit of 55 kmph, with sub arterial and collector roads 45 kmph. In the case of the old city, local streets and gamtal areas, the speed limits are further reduced to 30 kmph.
- 3. **Accident Monitoring Cell:** The Traffic Police Department needs to institute a GIS-based accident management cell which would look at analysing accidents, monitoring and devise strategies to reduce the same.



PROPOSED PEDESTRAIN AND CYCLING NETWORK

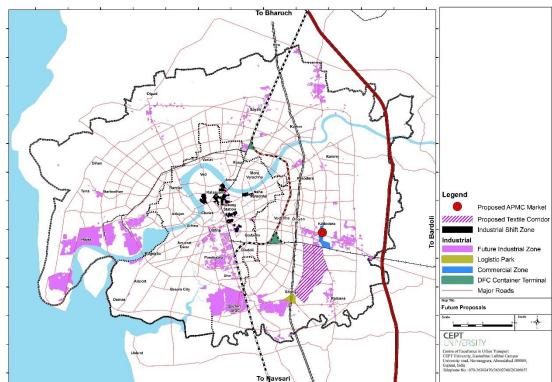
5. Urban Freight Management

The objective of freight management in the context of this plan is to 'improve freight mobility within the overall transport sector priorities of facilitating urban mobility and public safety'. The following are proposed as a part of the plan:

- 1. New outer ring road for through freight and vehicular traffic: The regional ring road proposed as a part of the Road Network Plan is expected to cater to about 29% of through freight traffic in the region.
- 2. 'Textile corridor' with logistic park proposed near Palsana to help reduce freight vehicle intrusion into the city: About 10 to 12 sq. km of area is required to be reserved for the same as a part of the DP.
- 3. Entry exit restrictions for freight vehicles (HCVs and MCVs): It is recommended that freight vehicles (HCVs and MCVs) be allowed from 9pm to 6am only.
- 4. Parking regulations: Strict enforcement for regulating on-street parking for goods vehicle and restricting their parking in residential and commercial land use area is recommended to minimise conflicts with vehicular and pedestrian flow.
- 5. Provision of Farm to Market: In view of the growing demand for agriculture produce in the region, especially horticulture produce, the need to strengthen the linkages between the farm and the market is imperative. A new APMC (Agriculture Produce Market Committee) market facility is proposed to be located the market to the outskirts, which would provide efficient mobility of farm produce

TEXTILE CORRIDOR

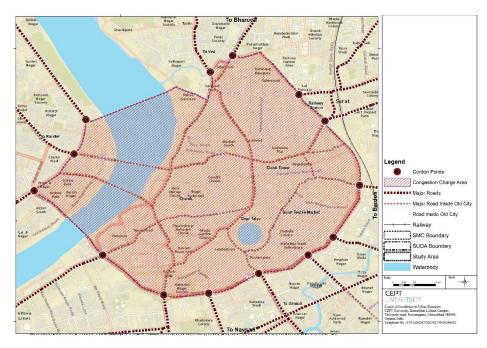




6. Fiscal Measures

Both pull and push measures are required for the success of the plan and hence, economic measures such as taxation, fare regulation, value capture, parking charges and congestion charging have been suggested as a part of the CMP.

- 1. Transportation Impact Charge: As per the GPMC Act (Clause No. 127 and 129), transport user charge can be levied in integration with property tax. It is proposed to levy the transport users' charge named as 'Transportation Impact Charge' similar to current charges that are levied for solid waste management in the city, it is estimated that a total of Rs. 90.13 crore can be initially recovered through the same.
- 2. **Value capture:** As mentioned earlier, as a part of the TOD proposal, about Rs. 20,000–30,000 cr could be generated as a part of the same.
- 3. **Fare regulations:** Automated fare revisions is also proposed to be taken up at regular intervals for the transit systems to operate efficiently.
- 4. Congestion Pricing: An area-based congestion pricing is proposed as a medium and long-term proposal for the old city area. In area-based pricing, all the roads that come under the old city area will be liable to be taken under congestion pricing. The pricing can be implemented through electronically collected toll systems with automatic number plate recognition cameras. This long-term proposal is expected to decongest the old city area.



Costing and Financing the Plan

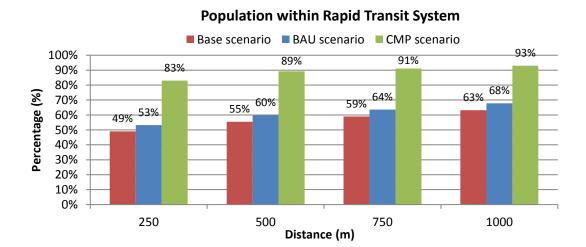
The total project cost of the plan is about Rs. 45 thousand cores (2017 prices). In the case of public transport, the cost of the buses is expected to be borne by the private partners.

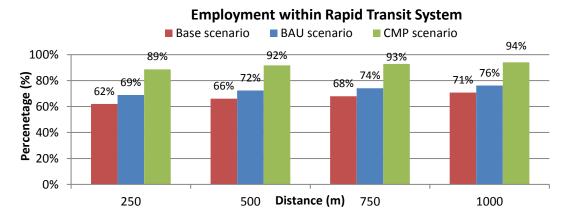
Budgetary provisions alone may not be sufficient to meet the capital expenditure requirements proposed under the plan. Additional resource mobilisations through land value capture, congestion pricing, introduction of transport impact charge, etc. are also to be explored.

Overall benefits of CMP

1. Accessibility to Transit

It has been observed that the transit accessibility would improve in the CMP scenario by an average of 23% w.r.t to business as usual scenarios. The percentage of people living within 500 m of transit will improve from 55% in base scenario to 89% in the CMP Scenario. Similarly, the job locations accessibility within 500 m will go up from 66% base to about 89% in CMP.

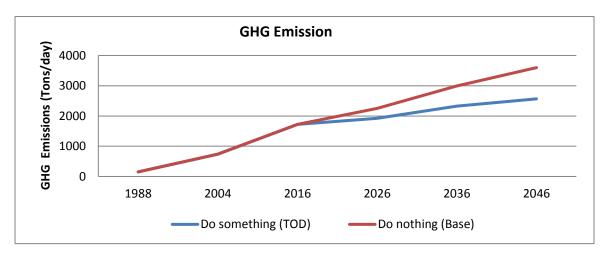




2. GHG Emissions

It is also observed that the savings in fuel consumption in CMP scenario is about 30% and 12% as compared to Base and BAU respectively.

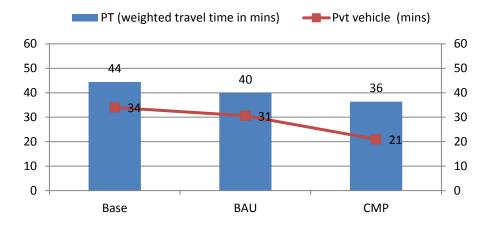
Savings in GHG emission is about 29% and 21% in CMP scenario as compared to Base and BAU respectively. Other particles which are emitted are also less in CMP scenario.



3. Road Congestion and Travel times

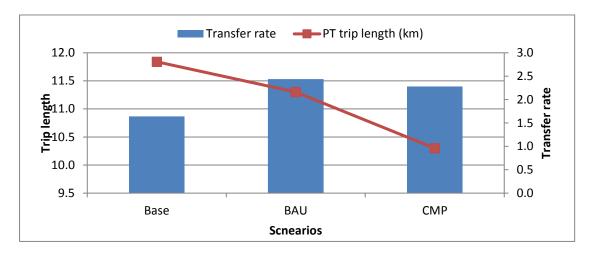
The overall congestion on the roads will be reduced if the CMP proposals are implemented. It is estimated that in terms of congestion on higher order road network the congestion in case of CMP scenario will be only 14 % as compared to 57% and 46% in base and business as usual scenarios.

In CMP scenario, it is observed that the average travel time for PT improves as compared to the base and BAU scenario by almost 8 and 4 minutes respectively. Benefits of reduced congestion are also seen in the speeds of private vehicles 21 min as compared to base and BAU scenarios saving of 13 and 10 minutes respectively.



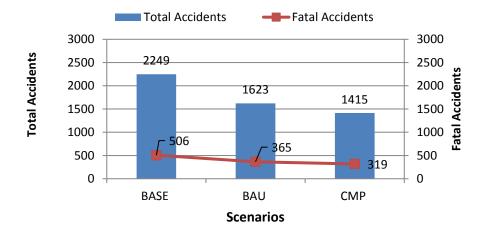
4. Transfer rate and average trip length

Since the CMP focuses on a multimodal transit system the average public transport trip length see a reduction of 2 km in the CMP scenario, the average trip length is about 10 km where as in BAU is about 12 km. consequently the transfer rate is also slightly less that is 2.28 as compared to 2.44 in BAU.



5. Safety

Better road network and focus on safety and freight management will also result in the reduction in accidents. It is observed that in case of CMP scenario the savings are about 37% and 13% in comparison to base and BAU scenario respectively.



CHAPTER -1Introduction

1. Introduction

1.1 Overview

With a population of 4.5 million (Census, 2011), Surat is India's eighth most populous city and the second most populated city in Gujarat. During the period 2001-02 to 2006-07, Surat clocked an annualised GDP growth rate of 11.5%¹—the fastest in the country—and is projected to grow by 9.9% a year over the 2016–30 period. Already popular as the diamond capital of the world with 92% of the world's diamonds being cut and polished in Surat, another major economic driver for the city is the textile sector. Surat is the biggest centre of man-made fibre in India and the largest manufacturer of clothes in the country (SGCCI, 2017). Besides being the country's textile and diamond trading hub, Surat has also emerged as India's highest ranked 'Smart City' with the largest number of projects implemented and completed under the Smart City Mission².

As per a study conducted by the National Council of Applied Economic Research (NCAER) in 2008, the city has an average annual household income of Rs. 4.57 lakh, which is twice the national per capita income. It is one of the cleanest cities in India and ranked fourth in the 'Swachh Sarvekshan' conducted by the Ministry of Housing and Urban Affairs (MoHUA) in 2017.

1.2 Project Background

The MoHUA, GoI formulated the National Urban Transport Policy (NUTP) in April 2006, which envisaged the preparation of Comprehensive Mobility Plans (CMPs) for cities. A CMP is a vision statement of the direction in which a city's urban transport should grow. Covering all elements of urban transport under an integrated planning process, it is a long-term roadmap to achieve desirable accessibility and mobility patterns for people and goods in the city, and provide safe, secure, efficient, reliable and seamless connectivity that supports and enhances economic, social and environmental sustainability. The revised toolkit³ on CMP developed by the MoHUA, GoI envisions the CMP as a macro-level plan which identifies and prioritises transportation projects for the city.

Today, city mobility plays a crucial role in helping a city meet its socio-economic needs. A city requires efficient mobility for meeting the needs of business, commerce, services and education as well as to improve its environmental health. Recognising this, the Surat Municipal Corporation has initiated several projects in urban transport over the past decade to facilitate efficient mobility in the city. Apart from structuring the urban road network, the city is now investing in procuring city buses, developing a Bus Rapid Transit System (BRTS) over a network of 102 km and planning for a metro system. Besides, an Integrated Operations Plan is also being prepared to boost the public transport share in the city by integrating city and BRT services.

While such initiatives are notable, an integrated view of the complete transport system in the city is essential. This can be achieved through a CMP that identifies and addresses transport and related issues and produces an integrated, multi-modal strategic framework for investment, management and

¹ 'Surat's GDP growth rate fastest in India: Study' in TOI dated 29 January 2008, accessed 13 March 2018.

² 'Surat tops ranking of smart cities with largest number of projects completed' in ET dated 18 January 2018, accessed 13 March 2018

³ Preparing a Comprehensive Mobility Plan (CMP): A Toolkit, MoUD, 2014

operational decision-making in urban transport. The CMP is expected to help integrate different components and proposals and present an overall strategic transportation plan for the city.

1.3 Past Efforts towards Mobility Management

Several efforts have been made in the past to understand the mobility trends and transport challenges faced by Surat. These include:

- a. Comprehensive Traffic and Transportation Study undertaken jointly by the CRRI and the SMC in 1992
- b. Development Plan for Surat prepared by the SUDA in 1998 and approved in 2004
- c. City Corporate Plan 2001 (initiated by the SMC and prepared by CEPT University)
- d. Surat Vision 2020 (undertaken by the SMC with assistance from CEPT University)
- e. City Development Plan 2005 (initiated by the SMC under JnNURM with technical support from CEPT)
- f. CTTS 2006 Final Report (study initiated by the SMC and prepared by the CRRI)
- g. Integrated Public Transport Study 2006 (assignment by the GIDB, prepared by the CES)
- h. Sustainable Transport System for Surat 2007 (CEPT Study)
- i. Comprehensive Mobility Plan 2008 (initiated by the SMC, technical support by CEPT)
- j. Bus Rapid Transit System (BRTS) Plan 2008 (initiated by the SMC, technical support by CEPT)
- k. Bus Rapid Transit System (BRTS) Phase 2 & 3 2012 (initiated by the SMC, technical support by CEPT)
- I. Service Level Benchmarks in Urban Transport for Surat City 2012 and 2015
- m. DPR for Introduction of City bus Services 2015, SMC/CEPT
- n. Performance Assessment of Public Transport in Surat Quarterly Reports 2016–18.

1.4 Scope of Study

The study area for the CMP is the entire Surat Urban Development Authority (SUDA) area. The base year for the plan is 2016 and the plan period is 30 years, with the intermediate and horizon years being 2026, 2036 and 2046 respectively.

The CMP is prepared as per the MoHUA's toolkit on 'Preparing a Comprehensive Mobility Plan'. The CMP preparation would involve analysing the present travel characteristics, forecasting travel demand for the planning horizon, integrating transport options with land use structure, developing alternative scenarios for sustainable transport, working out a mobility plan that is economically, socially, environmentally and technologically sustainable and in sync with the development plan, and suggesting an implementation framework for the proposed projects/interventions.

The focus areas of the CMP include:

- Land Use Transport Integration
- Road Network Plan
- Integrated Multi-Modal Public Transit System
- Non-Motorised Transit Plan
- Mobility management measures like Parking Plan, Intersection Improvement Projects, Demand Management
- Freight Traffic Improvement Plan

An enabling mechanism in the form of regulatory and institutional arrangements will also be recommended.

1.5 Study Approach

As embedded in the NUTP, the primary goals of the CMP are to:

- Reduce the need for travel
- Reduce the length of travel
- Reduce automobile dependence through promotion of the use of public transport and NMVs

The concept of mobility management as a part of the CMP specifically emphasises managing demand through a set of tools that encourage change in behaviour and, in turn, travel patterns in favour of sustainable modes of transport. The demand management tools include information and communications strategies as well as economic instruments such as parking fee, congestion charges and levy of surcharge that make car use expensive etc. and thus achieve reduction in car use.

The Centre of Excellence in Urban Transport at CEPT University, as a part of its research agenda, is developing an operational model of CMP for Indian cities. This model, termed as 'Planning for Desirable Outcomes', is a strategic planning approach, which, as a starting point, identifies the desired level of improvements in the quality of life defined as 'Desirable Outcomes' and works backwards to build different sets of strategy-mixes to achieve the same. This approach is also called 'Scenario building and Back-casting approach'. The present study proposes to adopt this approach while developing the CMP for Surat.

1.6 **Methodology**

The methodology used to undertake the study is in line with the methodology proposed as a part of the MoHUA toolkit.

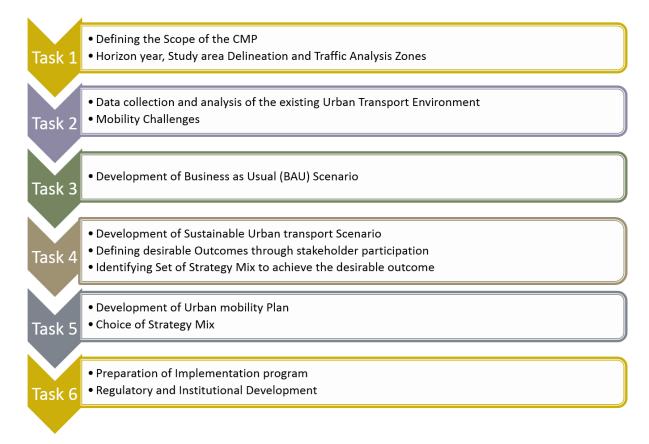


FIGURE 1-1: METHODOLOGY

Task-1: Defining the scope of CMP

The first task is to define the study area for which the study will be undertaken. This will be based on the interaction of the city with its region, taking into consideration administrative boundaries and important nodes that need to be connected. Plan horizon will also be defined at this stage and further traffic analysis zones will be defined.

Task-2: Existing situation analysis and mobility challenges

The existing analysis of the base year is carried out in terms of the population and employment growth in the region along with the situation of existing traffic and transportation system. This analysis will bring out the existing mobility challenges along with the gaps in the system.

Task-3: Developing business as usual scenario

The business-as-usual scenario is developed considering the existing trends and the committed investments in the study area.

Task-4: Development of sustainable urban transport scenario

The indicators for desirable outcomes would include level of accessibility, affordability, efficiency, safety and security and environmental status. These in operational terms would include trip lengths, travel times, fare levels, costs, air quality, noise levels, GHG emissions, road fatality and feeling of security. Selecting measurable indicators and setting the target value are critical tasks to be carried out based on benchmarking and stakeholder consultations. The amenity value in terms of quality of public places would also be a critical outcome.

Task-5: Development of urban mobility plan

As the relationships between strategies and outcomes are known only with respect to direction of movement and not in terms of degree of impacts, the development of alternative scenarios and their evaluation is important. This can be done using multiple techniques like developing simple ratios based on case studies, 4-stage model, Delphi technique etc.

Effectiveness of different sets of strategy-mixes is tested by analysing the performances of the urban transport systems under these options. Their implementation risks are analysed to choose the final strategy-mix for adoption.

Mobility indicators will be compared against the benchmarks.

The strategies include:

- Promoting the concept of Compact City through
 - Polycentric cities
 - o High density development and
 - Mixed land uses
- Ensure Complete Networks and Complete Streets
 - Networks to connect/serve regional movement traffic
 - Urban streets to have clear hierarchical network pattern
 - Streets to have appropriate allocation of RoW for different user groups with priority to mass transit and NMV
 - Promoting Mass Transit
 - Multimodal systems
 - Interchange facilities
 - Mode integration (physical, fare, social, economic)
 - Promoting NMV
 - o Pedestrianisation

- Walkable Streets
- Safe Bikeways
- Managing Freight Mobility
 - Logistic Hubs
 - Transport Terminal
- ITS for traffic management
 - Passenger Information Systems
 - Area Traffic Management
- Travel Demand Management
 - Parking Management
 - Vehicle Taxes
 - Congestion Charge

No single strategy would be sufficient for achieving the goals defined as part of this report. A mix of strategies introduced in different measures over the plan period would enable cities to achieve the desirable outcomes. An important task would be to develop alternative sets of 'strategy-mixes' to back-cast their effectiveness.

Task-6: Preparation of implementation program

Equally important is the need for financial closure of the Mobility Plans and an institutional arrangement for implementation of the CMP with specified targets. Financial closures are also linked to flexibilities in land regulations that could be used as incentives for private financing. This, in a way, is linked to the Master Plan and reviews would include mechanisms by which select cities have approached this issue and will be a key input in CMP financing. The other operations of financing will also be looked at, but the primary focus will be on sustainability of operations.

1.7 Introduction to Surat and Surrounding Regions

Transportation is a derived demand and hence it is important to understand the demographic characteristics of the study area in terms of household size, vehicle ownership and location of work and education centres which will have implications on the travel demand.

1.7.1 Surat

Surat emerged as an important port town and a trade centre since the 15th century. The foundations for the growth in the city were laid in the 1960s, with the expansion of the diamond trade, the gradual shift in the economic base into zari and textiles (power looms) and the intensification of oil and gas exploration activities.

Today, apart from the traditional industries of intricate zari works, textile manufacturing, trade, diamond cutting and polishing industries, gas-based industries have also come up at Hazira. As a result of the expansion in the economic base of the city and its surrounding region, there has been a spurt in the city's urban population.

Surat continues to experience a high population growth rate for the last four decades, placing itself at the 8th position in terms of population size countrywide as per Census 2011. Parallel to industrial expansion, Surat emerged as a major centre for trade and commerce in the region. Notwithstanding a vibrant economy and focus on growth, housing and services were not able to receive the desired level of attention from the local administration.

1.7.2 Surat Urban Development Authority (SUDA)

The Surat Urban Development Authority⁴ (SUDA) is the leading organisation for planning and regulating development in and around Surat. It has a total area of 958.16 sq. km. The prime objective of the body is to carry out planned development of the area falling outside the periphery of the Surat Municipal Corporation (SMC), which includes Ichhapore (CT), Bharthana Kosad (CT), Bhatha (OG), Bhatpor (OG), Chalthan (CT), Kadodara (CT), Kansad (M), Kavas (OG), Pardi Kanade (CT), Sachin (CT), Talangpor (OG) and Varelli (CT), Sachin (INA) and Hazira (INA) as well as 186 villages.

In recent years, the SUDA area has seen many jurisdiction changes. Till 2015, the area under the SUDA was 715 sq. km, which expanded to 1351 sq. km by addition of 100 villages as part of the revised development plan in December 2015. This area also included the Kator Grampanchayat Area Development Authority and the Hazira Development Authority as they were merged into the SUDA. Later, the Gujarat state government excluded 54 villages from the SUDA area just before the draft plan was submitted in October 2016. The state government later removed seven more villages from this area, leaving the SUDA with an area of 958.16 sq. km.

1.7.3 Outside Surat Urban Development Authority (SUDA)

This included the area of 365.84 sq. km that was removed from the SUDA's jurisdiction by the state government in 2016. This comprises the urban area Sayan (CT) and 61 villages.

1.8 Plan Period

The CMP has a long-term horizon of 30 years and hence, the horizon period is taken as 2016–2046.

1.9 **Study Area Delineation**

The first stage involves the delineation of the study area, which has been undertaken based on administrative boundaries, urban agglomeration, functional linkages and traffic and goods movements. The proposed committed developments in terms of industrial areas/investments, Dedicated Freight Corridor, Special Investment Regions (SIRs), proposed townships etc. have also been considered.

⁴ The SUDA was established on 30 January 1978 by the Government of Gujarat under the Gujarat Town Planning and Urban Development Act, 1976.

Surat is a major urban area in the region with strong linkages to urban centres in and around Gujarat. The SUDA had declared industrial zones in Pandesara GIDC, Udhana GIDC, Katargam GIDC, Navagam GIDC. Apart from these, SEZs have also been proposed in Sachin GIDC (SURSEZ Diamond & Gem Development Corporation) and Vanj GIDC (Surat Apparel Park Gujarat Industrial Development Corporation). In addition, the GIDC has developed the Hazira Special Investment Region. All these regions serve as important nodes and have been included in the study area.

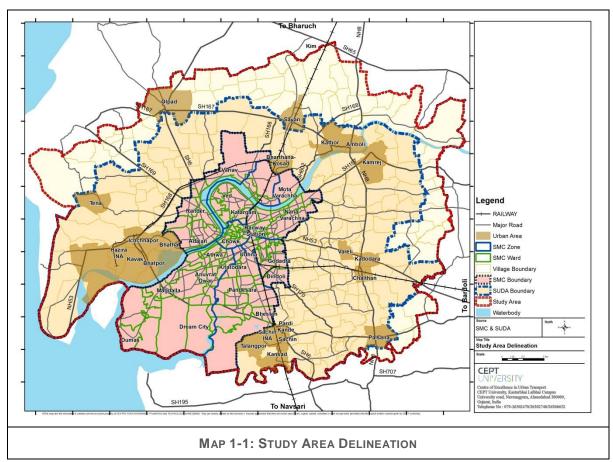
The Dedicated Freight Corridor (DFC) passing through the region along with the Delhi–Mumbai Industrial Corridor (DMIC) is expected to trigger huge investment and growth in the near future. The Surat industrial growth region has also been identified as a part of the recent Development Plan 2035. As part of the proposal, the industrial belt is identified towards the west of the SMC, connecting the industrial location in Hazira to the DFC corridor near Gothan. Apart from this, an industrial corridor along the broad-gauge railway line near Gothan—Kosad is also proposed. The development plan of 2035 has identified growth nodes in Olpad and Kamrej with residential areas to be developed in these places.

It is also observed that in the 1st revised draft plan of 2035, the SUDA area was increased by the Government of Gujarat to 1351 sq. km as per the notification dated 09/12/2015 and its corrigendum dated 18/12/2015. Hence, the same has been considered as the study area, even though the Development Plan area was subsequently reduced to 985.16 sq. km.

TABLE 1-1: STUDY AREA DETAILS

Study Region	Area (sq. km)	Comprises of
SMC	326.52	89 wards
SUDA Old	715	SMC area, 11 urban areas (Bharthana Kosad (CT), Bhatha (OG), Bhatpor (OG), Chalthan (CT), Ichchhapor (CT), Kadodara (CT), Kansad (M), Kavas (OG), Pardi Kanade (CT), Sachin (CT), Talangpor (OG) and Varelli (CT)}, 1 INA (Sachin INA) and 86 villages
SUDA extended (Since 2015)	1351	SMC area, Old SUDA, 4 urban areas (Amboli (CT), Limla (CT), Mora (CT), Sayan (CT)), 1 INA (Hazira) and 96 villages
Total	1351	SMC area, 2 INA, 15 urban areas and 182 villages

Source: Census of India, 2011



Source: CoE- UT, CEPT University

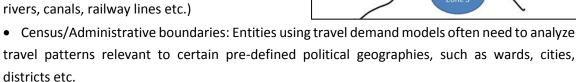
1.10 Traffic Analysis Zones

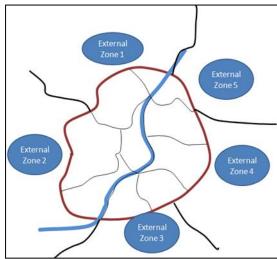
The study area is subdivided into smaller areas known as Traffic Analysis Zones (TAZs). TAZs are

delineated taking into account various factors like administrative boundaries, physical barriers such as water bodies, railway lines, highways and homogenous land uses.

The following criteria were used while delineating the TAZ boundaries.

- Road network
- Existing and planned transportation facilities
- Boundary compatibility
- Physical geography (physical barriers such as rivers, canals, railway lines etc.)





- Socio-economic data (existing and future)
- o Homogeneous land uses, where feasible
- Special generators
- o Trips per zone
- Developments of regional impact
- Access
- Transit access
- Freight/intermodal facilities
- o Other considerations
- Zone size and intra zonal trips
- Internal versus external zones

In SMC, 89 wards were further split to form TAZs based on the above criteria and around 313 TAZs were identified. A similar exercise was also carried out for the SUDA area and in most cases, the concept of 'one village as one TAZ' was adopted, while in some cases, bigger villages were split into two or more TAZs.

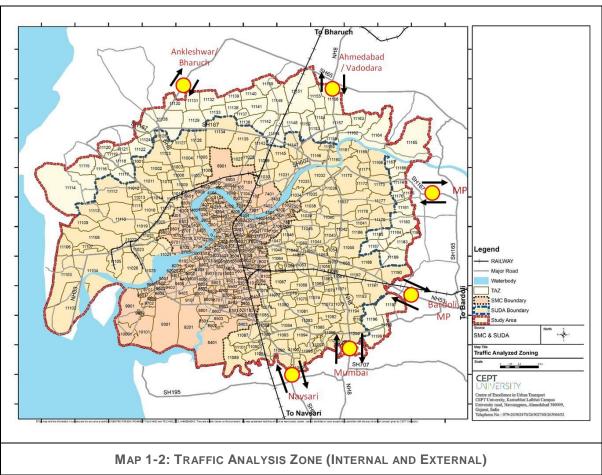
TAZs inside the study area or model boundaries are defined as internal zones. Zones outside the study area along the model boundaries are defined as external zones. The area outside the study area is aggregated into larger zones along the various directions of travel, which are known as external zones. This aids in estimating trip interaction among internal—external zones. In the case of the study area, six zones have been identified as per the direction of incoming traffic as below:

TABLE 1-2: DISTRIBUTION OF TAZ WITHIN STUDY AREA

Area	No of TAZ
SMC	313
SUDA (old)	102
SUDA (new)	100
Total study area (Internal)	515
Outside study area (External)	6
Total No of TAZs	521

Source: CoE- UT, CEPT University

Accordingly, a total of 521 zones, which include 515 internal and 6 external zones, are used in the base model.



Source: CoE- UT, CEPT University

1.11 Data Collection

The 'Service Level Benchmark for Urban Transport' study was completed for Surat city in 2012. As part of this study, performance evaluation of different aspects of urban transportation was conducted by carrying out extensive surveys. This study would serve as a useful base to understand the base situation and performance of transportation in the city. The following sets of data have been collected:

TABLE 1-3: DATA COLLECTION

Sr. No.	Data	Purpose	Source/ Survey
1	Household (HH) surveys (15700 HH surveys)	To understand the socio – economic and travel characteristics of the study area	Primary survey (Considered in Operations plan & MRT proposal)
2	Activity/ Employment surveys (3000 (within SMC) Non – residential properties)	To estimate the base employment in the city.	Primary survey (Considered in Operations plan & MRT proposal)
3	CVC at screen line locations (27 locations)	Used to calibration and validation the model.	Primary survey

Sr. No.	Data	Purpose	Source/ Survey
			(Considered in MRT proposal)
4	Terminal surveys 3 large terminals 2 small terminals (4000 passengers are interviewed)	To understand external – internal passenger trips (visa versa) travel pattern (Origin – Destination) and mode used for access/ egress.	Primary survey (Considered in MRT proposal)
5	Land use Survey	To know existing land use along transit corridor	Benchmarking Study for Surat
6	Cordon CVC and Road Side Interviews (RSI) 8 locations - 22000 (~10%) vehicles have been interviewed)	To estimate and understand the goods traffic and their travel pattern in study area.	Primary survey (Considered in MRT proposal)
7	Speed and Delay surveys (Journey Speed on major corridors for PT, 2w, 3w and 4w	To calibrate and validate the travel time in the model travel time.	Primary survey (Considered in SLB & MRT proposal)
8	Willingness to Shift 2000 samples (Pvt. Vehicle users, 3Wh users)	To forecast future mode share based on travel time and cost utilities.	Primary survey (Considered in Operations plan)
9	Parking Survey On/Off-Street (supply & demand)	Parking survey conducted for Parking Policy by SMC	Primary survey (shared by UMTC)
10	Total Vehicle Registration (past 10 years)	To understand vehicles growth over the years and help to predict for future.	Secondary (RTO Office)
11	Sub-infrastructure Details (List of proposed, under construction, and existing bridges) BU Permission Parking policy (Off street and on street) Proposed Logistic Report	To consider the existing and future road infrastructure proposal within the study area BU Permission, to know the growth as per permission in different zones. Draft parking policy for Surat city by UMTC, Off street and On street Parking to know the availability of parking in city	Secondary (SMC: Bridge Cell and Road Dept. Town Planning Dept.)
12	Revised DP Report	To consider the future proposal and other details	SUDA
13	GSRTC route details	Depots and terminal location. GSRTC routes and connectivity within study area and outside study area. Bus time table	Secondary (GSRTC Divisional Controller)
14	Major Commercial areas	To estimate the freight traffic generated through these activities and their major origins and destinations area.	Secondary (APMC, GIDC Office,

Sr. No.	Data	Purpose	Source/ Survey
	(APMC, GIDC and Textile market)	Restricted entry and exist time for heavy vehicle. Total employment generated and the trips attracted Allotment of Parking space for loading/unloading of vehicles For Future proposals of shifting or implementing the policy	FOSTTA (Textile Market) Police commission office)
15	Goods vehicle information through Railway (trains / trucks)	No. of trucks for distributing the goods from Railway yard to other destination areas with study area	Secondary (Railway Department)
16	Port	Type of Commodities and number of truck for distribution.	Secondary (Magdalla Port)
17	TP Schemes	For consideration in future proposal	Secondary (SMC and SUDA)
18	Accident Data	To know the accident prone location	Secondary (Police Department)
19	Energy consumption in transport: city level	Type of Commodities and number of truck for distribution.	Secondary (Petrol pump)
20	Students Enrolment – SUDA Region (All primary, secondary and higher secondary schools and colleges)	As part of trip generation stage, to develop regression equation for educational trips	Secondary District Education Office (DEO)
21	Committed projects like DMIC, DFC, SMMTH, Hazira Port, Diamond City, Dream City, Bullet Train	For consideration in future proposal	Secondary SMC and SUDA

1.12 Report Structure and Chapter Scheme

This report assesses the growth trends and the existing situation of transportation in the city and summarises them in the form of issues and challenges.

The report is organised into six chapters:

Chapter 1 orients the readers towards the background of the study area, zoning, methodology adopted and the data collected for the study.

Chapter 2 introduces the growth trends in the study area—both physical and demographic. It looks into the existing activity patterns (land use) of where people stay, work and study, which has an impact on travel demand. This chapter also discusses the socio-economic and demographic characteristics of the population captured through household-level data.

Chapter 3 looks into the existing transportation situation in the city in terms of its networks, modes and infrastructure. It explores connectivity at the regional as well as local level for roads, NMT, public transport system and intermediate public transport system besides discussing parking infrastructure and its related issues. Along with this, the chapter also looks into the motorisation trends in the city and its impact on the performance of the system in terms of externalities of congestion, accidents and pollution.

Chapter 4 focuses on the analysis of household data on travel characteristics of people in Surat and how these have changed over time. Moving goods in a city is as important as moving people.

Chapter 5 discusses freight activities and their flow in Surat along with their impact in terms of congestion, conflicts etc.

Chapter 6 summarises the issues and challenges faced by Surat today and how these can manifest in the future in the absence of holistic planning.

Chapter 7 projects the growth trends for Surat given the present and future developments to come up in the city. It illustrates the future road network development process which were further developed in transport modelling software (EMME) followed by a four-stage modelling process. Further, these alternative scenarios were tested and evaluated for both auto (private vehicles) and integrated public transport systems.

Chapter 8 introduces the mobility vision for the city wherein the vision statement and strategic goals are being defined.

Chapter 9 focuses on the mobility improvement measures with the proposals on Road Network, Integrated Transport System, Transit-Oriented Development, Non-motorized Transit Facility, Mobility Management Measures, Urban Freight Proposals and Fiscal Measures.

Chapter 10 summarises the mobility management measures proposed in the CMP for Surat that is in line with the National Urban Transport Policy (NUTP) objectives.

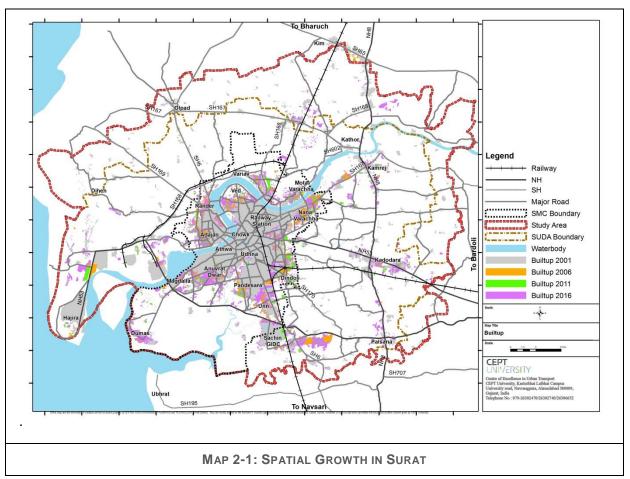
Chapter 11 focuses on the implementation programme wherein the prioritisation of projects according to timeline, the implementing agencies and costing of the projects over the period of timeframe is being put forth.

CHAPTER -2Growth Trends

2. Growth Trends

2.1. Spatial Growth

Surat witnessed rapid spatial expansion in a radial manner along five major corridors in the north, south, east, west and south-west of the city till the end of the 1980s. Since then, the city has been growing rapidly on the eastern, southern and south-western sides where a large area was brought under residential use by the SUDA. If we analyse the growth trends in Surat, it is seen that the built-up area has grown from 165.6 sq. km to 233.9 sq. km in the last 10 years, registering a growth rate of 41%. The growth has been especially rapid over the last five years as compared to earlier periods, which could be attributed to the rise of Surat's economy.



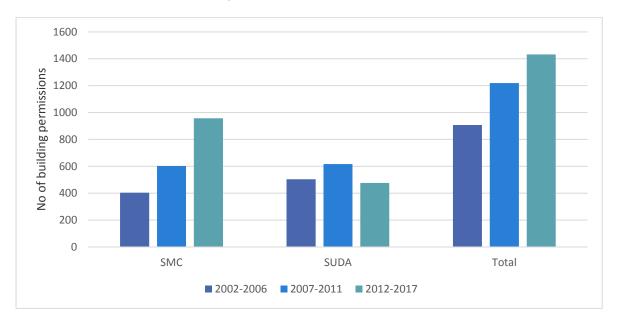
Source: Google Image interpretation

TABLE 2-1: GROWTH IN SURAT

17,022 2 11 01(01) 111 00(01)							
Year	Built up area (Sq.Km)	Growth rate %	Building permissions SUDA and SMC*	% growth			
2001	153	-					
2006	165.6	8	908				
2011	175.9	6	1219	34			
2016	233.9	33	1433	18			

Source: *Town Planning Department, SMC 2016

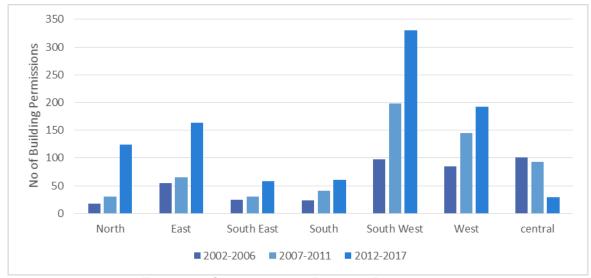
When we compare the building permissions data for the SMC and the SUDA, it is observed that growth in the SMC area has been around 18% during the period 2011—16 while in the case of the SUDA, a negative growth rate of -23% has been observed for the period 2012—17 as can be seen in Fig. 2-1. This was also the period during which the revised development plan was being prepared and hence, this could be one of the reasons for the slump in the market.



GRAPH 2-1: COMPARISON OF BUILDING PERMISSIONS 2002-2017

Source: Town Planning Department, SMC 2016

If we observe the trends in the SMC, it is seen that the south-west part of the city recorded the highest growth in the last five years followed by the western, eastern and northern parts. The south-east, south and central zones recorded the least growth. This is attributed to the fact that all these areas are already densely built up whereas the other zones still have scope for further development.



GRAPH 2-2: ZONE WISE COMPARISON OF BUILDING PERMISSIONS 2002- 2017

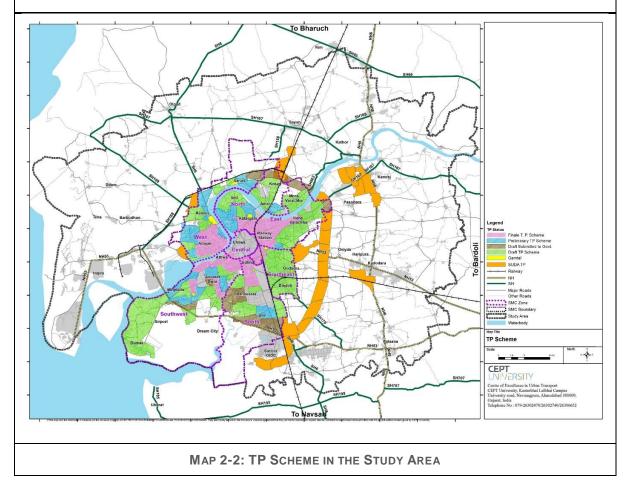
Source: Town Planning Department, SMC 2016

In the case of TP Schemes, it is observed that around 55% of the total SMC area is being developed under TP Schemes. Most of the schemes are in preliminary or draft stage of implementation. As seen in the map below, a majority of the total built up area in the SMC region is developed under TP Schemes (62%). In the case of the SUDA, new TP schemes are planned along the proposed ORR and areas near Kamrej, Kadodara and Sachin on the eastern side, apart from two schemes being developed towards the west just outside the SMC boundary and one north of Kosad adjoining the SMC boundary.

TABLE 2-2: STATUS OF TP SCHEMES

TP Scheme	Number of TP schemes	Total Area in sq. km
Final T. P. Scheme	50	54.92
Preliminary TP Scheme	18	21.08
Draft Submitted to Govt.	0	0
Draft TP Scheme	60	101.38
SUDA TP Scheme	23	49.44
Total	151	226.82

Source: SMC 2018



Source: SMC 2016

2.2. Land Use

2.2.1. Land Use Distribution

An analysis of the Development Plan 2004, the existing land use scenario in 2016 and the Development Plan 2035 reveals that the city has been growing rapidly on the north-eastern, southern and southwestern sides since the 1990s owing to the development of many industries in Sachin, Hazira etc. along with residential zones.

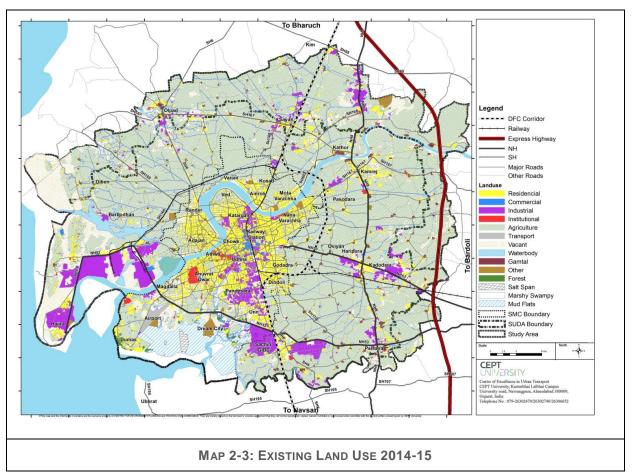
The urbanised area in Surat city has increased by nearly three-folds between 1978 and 2004, with development mostly occurring within the SMC limits. The SUDA area (excluding the SMC area) has developed largely in the form of residential and industrial clusters. The existing land use survey was conducted by the SUDA in 2014, where it was observed that of the total area, only about 21% was urbanised—the breakup of the same is provided below:

TABLE 2-3: LAND USE DISTRIBUTION 2014

Sr. No.	Type of Zone	Area in Sq.Km	% of Urbanized land
1	Residential	136.94	47.43
2	Commercial	5.71	1.97
3	Industrial	74.61	25.84
4	Educational Public Purpose	17.52	6.06
5	Recreation garden and open space	2.46	0.85
6	Transport & Communication	51.48	17.83
7	Total Urbanized Area	288.72	100
8	Agriculture and Non-Urbanized Area	1062.81	
	Total	1351.53	

Source: Development Plan 2035, SUDA

It is seen that residential area dominates the urbanised area breakup with almost half of it being in this category. Since mixed use is not recorded separately, this also includes mixed use areas in the city. Surat being an industrial town, the percentage of urbanised area under industrial use is quite high and covers almost one-fourth of the total area. The area under transport is about 17.83%, indicating adequate network. The city lacks recreation spaces as less than 1% of the urbanised area is classified as recreational.



Source: Development Plan 2035, SUDA

If we compare the existing land use against the proposal for the Development Plan 2004, it is observed that the growth envisaged in industrial and transport use has been realised. The table below indicates the percentage of built up achieved in the year 2014-15 as against that proposed in the Development Plan 2004. The existing land use distribution (for the year 2014-15) shows that there has been a substantial increase in the area under industrial, road transport and communication use, followed by area under commercial and residential use.

Out of the developed residential area in 2014 (i.e. 102.49 sq. km), only 83.98 sq. km was developed within the proposed residential zone of Development Plan 2004 while the remaining 18.51 sq. km was developed outside the proposed residential zone and can be considered as spillover. This spillover can be identified along the developed Ichhapore and Sachin industrial areas. The establishment of industries has attracted the workforce population, thereby further fuelling the demand for residential areas in the proximity of existing industrial clusters.

Surat's walled city is a densely populated area, with a huge concentration of commercial activity. The textile market, the APMC, the main railway station and the GSTRC terminal are present in this area. This results in heavy congestion and an increased risk of accidents.

In 2014, the industrial areas were mostly being developed on the southern side towards Sachin and on the western side towards Hazira. It is to be noted that 11.21 sq. km of industrial area was developed

outside the proposed industrial zone in Ichhapore, Sachin etc. Presently, there are hazardous and polluting industries located within the residential areas of Katargam in the Surat city, affecting the overall quality of life of the local residents.

Land under transport covered an area of 1,661 hectares in 2004, which has grown by almost 2.5 times to 3,950 hectares by 2014 (inclusive of Town Planning schemes and society level roads).

TABLE 2-4: LAND USE DISTRIBUTION COMPARISON OF DP-2004 AND SCENARIO 2014-15

Land use	Proposed as per DP- 2004	Existing in 2014	% Built in 2014 (of DP - 2004)
Residential	204	102.49	50 %
Commercial	7.65	4.66	61 %
Industrial	42.93	38.89	89 %
Educational & Public Purpose	64.21	13.6	21 %
Garden & Recreational	12.36	2.34	19 %
Road, Transport & Communication	40.75	35.31	87 %
Urbanized area	371.9	197.29	100%
Non - Urbanized area	343.41	517.71	
Total	715	715	

Source: Development Plan 2035, SUDA

2.2.2. Demographic Trends

As mentioned in Section 1.9, the SUDA area has been considered as the study area, which includes the Surat Municipal Corporation, two industrial notified areas, 15 urban areas and 182 villages. The total population of the study area is 50.81 lakhs (2011), with an annual growth rate of 4.3% in the last decade. The population of the study area is estimated to be 59.29 lakh in 2016.

TABLE 2-5: STUDY AREA POPULATION (2011)

Taluka	Urban Areas	Industrial Areas	Village	Area (sq km)	Population 2001	Population 2011*	Population 2016**
Chorasi	11	2	42	601	60,052	30,16,775	46,84,523
Kamrej	0	0	54	285.25	1,38,915	1,59,139	1,80,175
Mangrol	0	0	1	8.22	2611	7765	9053
Olpad	0	0	57	327.92	1,07,979	1,15,679	1,33,387
Palsana	4	0	29	129.1	85,730	1,14,750	1,27,304
Total	15	2	182	1351	33,52,010	50,81,856	59,29,821

Source: *Census of India, 2011; ** CEPT estimates

The city has experienced rapid growth in population during the past five decades. Surat's decadal growth rate of 63.3% between 2001 and 2011 has been one of the highest in the country and the highest in the state of Gujarat. High rate of growth experienced by the city over four successive decades has been a major feature in the city's growth, necessitating prompt responses with regard to

supply of infrastructure. Even as Surat's growth rate has slightly reduced in the last decade, it is still very high as compared to the national average of 17.64% for urban India.

TABLE 2-6: POPULATION GROWTH IN SURAT URBAN AGGLOMERATION

Surat Urban Agglomeration	1951	1961	1971	1981	1991	2001	2011
Population	2,23,182	2,88,026	4,93,001	9,13,806	15,18,950	28,11,464	45,91,246
Decadal Growth Rate %		29.1	63.75	85.36	66.22	85.09	63.3
CARG (%)		2.6	5.5	6.4	5.2	6.4	5.0

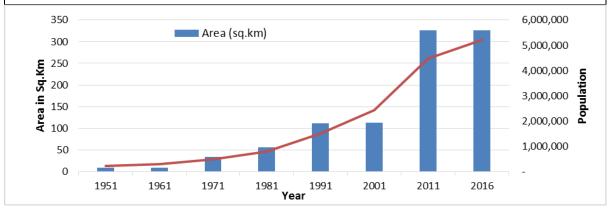
Source: Census of India

The table below compares Surat with other urban agglomerations (U.A.) in the state of Gujarat. It clearly shows that though the decadal growth rate of Surat is the highest and continues to hold the top position in Gujarat in the last two decades; it also has the lowest sex ratio, which has further declined in 2011. This can be attributed to the large increase in male in-migration to the city over the last decade, giving the city a predominant migrant city status.

TABLE 2-7: COMPARISON OF SURAT WITH OTHER URBAN AGGLOMERATIONS IN GUJARAT

	,	Year 2001		Year 2011			
Area	Population	Decadal Growth Rate (1991-2001) %	Sex- ratio	Population	Decadal Growth Rate (2001-2011) %	Sex- ratio	
Ahmedabad- U.A.	45,19,278	36.44	885	6,361,084	40.75	899	
Surat U.A.	28,11,464	85.09	760	45,91,246	63.30	753	
Vadodara U.A.	14,92,398	32.44	905	1,670,806	11.95	921	
Rajkot U.A.	10,02,160	53.12	906	1,286,678	28.39	908	

Source: Census of India



GRAPH 2-3: GROWTH IN AREA AND POPULATION SMC

Source: Census of India, 2016 CEPT Estimates

The average household size in Surat in 2011 was 4.60, which has shown a decrease of 5.45% from 2001. It can be seen that the average household size in the case of Surat is much lower as compared to India (5.3) and Gujarat (5.2).

It is also observed that apart from the Olpad taluka, all other constituencies have shown a growth in the total number of households. In terms of the proportion of households in the study area, it is observed that a greater number of households have chosen to settle within the SMC boundary in the last decade as a result of which its proportion with respect to the other talukas remains almost the same.

TABLE 2-8: DISTRIBUTION OF HOUSEHOLDS IN THE STUDY AREA

Administrative Constituency	Households 2001	Proportion of Total Households 2001	Households 2011	Proportion of Total Households 2011					
SMC	586230	92%	975797	93%					
Chorasi	22934	4%	37583	4%					
Kamrej	11652	2%	15062	1%					
Olpad	4135	1%	4052	0%					
Palsana	11629	2%	18249	2%					
Total	638581	100%	1052754	100%					
Source: Census of India, 2011									

The migration census has not been released yet and as per a recent study conducted by the UNESCO in 2013 (which used NSSO 2007-08 data) which looked into migration trends in selected million plus cities, it was seen that Surat ranked highest with 58% of internal migration in India. It also implies that almost 26% of the city's population is comprised of migrants with the highest numbers coming from the states of Uttar Pradesh, Bihar, Odisha, Maharashtra and Rajasthan and getting employed in textile, construction and diamond sectors in the region (Census, 2001).

2.2.3. Population Distribution

The development of any city is linked to its population and its long-term growth rate. The requirement of energy, infrastructure and other basic amenities are directly related to the population of the city. As mentioned earlier, Surat is divided into seven administrative zones, with the majority of growth seen in the south-east zone followed closely by the south and north zones. The population in the central zone is on a decline, experiencing a negative growth rate of 0.12%. High growth is also seen in the urban areas in the SUDA, which are growing rapidly owing to the employment opportunities present in the region.

About 48% of the total SMC area is built up (i.e. 155.84 sq. km). The overall density of the SMC was 137 pph in 2011; however, the built-up density is more than double at 335 pph. The city also accounts for about 93% of the total population of the Surat Urban Agglomeration. High population growth rates are experienced in the north and south-east zones and nearly 88% of the total population in the study area resides within the SMC area itself.

TABLE 2-9: STUDY AREA GROWTH RATE

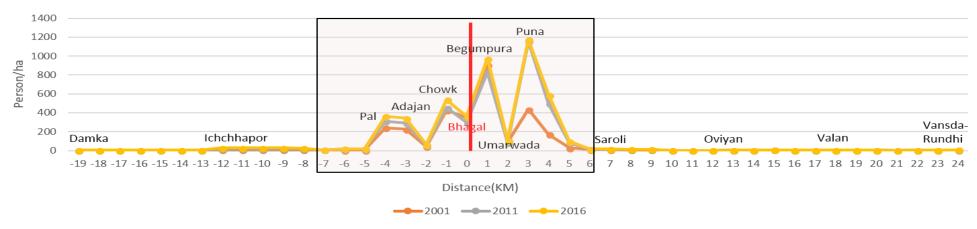
TABLE 2-3. STOD! AREA GROWIII RATE											
Name	Area in Ha	2001*	2011*	2016**	Density 2001 (PPH)	Density 2011 (PPH)	Density 2016 (PPH)	CAGR (2001- 2011)			
SMC	32652	2876374	4466826	5213426	88	137	160	4.50%			
Central Zone	978	413641	408760	487259	423	418	498	0.12%			
East Zone	3643	707768	1134822	1290382	194	311	354	4.83%			
North Zone	3293	428573	717016	845206	130	218	257	5.28%			
South East Zone	2154	371341	722400	835806	172	335	388	6.88%			
South West Zone	11052	247473	351879	419166	22	32	38	3.58%			
South Zone	6516	420434	706963	834406	65	108	128	5.33%			
West Zone	5015	287144	424986	501200	57	85	100	4.00%			
SUDA	66527	339608	444507	521705	5	7	8	2.73%			
Municipality	709	17384	28327	30901	25	40	44	5.00%			
Out Growth	2504	14711	26488	28895	6	11	12	6.06%			
Census Town	2645	56927	104176	129764	22	39	49	6.23%			
INA	653	3293	2680	1930	5	4	3	2.04%			
Village	63229	279388	337651	390011	4	5	6	1.91%			
Outside	32483	103933	115708	134894	3	4	4	1.08%			
Census Town	690	12847	15324	17865	19	22	26	1.78%			
Village	31794	91086	100384	117029	3	3	4	0.98%			
Grand Total	134876	3352010	5081856	5929821	25	38	44	4.25%			

Source: * Census of India 2001 and 2011; ** CEPT Estimates

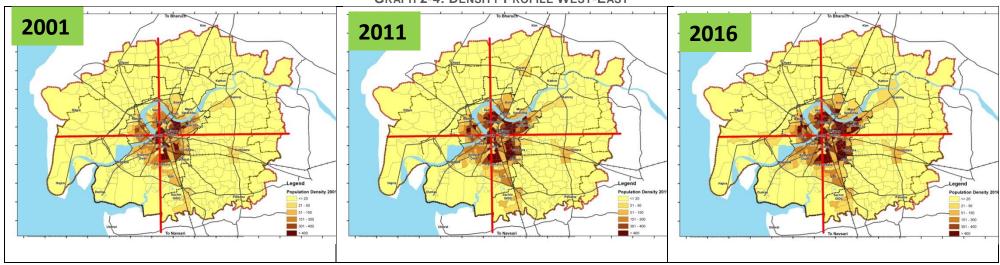
The SUDA area is also experiencing a moderate growth rate of 2.6%. The urban areas are showing high growth rate as evident from the table below, while the population in the industrial notified areas is decreasing.

Density profiles for the city were drawn from east to west and north to south and they reveal that the population densities in the city are high and reduce towards the outer edges. The areas which are either industrial in nature or vacant show low density.

East-West Profile

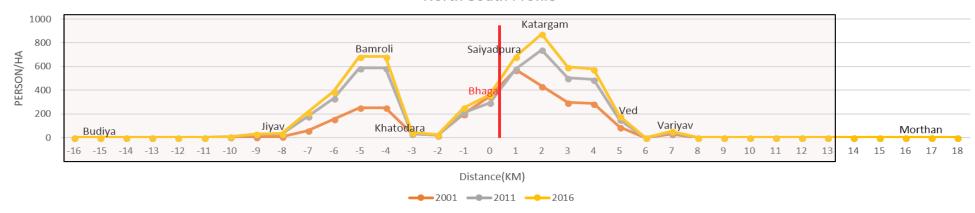


GRAPH 2-4: DENSITY PROFILE WEST-EAST

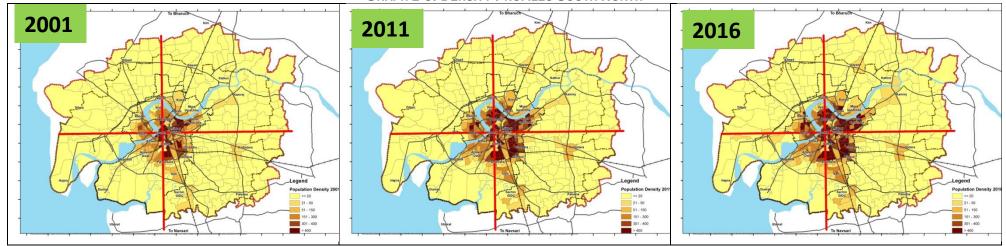


Source: CoE- UT, CEPT University

North-South Profile

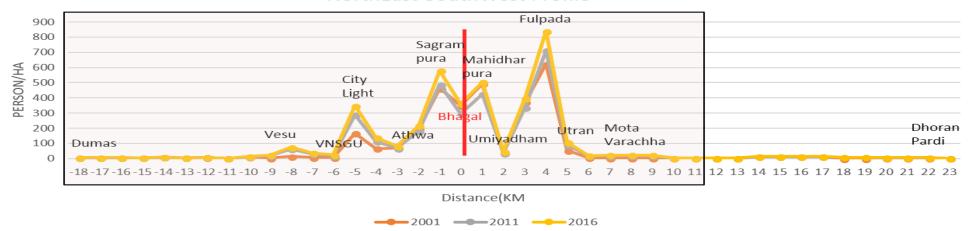


GRAPH 2-5: DENSITY PROFILES SOUTH NORTH

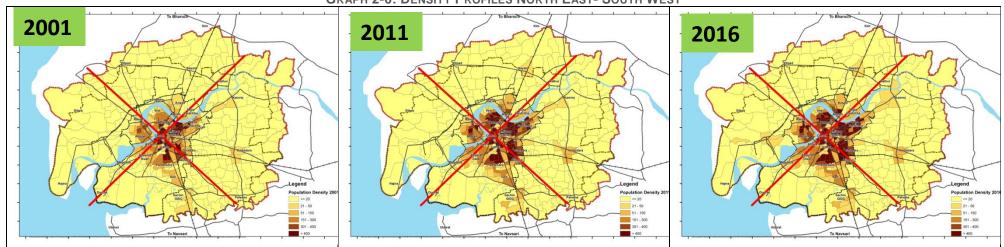


Source: CoE- UT, CEPT University

NorthEast-SouthWest Profile

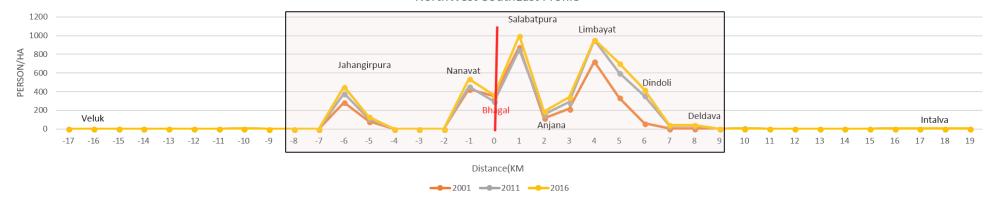


GRAPH 2-6: DENSITY PROFILES NORTH EAST- SOUTH WEST

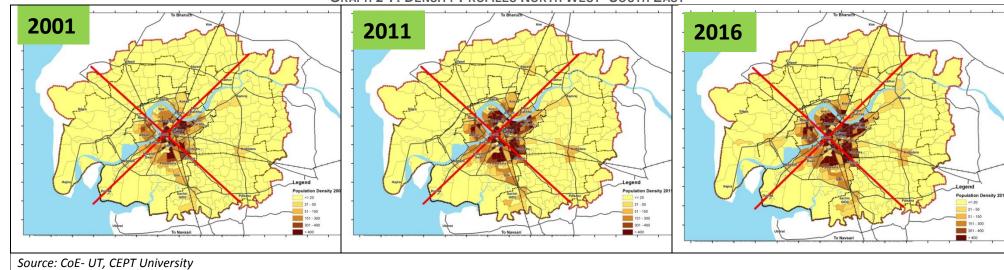


Source: CoE- UT, CEPT University

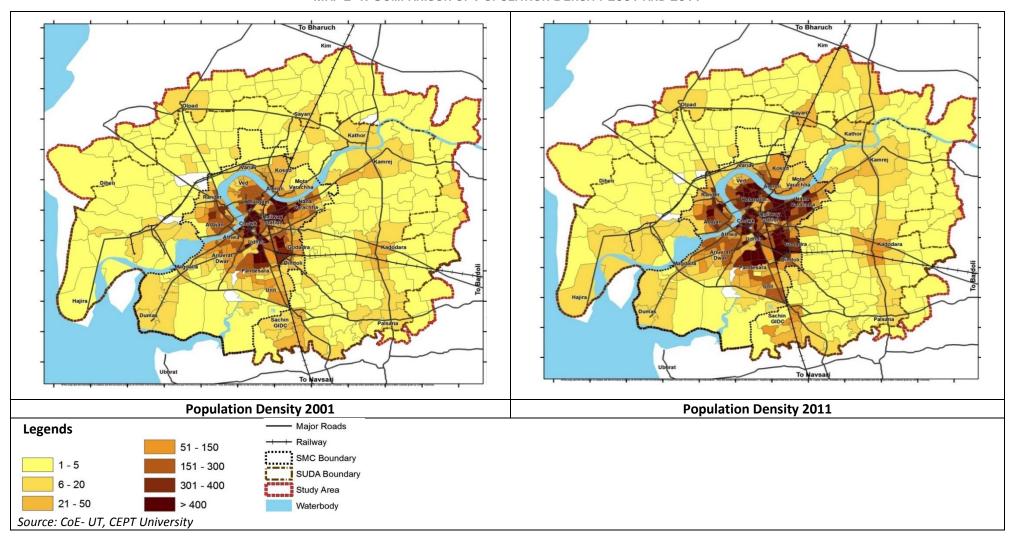
NorthWest-SouthEast Profile



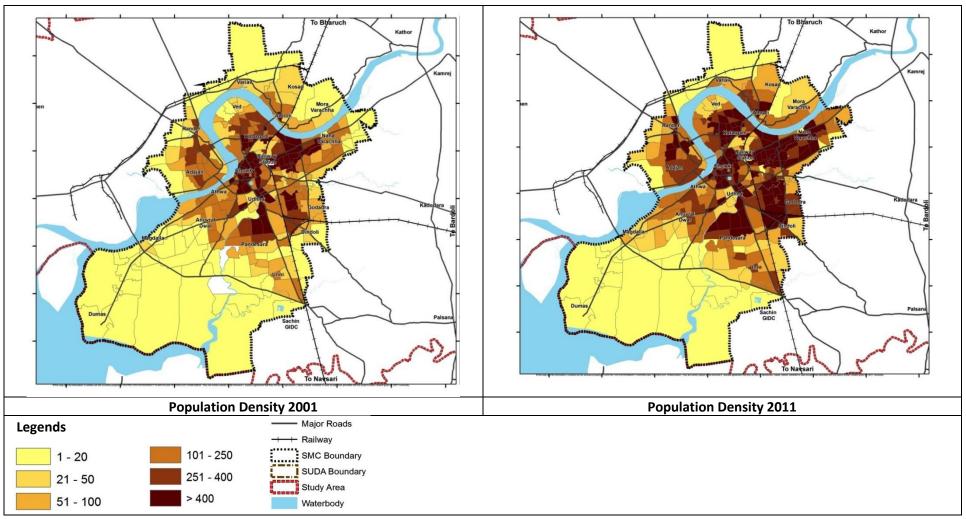
GRAPH 2-7: DENSITY PROFILES NORTH WEST- SOUTH EAST



MAP 2-4: COMPARISON OF POPULATION DENSITY 2001 AND 2011



MAP 2-5: COMPARISON OF POPULATION DENSITY IN SMC 2001 AND 2011



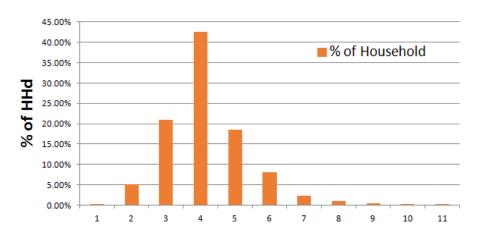
Source: CoE- UT, CEPT University

2.3. Socio Economic Characteristics

A household survey was carried out in 2016 for 15,777 households in Surat. The data collected was analysed to provide an understanding of the demographic and socio-economic characteristics.

2.3.1. Family Size and Composition

The average family size in Surat is 4.2 which is lower than the average family size in a city like Ahmedabad which is of comparable population size. This could be attributed to the high levels of inmigration of single male workers to the city.

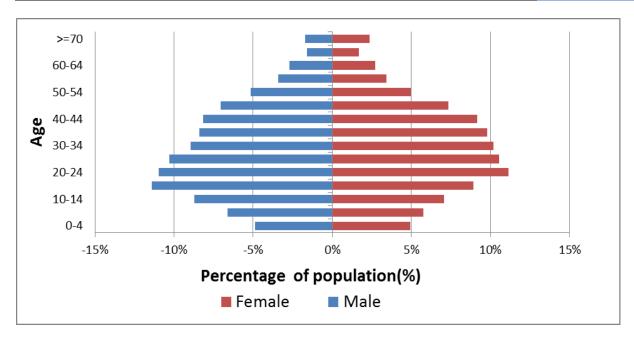


GRAPH 2-8: AVERAGE FAMILY SIZE

Source: Household Survey 2016

2.3.2. Gender Status and Household Size

As per Census 2011, the sex ratio (females per thousand males) for the SUDA area stands at 758. The figure below shows that the demographic transition is widest in the age group of 15–19 years for males and 20–24 years for females. The majority of immigrants who come to find work in the city belong to the working age group. As per 2016 HH survey data, about 62.40% of the male population is in the working age group as compared to 66.56% of females. About 5.96% of the population belongs to the retired and old age category for males as compared to 6.76% for females. The average age of the city's population is 30.4 years. The age sex pyramid depicts that the natural growth rate of the population in the city is low as denoted by lesser % of the population below 14 years; this is attributed to single migrants coming to the city for employment. The city is dominated by migrant workers, for the city to maintain the economic growth; migrants will play an important role in the future as well. The issue with this kind of growth is that in case the migrant population reduces in future the economic growth will slow down with not many people in the working age group.

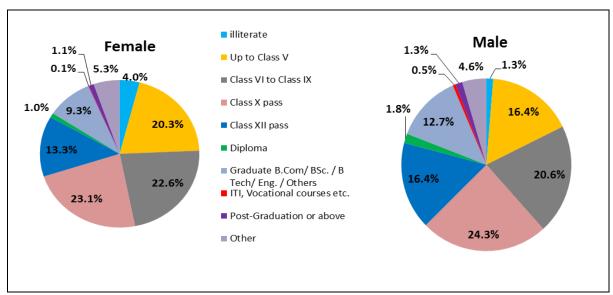


GRAPH 2-9: AGE SEX PYRAMID

Source: Household Survey 2016

2.3.3. Education

The overall literacy rate of Surat city as per HH data is 96.62% of which male and female literacy stands at 98.21% and 94.75% respectively. The share of secondary education is highest both in males and females. In general, males enjoy a higher education level as compared to females. The share of illiteracy in males and females is 1.32% and 4.25% respectively.



GRAPH 2-10: EDUCATION LEVEL

Source: Household Survey 2016

Secondary data on student enrolment in educational institutions was collected from the District Education Office (DEO) office in Surat and the Sarv Shiksha Abhiyan website. It is estimated that the

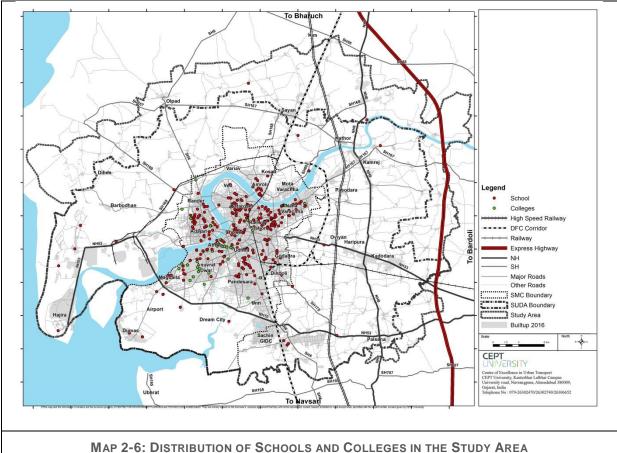
study area has around 8.9 lakh students enrolled in 758 schools. Apart from these, about 2.2 lakh students are enrolled in 76 colleges in the study area.

TABLE 2-10: INSTITUTION DETAILS WITHIN STUDY AREA

Type of institution	Number	Student enrolment
Schools	758	898933
Colleges	76	228937
Total	834	1127870

Source: District Education Office (DEO, 2016)

Location of schools and colleges in the study area is given in the map below:



MAP 2-0. DISTRIBUTION OF SCHOOLS AND COLLEGES IN THE ST

2.3.4. Income Distribution

Source: District Education Office (DEO, 2016)

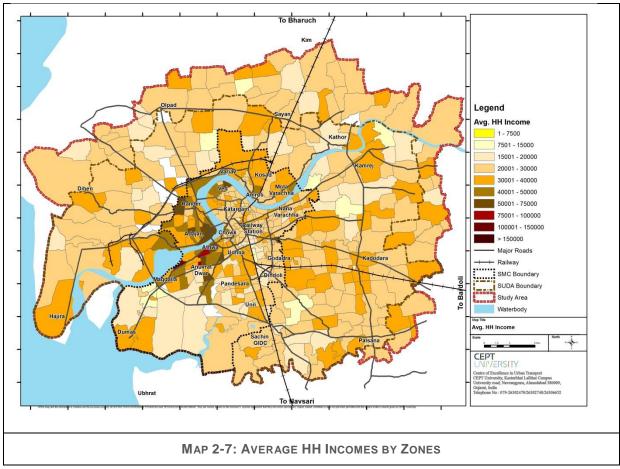
The household income of the city is derived from the household survey conducted in 2016 where it was found that the average income per household is Rs. 31,300 per month within the SMC area. The average monthly household income in the SUDA region is Rs. 26,150 while that of the overall study area is Rs. 29,100. The study reveals that 0.6% of the households have low income (below Rs. 7500 per month).

TABLE 2-11: DISTRIBUTION OF HH ACCORDING TO INCOME GROUP

Income Category in Rs.	Number of sample HH	Percentage
<7500	96	0.6
7501 – 15000	2194	13.9
15001 – 20000	3220	20.4
20001 – 30000	3882	24.6
30001 – 40000	3236	20.5
40001 – 50000	2021	12.8
50001 – 75000	775	4.9
75001 – 100000	239	1.5
100001 – 150000	97	0.6
>150000	17	0.1
Grand Total	15777	100%

Source: Household Survey 2016

The income distribution in the city reveals that most of the high-income group people reside in the west and south-west zones of the city, along the river Tapti in the areas of Adajan, Athwa Gate and Palanpur Patia whereas the poor are located mostly around the industrial areas, along the railway line as well as towards the south.



Source: Household Survey 2016

2.4. Economy

The city of Surat is popularly known as the diamond capital of the world and the textile capital of India. Surat is known for its textile manufacturing, trade, diamond cutting and polishing industries. In fact, 92% of the world's diamonds are cut and polished in Surat. Diamond-studded gold jewellery and real estate are the new emerging businesses in the city. Apart from this, intricate zari works, steel, petrochemical industries and gas-based industries at Hazira established by leading industry houses such as ONGC, Reliance, ESSAR, and Shell are the other industries generating significant employment. The city economy is characterised by a large number of small and medium sized unorganised industries with the industrial base being largely labour intensive.

Surat is the biggest centre of MMF (man-made fibre) in India with an overall annual turnover of around 5 billion rupees (approximately USD 82 million). It also produces 9 million meters of fabric annually, which accounts for 60% of the total polyester cloth production in India. Textile and apparel industries offer major employment in this region. The city has consistently maintained a high GDP growth rate of 12–13% resulting in a high per capita income (details of Surat's industrial activities are given in Annexure 1).

Much of the industrial development is located within the limits of Surat city. In fact, Surat is truly an industrial city with over 50% of the workforce engaged in manufacturing activity. While the problem of unemployment is almost non-existent, wages are also low, in particular for industrial sector workers, and workers are generally deprived of social and other benefits. The detailed account of the sub-sectors of the economy is presented below:

BOX 1: Surat's Contribution to State and National Economy

90 % of the world's total rough diamond cutting and polishing

 $99.9\,\%$ of the nation's total rough diamond cutting and polishing

90 % of the nation's total diamond exports

40 % of the nation's total manmade fabric production

18 % of the nation's total manmade fiber production

12 % of the nation's total manmade fiber export

Surat's Contribution to State and National taxes is also significant.

Tax	1997-98	2005-06
Income Tax	271.5	1006.85
Excise Tax	1811.86	5439
Sales Tax	421.5	960.31
Octroi	175.17	406.12
Total	2700.03	7812.28

Source: Surat Draft Development Plan 2035 and SMC Smart City Proposal 2016

2.4.1. Resident Workers

Work Force Participation Rate (WPR) is defined as the ratio of total number of workers in an area to the total population of that area. A low ratio indicates high dependency of population on few jobs. At the same time, areas with high employment potential and having migrant workers show unusually high ratio due to the large number of workers without their families living in the area.

The high growth rate experienced by the city over four successive decades has been a major feature in the city's ability to create jobs. The employment-to-population ratio of the working-age population (those between 15–59 years) employed in Surat in the year 2011 is stated below.

The WPR for the study area is 46% of the total population. The male worker population constitutes 88% and the female worker population constitutes 12% of the total working population in the study area. However, the HH survey conducted in 2016 estimated the WPR at 35%.

Worker **Male Worker** WPR Female Worker **WPR** 2011 **Population Population** (Male) **Population** (Female) **SUDA** 1794241 89% 1601501 192740 11% **SMC** 283852 228247 80% 20% 55605

88%

248345

12%

1829748

TABLE 2-12: WORK FORCE PARTICIPATION OF THE STUDY AREA

Source: Census 2001 and 2011

2078093

Total

In case of the distribution of workers, it is seen that there is a consistent growth in the main workers in the study area, with their proportion rising from 37.94% to 38.93% during the last decade. Further, it is observed that the proportion of both male and female workers has remained the same in the last decade, with about 90% of the total main workforce being male and about 9% female.

Also, as per the breakup below, the majority of workers fall in the other/service sector category:

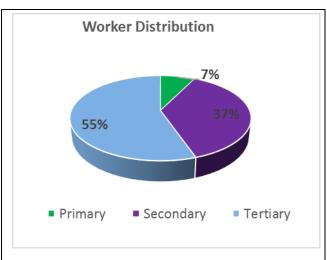
Type of Workers 2001 2011 **Total Workers** 39% 41% **Primary Workers** 9% 5% 2% **Household Industry Workers** 3% **Others Workers** 88% 93% Non Workers 61% 59%

TABLE 2-13: SECTOR WISE WORKER DISTRIBUTION

Source: Census 2001 and 2011

If we see the distribution of workers captured through household surveys, it is seen that about 55.3% are in the tertiary sector followed by 37.3% in the secondary sector and 7.4% in the primary sector. The high proportion of workers in the secondary sector is expected, owing to Surat's strong industrial base.

In terms of occupation class, 46% of workers are associated with private services/jobs, 23% in business sectors and 19% in the industrial sector. The proportion of workers employed in the informal sector is 8.6% while those employed in the government sector constitute 3%. Workers for the base year 2016 are estimated assuming the WPR to be the same as 2011 census (Table 2-14).



Source: Household Survey, 2016

GRAPH 2-11: WORKER DISTRIBUTION BY SECTOR OF WORK

Source: Census 2001 and 2011

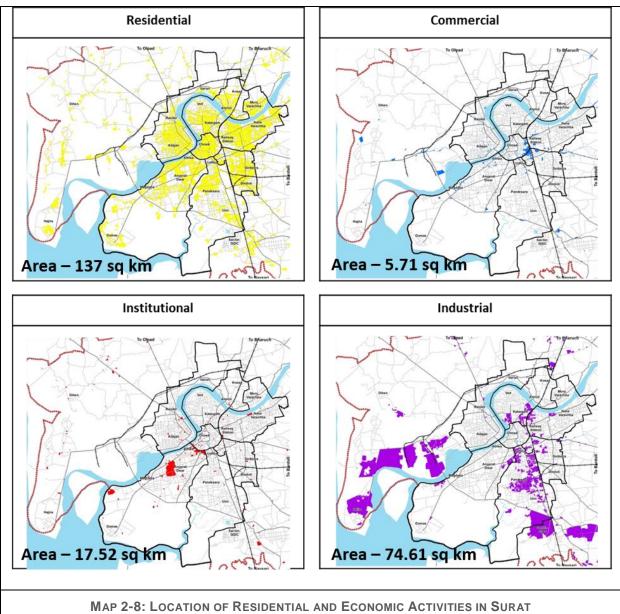
TABLE 2-14: WPR OF THE STUDY AREA

TABLE 2-14. WIN OF THE OTOD TAKEA				
Boundary	SUDA	SMC	Total	
Year 2011				
Pop 2011	615030	4466826	5081856	
Worker Pop 2011	283852	1794241	2078093	
WPR 2011	46%	40%	41%	
Year 2016				
Pop 2016	716395	5213426	5929821	
Worker Pop 2016	329542	2085370	2414912	
WPR 2016	46%	40%	41%	

Source: Census 2001 and 2011

2.4.2. Employment Generating Activities

The nature and location of economic and institutional activities in relation to residential areas determines the travel demand in a city. Surat is a polycentric city where activities are dispersed. The industrial areas are also spread across the city; however, most of them are concentrated along the railway line. Apart from these, industrial areas in the vicinity of the SMC (like Hazira, Sachin and Kadodara) also act as predominant work centres, attracting traffic. Most of the commercial areas are concentrated close to the core city area which also houses the textile market and the APMC. The diamond market is located towards the north of the core area in Varachha while institutional areas are located at Athwa and Anuvrat Dwar.



2.4.3. Employment Estimates

Source: Source: Development Plan 2035, SUDA

Base year employment was estimated for the SMC and the SUDA area separately. In the case of the SMC area, non-residential property data from 76 property tax wards was used to conduct the activity survey. As per the list provided, the city classified its activities into 149 types, which were further aggregated into 102 activity types (based on the ones that generate employment) for which survey was conducted. Average sample size of 0.85% per ward was taken and 3082 activities were surveyed. Details of the same are given in the table below:

SMC Zone	No of Property Tax Wards	Total NR Properties *	Surveyed Properties	% Samples
Central Zone	14	77316	579	0.75%
East Zone	10	77924	698	0.90%
North Zone	6	46563	413	0.89%
South East Zone	9	50782	506	1.00%
South West Zone	18	30820	267	0.87%
South Zone	11	55233	404	0.73%
West Zone	8	23514	215	0.91%
Total	76	362152	3082	0.85%

TABLE 2-15: TOTAL PROPERTIES AND SURVEYED SAMPLE SIZE WITHIN SMC ZONE

This information was then used to estimate the per unit area employment generation by the different property types and the same was expanded to the rest of the area.

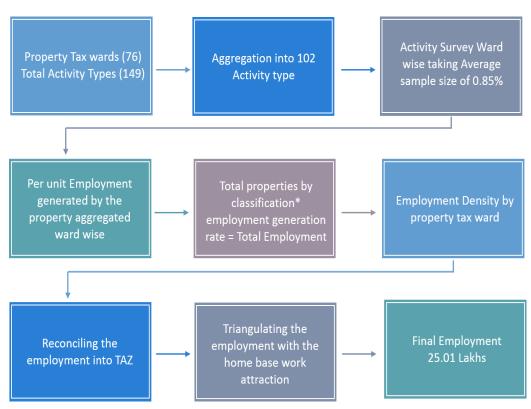


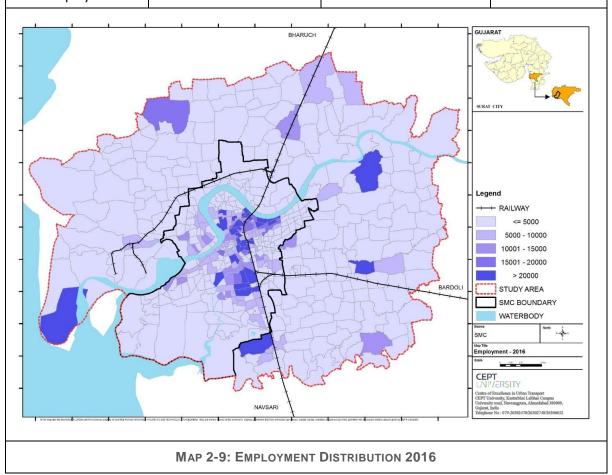
FIGURE 2-1: EMPLOYMENT ESTIMATION METHODOLOGY

In the case of the SUDA area, data was collected from the Industries Department and the Chamber of Commerce on the number of establishments and their employment. The IEM and EM data was also used to estimate the overall employment of the base year. The same was cross-checked with the home base work attraction numbers generated by the extensive household survey conducted for 150,000 HH across the study area.

^{*} Activities that generate employment

Estimated Employment Percentage of total **Employment Area** employment rate 2016 **SMC** 2501653 85% 48% **SUDA** 426906 15% 60% 49% **Total Employment** 2928559 100%

TABLE 2-16: EMPLOYMENT ESTIMATION



Source: Activity Survey, 2016

2.5. Summary

Surat is growing at a rapid pace, mostly along its transport corridors. Owing to the city's compact and polycentric character with very high densities, this is expected to impact travel demand patterns. The average household incomes in the city are high and hence, motorisation rates are higher and increasing. The future expansion of the city is expected to be towards the south-east and eastern parts as a result of high investment projects like the DFC corridor, high speed rail and the Delhi–Mumbai expressway. The major challenge is to channelize the spatial growth to achieve efficient mobility.

CHAPTER-3

Existing Transportation System

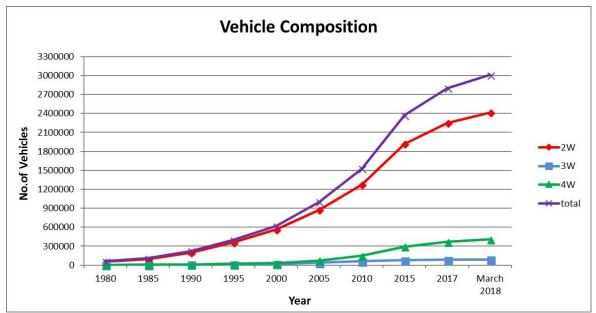
3. Existing Transportation System

The city of Surat is well connected by road, rail and air. Several National and State Highways pass through the city. As a result, the volume of traffic entering the city is very high. The city's transportation system is predominantly road based. Dependence on individual modes and intermediate public transport is high due to the absence of an adequate public transport system. Though roads are generally wide, network design and development is not complete.

This chapter provides an overview of the existing road transportation system. It describes the components of urban transport system such as road, vehicles and public transport system in terms of existing situation, trends, gaps and performance of the system.

3.1. Vehicular Growth

The city of Surat has high motorisation rates. The number of vehicles registered with the Surat RTO has risen from 0.62 lakh in 1980 to 30.09 lakh in March 2018. In the last five years alone, the growth in vehicles has been around 9% per year. In terms of the number and type of vehicles being registered, it is seen that 2-wheelers lead the growth followed by cars and 3-wheelers.

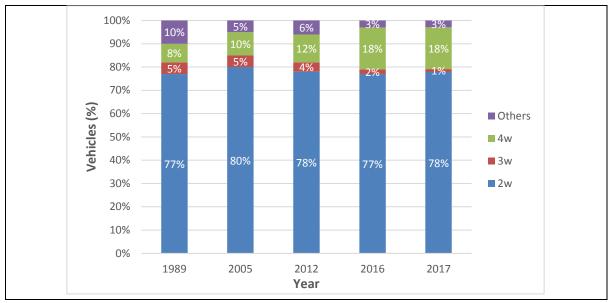


GRAPH 3-1: VEHICULAR GROWTH BY MODE

Source: RTO, Surat

As per Surat RTO data, of the total vehicles registered (30.09 lakh) till March 2018, 2-wheelers account for about 24.14 lakh and 4-wheelers for about 4.07 lakh. It is observed that currently, 604 vehicles are registered at the RTO on a daily basis (481 two-wheelers and 97 cars, three autos, five goods vehicles and 1 bus) (*RTO*, *Surat*, *2016*). In the past three years, 2-wheelers per 1000 population has increased from 260 to 280 while during the same period, 4-wheeler per 1000 population has increased from 41 to 48.

In terms of the share of vehicles in the last 10 years, it is observed that the share of 2-wheelers is almost stable at around 78% while that of 4-wheelers has increased from 10%—18%, which is likely to have major implications in terms of congestion.



GRAPH 3-2: COMPOSITION OF REGISTERED VEHICLES ACROSS YEARS (1989-2016)

Source: RTO, Surat

3.2. Road Network

3.2.1. Regional Network

The city is well connected with two National Highways (NH-8 and NH-53) and six State Highways (SH-6, SH-167, SH-168, SH-169, SH-170 and SH-602). NH-8 is the busiest highway of the nation and passes towards the eastern periphery of the city and provides connectivity from Delhi to Mumbai.

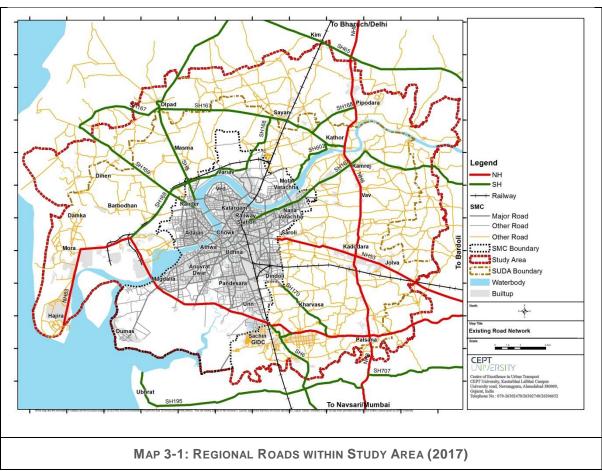
The road network of Surat is around 1914 km long. Apart from the National Highway Authority of India, the State Roads and Buildings Department, and the two urban local bodies, the SMC and the SUDA, are responsible for developing, operating and maintaining road infrastructure in the study area.

Details of the same are provided in the table and shown in the map below.

TABLE 3-1: DISTRIBUTION OF ROAD NETWORK IN STUDY AREA (2017)

Туре	Length in km
National Highways	142
State Highways	260
Other Roads	1512
SMC	3859
Total	5773

Source: Revised Development Plan- 2035, SUDA



Source: Revised Development Plan- 2035, SUDA

3.2.2. Urban Road Network

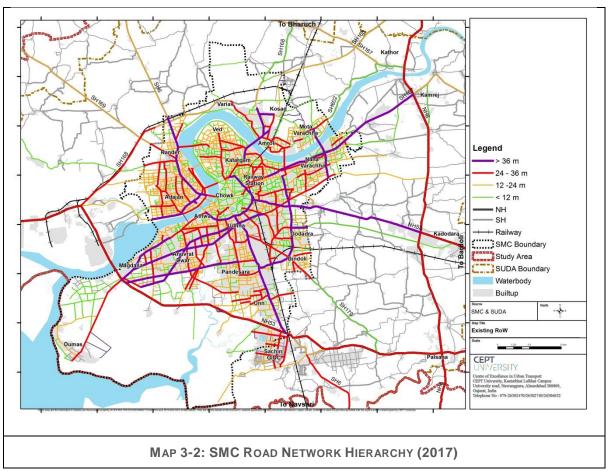
3.2.2.1. Road Network Hierarchy

A hierarchy of roads is required to cater to various levels of mobility needs of the city. The hierarchy is predominantly defined by the function that the roads cater to. However, the road network hierarchy defined by the SMC is based purely on road widths, without taking into consideration the functionality of the road network. The hierarchy adopted for the design of Surat's road network is as follows:

TABLE 3-2: EXISTING ROAD NETWORK HIERARCHY IN SMC (2017)

Road Levels	Length (km)	%Share
Level 1 - Arterial (above 36)	370	10%
Level 2 - Sub Arterial (24-36m)	356	9%
Level 3 - Collector (12-24m)	953	25%
Level 4 - Local (<12m)	2180	56%
Total	3859	100%

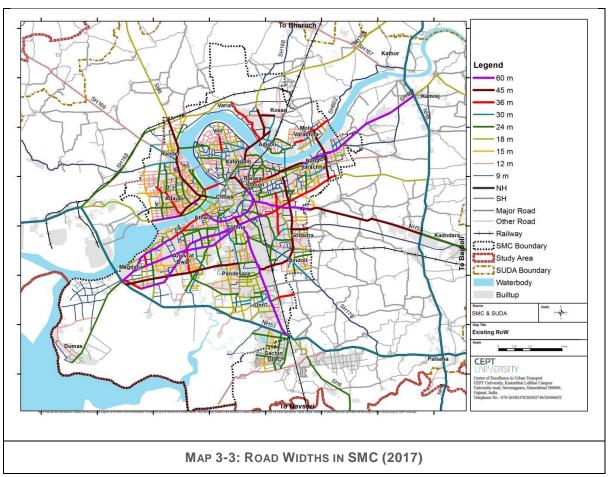
Source: SMC, 2017



Source: SMC, 2017

3.2.3. Road Widths

In terms of distribution of roads widths, excluding local level roads (9 m road width), the city is well placed with about 24% of its width exceeding 30 meters and above; about 28% of the network is wider than 18 meters. It is important to note that many of these roads form a part of NH/SH network. Within the developed area, road densities are about 12 km/sq. km (Sources: SLB for Indian Cities, 2016). The area under roads (area of 88 sq. km) is about 26% of the total area of the SMC limits. With reference to the map given below, it is observed that not all roads are developed to their full widths. This is of concern as inconsistency in road widths along major corridors leads to congestion and bottleneck at junctions.



Source: Service Level Benchmarks in Urban Transport for Indian Cities-Round 2, MoUD, CoE- UT CEPT, 2016; SMC 2017

TABLE 3-3: CLASSIFICATION OF ROADS BY WIDTH, SMC (2017)

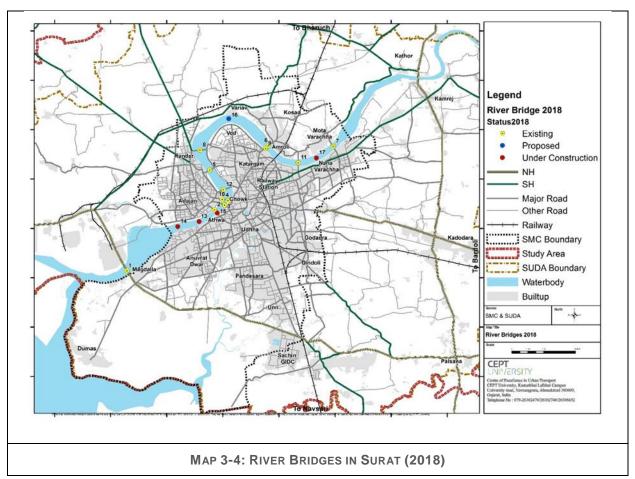
ROW	Total length (km)	Percentage
60	55.66	1.4%
45	52.59	1.4%
36	29.89	0.8%
30	153.54	4%
24	150.42	3.9%
18	196.22	5.1%
15	51.43	1.3%
12	273.52	7.1%
9	272.84	7.1%
<9	2622.88	68%
Total	3859.00	100%

Source: SMC, 2017

3.2.4. Bridges, Flyovers, Rail over Bridge and Rail under Bridge

1) River Bridges

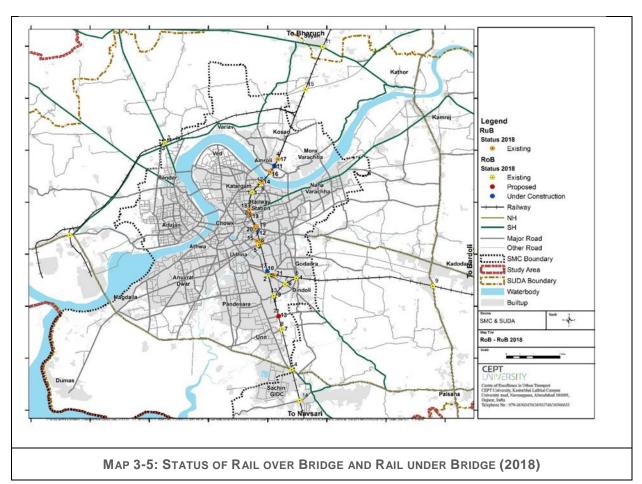
At present the city has 62 existing bridges and 11 are under construction. Of these, there are 12 bridges across river Tapi as shown in the map below. Amongst these, one is a weir cum causeway. Availability of the 12 river bridges, makes it easy to traverse east west across the river. Four more bridges are under construction and one more at a proposal stage to improve connectivity. A list of the same is presented in the Annexure 12.



Source: SMC, 2018

2) Rail over Bridge and Rail under Bridge

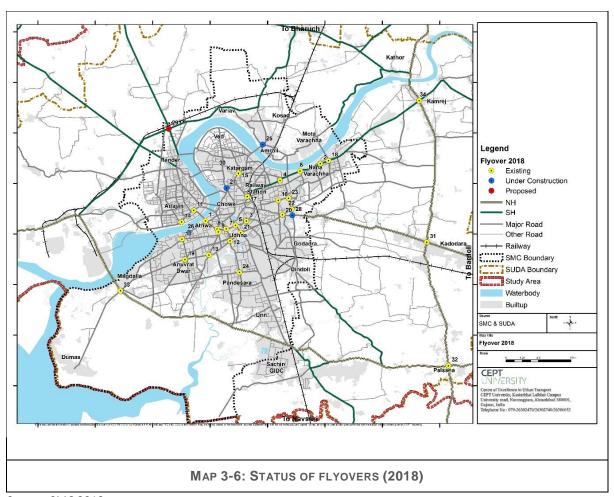
Broad-gauge and meter-gauge railway lines pass through the city acting as a barrier to smooth flow of traffic. Underpasses and over bridges have been constructed at 22 rail road crossing locations in the city. The lane configurations are found to be inadequate in existing underpasses such as Suryapur Gate, Lambe Hanuman and Sahara Gate, thereby resulting in congestion and bottlenecks. Three new RoBs are under construction and one new RoB is proposed whereas one RoB proposed for redevelopment by SMC. A list of the same is presented in the Annexure 14.



Source: SMC 2018

3) Flyovers

In the past, the city has chosen road based solutions over public transport to improve mobility and has invested huge amount in the construction (Rs. 869.70 crore till date) of flyovers. This has improved condition to a certain extent during initial periods but has created chain of flyovers in the city. In 2005, Surat had five flyovers which have now increased to 28 flyovers. Four more are under construction and one more is proposed by SMC. A list of the same is presented in the Annexure 16.



Source: SMC 2018

The overall status of bridges in developed area of city is shown in table below:

TABLE 3-4: SUMMARY OF EXISTING BRIDGES (2018)

Status	River bridges	Flyover	RuB	RoB	Total
Existing	12	28	7	15	62
Under Construction	4	4	0	3	11
Proposed	1	1	0	1	3

Source: SMC 2018

3.2.5. Road Network Pattern

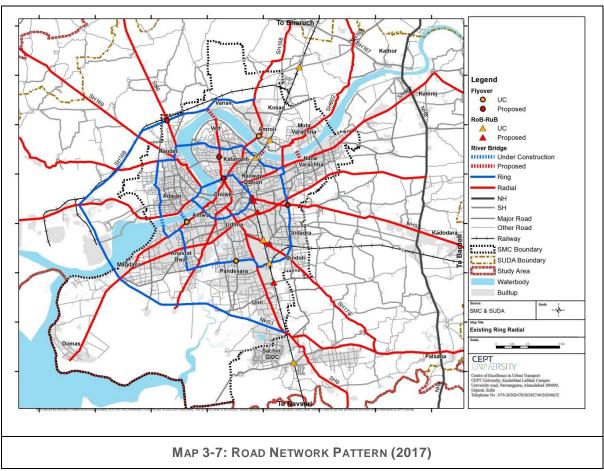
The street network in Surat may be classified as a ring radial pattern. The pattern has been defined with the overlapping of all the under construction and approved proposals of bridges with existing network. It is observed that the city has a strong radial pattern supported by three layers of ring at the city level and a grid-iron pattern at the local level. A total of 14 radials and three rings, out of which one ring is incomplete and two are complete rings, form the major road network of the city.

A majority of the vehicular load is taken by the inner ring road which connects to all major radials, as a major destination in the inner city area. The middle ring forms a zigzag pattern with inconsistent

road widths. The third ring which is SH-168 creates a half ring connecting the western part of the city. All roads in the walled city are congested due to high volumes of traffic and constrained widths varying from 12 m to 18 m. Within the developed area, road density is high but observed road width is narrow.

The canal corridor has been recently upgraded as a part of the BRT network improvements in the city and now acts as one of the major arteries in the city, with a road width of 60 m. Similarly, the road towards Udhana–Sachin has also been upgraded as a part of the BRT project.

The existing road network length in the SMC area is 3859 km and in the SUDA area is 1914 km. As per the Revised Development Plan 2035, around 17.83 sq.km area is under roads.



Source: CoE-UT, CEPT University

TABLE 3-5: TOTAL ROAD NETWORK LENGTH IN THE STUDY AREA (2017)

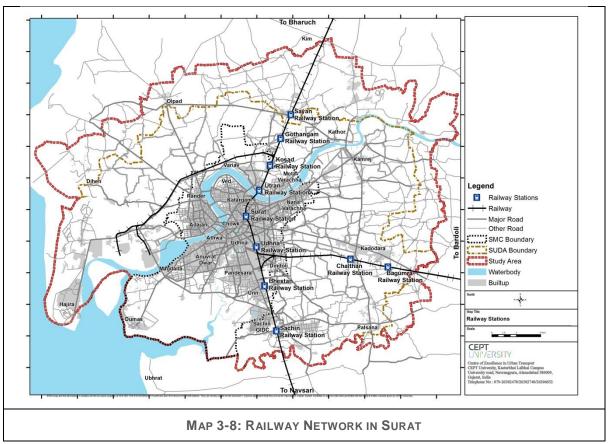
Jurisdictional Area	Road length (km)	% of road
SMC*	3859	67%
SUDA**	1914	33%
Total Study Area	5773	100%

Source: * SMC, 2017 and ** SUDA Revised Development Plan

3.3. Regional Transport Network- Flows and Terminals/Nodes

3.3.1. Railway

Surat is served by the busy North–South line of Western Railways connecting Gujarat with Mumbai and other important centres. Branches of the railway line serve areas of the Tapi district and the state of Madhya Pradesh. A dedicated goods line exists between Kosad and Hazira. The city is serviced by express, mail, passenger and local trains. The main line carries high volume of traffic due to the presence of the industrial belt between Ahmedabad and Mumbai and the sea ports in Gujarat and Mumbai. The total broad-gauge network length in the study area is 94.32 km. Of the total 10 stations in the study area, five stations fall within the city. The main station (Surat railway station) is located just outside the walled city, abutting the Ring Road. The Udhana Railway Station is also an important transport node within the city. Bhesthan and Sachin railway stations towards the south of the city cater to the industrial areas of Pandesara, Unn and Sachin. Uttran and Kosad in the northern part of the city across the River Tapi are not very significant as the development in this area is limited. The main station caters to 112 trains on an average daily (including up and down direction). Of these, 63 are daily trains. The Surat railway station caters to 1.45 lakh passengers per day.



Source: CoE-UT, CEPT University

3.3.2. Regional Bus Network

The Gujarat State Road Transport Corporation (GSRTC) operates regional bus transport passenger services, both within Gujarat and to neighbouring states. These services provide connectivity to Surat from suburban areas/villages within the SUDA area (such as Olpad, Kamrej, Choryasi, Limba, Bhatpor, Kamrej, Kholeshwar, Dhatva, Jat Bharthana and Asta) and other cities outside Gujarat such as Nasik, Aurangabad, Malegaon, Mumbai, Pune, Shirdi etc. The total GSRTC network in the study area is 197 km.

There are four terminals including a major one near the Railway station;

- 1. The Central Bus Station (CBS) near the Railway Station is the major regional bus terminal which caters to more than 60% of the passenger traffic per day.
- 2. Adajan is the new terminal which has been recently developed and is expected to operationalise soon. Currently, it acts as an intermediate bus stop which caters to about 10,000 passengers (boards + alights) daily.
- 3. Udhna is the existing major intermediate station which acts as a terminal for passengers. Currently, it caters to about 4500 passengers (boards + alights) daily where the number of express buses stop, going towards southern cities.
- 4. Kamrej, again a major intermediate pick up and drop off location, acts as a terminal for passengers and is where most of the express services going towards northern cities stop. It caters to about 380 bus departures, with about 12,000 passengers daily.

A total of 398 routes are plying under four different categories from Surat city. These are:

- 1. Inter-state routes service 66 routes
- 2. Regional routes service (within Gujarat) 304 routes
- 3. Volvo bus routes 5 routes
- 4. Sub-urban routes service 23 routes

TABLE 3-6: PASSENGER DETAILS OF MAJOR TERMINAL

Terminal	No. of Average Passenger	% of Boarding	% of Alighting
Central Bus Stand	42000	47%	53%
Kamrej	12000	46%	54%
Udhana	4600	54%	46%
Adajan	10000	53%	47%

Source: GSRTC Terminal Survey, 2016

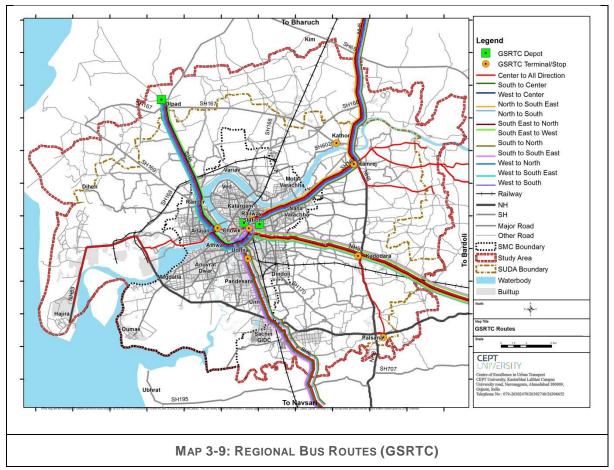
In terms of the total trips, there are a total of 3439 bus trips daily. Of these, express services have 379 trips whereas local services operate 3060 trips per day. The total number of passengers per day on the GSRTC network is 68,600. The map below shows the routes alignments. Routes have been aggregated by direction, which is also used as part of the transport model.

Jeeps and matadors operate passenger and goods services to the neighbouring villages and towns. Private bus operations also provide inter-city bus transport to various cities from Sahara Darwaja. In the absence of a separate bus terminal for private operators, their operations originate in front of their offices, resulting in traffic congestion at Sahara Darwaja.

TABLE 3-7: SUMMARY OF GSRTC SERVICES

Characteristics	Details
Total Network (km)	197
Total No of Routes	398
Average Passenger/day	68,600
No of Bus stops	4

Source: GSRTC Terminal Survey, 2016



Source: CoE-UT, CEPT University

3.4. Public Transport

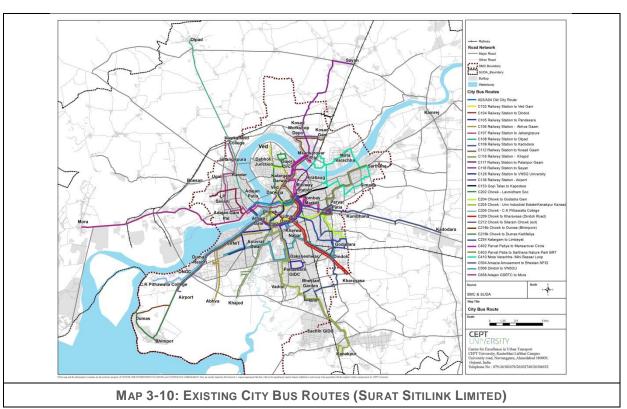
Till the year 2004, the Gujarat State Road Transport Corporation (GSRTC) operated the public transport service in the city of Surat. Over the years, the routes served by the GSRTC bus services increased, but fleet availability reduced drastically and, since May 2007, the GSRTC finally withdrew all urban bus operations. Later in August 2007, private bus operations by Rainbow Tours and Travels Private Limited was introduced on a net cost contract under supervision of SMC which operated till August 2017. Currently, the city bus services and bus rapid transit services are being operated on gross cost basis by Sitilink Ltd, SMC.

3.4.1. City Bus Services

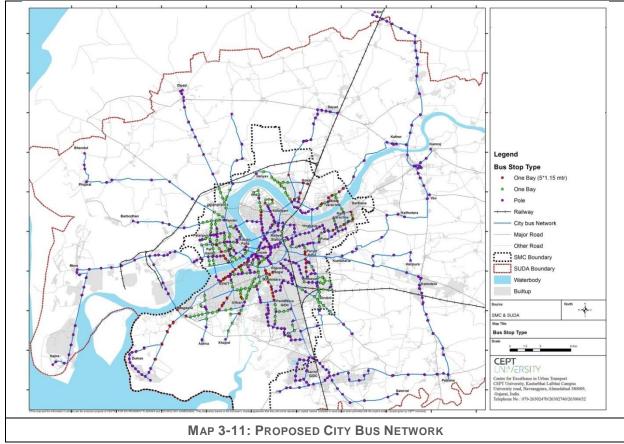
There are 29 routes plying within the study area, with approximately 236 buses on road. Bus routes are scheduled to operate at 8–20 min. headway. The bus system is carrying an average of about 82,000 riders per day (February 2018).

All these buses for the City Bus Services are managed by Sitilink Ltd., a company owned by the SMC. All these buses are midi buses and operated by private operators (Aditnath, CSPL and Maruti) on Gross Cost Contract (GCC). City is also expecting another 300 midi buses which would be operated on CBS routes in two to three months' time. These would have the additional new City Bus routes in the city and some upgradation in frequencies of the existing 29 routes would be needed. Recently, Surat city has prepared a Public Transport Operations Plan, which outlines about 550 km of PT network proposal for City Bus services integrating with BRTS, to be operated by Sitilink Ltd. A total of 1000 buses are planned for this planned city bus network. Out of these 1000 buses, 275 buses have arrived while 300 buses are about to arrive in two—three months' time.

Currently, the City Bus coverage is 73% and once the full system is operational, it plans to cover almost 95% of the area.



Source: CoE-UT, CEPT University

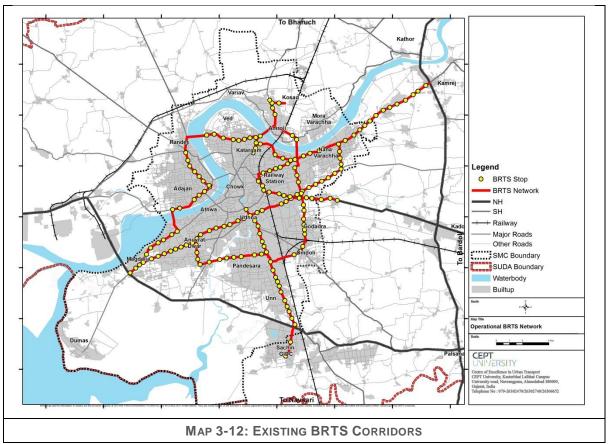


Source: CoE-UT, CEPT University

3.4.2. Bus Rapid Transit System (BRTS)

Sitilink inaugurated BRTS Phase I of 30 km in 2014 and now it has the largest BRTS in India, with 102 km network operational. The BRT network is currently attracting about 80,000 passengers per day. Sitilink BRTS connects major transit nodes such as railway station, GSRTC terminal, residential and commercial hubs, recreational and public areas of the city, with provisions for NMT (pedestrian pathways and cycle tracks) along the corridors. The average speed of BRTS buses is 24 kmph, which is quite high in comparison to the existing city bus services and auto rickshaws.

A high quality bus operation is also underway along the 12 km Inner Ring Road, which will connect all the major radial and textile markets along the Ring Road. This corridor is being envisaged for 24-hour service, with 2-3 minutes headway during the day and 30 minutes during night.



Source: CoE-UT, CEPT University

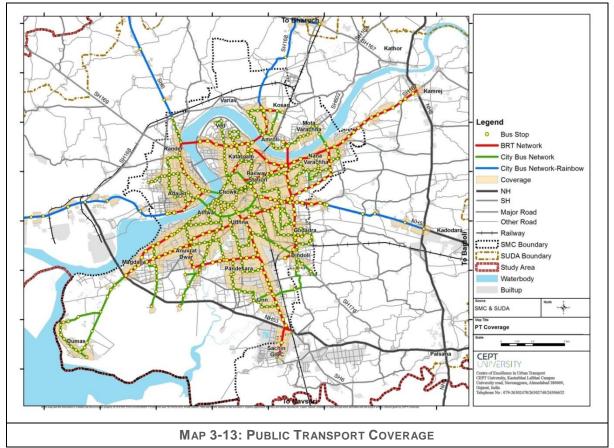
3.4.3. Public Transport Coverage

In terms of public transport coverage, it is observed that about 87% of SMC builtup area and about 59% of the total SMC area is within 500 m catchment area of public transport.

TABLE 3-8: PUBLIC TRANSPORT COVERAGE

Area	Built up area (Sq km)	PT Area coverage 500m (Sq km)	% PT coverage
SMC	137	119	87%
Total Study area	228	135	59%

Source: CoE-UT, CEPT University



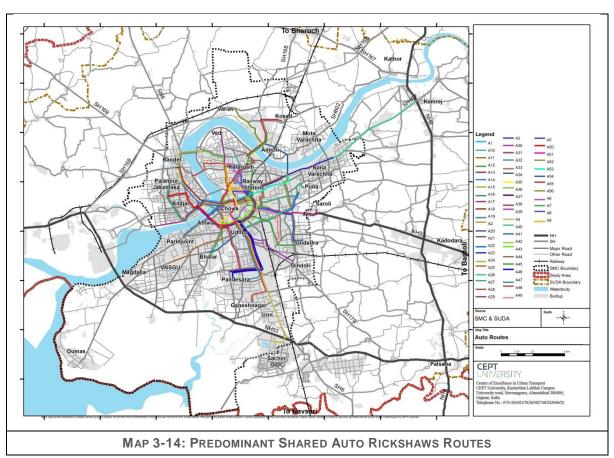
Source: CoE-UT, CEPT University

3.5. Intermediate Public Transport (IPT) Modes

The city of Surat is known for auto rickshaw transportation for years. Currently, there are about 38,000 registered autos in the city, after year 2006. Most of the autos in Surat operate on fixed routes with fixed fares based on distance.

An absence of an efficient bus service has resulted in transfer of trips from buses to illegally operating autos on a point-to-point service. Around 8.6 lakh trips are being undertaken as per 2016 household surveys on these auto rickshaws. There are about 52 shared auto rickshaw routes identified as part of this study. The autos have unorganised operations and suffer from problems of overloading and poor

vehicle quality. They also contribute to issues of congestion and pollution levels in the city. But they also have better frequency and coverage in comparison to the bus network.



Source: CoE-UT, CEPT University

3.6. Non-Motorised Transport (NMT)

Surat is a compact city with high densities (380 pph), mix land use and shorter trip lengths (5.07 km including walk in SMC). However, the NMT share is showing a declining trend, from about 65% in 1988 to 43% in 2016.

While the pedestrian share has decreased to 41% from 45.4% in 1988, the bicycle share has drastically reduced to 2% from 19.2% in 1998.



GRAPH 3-3: SHARE OF NMT OVER THE YEARS
Source: CRRI 1998 report; CRRI 2005 report; CES 2005 (GIB study); CMP 2008 (CEPT); Household Survey2016

Surat has a large immigrant population, with the textile and diamond industry acting as employment magnets. Industrial areas such as Pandesara, Katargam, Sachin, Kapodara, Bhestan, Varachha, and Fulpada attract worker settlements due to lower land prices and their proximity to employment locations. These areas have transformed into low rise high density residential areas for the workers. As a result, the work trip distances are invariably short and most of these trips happen on foot or bicycles. However, these areas lack quality footpaths, street lighting, signalised junctions, traffic monitoring, etc.

3.6.1. Existing Non-Motorised Transport (NMT) Infrastructure in Surat

Mapping of footpaths as part of the road inventory surveys, as seen in the figures below, shows that in 2015 only 20% (61 km footpaths with respect to a total of 302 km of roads) of the city roads had footpaths. However, this is higher in comparison to 17% footpath coverage in 2012. In addition to the poor share of footpaths in the city, the poor state of footpaths along various road sections makes them difficult to use.

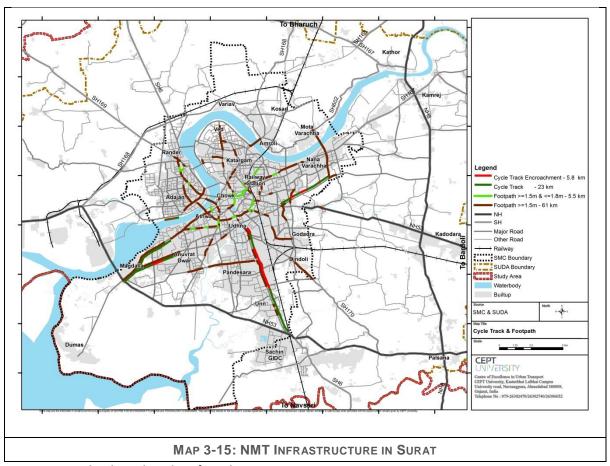
Footpaths in the city are often discontinuous and of varying widths and levels. Footpaths often serve as platforms for street posts/transformers/electric meters/post boxes/waste bins/street furniture, invariably reducing the space and comfort in using them. The footpaths are often too narrow. In addition, footpaths are also often encroached upon by adjacent shop owners, hawkers or parked vehicles, reducing the usable width. The pedestrians are often forced to use the carriage way space along with motorised vehicles, which could be a reason for decreased walk mode share in the city.

The concept of dedicated bicycle tracks was absent in the city of Surat until the recent past. In 2012, the city had a short stretch of 1.5 km of bicycle tracks along the Udhna–Sachin road. However, in 2015, dedicated bicycle tracks were introduced along Udhna–Sachin, Magdalla–Bhatar, Magdalla–SVNIT etc., covering 23 km of the city roads. The NMT network has been developed along the BRTS corridor, resulting in this percentage increase. However, the same is still very low at 8% of the city roads. The number of interchanges in the city has increased in the last two years, with the interchange at Kharwarnagar being added. However, no improvement is seen in the availability of NMT facility at these interchanges.

It is also seen that of the total 115 major junctions in Surat, only 44 have been signalised. Of these 44 signalised junctions, only 38 have a pedestrian crossing and, within them, half have an average pedestrian waiting time of more than 45 sec, which is considered to be inadequate infrastructure for pedestrians (Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT).

As far as Lux levels on footpaths in the city are concerned, a good lux level (15–17) is seen at most of the locations.

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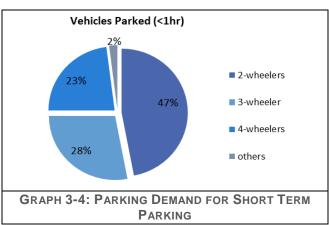
Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

Surveys show that around 25% of these lanes are encroached upon by parking. These practices discourage bicyclists from using the provided dedicated lanes and they are forced to share space with motorised vehicles. Of the four major interchanges (Surat railway station, Chowk, Udhna and Kharwarnagar) in Surat, only Surat city railway station has a dedicated cycle parking facility. It can hence be inferred that the city lacks bicycle facilities.

3.7. Parking

Lack of public transport and high growth of private vehicles in Surat has created a high demand of parking in the city. Around 47.5% of the road space is lost to parking and in terms of value, land worth Rs. 14.39 crore is used up in parking. (Draft Parking Policy, 2017).

City has constructed nine multi-level parking in Surat and has converted the dead space available below flyovers into parking spaces. There are 13 such parking locations either



Source: Draft Parking Policy for the Surat, UMTC

below flyover or on-street parking and 15 surface parking are also available in the city. These 28 (13+15) authorized paid parking supply 7775 parking bays to the users (Source: Draft Parking Policy for the Surat, UMTC).

The major parking areas are provided near the railway station, APMC, Khatodara, Adajan etc. (Central zone of the SMC in the core city due to the location of the textile market, APMC etc.). High demand and constrained supply is observed in the inner city area. Except Ring Road and railway station, parking supply in central area is very low. About 80% of the vehicles along Ring Road are parked for less than 30 min, resulting in higher utilisation rate for turnaround and parking.





FIGURE 3-1: ON STREET GOODS PARKING

FIGURE 3-2: TWO WHEELER PARKING BELOW FLYOVER

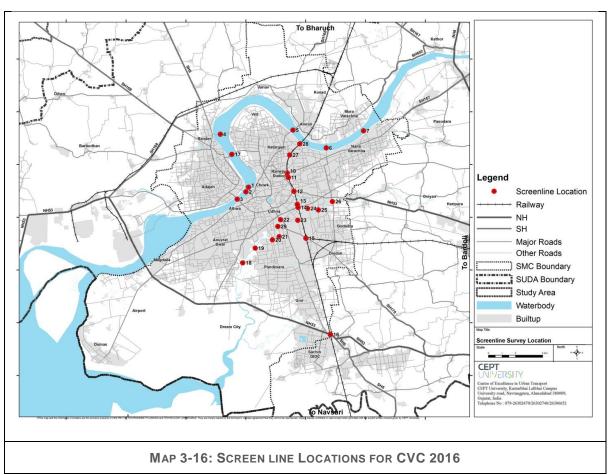
Source: CoE- UT, CEPT University

As per the Service Level Benchmark study conducted for Surat, the city has increased the availability of paid parking spaces to 92% from 78%. The city authorities have also revised the parking charges for 4-wheelers from Rs. 10 to Rs. 20; however, the charges for 2-wheeler parking remain the same at Rs. 5 for two hours.

3.8. System Performance

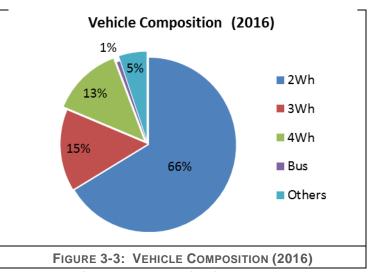
3.8.1. Traffic Volume

Classified Volume Count (CVC) Surveys have been carried out at major screenline locations along the Tapi river, railway line and Khadi. Screenlines are physical barriers like railway line, river passing through the city dividing it into parts. The main objectives with which CVC surveys has been carried out are to analyse temporal traffic pattern in the city and to validate the private vehicular assignment model.



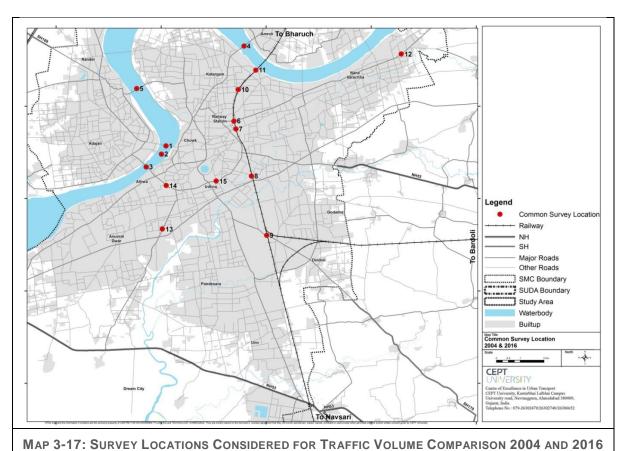
Source: CoE- UT, CEPT University

As shown in map above, there were screenline locations where classified volume count surveys were conducted for 16 hours (7:00 am to 11:00 pm). The surveys were carried out by installing video cameras at the screen line locations. This was followed by classified traffic counts from the captured videos. The traffic surveys were carried out in the months of August and September 2016 and, while doing so government holidays and rainy days were avoided for surveys. Results for the same are provided on Annexure 21.

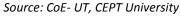


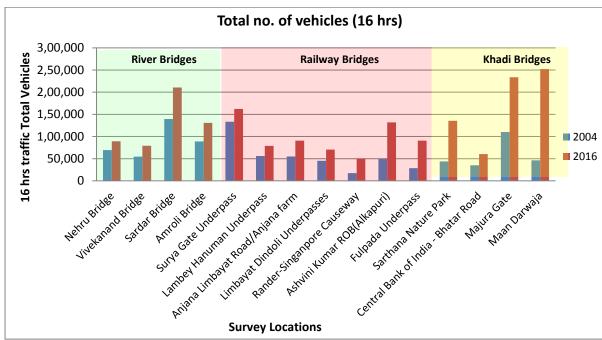
Source: Classified Volume Counts (CVC), 2016

Of all the 27-location surveyed in 2016, 15 locations are common with 2004 CRRI survey were compared as shown in map below.



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GRAPH 3-5: COMPARISON OF OVERALL TRAFFIC (16 HOURS)
Source: CRRI 2005 report, Classified Volume Counts (CVC) 2016 (CoE- UT, CEPT)

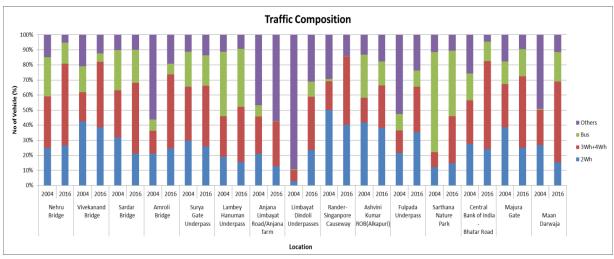
The table below depicts the increase in traffic volumes during this period for the common locations.

TABLE 3-9: COMPARISON OF TRAFFIC VOLUMES 2004 AND 2016

	I ADE	E 3-9. COMP		ehicles	Total PCU		ND 2016	0/ 01
Code No.	Survey Location	Type of Location	2004	2016	2004	2016	% Change in Vehicles	% Change in PCU
River B	ridges (No 1-4)							
1	Nehru Bridge	Bridge	69415	89157	49802	79623	28%	60%
2	Vivekanand Bridge	Bridge	54429	79312	33361	65697	46%	97%
3	Sardar Bridge	Bridge	139532	210694	58090	183235	51%	215%
4	Amroli Bridge	Bridge	89011	130940		118267	47%	146%
Railwa	y Bridges (No 5-11)						·	
5	Rander-Singanpore Causeway	Bridge	17383	49827	9829	40877	187%	316%
6	Surya Gate Underpass	RuB	133350	162281	97488	140120	22%	44%
7	Lambey Hanuman Underpass	RuB	56095	78703	42514	72741	40%	71%
8	Anjana Limbayat Road/Anjana farm	RoB	54913	90716	36804	89332	65%	143%
9	Limbayat Dindoli Underpasses	RuB	45055	70489	18448	62761	56%	240%
10	Ashvini Kumar ROB(Alkapuri)	RoB	49137	131846	32221	107941	168%	235%
11	Fulpada Underpass	RuB	28618	90809	16240	75856	217%	367%
Khadi E	Bridges (No 12-15)							
12	Sarthana Nature Park	Mid-Block	43642	135553	46262	123863	211%	168%
13	Central Bank of India - Bhatpara Road	Mid-Block	35194	60427	23624	55108	72%	133%
14	Majura Gate	Mid-Block	110088	233894	71856	204666	112%	185%
15	Maan Darwaja	Mid-Block	46437	252087	31109	241625	443%	677%
	Total		972299	1866735	615661	1661713	92%	170%

Source: CRRI 2005 report, Classified Volume Counts (CVC) 2016 (CoE- UT, CEPT)

It is evident from the above table the total vehicles have almost doubled (i.e. 1.9 times), whereas the total of PCUs has increased by 2.6 times.



GRAPH 3-6: COMPARISON OF TRAFFIC COMPOSITION AT COMMON LOCATIONS

Source: CRRI 2005 report, Classified Volume Counts (CVC) 2016 (CoE- UT, CEPT)

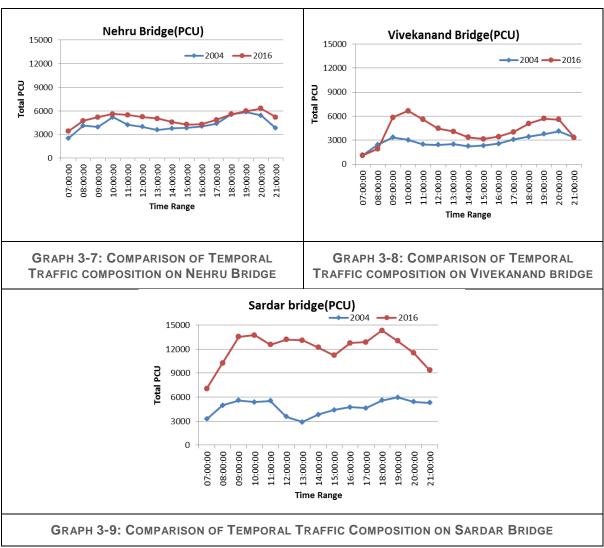
On comparison of traffic composition at these 15 common locations, it is observed that the two-wheelers have risen by 2.5 times whereas growth in three-wheelers and four-wheelers is about 1.7 times. With the recent ongoing improvements in the public transport systems, the buses have also increased by 1.6 times as compared to 2005 figures. However, there is a decrease of 0.4 times in the other traffic which could be attributed to restriction on heavy freight vehicles entering the city. If we compare the traffic composition on major bridges, data is available for only one location (i.e. Nehru Bridge) for three time frames: 1988, 2004 and 2016. It is observed that two-wheelers have grown almost 1.6 times, whereas three-wheelers and cars have reduced by half.

On comparing the data of 2005 and 2016 for other four bridge locations, it is observed that two-wheelers have grown between 1–1.2 times whereas the growth in the case of cars is about 1.5 times in most of these locations.

TABLE 3-10: TRAFFIC COMPOSITION (PCU) ON RIVER BRIDGES

Bridge	Total PCU -2016 (peak hour)	% of Traffic carried for the location	Peak hour
Nehru	6316	7.93	20:00-21:00
Vivekanand	6650	10.13	10:00-11:00
Sardar	14316	7.67	18:00-19:00

Source: Classified Volume Counts, (CVC) on screenline, 2016



Source: CRRI 2005 report, Classified Volume Counts (CVC) 2016 (CoE- UT, CEPT)

To compare the temporal variation in traffic, four common locations on bridges were taken for which CTTS 2004 data was available. It is observed that the peak hour on all the bridges, apart from Vivekananda, is in the evening between 18:00 and 21:00.

In terms of the trend of peak hour, it is seen that in most of the cases the peak hour is extended though the profile remains almost the same except in the case of Sardar Bridge where a drop is observed between 14:00 and 15:00.

The growth trend discussed above has led to congestion on Surat roads. If we analyse the congestion levels in the city it is observed that of the higher order road network in the city—i.e. arterial, sub arterial and major collectors—about 14% is congested with VCR ratios above 0.9. The map below depicts the vehicular flow on the network from the calibrated model. The lines in yellow depict places where the VCR ratio is above 0.9.

 VCR Category
 % of Higher order Network

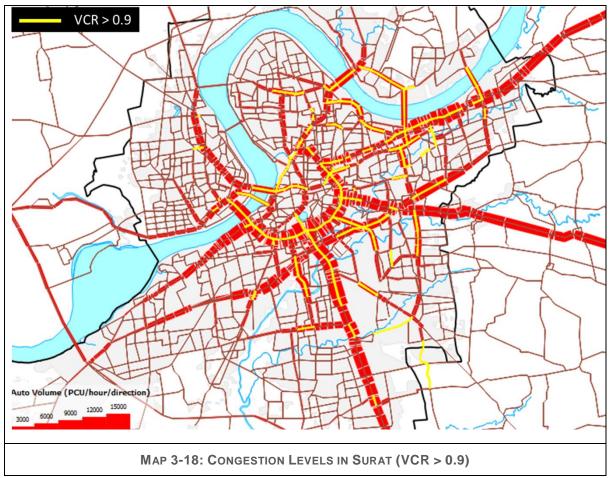
 >0.9
 72km (14%)

 >0.7 & <0.9</td>
 64km (12%)

 <0.7</td>
 382km (74%)

TABLE 3-11: VCR FOR HIGHER ORDER ROADS IN SURAT

Source: CoE- UT, CEPT University



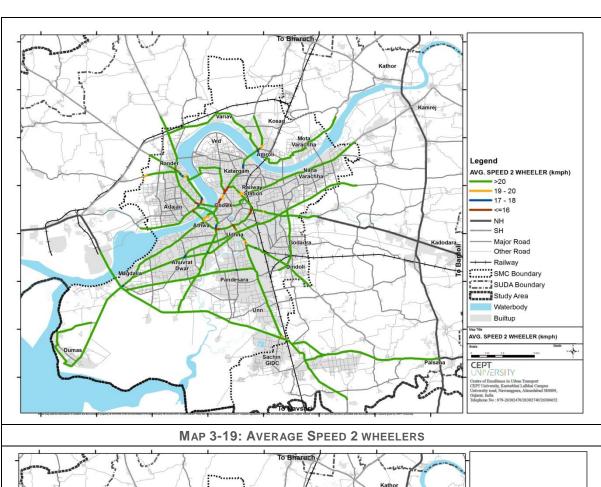
Source: CoE- UT, CEPT University

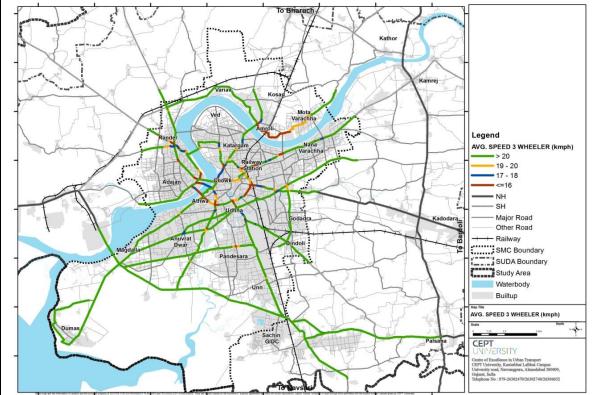
3.8.2. Network Speeds

To ascertain travel speeds across the network, speed and delay surveys were also carried out. The map below shows travel speeds across the network (Source: SLB for Indian Cities, 2016). The travel speeds along most of the corridors are more than 25 kmph except the old city area.

In Surat city, the strategic network of NH and SH has high average speeds and lower travel speeds on MDR and internal roads. The average speed of 2Wh is 30 kmph, followed by 4Wh and 3Wh i.e. 29 kmph and 22 kmph respectively. Though public transport share in Surat is very low, the average speed of public transport is 22 kmph, i.e. BRTS and City bus together.

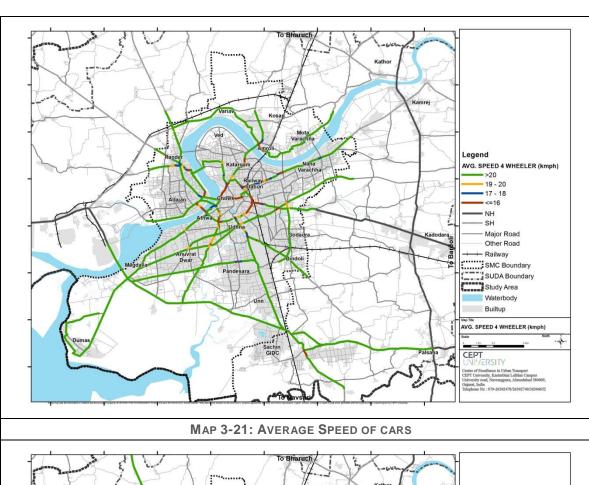
It is also seen that the inner ring road has slower speeds due to high congestion.

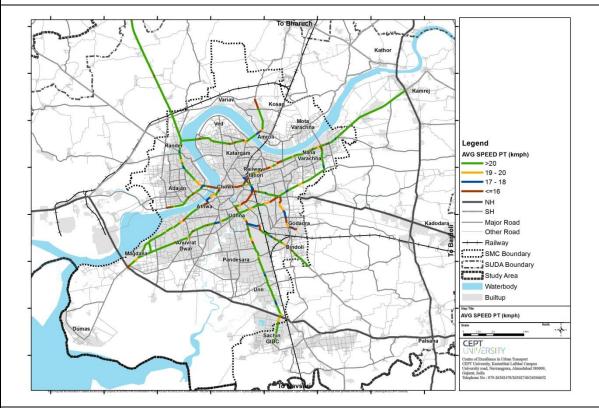




MAP 3-20: AVERAGE SPEED 3 WHEELERS

Source: Service Level Benchmarks in Urban Transport for Indian Cities- Round2, CoE –UT, CEPT 2016





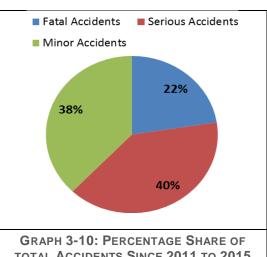
MAP 3-22: AVERAGE SPEED OF PUBLIC TRANSPORT

Source: Service Level Benchmarks in Urban Transport for Indian Cities- Round2, CoE –UT, CEPT 2016

3.8.3. Accidents

Accidents have high economic and social costs. Occurrence of an accident is an outcome of a number of factors, like quality road conflicts between pedestrian and vehicle population, land use in the surrounding area, adherence/enforcement of road safety regulations etc. Higher exposure to road accident risk may be mitigated by behavioural interventions and policy enforcement. Hence an effective policy and traffic management plays an important role in reducing accidents in the city.

The total fatalities in the city have increased from 224 in 2012 to 273 in the year 2016. One of the major concerns is that about 33% of fatalities include pedestrians and cyclist (2016).



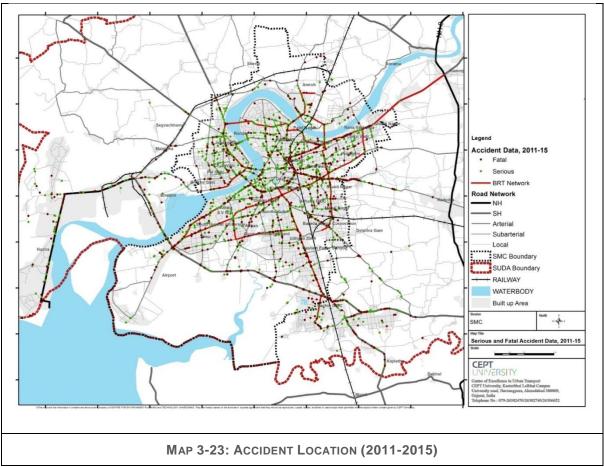
TOTAL ACCIDENTS SINCE 2011 TO 2015

Source: Traffic Police

TABLE 3-12: TOTAL ACCIDENTS (YEAR 2011-2017)

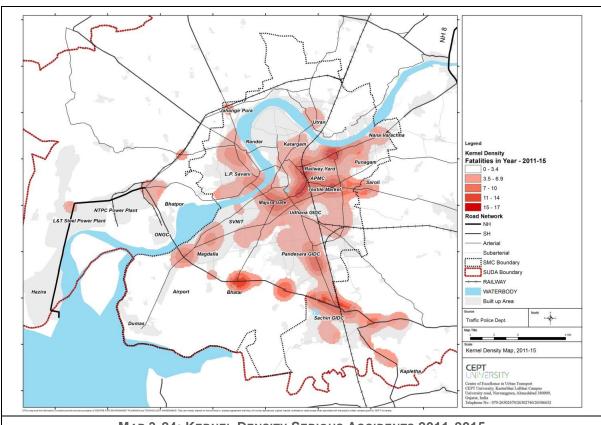
Vaar	Accidents	,	,	
Year	Fatal	Serious	Minor Accidents	Total
2011	240	425	558	1223
2012	225	437	484	1146
2013	213	414	344	971
2014	246	406	324	976
2015	251	386	266	903
2016	273	327	190	790
2017	230	439	161	830

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT; Traffic Police Department, Surat

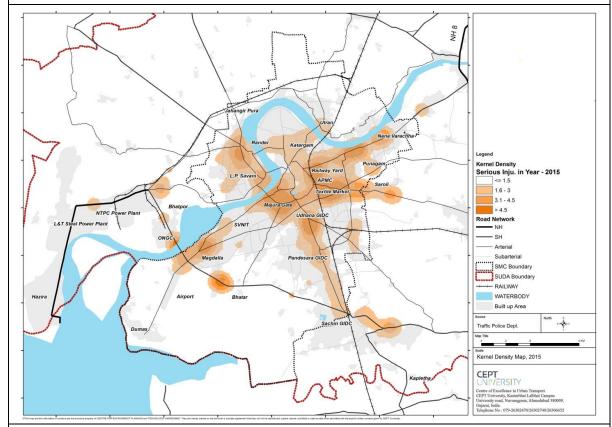


Source: Traffic Police

In order to identify accident hot-spots (road sections with high risk of crashes) kernel density analysis using GIS was carried out. Based on fatal and serious accident locations, this analysis was undertaken. It was observed that most of the accidents were concentrated near the central city where conflicts between motorised and NMV mode seem to occur due to the mixed use activities located in this area. The ring-road and the major radials such as Athwagate to ONGC colony, Udhna Gate to Sachin, Sahara Darwaja to Magob and Varachha road are major hot-spot locations. Fatal accidents seem to be concentrated in the area along SH-168, where freight vehicular movement is high.



MAP 3-24: KERNEL DENSITY SERIOUS ACCIDENTS 2011-2015



MAP 3-25: KERNEL DENSITY FATAL ACCIDENTS 2011-2015

Source: CoE-UT, CEPT University

When we analyse the affected modes for accidents in Surat, it is observed that the NMT users are most affected in terms of fatalities and serious accidents as evident from the Table 3-13 and Table 3-14. NMV users are involved in half of the total fatalities and one-third of total serious accidents. If we see the concentration of the accidents where pedestrians are involved, it is seen that most of these are located in areas where the activity mix creates unsafe crossing for them. Two-wheeler users are the second most affected, with one-third of them involved in fatalities.

In terms of the responsible mode for NMV users, it is observed that trucks and other vehicles (which include JCB, crane, emergency vehicles etc.) are responsible for the fatalities. For two-wheeler serious injuries and fatalities, trucks are mainly responsible. It is also observed that trucks are responsible for one-fourth of the total fatalities, followed closely by other vehicles. In case of serious injuries, the most affected modes are the pedestrians and cyclists at 43%, followed by two-wheelers at 40%. However, in the case of serious injuries, four-wheelers have emerged on the top in terms of responsible mode accounting to around one-third of all serious injuries in accidents, followed closely by two-wheelers at 26%. Trucks and other freight vehicles only account for one-tenth of the accidents. Bus is found to be the least responsible as a mode in terms of fatalities and serious accidents.

TABLE 3-13: FATALITIES BY AFFECTED AND RESPONSIBLE MODE

Responsible Mode/ Affected Mode	Two Wheeler	Three Wheeler	Four Wheeler	Bus	Truck/ Eicher	Others	Total
Pedestrian	88	95	90	22	90	118	503
Pedestrian	(7.6%)	(8.2%)	(7.7%)	(1.9%)	(7.7%)	(10.1%)	(43%)
Picyclo	6	3	10	4	10	19	52
Bicycle	(0.5%)	(0.3%)	(0.9%)	(0.3%)	(0.9%)	(1.6%)	(4%)
Two Wheeler	36	24	77	24	151	90	402
Two wheeler	(3.1%)	(2.1%)	(6.6%)	(2.1%)	(13%)	(7.7%)	(35%)
Three Wheeler	0	3	7	3	17	5	35
Tillee Wileelei	(0%)	(0.3%)	(0.6%)	(0.3%)	(1.5%)	(0.4%)	(3%)
Four Wheeler	0	0	4	0	16	10	30
roui wheeler	(0%)	(0%)	(0.3%)	(0%)	(1.4%)	(0.9%)	(3%)
Truck/ Eicher	0	0	0	0	7	4	11
Trucky Elcher	(0%)	(0%)	(0%)	(0%)	(0.6%)	(0.3%)	(1%)
Other	66	40	9	0	9	6	130
Other	(5.7%)	(3.4%)	(0.8%)	(0%)	(0.8%)	(0.5%)	(11%)
Total	196	165	197	53	300	252	1163
Total	(17%)	(14%)	(17%)	(5%)	(26%)	(22%)	(100%)

Source: Traffic Police, 2015

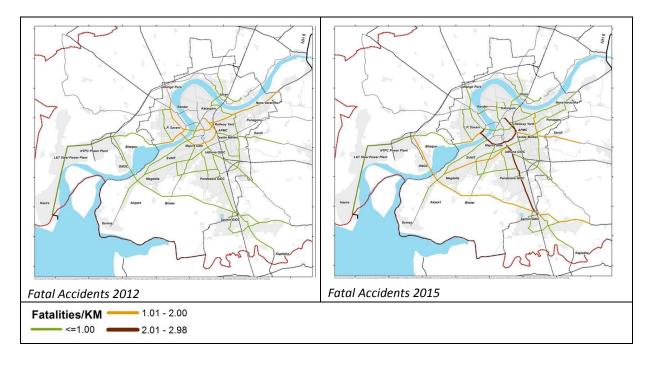
TABLE 3-14: SERIOUS INJURIES BY AFFECTED AND RESPONSIBLE MODE

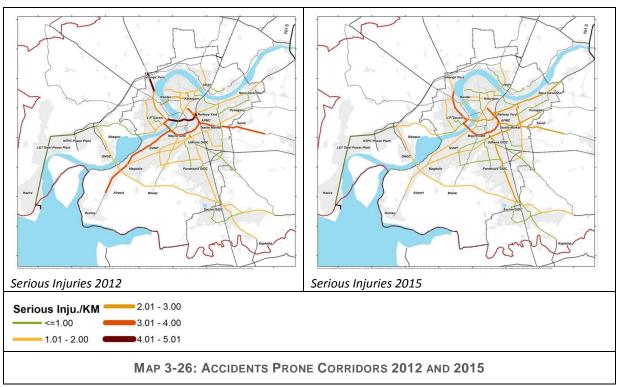
Responsible Mode/ Affected Mode	Two Wheeler	Three Wheeler	Four Wheeler	Bus	Truck/ Eicher	Others	Total
Pedestrian	371	178 (7.8%)	193 (8.5%)	16 (0.7%)	46	61	865
Pedestrian	(16.3%)	176 (7.6%)	193 (8.5%)	10 (0.7%)	(2%)	(2.7%)	(38%)
Dicyclo	29	18	25	2 (0 19/)	13	7	95
Bicycle	(1.3%)	(0.8%)	(1.1%)	3 (0.1%)	(0.6%)	(0.3%)	(4%)

Responsible Mode/ Affected Mode	Two Wheeler	Three Wheeler	Four Wheeler	Bus	Truck/ Eicher	Others	Total
Two Wheeler	186	145	508	26	113	94	1072
TWO WHEELER	(8.2%)	(6.4%)	(22.3%)	(1.1%)	(5%)	(4.1%)	(47%)
Three Wheeler	7	24	61	5	24	14	135
Tillee Wileelei	(0.3%)	(1.1%)	(2.7%)	(0.2%)	(1.1%)	(0.6%)	(6%)
Four Wheeler	0	4	30	1	25	16	76
Four Wheeler	(0%)	(0.2%)	(1.3%)	(0%)	(1.1%)	(0.7%)	(3%)
Turrels / Fielder	0	0	0	0	6	0	6
Truck/ Eicher	(0%)	(0%)	(0%)	(0%)	(0.3%)	(0%)	(0%)
Other	6	4	9	0	5	3	27
Other	(0.3%)	(0.2%)	(0.4%)	(0%)	(0.2%)	(0.1%)	(1%)
Total	599	373	826	51	232	195	2276
TULAT	(26%)	(16%)	(36%)	(2%)	(10%)	(9%)	(100%)

Source: Traffic Police, 2015

On comparing the 2012 and 2015 accident locations in terms of fatal and serious accidents, it is observed that the concentration in case of fatal accidents has increased along the Udhana–Sachin road, new locations in Amroli area and on the canal corridor and Khodiyar Nagar area. In terms of serious accidents, the number of locations have reduced drastically as compared to 2012; however, the location of serious accidents are the same as fatal accident locations.





Source: CoE-UT, CEPT University

3.8.4. Air Quality

Transportation is one of the biggest contributors of GHG emissions in the urban areas. Though, Surat has an Industrial base, the air quality levels are quite good. This could be due to the fact that most of these industries are textile related and hence water polluting and not air polluting. The city has 10 monitoring stations, one in institutional area, two in central city area and seven in industrial areas. In 2012, GPCB took up the initiative to reduce air pollution in the city by phasing out 15 year old commercial vehicles. The issues with SPM still remain at moderate range and GPCB has also asked industries to install CCTVs on chimneys.

Location	PM ₁₀	PM _{2.5}	SO ₂	NOx
SVR College	85	28	13.5	22.4
BRC, Udhana(Darshan Processors)	100	34	18.9	26.3
Air India Building	96	32	14.3	27.8
CETP Palsana	99	34	16.2	27
Chaltan Sugar	101	34	14.1	27.4
GIDC Pandesara	100	35	17.2	30.3
Near Plot no. 54 & 80	98	33	17.9	30.4
Delhi Gate Police Chowki	102	35	15.9	28.5
Hi-Choice Processers, Sachin	105	35	18	32.8
Garden Silk Mills Kadodara	103	35	15.1	27.3
Average	98.9	33.5	16.11	28.02

Source: GPCB Annual Report 2016-17

Estimation of carbon emissions for the base year were calculated using the vehicle km, age of vehicle, fuel type using emission factors given by CPCB. As per this, transportation sectors accounts about 1688 tons of CO_2 every day. 44% of the total emissions are from 2 wheelers where as cars contribute to about 36% followed by 3 wheelers at 15% and bus at 1% and others buses (i.e company/school/Pvt buses) at 4%. The per capita CO_2 emission in Surat is 0.32 kg/day. As per a research published for 2011 emissions for different Indian cities (Swamy, Gautam, Lohia & Bhakuni, 2012), the CO_2 emissions have increased by 15% in four years.

TABLE 3-15: EMISSIONS BY VARIOUS MODES (2016)

Modes	CO (Tons/day)	NOX (Tons/day)	PM (Tons/day)	CO2 (Tons/day)
2Wh	20.56	1.67	1.12	735.95
3Wh	7.42	0.60	0.10	244.25
4Wh	6.65	0.93	0.13	623.83
Bus	0.18	0.35	0.01	14.64
Company Bus/ Pvt. Bus/ School- College Bus	0.86	1.65	0.04	69.66
Total	35.66	5.20	1.40	1688

Source: CoE-UT, CEPT University

3.9. Benchmarking Urban Transport

A Service Level Benchmarking as per the MoUD's SLB indicators was carried out for 11 focus areas in transport for the year 2012 and 2015. Looking at the overall 'Report Card' for the city, it is observed that even though the focus area LoS remains the same, the city has started investing in its public transportation system, signalling its junctions, improving road network and paid parking which is evident in the indicator results for the respective focus areas.

TABLE 3-16: SERVICE LEVEL BENCHMARKING REPORT CARD SURAT

Sr. No	Benchmarks	Level of Service for Urban Transport		
		LoS for 2015	LoS for 2012	
1	Public Transport Facilities	3	3	
2	Financial Sustainability of Public Transport	3	3	
3	Pedestrian Infrastructure Facilities	3	3	
4	Non-Motorized Transport Facilities	3	3	
5	Application of ITS Facilities	3	4	
6	Road Network Performance	2	3	
7	Parking Management	2	3	
8	Road Safety	3	3	
9	Environment	2	2	
10	Integrated Land Use Transport System	2	2	
11	Intermediate Public Transport	3	3	

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

Legend

No Change Positive Change Negative Change

Details of focus area wise indicators are given below:

1. Public Transport:

In case of focus area on public transport, three out of 14 indicators have shown improvement and the overall LoS has improved from 4 to 3. Along with the inclusion of new buses, routes of BRTS operating on or below 10 min headway have improved frequency of buses at stops. This has resulted in a remarkable improvement of the average waiting time, from LoS 4 to LoS 1. New buses introduced as a part of the BRTS system are all UBS and hence this has led to the improvement in the indicator. The speed of public transport in the city has reduced from 24 kmph in 2012 to 22 kmph in 2015. Improvement is also seen in one of the interchanges in terms of the facilities available at Kharwarnagar interchange, which now has weather protection and physical barrier free transfer; however, the LoS remains the same.

TABLE 3-17: BENCHMARKING PUBLIC TRANSPORT FACILITIES

Sr. No	Public Transport Facilities	Target LoS*	value - F1 Facilities		Surat LoS -	PT Facilities
			2015	2012	2015	2012
1	Presence of Organized Public Transport System in Urban Area (%)	1	100%	100%	1	1
2	Extent of Supply-Availability of Public Transport (PT per 1000 population)	2	0.026	0.023	4	4
3	Service Coverage of Public Transport in Study Area (km/km²)	2	0.42	0.31	3	3
4	Transit Access Area (% built-up area within 500 m of PT plying)	2	48%	46%	3	3
5	High Frequency transit accessible area (% area with transit access 10 min or less headway)	2	26%	10%	4	4
6	Average Waiting Time for Public Transport Users (minutes)	2	6	12	1	4
7	Level of Comfort in Public Transport (passenger/seat)	3	1.8	2.5	2	3
8	Percentage Fleet Size as per Urban Bus Specification (UBS) (%)	3	26%	0%	3	4
9	Total Boarding per 1000 population	2	12	15	4	4
10	Average Travel Speed of Public Transport (kmph)	2	22	24	1	1
11	Affordability of Public Transport (% expenditure on transportation)	2	17%	14%	2	1
12	Breakdown of Public Transport (per 10,000 km)		3.05	NA	4	4
13	Vehicle Utilization (km per day)		165	166	4	4
14	Interchanges having Multimodal Facilities (%)		17%	0%	4	4
	Total Score					44
Overa	II LoS – 3				3	3

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

2. Financial Sustainability:

The overall LoS of the financial sustainability remains at 3 over the years. Public transport in Surat is negligible as a result of which the LoS is still at 3. The fleet size of the BRTS is very low compared to the length of the network. Due to low fleet size, staff per bus ratio has increased. Along with this, the operating ratio has worsened.

TABLE 3-18: BENCHMARKING FINANCIAL SUSTAINABILITY OF PT

Sr. No	Financial Sustainability of PT	Target LoS*	Surat Indica Financial Sus		Surat LoS- Financial Sustainability	
			2015	2012	2015	2012
1	Extent of Non-Fare Revenue (%)	1	3.80%	4.12%	4	4
2	Staff per Bus Ratio		4	3	1	1
3	Operating Ratio	1	2.87	1.96	4	4
Total S	core	9	9			
Overal	Overall LoS – 3					3

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

3. Pedestrian Infrastructure Facilities:

The numbers of signalised intersections in the city have remained the same; however, the major junctions have increased due to the inclusion of level 1 and 2 roads. The pedestrian delay below 45 seconds has improved and now 39 intersections fall in this category, resulting in slight improvement in LoS from 4 to 3. The city has also added 16 km of footpath and the length has now become 61 km, though the LoS for this indicator still remains low at LoS 4. No changes are seen in the Lux level and the same remains good at LoS 1.

TABLE 3-19: BENCHMARKING PEDESTRIAN INFRASTRUCTURE FACILITIES

Sr. No	Pedestrian Infrastructure Facilities	Target LoS*	Surat Inc Valu Pedest Infrastru Facilit	e - rian icture	Surat LoS - Pedestrian Infrastructure Facilities		
			2015	2012	2015	2012	
1	Availability of Signalised Intersection (%)	2	38%	41%	3	3	
2	Signalised Intersection Delay (%)	2	51%	20%	3	4	
3	Percentage City covered with Footpath (%)	2	20%	17%	4	4	
4	Street Lighting (Lux level) for Footpath	2			1	1	
Total Score						12	
Overall Lo	3	3					

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

4. Non-Motorised Transport:

The NMT network has been developed along the BRTS corridor resulting in percentage increase in NMT network; however, the same is still very low at around 8% of the major network and the LoS remains at 4. It is seen that around 25% of the NMT network is encroached by vehicular parking, however, the percentage coverage is very low and hence the LoS has been considered LoS 4.

TABLE 3-20: BENCHMARKING NON-MOTORISED TRANSPORT

Sr. No	Non-motorized Transport Facilities		Surat Indicator Value- Non Motorized Transport		Surat LoS- Non Motorized Transport	
			2015	2012	2015	2012
1	NMT Coverage (%)	3	7.6%	0.5%	4	4
2	NMT Encroachment (%)	3	25%	0%	4	4
3	NMT Parking Facilities at Interchange (%)		33%	40%	3	3
Total Score						11
Over	Overall LoS – 4					

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

5. Application of ITS facilities:

The overall LoS has improved for this focus area from LoS 4 to LoS 3. Improvement is seen in four indicators in this focus area. Firstly, the availability of the surveillance system has improved with the installation of CCTV camera in the city: three terminals out of four and 18 signalized intersections have CCTV cameras now. BRTS buses in the city are equipped with the GPS system providing real time information to users resulting in improvement of LoS from 4 to 3. There is a proposal to purchase new city buses which will be GPS-enabled. New ATCS systems have been installed at 17 out of 39 signals, which have again resulted in overall improvement in LoS.

TABLE 3-21: BENCHMARKING APPLICATION OF ITS FACILITIES

Sr. No	Application of ITS Facilities		Applicat	ator Value- ion of ITS lities	Surat LoS- Application of ITS Facilities		
			2015	2012	2015	2012	
1	Availability of Surveillance System (%)	1	47%	12%	3	4	
2	Passenger Information System (%)	1	100%	67%	1	1	
3	Global Positioning System (%)	1	26%	0%	3	4	
4	Signal Synchronization (%)	1	44%	0%	3	4	
5	Integrated Ticketing System (%)	1			2	4	
Total Score						17	
Overall LoS – 3						4	

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

6. Road Network Performance:

Improvements are seen in this focus area with overall LoS improving from LoS 3 to LoS 2. Improvements are seen in two indicators: firstly, the road density which has improved from 9 to 12km/km²; along with this, the percentage area under roads has also improved from 13 to 15%. The city has good overall speed.

TABLE 3-22: BENCHMARKING ROAD NETWORK PERFORMANCE

Sr. No	Road Network Performance		Surat Indicator Value- Road Network Performance		Surat LoS- Road Network Performance	
			2015	2012	2015	2012
1	Average Speed of Personal Vehicles (kmph)	1	30	30	1	1
2	Average Speed of Public Transport (kmph)		22	24	1	1
3	Road Density of Built-Up Area (km/km²)		12	9	1	2
4	Percentage of Higher Order Roads (%)		14%	17%	3	3
5	Street Lightening (LUX Levels) for Roads (50% mark from the cumulative graph)	2			2	4
6	Percentage Area under Roads (%) 15%		13%	1	2	
Total Score						13
Overal	Overall LoS – 2					3

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

7. Parking Management:

The overall LoS for this focus area has improved from 3 to 2. Surat has increased paid parking spaces in the city and also added 20 off-street paid parking locations. The LoS of this focus area has improved due to increase in parking fees.

TABLE 3-23: BENCHMARKING PARKING MANAGEMENT

Sr. No	Parking Management	Target	Surat Indicat Parking Mar		Surat LoS- Parking Management	
NO	LOS*	2015	2012	2015	2012	
1	Availability of Parking Spaces (%)	2	92%	78%	1	1
2	Ratio of Maximum to Minimum Parking fee in the City		2	1	3	4
Total Score						5
Overall LoS – 2						3

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

8. Road Safety:

Below is the service level benchmarks comparison for the road safety in Surat city. Though overall Level of Service (LoS) has not changed over the years, increase in road fatalities is a major concern.

Surat Indicator Value-**Surat LoS-Road Safety** Sr. **Target Road Safety Road Safety** LoS* No 2015 2012 2015 2012 Fatalities per Lakh Population 5 5 1 3 3 Fatality Rate for Pedestrian & NMT (%) 2 33% 34% 7 Serious Injuries per Lakh Population 9 4 4 Total Score 9 9 Overall LoS – 3 3 3

TABLE 3-24: BENCHMARKING ROAD SAFETY

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

9. Environment:

Sr. No

Total Score

Overall LoS – 2

The overall LoS for the air quality is 2 in both the years. The concentration of the SPM remains high again the set benchmarked by the Central Pollution Control Board.

Surat LoS-**Surat Indicator Value-Target Environment Environment Environment** LoS* 2015 2012 2015 2012 Annual Mean Concentration of SO₂ (μg/m³) 1 1 13 24 1 Annual Mean Concentration of NO₂ (µg/m³) 22 25 1 1 1 Annual Mean Concentration of SPM (μg/m³) 1 86 92 2 2

1

31

30

1

5

1

5

TABLE 3-25: BENCHMARKING ENVIRONMENT

Source: Service level Benchmarking fo	r Indian Cities, 2016 CoE-UT, CEPT
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10. Integrated Land Use Transport System:

Annual Mean Concentration of RSPM (µg/m³)

The overall LoS for this focus area improved from LoS 3 to LoS 2. The draft DP has provision of maximum permissible FSI of 1.8 for residential area, and there is no provision for transit oriented development. The road network pattern is primarily ring radial at the city level and grid iron at the block level. The BRTS project is ongoing in the city and, as of March 2016, City Corporation has approved a BRTS network of 102 km.

TABLE 3-26: BENCHMARKING INTEGRATED LAND USE TRANSPORT SYSTEM

Sr. No	Integrated Land Use Transport System			tegrated Transport	use-Tra	LoS- ed Land Insport tem
			2015	2012	2015	2012
1	Population Density (pph)		301	263	1	1
2	Mixed Land Use Zoning (%)		62%	53%	1	1
3	Potential of Development Citywide (FSI)		1.8	1.8	2	2
4	Potential of Development along Transit Corridor (FSI)		2.7	2.25	3	3
5	Road Network Pattern and Completeness				2	2

Sr. No	Integrated Land Use Transport System	Target LoS*	Surat Indicator Value- Integrated Land use-Transport System 2015 2012		Surat LoS- Integrated Land use-Transport System 2015 2012	
6	Percentage Network with exclusive ROW for Transit (%)		27%	9%	2	2
Total Score						11
Overall LoS – 2						2

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

11. Intermediate Public Transport:

No change is observed in this focus area with LoS remaining at 3. The speed of the IPT is similar to the speed of public transport in the city. The IPT is increasing at the annual growth rate of 4% but when looked at per 1000 population, it is showing a reduction.

TABLE 3-27: BENCHMARKING INTERMEDIATE PUBLIC TRANSPORT

Sr. No	Intermediate Public Transport	Target LoS*	Surat Indicator Value- Intermediate Public Transport		Surat LoS- Intermediate Public Transport	
			2015	2012	2015	2012
1	Average Speed of IPT (kmph)		22	21	1	1
2	IPT Vehicles with ITS Facilities/GPS (%)	2	0%	0%	4	4
3	Presence of IPT Vehicles per 1000 Population	2	14	15	4	4
Total Score						8
Over	Overall LoS – 3					

Source: Service level Benchmarking for Indian Cities, 2016 CoE-UT, CEPT

3.10. Summary

As a result of economic prosperity, the numbers of vehicles in the city are on the rise. If we observe the trends, it is evident that congestion in the city has increased significantly during the last decade. The vehicular traffic on the bridges has doubled and there is a need to focus on both demand and supply side measures to deal with the situation. The network is incomplete and for efficient mobility in the future, the same needs to improve by completing the missing links and also developing proper hierarchy of network along with augmenting the supply. The SMC is already working towards this. However, more needs to be done to improve mobility in the city. Road safety is another area of concern with pedestrians and NMT users being the most vulnerable and affected in serious and fatal accidents.

CHAPTER -4People Movement

4. People Movement

Analysing travel characteristics like trip rate, trip length, mode choice, origin-destination indicates travel patterns in the city and land use distribution as well as location of activities that influence travel patterns in the city. Socio-economic characteristics such as income, age, sex, occupation, vehicle ownership etc. can be related to travel choices of individuals as well as households. In order to understand travel characteristics in the city, household surveys were undertaken. Information on personal and household characteristics along with trip details of the household members has been captured through these surveys.

This chapter provides a brief description of household characteristics along with travel characteristics in the Surat Urban Development Authority area.

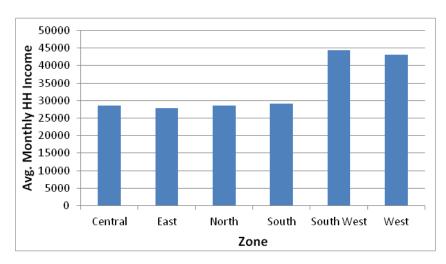
4.1. Household Surveys

For estimating the base year demand, the study has used the data from the available survey of 12,000 households carried out by the CEPT University as part of the Public Transport Operations Plan for Surat, 2016. An additional 3777 households were surveyed as part of this study, taking the total household samples to be around 15,777 (1.12%) households for the city of Surat. Data from various reports such as CTTS (CRRI, 1998 and 2005), GIDB study (CES, 2005) and so on have been used for comparison.

4.1.1. Household Income and Vehicle Ownership

The city of Surat is known for being one of the highest income cities of India. As per the 2016 Household Survey, Surat has an average monthly household income of Rs. 31,300 in the SMC area and Rs. 26,150 for the SUDA region. Average monthly household income for the overall study area is Rs. 29,100.

If we analyse the household incomes by zones, it can be seen that south-west and west zones have high monthly incomes (above Rs. 40,000) whereas east zone has the lowest income (Rs. 27,855).

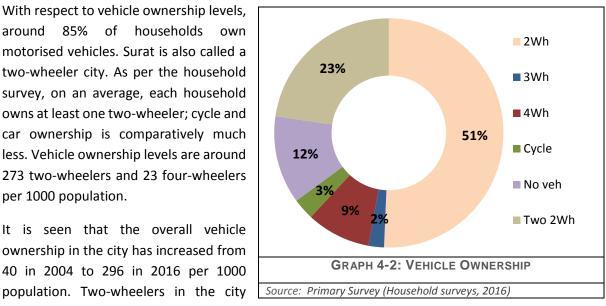


GRAPH 4-1: ZONE WISE AVERAGE MONTHLY HOUSEHOLD INCOME (2016)

Source: Primary Survey (Household surveys, 2016)

With respect to vehicle ownership levels, around 85% of households motorised vehicles. Surat is also called a two-wheeler city. As per the household survey, on an average, each household owns at least one two-wheeler; cycle and car ownership is comparatively much less. Vehicle ownership levels are around 273 two-wheelers and 23 four-wheelers per 1000 population.

It is seen that the overall vehicle ownership in the city has increased from 40 in 2004 to 296 in 2016 per 1000



have increased by almost 1.5 times whereas four-wheelers have seen a growth of only 1.1 times.

TABLE 4-1: COMPARISON OF VEHICLE OWNERSHIP PER 1000 POPULATION

Туре	CRRI 1998	CTTS 2004	CMP 2016	% increase
2 Wheeler / 1000	133	186	273	47 %
population				
4 wheeler / 1000	7	21	23	9.5 %
population				
Motorised vehicle/1000	138	207	296	43%
population				
Cycle/1000 population	145	100	44	-56%

Source: CRRI 1998 report; CRRI 2005 report; Household Survey2016 (CoE-UT, CEPT)

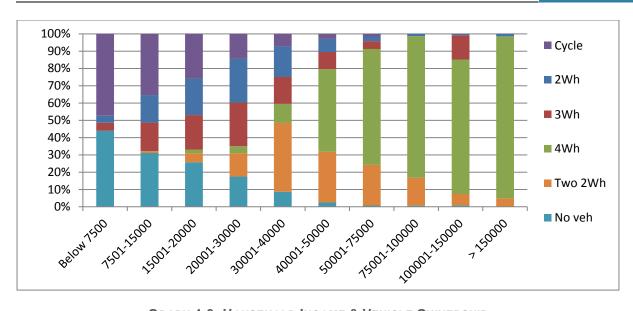
In 2016, vehicle ownership within the SMC and the SUDA areas are shown in the table below.

TABLE 4-2: VEHICLE OWNERSHIP (2016)

	,	,	
Area	2-wheeler / 1000 population	4-wheeler / 1000 population	
SMC	275	22	
SUDA	262	28	
Total	273	23	

Source: Household Survey, 2016

When we compare the numbers with Ahmedabad it is observed that though the overall 4 wheeler ownership rates are slightly lower than that of Ahmedabad (35 /1000 population) the 2 Wheeler in Ahmedabad are lower at (215/1000 population). The growth of 2 wheelers is high which could be attributed to the lack of a public transport system in the city in the last decade, with people having no choice but to move towards private modes. This was further aided by high income levels in the city and the economic growth which made owning a private vehicle easy.



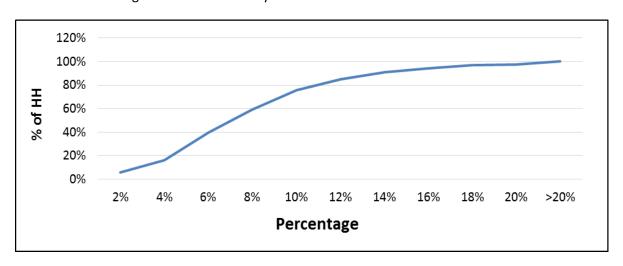
GRAPH 4-3: HOUSEHOLD INCOME & VEHICLE OWNERSHIP

Source: Household Survey, 2016

The above figure shows vehicle ownership by different income groups. With increase in income levels, increase in the share of four-wheeler ownership and decrease in the share of two-wheeler ownership can be observed.

4.1.2. Household Expenditure on Transportation

Expenditure on transport depicts affordability of the transport system in the city. The average expenditure on transport is around 8% of the household income in the study area. From the survey, it was observed that more than 90% of the households spend less than 15% of their income on transport, which indicates a high level of affordability.



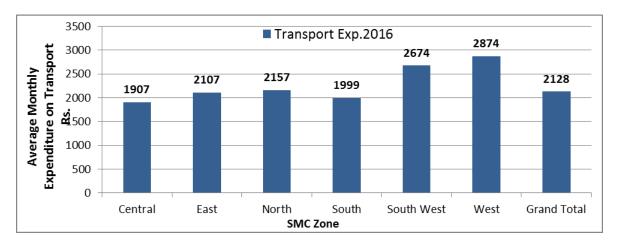
GRAPH 4-4: PERCENTAGE OF INCOME SPENT ON TRANSPORTATION

Source: Household Survey, 2016

However, the expenditure on transport by the lowest strata of income category is found to be relatively high. Around 17% of households having income less than Rs. 15,000 per month end up

spending about 15% or more of their income on public transportation. This indicates that affordability could be an issue in the case of poor households.

If we compare the average monthly expenditure on transport in 2016, it is observed that the west zone has the highest expenditure followed by the south west. The south and central zones have the lowest expenditure, which can be attributed to the proximity to work areas.



GRAPH 4-5: ZONE WISE AVERAGE MONTHLY EXPENDITURE ON TRANSPORT IN SMC Source: Household Survey, 2016

4.2. Travel Characteristics

Travel characteristics can be defined in terms of trip rate, mode choice, geographical distribution etc.

4.2.1. Trip Rate

Trip rate is defined as the total number of trips made per capita per day. The per capita trip rate (PCTR) for the study area (all modes) is observed to be 1.60. The same excluding walk and shorter trips (<0.5 km) is 0.96. The per capita motorised trip rate is 0.93.

TABLE 4-3: TRIP CHARACTERISTICS OF STUDY AREA

Particulars	Study Area
Year of Household Survey	2016
Households surveyed	15777
Trip-Rate Total	1.6
Trip rate – Motorised	0.93
By excluding walk trips (<0.5km) which are generally short in length, the estimated PCTR is	0.96
Public transport trip rate	0.01

Source: Household Survey, 2016

It has been observed that, over the years, as people in Surat have started travelling more, the per capita trip rate has increased from 1.13 in 2005 to 1.60 in 2016. The motorised trip rate has also increased from 0.8 to 0.9.

It was observed that the western and south western part of the city have high motorised trip rates, as the income levels are higher in these areas (refer Section 2.3.4). Similarly, the south eastern part of the city has a high NMT trip rate as weaker income population is located mostly around the industrial areas along the railway line and towards the south, close to the industrial areas (refer Section 2.3.4).

4.2.2. Mode Share

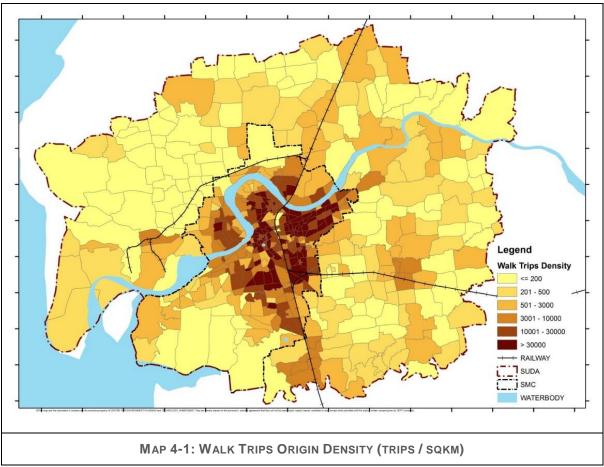
Two-wheeler is a predominant transportation mode in Surat, accounting for 62% of the trips. As discussed in the previous section, the share of the public transport mode is quite low. The share of walk and cycle trips is about 43%, which is quite high as a result of compact and mixed land use development in the city. The south-eastern part of the city has lower and middle-income group housing having high NMT and PT share, whereas the south-western part of the city has middle and higher income group housing, leading to more motorised (mainly four-wheeler) trips share. Shared auto rickshaw is the most prominent form of public transport and has a motorised mode share of 17%.

If we compare the 2008 mode share, it is seen that walk mode share increased from 35% to 40%. On the other hand, bicycle share has decreased from 10% to 2%. Autorickshaw trips have reduced to half, from 21% to 10%. This could be attributed to the economic growth in the city resulting in the rise of two-wheeler trips, from 29% to 36%.

Difference 2004 Mode **CRRI - 1988 CTTS 2004 CEPT - 2016** and 2016 Walk 45.4% 35.3% 40.3% 5.0% Bus + Rail 5.7% 0.8% 1.4% 0.5% Car 1.3% 1.5% 2.0% 0.6% 2W 21.3% 29.3% 35.6% 6.3% 19.2% 9.9% 2.0% -7.9% Bicycle Auto-rickshaw 7.2% 21.0% 10.3% -10.7% Others 0.0% 2.3% 8.0% 5.8%

TABLE 4-4: COMPARISON MODAL SHARE

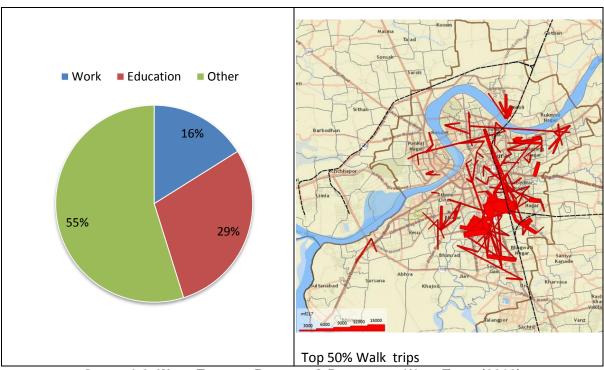
Source: CRRI 1998 report; CRRI 2005 report; Household Survey2016 (CoE-UT, CEPT)



Source: Household Survey, 2016

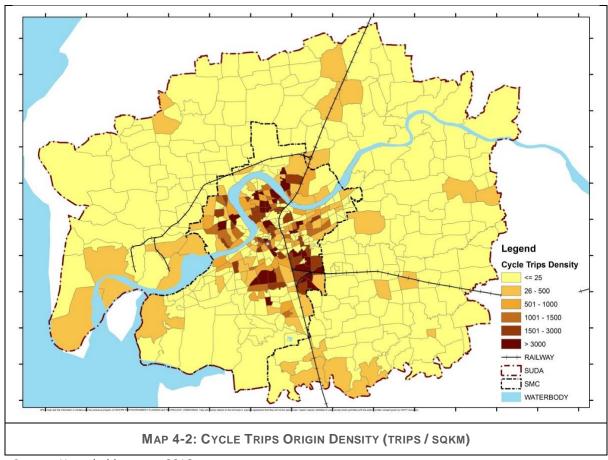
Pedestrians in Surat have an average trip length of 2.9 km. Surveys recorded that 29% of pedestrian trips are for educational purposes, 16% for work and remaining 55% for other purposes. The movement patterns of the top 50% trips have been generated based on origin-destination for the years 2016 and have been depicted in the form of desire lines.

From the images, it is evident that the walk trips are mainly concentrated in the employment centres like Katargam, Ved Gam, Khodiyar Nagar, walled city areas and Udhana–Sachin due to the diamond and textile industries and related activities. A similar pattern is also seen in the case of cycling trips, with greater concentration close to the industrial areas and the diamond market.



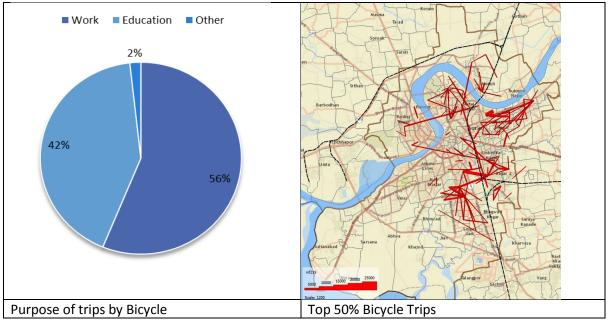
GRAPH 4-6: WALK TRIPS BY PURPOSE & DESIRE LINE WALK TRIPS (2016)

Source: Household surveys, 2016



Source: Household surveys, 2016

The average trip length for a bicyclist in Surat is 4 km. Surveys recorded 42% of bicycle trips for educational purposes, 56% for work and remaining 2% for other purposes. Desire lines for bicycle movements in the city are as shown in the figures below.



GRAPH 4-7: CYCLE TRIPS BY PURPOSE & DESIRE LINE BICYCLE TRIPS

Source: Household Survey, 2016

It is evident from the images above that work trips by cycle connect residential settlements from the urban fringes to the employment centres in the city. Maximum trips are concentrated in the walled city area, Udhana, textile market areas, APMC, Katargam etc. There are shorter trips that connect the residential settlements within these industrial zones to factories/employment centres. It has been observed that bicycle as a mode is preferred by the worker population and students.

4.2.3. Trip Purpose and Mode Share

About 28% of work trips are made by 2-wheelers, whereas only 0.52 % trips are made by PT. Work trips made by 3-wheelers contributes to 4.6 %. For education purpose, about 13 % of trips are made by walk and cycle.

TABLE 4-5: TRIP PURPOSE BY MODE SHARE (2016)

Mode	Walk	Bicycle	2 wheeler	4 wheeler	3 wheeler	PT	Others	Total
Work	6.46%	1.09%	28.42%	1.94%	4.62%	0.52%	0.73%	43.78%
Education	11.68%	0.82%	4.40%	0.06%	4.69%	0.51%	7.95%	30.10%
Others	22.01%	0.03%	2.68%	0.13%	1.19%	0.04%	0.03%	26.12%
Total	40.15%	1.94%	35.50%	2.12%	10.49%	1.07%	8.72%	100.00%

Source: Household Survey, 2016

If we compare the trip purpose over the years, it is seen that the proportion of other trips in the city have increased indicating that with increase in incomes, the residents are making more trips apart from those for regular work and education. Hence, while planning for future transportation options, this aspect should also be taken into consideration.

TABLE 4-6: COMPARISON OF TRIP BY PURPOSE OVER YEARS

Trip Purpose	CRRI - 1988	CRRI 2004	CEPT 2016	Difference 2004 and 2016
Work trip	50.9%	52.0%	43.8%	-8.2%
Educational Trips	27.3%	39.0%	30.2%	-8.8%
Others	21.8%	9.0%	26.1%	17.1%

Source: CRRI 1998 report; CRRI 2005 report; Household Survey2016 (CoE-UT, CEPT)

4.2.4. Trip Length Frequency Distribution

The following figure shows the trip length frequency distribution for all trips in the study area. It can be seen that more than 80% of the trips are of less than 7 km length.

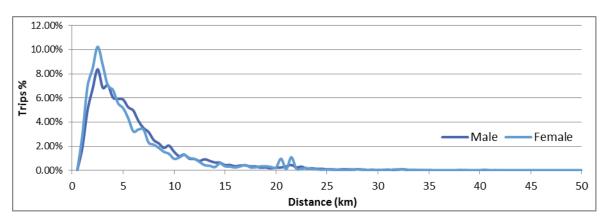


FIGURE 4-1: TRIP LENGTH FREQUENCY DISTRIBUTION

Source: Household Survey, 2016

The average trip length of the study area is 5.01 km. Average trip length by modes is shown in the table below. It can be seen that the average trip length by public transport is around 10.3 km, followed by 4-wheelers which have a trip length of 7.9 km.

TABLE 4-7: MODE WISE TRIP LENGTH

Modes	Average Trip length (km)
Two-Wheeler	5.8
Four-Wheeler	7.9
Three-Wheeler	6.1
Public Transport	10.3
Walk	2.88
Bicycle	4.1
All modes	5.01

Source: Household Survey, 2016

If we compare the trip length from the earlier studies, it is found that the average trip length including walk has increased by 700 m in the last decade whereas the motorised trip length has increased by 400m, indicating that Surtis are making longer trips which adds to the congestion on the roads.

TABLE 4-8: COMPARISON OF TRIP LENGTH OVER YEARS

Trip Length in Km	CRRI - 1988	CRRI- 2004	CEPT- 2016	Difference 2004 and 2016
Average Trip Length - Including Walk	3.54	4.11	4.8	0.7
Average Trip Length - Excluding Walk	5.6	5.33	5.7	0.4

Source: CRRI 1998 report; CRRI 2005 report; Household Survey2016 (CoE-UT, CEPT)

If we compare the motorised trip length for various modes by purpose, it is seen that for work, PT is the preferred mode of travel followed by 4-wheeler. It should also be noted that the overall average trip length for work has increased by 500 m since 2004. This is because the employees whose industries are in Hazira or outside the SMC boundary, are provided buses for transportation by their employers.

TABLE 4-9: COMPARISON OF TRIP LENGTH BY MODE AND BY PURPOSE

Mode \ Purpose	CRRI 2004			CEPT 2016		
wise trip length in Km	Work	Education	Others	Work	Education	Others
2-Wheeler	5.8	-	-	5.8	6.5	4.0
3-Wheeler	5.3	-	-	4.9	5.3	3.4
4-Wheeler	9.7	-	-	7.9	8.4	7.5
PT (City Bus, BRTS, GSRTC)	12.4	-	-	9.6	11.5	6.9
Others	5.8	-	-	14.5	5.5	9.0
Average overall	5.6			6.1	6.1	5.3

Source: CRRI 2005 report; Household Survey2016 (CoE-UT, CEPT)

The trip length frequency graph for the various motorised modes is shown below. It is observed that while 2-wheeler and 3-wheeler trips follow a similar profile. It can be observed however that the trip length of PT trips have increased significantly since 2004. In the case of 4-wheelers, the trip length has increased because a lot of people commute from suburban areas to the city centre.

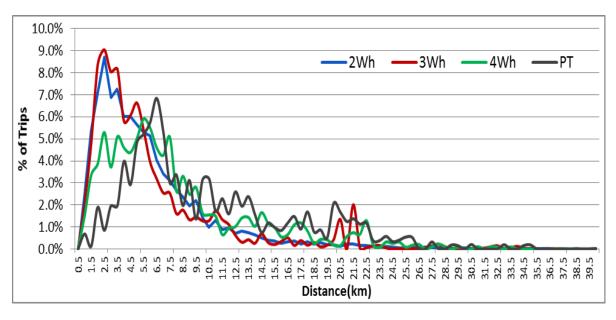


FIGURE 4-2: TRIP LENGTH FREQUENCY BY MODE 2016

Source: Household Survey, CoE-UT, CEPT University

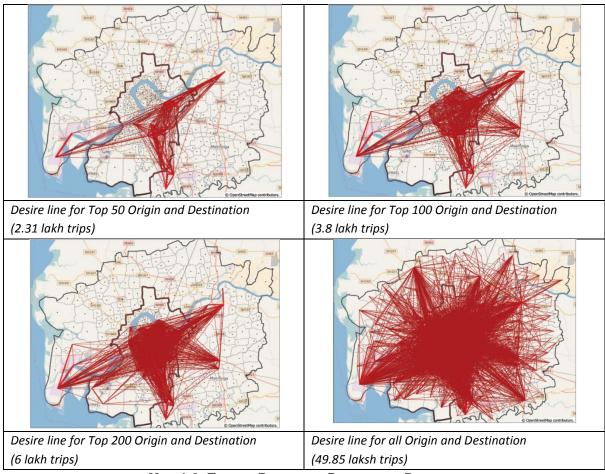
On analysing the percentage of trips by distance it was found that almost 77.5% of the trips are within the range of 6–8 km (average motorised trip length 6.4 km) and almost 64.5% of the trips are within the range of 4–6 km (average trip length of the city is 5.1 km).

TABLE 4-10: DISTANCE RANGE AND PERCENTAGE OF TRIPS, 2016

Dist. Range in Km	Trips %
<2	14.4%
2-4	28.3%
4-6	21.9%
6-8	12.9%
8-10	7.7%
>10	14.8%
Total	100.0%

Source: Household Survey, CoE-UT, CEPT University

The figures below shows major traffic is along the eastern and western part of the cities, central and southern part for the top 50 origin and destination (OD) pairs. The major attractor points for top 50 OD pairs include Hazira, Sachin GIDC, Kamrej, Varachha area, Pandesara GIDC and some areas of the old city. Areas like Kamrej and Hazira show high intensity of trips in top 100 OD pairs. Additional areas like Kadodara and Mota Varachha also add up in this list.



MAP 4-3: TRAVEL PATTERN - DESIRE LINE DIAGRAM

4.3. Summary

Over the decades, income per household in the city has increased significantly, which has led to high motorised vehicle ownership. Two-wheelers account for almost three-fourths of all the vehicles owned. The people of Surat are also travelling more and longer on motorised modes in comparison to the year 2006. It is also seen that the share of walk and cycling trips in the city has decreased. The trip length in the city has increased over the years despite high densities and mixed use development. The public transport has not been able to keep pace with the growing mobility needs of the city and its share is very low. It is also observed that affordability of transportation, especially for the urban poor, is becoming an issue. With more affordable housing being constructed on the outskirts of the city, connectivity to the city centre is not adequate. Hence, efficient and affordable PT is required along with improved NMT facilities to cater to their needs. The city authorities need to take measures to reduce the use of private vehicles especially cars and two-wheelers in future.

CHAPTER -5 Urban Freight Movement

5. Urban Freight Movement

5.1. Introduction

The efficient flow of goods is essential for the effective functioning of the urban economy. Since the transportation of goods will grow with economic growth, the planning for the movement of goods needs to be given a much greater focus. The efficiency of goods movement will determine the competitiveness of urban areas and has an impact on the cost of products, congestion, energy consumption, environment, safety, security and resource use. This chapter attempts to define urban freight, analyse inter-urban freight movements, location and impact of freight generators on the neighbourhood and the road network, and summarise the issues to be addressed as part of the plan.

5.2. Defining Urban Freight

Freight traffic and movement of goods within the city affects the overall city mobility. The study defines urban freight as a part of freight transportation that takes place with origins and/or destinations within the city limits

The urban freight movements can be classified as:

- External Flows (External–External or E–E) include movements which have both origin and
 destination outside the urban/study area. These transient trips are by-passable and are often
 not included as part of urban freight. However, as these vehicles ply on urban roads and utilise
 urban infrastructure, they add to the congestion on the city roads. Hence, they have been
 included as part of the analysis.
- Inter-Urban Flows (External-Internal (E-I) or Internal-External (I-E)) include movements which have either origin or destination outside the urban/study area.
- Intra-Urban Flows (Internal–Internal or I–I) include movements which have both origin and destination within the urban/study area.

Since the study aims to plan for the freight mobility in the city, hence the focus in this report is the movement of freight-vehicles instead of the movement of goods, shipment or parcel. Further, the objective being minimisation of external traffic intrusion, external and inter-urban goods movement is the key focus area. The chapter discusses road-based freight transport with limited focus on rail-based movement.

5.3. Institutional Responsibilities

Urban freight movement is primarily governed by the general regulations of transportation framed by the Government of India. Additionally, urban freight movement is managed by the Traffic Police. Their various roles include assigning of routes and establishing timing of freight movement, restricting major entry/exit points etc. It is important to note that freight generator location is a function of land use and related development control regulations, outlined in the Master/Development Plan and other related documents. In certain cases, specialised agencies such as Agricultural Produce Market

Committees (APMC), wholesale markets etc. are responsible for the management of trading and distribution/transportation of the commodities.

5.3.1. Urban Freight Vehicles and Time Zones

There are different types of goods vehicles; the choice of the type of vehicle depends on the tonnage and the commuting distance of the material/commodity. Goods vehicles are categorised into three types i.e. heavy commercial vehicles (HCVs as Trucks & MAVs), medium commercial vehicles (MCV), and light commercial vehicles (LCV), each one having a different externality on the urban traffic system.





Heavy Commercial Vehicles (HCVs); Multi Axel Truck: 25 – 44 Ton; Truck: 13 – 25 Ton





Medium Commercial Vehicles (MCVs)

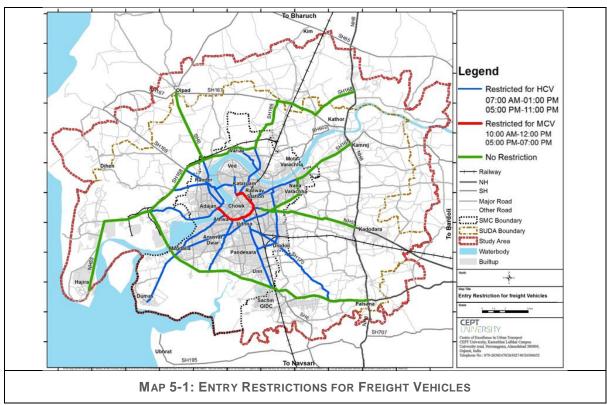
Eg.: Eicher: 8 – 13 Ton

Light Commercial Vehicles (LCVs)

Eg.: Tempo and Chota Hathi: up to 8 Ton

FIGURE 5-1: DIFFERENT TYPES OF COMMERCIAL VEHICLES

In the city of Surat, Traffic Police regulates the entry and exit of freight vehicles through 'time zones'. Map 5-1 indicates roads and the respective time zones on which freight vehicles are permitted. These restrictions are imposed on heavy commercial vehicles (HCVs as trucks & MAVs) and medium commercial vehicles (MCV), and light commercial vehicles (LCV). It can be seen from the below map that freight vehicles are allowed on all the major network of the city including the Inner Ring Road.



Source: Traffic cell, SMC

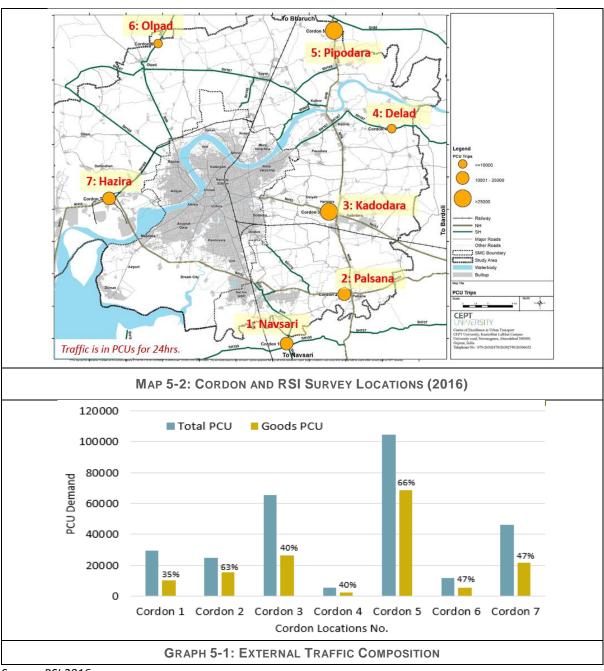
No restriction zone implies that trucks are allowed to ply on these routes/roads throughout the day. HCVs and MCVs are not allowed the Ring Road and in core city area during peak hours—10am to 12pm and 5pm to 7pm. On the outer part of the Ring Road and on all the major radials, MCVs are allowed at all times of the day. Freight originating from the railway yard is allowed in the city at all times. In this chapter, MCV (e.g. Eicher) has been included in the truck category because its size and space requirement is quite similar to a truck.

5.4. Primary Data Base

With economic growth, freight demand and movements have been on the rise. Since the quantitative information on the freight flows is not readily available, evaluation of the urban freight mobility is difficult. The analysis in this report is based on Road Side Interview (RSI) surveys at cordon locations and Activity Surveys carried out by the CoE-UT CEPT (2016). RSI has been carried out to estimate the external traffic (goods and private vehicles) whereas internal to internal goods movement has been estimated through activity surveys.

5.5. External Freight Movement

To evaluate external freight movement, an RSI survey was carried out on a full working day (24 hrs.) on seven major entry/exit points of Surat (refer Map 5-2. The survey was carried out to estimate total external—internal (both ways) and external—external interactions. The details captured include quantum of inflows and outflows: by direction, by commodity and by type of vehicles. RSI also gives the details of the origins and destinations. The available classified volume count data has been used to estimate the inter-urban freight trips.



Other sources of information include field observations and discussions with stakeholders to get additional information regarding the issues of urban freight. Map 5-2 shows the locations of cordon points and RSI surveys locations, these points/locations cover all major entry/ exit points. Out of the total external movement, goods vehicle contributes about 55% of the total demand. Significant movement in terms of PCUs demand has been observed from Cordon 5 (Pipodara) and Cordon 3 (Kadodara); freight movement is significantly high from/towards these two directions. The maximum traffic enters the city from Cordon 5 near Pipodara, located in the north direction (Ahmedabad/Delhi/origins from northern parts of the country).

5.5.1. Commodity Movement

The consumer goods (FMCG), industries and mining materials, construction materials, foodgrains, textiles, oil and products etc. are the predominant commodities imported/exported from Surat. Consumer products, food & agriculture products and chemicals are some of the commodities for which import was found to be higher than exports. In case of other commodities, the quantum of import and exports were found to be similar. Table 5-1 shows the inbound and outbound proportion of commodities with their tonnages.

TABLE 5-1: GOODS COMMODITIES TONNAGES

Commodities	Out-bound	In-bound	Total
Chemicals	9237 (4%)	10691 (4%)	19928 (8%)
Construction materials	24496 (10%)	17414 (7%)	41911 (17%)
Food + Agriculture Products	13155 (5%)	9364 (4%)	22519 (9%)
Industry + mining material	21647 (9%)	37645 (16%)	59291 (25%)
Others (mostly FMCG)	25722 (11%)	33100 (14%)	58822 (24%)
Petroleum/Gas	3273 (1%)	2228 (1%)	5501 (2%)
Textiles materials	13965 (6%)	18694 (8%)	32659 (14%)
Grand Total	111495 (46%)	129137 (54%)	240631 (100%)

TABLE 5-2: COMMODITIES AND THEIR TONNAGE BY CORDON LOCATION (STUDY AREA) 2016

Cordon No.	Location Name	Chemical s	Construction materials	Food + Agriculture Products	Industry + mining material	Others	Petroleum/ Gas	Textiles materials	Grand Total	% of Tonnage of Goods by Location
1	Wada/ Navsari	1915	6924	2146	8199	4021	771	3376	27353	11%
2	Palsana	4338	5508	3826	7887	10697	863	3664	36784	15%
3	Kadodara	2315	6408	6707	5032	8171	1101	15846	45579	19%
4	Delad		3383	996	238	261	0		4878	2%
5	Pipodara	3944	9437	5170	6899	29145	1495	6552	62642	26%
6	Olpad	1423	3183	1787	7583	586	143	175	14880	6%
7	Hazira	5994	7067	1888	23453	5940	1127	3046	48516	20%
Gr	and Total	19928	41911	22519	59291	58822	5501	32659	240631	100%
% of Tota	I Goods by types	8%	17%	9%	25%	24%	2%	14%	100%	

TABLE 5-3: COMMODITIES AND THEIR TONNAGE BY CORDON LOCATION (EXCLUDING HAZIRA REGION) 2016

Cordon No.	Location Name	Chemicals	Construction materials	Food + Agriculture Products	Industry + mining material	Others	Petroleum/ Gas	Textiles materials	Grand Total	% of Tonnage of Goods by Location
1	Wada/ Navsari	772	4068	1305	2833	2422	148	1384	12933	9%
2	Palsana	1797	4093	2649	4432	7555	97	1799	22422	16%
3	Kadodara	1965	6306	6537	3187	7697	901	15025	41616	30%
4	Delad		3383	996	50	261	0		4690	3%
5	Pipodara	2426	8160	4180	5592	26833	989	5180	53359	39%
6	Olpad	212	680	725	302	392	20	0	2331	2%
7	Hazira		150	156	63	138			507	0%
Gı	rand Total	7172	26840	16548	16459	45298	2155	23388	137859	
% of Tota	al Goods by types	5%	19%	12%	12%	33%	2%	17%		

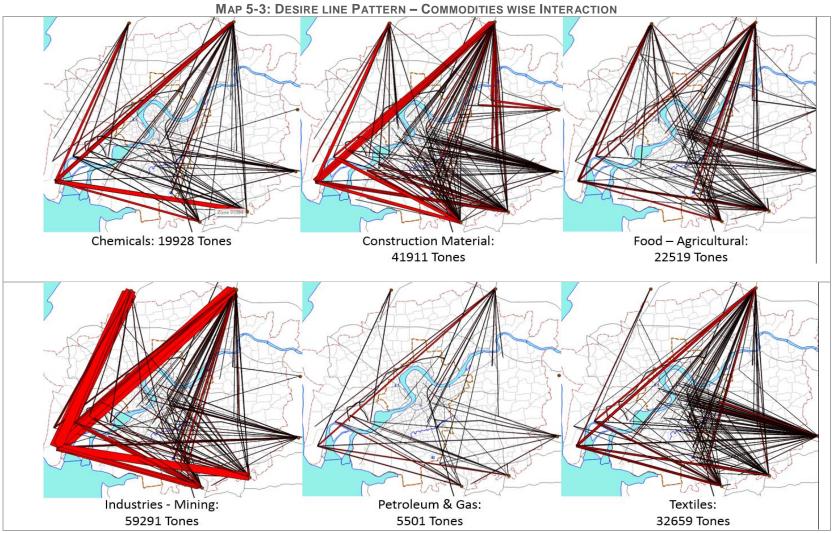
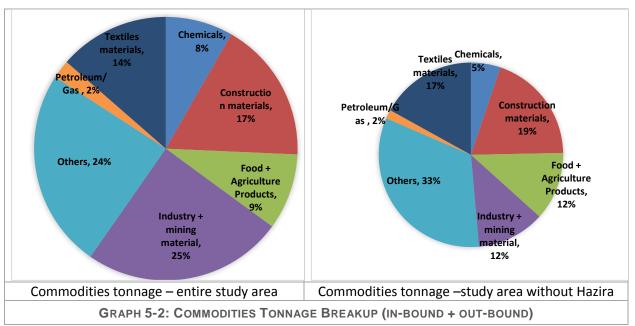


Table 5-2 and Table 5-3 show the incoming and outgoing commodities and their tonnage by cordon locations. It can be seen that of the total 2.4 lakh tonnes of commodities, 43% are from/to Hazira. Hazira has a port as well as industrial area, but it was seen that most of the commodities that interact with Hazira, do not have consumption in the study area.



Source: RSI, 2016

Graph 5-2: shows inbound and outbound tonnages (both ways) of commodities with respect to only Surat (without Hazira). The industry and mining material is the major commodity among the others which is highly interacting with Hazira and is not consumed in the rest of the study area.

Surat is well known for textiles industries which contributes about 14% of the total commodities tonnage within the study area (except Hazira). Other commodities such as FMCG (daily consumptions) —packaged materials, electronics and appliances, drugs and medicines, toiletries, garbage, automobile and their spare parts etc.—also form a significant portion of the quantum of the goods destined to Surat city.

Table 5-2 and Table 5-3 presents commodities tonnages and the direction with external locations.

Map 5-3: represents the desire line diagram of tonnage by commodity and the red band width signifies the quantum of commodities. As discussed above, desire line diagram shows that industries and mining materials are the major commodities that is coming from/going to the Hazira region. High quantum of textiles and food-agriculture products were seen interacting with the central part of the city. In the case of construction materials, the desire lines show interaction with the Hazira region as well as the city's central part.

5.5.2. Goods Vehicular Flows

Multi Axle Trucks (MAV) forms 44% of the total vehicular composition followed by trucks at 30%. External—External (E—E) trips which are not destined to the city are about 29% of the total goods vehicular trips. These trips predominantly pass through NH-8. Internal—External (I—E) and External—Internal (E—I) movements are more critical for managing the urban freight traffic as they contribute to 57% total goods vehicular trips. Around 15% vehicles were found to be carrying out Internal—Internal (I—I) movements.

TABLE 5-4: GOODS VEHICLES FLOW AND TYPE OF INTERACTION (No. of VEHICLES AND PERCENTAGE) 2016

Vehicles types	External- External	External- Internal	Internal- External	Internal- Internal	Grand Total
3Wh Goods	0 (0%)	817 (2%)	691 (1%)	1098 (2%)	2606 (5%)
LCV (4Wh Tempo)	1035 (2%)	3563 (7%)	3785 (7%)	2818 (5%)	11201 (21%)
Multi Axel Truck	8858 (16%)	6208 (12%)	6140 (11%)	2222 (4%)	23428 (44%)
Tractor	31 (0%)	92 (0%)	101 (0%)	145 (0%)	368 (1%)
Truck	5552 (10%)	4742 (9%)	4308 (8%)	1541 (3%)	16143 (30%)
Grand Total	15476 (29%)	15422 (29%)	15025 (28%)	7823 (15%)	53747 (100%)

Source: RSI, 2016

5.5.3. Truck Flows - Major Commodities

As discussed in the previous section, apart from tonnage of commodities, number of vehicles used to transport commodities is vital to estimate and analyse the direct impact of vehicular traffic levels in the study area. Industry & mining, construction material, textiles and chemicals are some of the major commodities that are being transported through trucks. The most critical observation drawn out from Table 5-5 is that about 28% vehicles (trucks) run empty within the study area.

TABLE 5-5: GOODS VEHICLE - MAJOR COMMODITIES CARRIED

Commodities	Out-bound Vehicles (MAV, Trucks, Tractors)	In-bound Vehicles (MAV, Trucks, Tractors)	Total
Chemicals	652 (6%)	625 (6%)	1277 (12%)
Construction materials	1059 (10%)	1473 (13%)	2532 (12%)
Food + Agriculture Products	637 (6%)	989 (9%)	1626 (8%)
Industry + mining material	2037 (19%)	1347 (12%)	3384 (16%)
Others	1570 (15%)	2088 (19%)	3658 (17%)
Petroleum/Gas	141 (1%)	231 (2%)	372 (2%)

Commodities	Out-bound Vehicles (MAV, Trucks, Tractors)	In-bound Vehicles (MAV, Trucks, Tractors)	Total
Textiles materials	1640 (16%)	1124 (10%)	2765 (13%)
Empty	2813 (27%)	3164 (29%)	5978 (28%)
Grand Total	10549 (100%)	11042 (100%)	21591 (100%)

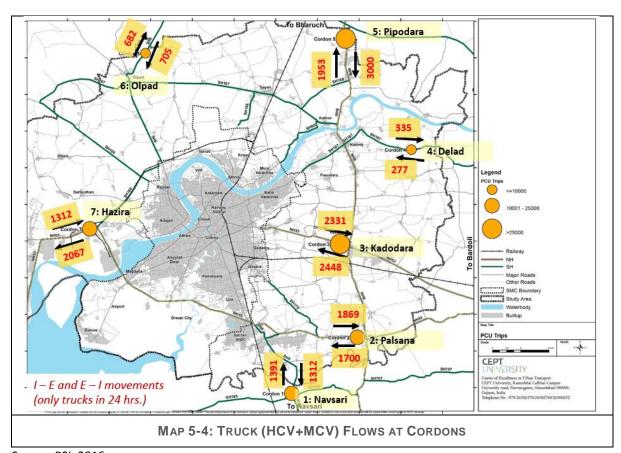


TABLE 5-6: TRUCKS MOVEMENT BY COMMODITIES AND CORDONS (ONLY I-E AND E-I FOR STUDY AREA)

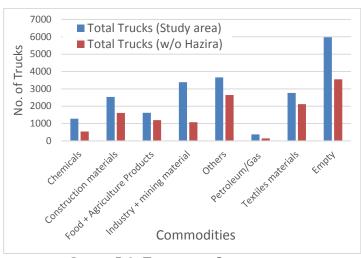
Cordon No.	Location Name	Chemicals	Construction materials	Food + Agriculture Products	Industry + mining material	Others	Petroleum/ Gas	Textiles materials	Empty	Total	% of trucks by commodities
1	Wada/ Navsari	136	463	153	509	400	50	219	773	2702	13%
2	Palsana	278	373	268	501	810	79	274	987	3569	17%
3	Kadodara	149	395	472	276	879	61	1536	1211	4979	23%
4	Delad		177	58	15	17			345	611	3%
5	Pipodara	328	589	442	484	1165	120	539	1286	4953	23%
6	Olpad	72	175	111	436	30	4	11	548	1387	6%
7	Hazira	315	361	123	1164	357	58	185	827	3390	16%
Gra	and Total	1277	2532	1626	3384	3658	372	2765	5978	21591	100%
	tal Vehicles by odities types	6%	12%	8%	16%	17%	2%	13%	28%	100%	

TABLE 5-7: TRUCKS MOVEMENT BY COMMODITIES AND CORDONS (ONLY I-E AND E-I FOR STUDY AREA WITHOUT HAZIRA)

Cordon No.	Location Name	Chemicals	Construction materials	Food + Agriculture Products	Industry + mining material	Others	Petroleum/ Gas	Textiles materials	Empty	Total	% of trucks by commodities
1	Wada/ Navsari	58	264	85	189	225	6	93	423	1342	10%
2	Palsana	116	255	185	291	576	17	138	616	2195	17%
3	Kadodara	124	391	462	182	819	51	1463	1003	4495	35%
4	Delad		177	58	5	17			345	602	5%
5	Pipodara	230	469	362	399	995	66	426	1113	4059	32%
6	Olpad	11	47	37	11	11	1		45	164	1%
7	Hazira		6	6	3	6			6	27	0%
Gra	and Total	539	1610	1195	1081	2649	142	2120	3550	12884	100%
	tal Vehicles by odities types	4%	12%	9%	8%	21%	1%	16%	28%	100%	

5.5.4. Goods Vehicular Flows - Vehicle Load

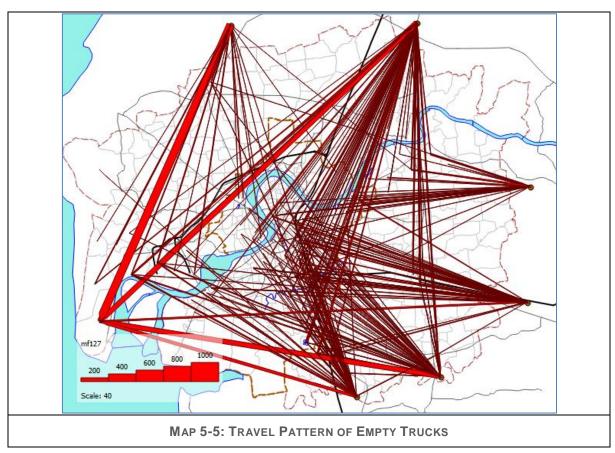
Empty run is a major issue and indicates inefficiencies in urban freight management. In Surat, about 28% of the trucks run empty. These origin/destination trucks have within Gujarat or the neighbouring region. There is some scope of reducing empty run by developing distribution centres outside Surat. Vehicles bringing vegetables, milk etc. to the city on a daily basis, generally return empty. Long distance trucks wait for a day or two to take back the load. The map below represents the travel pattern



GRAPH 5-3: TRUCKS BY COMMODITIES

Source: RSI, 2016

of empty vehicles; about 11% empty vehicles interact with Hazira whereas 17% interact with the rest of the urban area.



5.5.5. Vehicular Composition (I-E and E-I)

Map 5-6 represents the vehicular pattern of HCVs (Trucks & MAVs) and LCVs. HCVs are usually used for long haul movement which could be inter-city or inter-state. Hazira, being a port and a major SIR within the southern part of the state, appears to have a very high external freight interaction of HCVs, most of which come from the northern and southern part of the state. At present, all this traffic runs on NH-8 which connects Ahmedabad and Mumbai to Surat and on NH-6 which directly connects NH-8 to the Hazira port. Huge traffic from Ankleshwar and Bharuch come to Hazira on SH-6 via Olpad. Apart from Hazira, HCVs entering and exiting from Pipodara and Palsana have very high interaction with Sachin and Pandesara GIDCs and central part of the city (near Sahara Darwaja) has very high interaction with the Kadodara cordon.

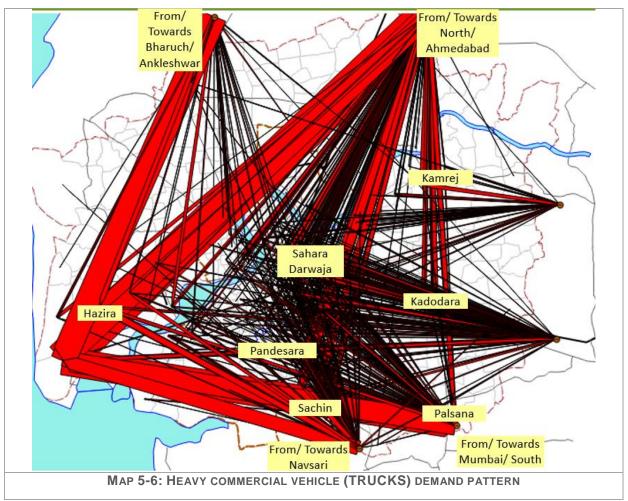
LCVs are generally used for short haul, for goods movement which may be inter-city as well as inter-district, mostly within the state. Looking at the desire line diagram in Map 5-7, major LCVs enter/exit from Pipodara, Kadodara, Palsana and Navsari and very less movement is observed from Olpad and Delad. Traffic coming from/going out from Pipodara and Palsana have very high interaction with Sahara Darwaja and the APMC area within the city.

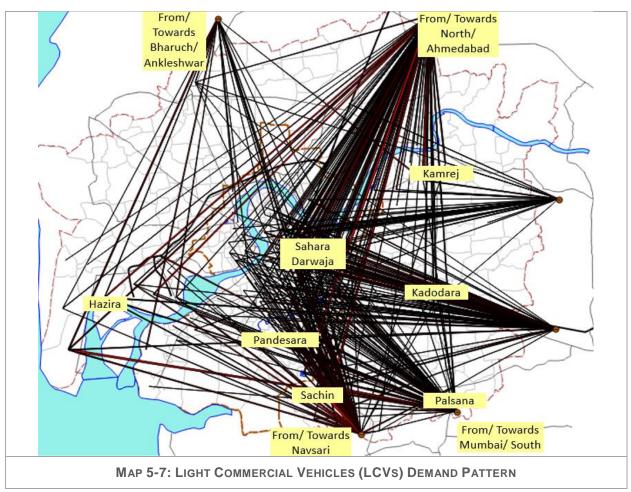
The table below presents the vehicular composition captured through the RSI and Cordon surveys. Trucks contribute about 75% of total vehicles; LCVs contribute about 25% of the total vehicles.

TABLE 5-8: VEHICULAR COMPOSITION AND TYPES OF INTERACTION 2016

Cordon No. and type of interaction	3Wh Goods	LCV (4Wh Tempo)	Multi Axel Truck	Tractor	Truck	Grand Total
1: Navsari	304	811	1459	2	1242	3817 (13%)
External-Internal	157	429	782	2	606	1977
Internal-External	147	382	677		635	1841
2: Palsana	187	1050	2209	55	1305	4806 (16%)
External-Internal	120	475	1047	30	623	2294
Internal-External	67	576	1162	25	683	2512
3: Kadodara	800	1922	1300	72	3607	7702 (25%)
External-Internal	444	966	726	35	1887	4058
Internal-External	357	956	575	37	1720	3644
4: Delad	0	118	294	49	269	729 (2%)
External-Internal		58	106	25	146	334
Internal-External		60	188	24	123	395
5: Pipodara	190	2909	2828	0	2125	8052 (26%)
External-Internal	77	1378	1748		1252	4454
Internal-External	114	1531	1080		873	3598
6: Olpad	15	288	1099	15	273	1690 (6%)
External-Internal	15	161	559		146	881
Internal-External		127	540	15	127	809
7: Hazira	12	249	3160	0	230	3650 (12%)
External-Internal	5	97	1240		83	1424

Cordon No. and type of interaction	3Wh Goods	LCV (4Wh Tempo)	Multi Axel Truck	Tractor	Truck	Grand Total
Internal-External	7	152	1920		147	2226
Grand Total	1508	7348	12348	192	9050	30447 (100%)
% of vehicles	5%	24%	41%	1%	30%	100%

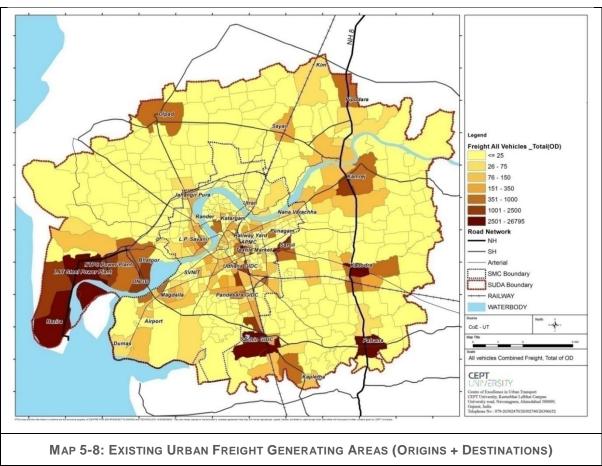




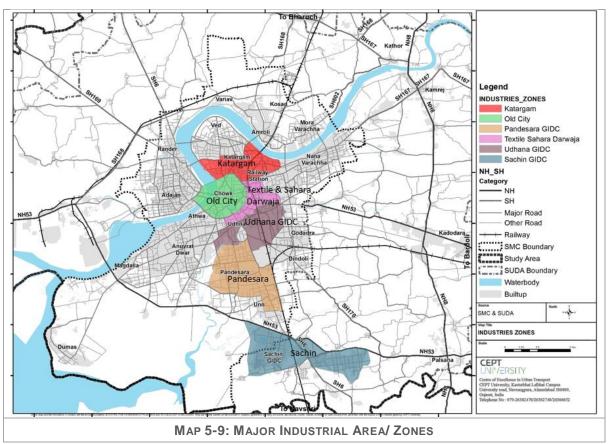
Out of 30,447 vehicular trips, 9918 trips (32.5%) belongs to Hazira which do not affect the urban area, remaining 20530 vehicle trips belong to rest of the study area.

5.5.6. Urban Freight Generators

The urban freight generators are the consolidated or individual endpoints that generate or receive freight flows. Their distribution over space determines the freight vehicle movement within the urban areas. They are the key points of production, consumption or distribution of goods. The major urban freight generating within study area are the APMC market, the textile market, Pandesara & Sachin GIDC, and they generate I–E and E–I trips.



Map 5-9 shows the industrial areas where most of the goods traffic oriented activities are located. Goods vehicles movement generated from these areas essentially impact the urban traffic, therefore it is important to understand their trends of I–E and E–I movements.



Source: CoE-UT, CEPT University

Table 5-9 represents the quantum of trucks movement in identified industrial areas. About 40% trucks only belong to Hazira port and SIR. The breakup below is only for the remaining 60%.

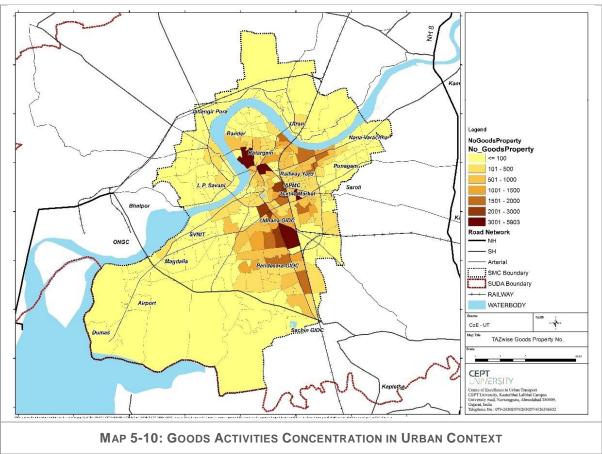
TABLE 5-9: TRUCK FLOWS IN URBAN CONTEXT

Industrial Area	Cordon 1: Navsari	Cordon 2: Palsana	Cordon 3: Kadodara	Cordon 4: Delad	Cordon 5: Pipodara	Cordon 6: Olpad	Total Trucks at Industrial Area
Katargam	0	43	233	18	58	0	352 (3%)
Old City	26	44	168	5	215	14	472 (4%)
Pandesara	133	201	160	15	309	11	829 (6%)
Sachin & adjoining	589	338	108	0	1359	1	2396 (19%)
Sahara Darwaja	54	218	960	0	496	1	1730 (13%)
Udhana GIDC	56	28	829	0	249	1	1164 (9%)
Rest of the study area	401	1230	1147	553	2467	142	5940 (46%)
Total trucks (Origins + Destinations)	1260 (10%)	2104 (16%)	3605 (28%)	592 (5%)	5153 (40%)	171 (1%)	12884 (100%)

More than 50% (of 12,884 trucks) of the trucks are interacting with the urban industrial areas. As presented in the map above, the entire central city area with Sahara and the APMC market and the belt of Sachin–Udhna GIDC including Pandesara GIDC, interact with external 6900 trucks every day. These industrial areas also generate a significant LCV traffic during the day time that has been analysed in the subsequent sections.

5.6. Internal Goods Movement

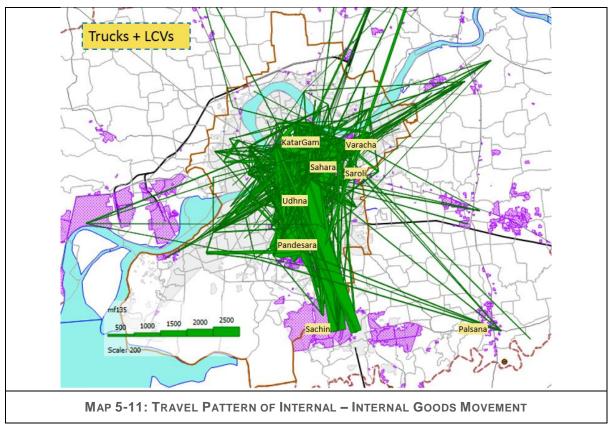
To estimate current employment and goods vehicle movement pattern within the city, activity surveys were carried out. These surveys helped in estimating internal—internal goods movement in the study area. There are about 3.62 lakhs non-residential (NR) properties within the SMC, which are categorised into 102 types of different usages by the Property Tax Department (SMC). Around 30 different types of usages were identified which can be associated with goods movement within the city. A total of about 3069 (0.85% sample size) NR properties were sampled. Out of the total surveyed properties, about 865 (28%) properties are associated with goods movement daily. During the surveys, their daily travel pattern of goods movement were captured along with their origin and destination, type of vehicles frequencies etc. The internal goods movement were observed to be of short distance, fewer in number and decentralised.



Source: Property tax department, SMC, 2016

These freight-generating activities are concentrated at the places where different stages of manufacturing process of goods/materials are involved. The map below represents the goods-

oriented properties concentration within the SMC. The Activity Survey data revealed that most of the I–I movement happens through the LCVs. The estimated internal–internal vehicle movement is about 2.69 lakhs vehicle trips, out of which 2.61 lakhs is by the LCVs and 0.08 lakhs trips by trucks.



Source: Activity Survey, 2016

5.6.1. Manufacturing Activity Clusters

The Gujarat Industrial Development Corporation (GIDC) established the following industrial estates in and around the city of Surat: Pandesara, Katargam, Sachin, Udhana and Hazira. Along with textile and diamond, there are other sectors in the city like petroleum, oil & gas, shipping, cement, metallurgy, paper, chemical, fertilisers etc.

1. Sachin GIDC

The Gujarat Industrial Development Corporation (GIDC) estate at Sachin occupies an area of 692 hectares and houses 2030 manufacturing units such as engineering works, textile and chemical industries and construction machineries. The major access road to the Sachin GIDC is the Surat–Navsari Highway. The estate is managed by the Industries Association, Sachin Industrial Cooperative Society Limited (SICSL). Sachin GIDC and adjoining areas generate an average of 2300 trucks every day (inflow–outflow).

2. Udhna GIDC

In 1955, GIDC constructed its second industrial estate in Surat at Udhna. Udhna is host to more than 700 major and 6000 small scale industries of textile, chemical, pharmaceutical and metal. Some industries run in 24 hour shifts. The major access road to the Udhna GIDC is the Surat-Navsari highway. Udhna GIDC generates an average of 1160 trucks every day (inflow-outflow). Khatodara GIDC and Udhna Udhyognagar Sangh are also major industrial estate within the Udhna GIDC.

1. Katargam Industrial Estate

The third GIDC estate in Surat was constructed in Katargam. The estate occupies an area of 38.33 hectares, consisting of 837 industrial units specialising in textile, knitting, diamond, dyes & chemicals, machinery & related components. The major access road to the Udhna GIDC is the Surat–Navsari highway. The Katargam industrial area attracts around 350 trucks every day (inflow–outflow).

2. Pandesara Industrial Estate

The Pandesara Industrial Estate is spread over 219.58 hectares and is one of the largest industrial estates, housing 785 industrial units. While there are a few large scale units, most of the units are small and micro units for textile production, dying and printing, art silk, machinery and components, chemicals, paints, plastics and rubber units. On an average, the Pandesara estate attracts over 830 trucks every day (inflow—outflow).

3. Hazira

Hazira is spread over an area of 167 sq. km. It is a major industrial estate located within the SUDA limits. The Magdalla light range port, which also includes captive jetties of M/S ESSAR, RIL, L&T, GACL and KRIBHCO, provides sea connectivity to the region. The Hazira region accommodates 20 large and medium sized industries. The major commodities transported from Hazira are petroleum, chemicals and construction machineries units. Few other commodities being produced are polymer, heavy engineering products, gas, LPG bottling, steel foils, ammonia, food and agriculture processing units etc. The major access road to the Hazira is SH-168. The Hazira estate, on an average, caters to 8500 trucks every day (inflow—outflow).

5.6.2. Wholesale Trade Activity Concentrations

There are a few major wholesale trading markets in Surat. These wholesale and semi-wholesale markets generate large vehicular movement and impact the overall mobility in the city. The APMC market, road-side vegetable market and New Bombay textile market are located along the Ring Road near Sahara Darwaja which results in long queues and congestion along the abutting road. The market activities usually encroach the carriageway resulting in reduction of road space for traffic. Apart from these godowns located near Parvat, Puna and Saroli Kumbhariya highways also adds to traffic congestion in the area.

1. APMC

The Agricultural Produce Market Committee (APMC) was established in 1951. It is located along the Kadodara Road near Sahara Darwaja and caters to Surat city and 47 nearby villages. The market serves as the main distribution centre from where the vegetables are sold to semi-wholesale/retail markets. The market operates for 24 hours. At present, there are 529 units and 70% of the vegetables are

distributed within the city. Daily average arrivals of vegetables are about 25,000 quintals. The average inflow-outflow of trucks in the APMC zone per day is about 800-1000. No major issues due to goods vehicles' parking or congestion were seen within or outside the market premises.

2. Textile market

The Federation of Surat Textile Traders Association (FOSTTA) was set up in 1984 with the objective of regulating and managing the textile market. There are around 165 market buildings and 65,000 wholesale agents, mostly concentrated along the Ring Road and within its influence area near Sahara Darwaja. The entire parking is below the flyover and loading-unloading activities take place on the Ring Road, below the flyover and inside the 6 meters of yellow belt which the SMC has provided on the roads. During peak hours, due to loading and unloading of the goods, the entire 2 km stretch from Mann Darwaja to Sahara Darwaja becomes very congested.





FIGURE 5-2: PARKING DONE BY GOODS VEHICLES

Source: Apparel Online Magazine

Textiles Industries in Urban Freight

Surat being the textile hub of the country, leads to generation of significant goods movements. The textiles manufacturing process involves several stages, requiring goods flow from one place to another for its processing. Textiles industries (all stages of the manufacturing process) contribute to around 38-40% of the goods vehicle trips. Most of the chemical and engineering industries within Surat are also associated with the textile manufacturing process. Out of the total goods vehicle trips, trucks (HCVs and MCVs) contribute only about 7%.

Surveys	Activity Surveys	RSI and Cor (Study area	Total	
Type of Interaction	Internal - Internal (within Urban Area)	Internal - External		
Total Goods Vehicles	269122	9819*	12884*	291825
Trucks (MCVs, MAVs)	8041	5845	7039	20925 (100%)
LCVs	261081	3974	5845	270900 (100%)
Textiles Total Vehicles	108595	1501	1774	111869
Textiles: Trucks (MCVs, MAVs)	3487	1198	921	5607 (32%)
Textiles: LCVs	105108	303	852	106263 (40%)

Surveys	Activity Surveys	RSI and Cordon Surveys (Study area w/o Hazira)		Total
Type of Interaction	Internal - Internal (within Urban Area)	Internal - External	External - Internal	Total
% of Textiles Vehicles	40%	15%	14%	38%
* Includes empty vehicles.				

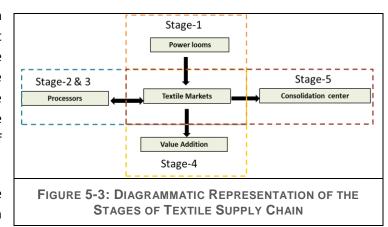
Source: Activity Survey, 2016

Out of total trucks movement within the study area (w/o Hazira), textile trucks contribute about 32% and LCVs used for textile contribute 40% (refer Table 5-10). Apart from the textile sector, other sectors such as FMCG, engineering, chemicals and other categories of goods range from 2–10% each and are very diversified and dispersed across different parts of the city.

5.7.1. Textile - Supply Chain Analysis

As textiles contribute 38–40% in overall goods vehicle trips, it becomes essential to understand the supply chain of textiles in detail. The whole process is divided into five stages. Figure 5-3 and Figure 5-4 give a diagrammatical representation of the various processes.

Stage 1: From northern cordon of the city, raw material in the form of yarn reaches the power looms situated in



Surat. This yarn is processed in the power looms to produce greige cloth. This greige cloth is then sent to the textile market for further processing or it is transported outside the study area. In this stage, the predominant modes of transport are HCVs and MCVs.

Stage 2 and 3: Once the greige cloth is received in the textile market, it undergoes various physical quality checks. It is then dispatched to the processors for dyeing and printing activities. Then the processed fabric, for a second time, is sent to the textile market for physical quality checks. Here the transportation of the fabric takes place through LCVs.

Stage 4: The processed fabric from the textile market is sent to various small scale value addition units scattered across the city or it is transported outside the study area. As the name suggests, value addition units add value to the processed fabric in the form of embroidery, zardozi work, lace work etc. The value addition units are generally home based manufacturing entities. Once the value addition work is done, this fabric is sent back to the textile market for another quality check. Since the quantum of fabric sent to the value addition units is very small, the transportation takes place predominantly on two-wheelers.

Stage 5: In this stage, the processed and value added fabric, after undergoing physical quality checks at the textile market, is dispatched to the consolidation centre. From the consolidation centre, the finished textile is distributed outside the study area via HCVs and MCVs.

In this whole process, it should be noted that, at various stages of the supply chain, the fabric is repeatedly sent back to the textile market for quality checks. These back and forth movements results in significant empty vehicle trips, i.e. estimated about 28–30%. There is about 1.1 lakh estimated goods vehicle trips which results in 8.2 lakh vehicle km within the study area.

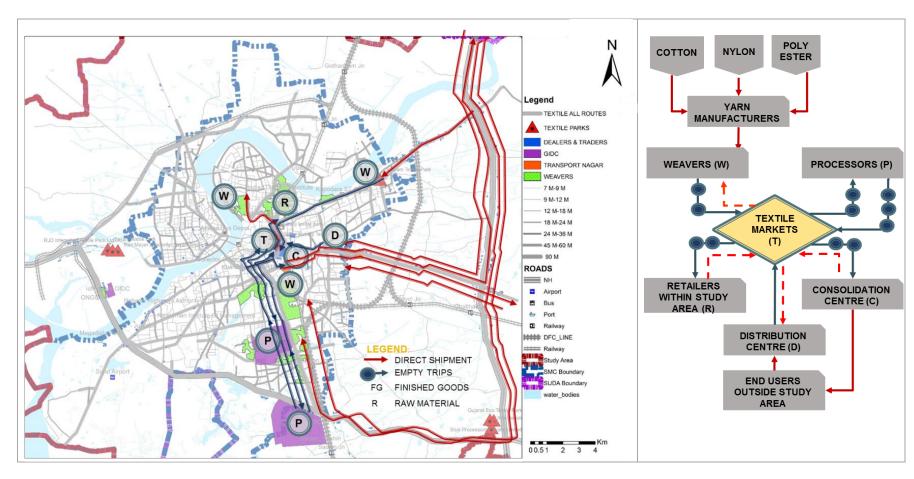


FIGURE 5-4: SUPPLY CHAIN FLOW OF TEXTILE

Source: Freight Project Studio 2017, MURP (Transport) Students

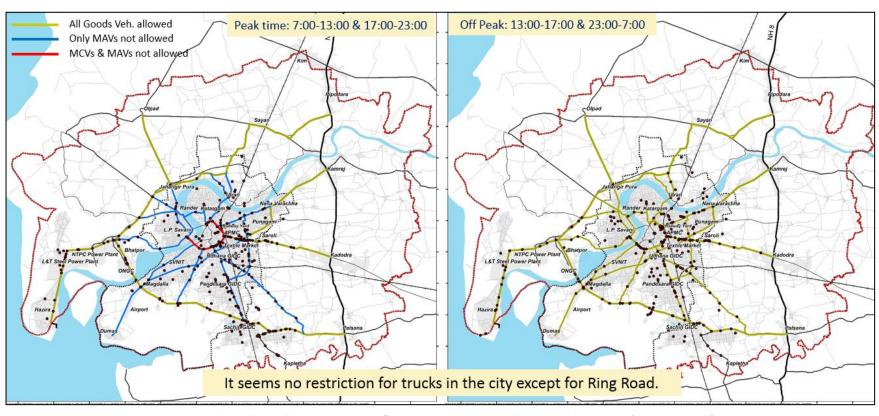
5.8. Externalities to Urban Freight

The discussion above indicates that there are several areas of concern with regard to freight mobility in Surat. The freight flows have direct as well as indirect impacts. These impacts are discussed in the sections below.

5.8.1. Urban Freight and Road Safety

The urban freight corridors can cause safety hazards in urban areas. Due to the large size and load of the vehicles, the severity of accidents generally tends to be very high. Most accidents due to trucks are fatal. Poor design and maintenance of streets, lack of footpaths, signages etc., are some of the causes of the accidents. To understand the trends and patterns of accidents, both fatal and serious accidents, were mapped (refer Map 5-7).

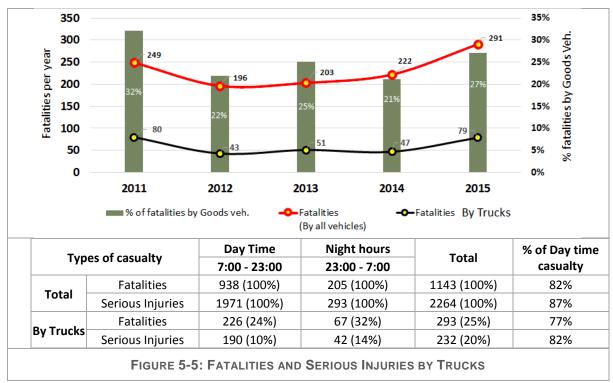
The road traffic accidents due to goods vehicle since 2011 to 2015 have been analysed to understand relation with freight movement in the city. Accident data has been analysed along with the goods vehicle restriction time. As described in the section above, MCVs (up to 13 ton capacity) are allowed at all the times in the city on all roads except for the Inner Ring Road, and HCVs (MAVs, above 13 ton capacity) are allowed on all the major urban roads except Ring Road as per time zones mentioned in the maps below. Accidents caused by MCVs and HCVs have been plotted on the map below; according to time restrictions for MCVs and HCVs, it seems that even though there is time restriction, there is not much difference in the number of accidents that occur by different time zone on various corridors.



MAP 5-12: FATALITIES AND SERIOUS INJURIES BY FREIGHT VEHICLES (2011 - 2015)

Source: Service Level Benchmarks in Urban Transport for Indian Cities-Round 2, MoUD, CoE- UT CEPT, 2016

The time restriction information indicates MCV movement within the city is allowed during most times of the day, resulting in increased conflict of freight with private vehicular and pedestrian movement thereby adding to more fatalities. About 24% of fatalities and 10% of serious injuries happen because of trucks (HCVs and MCVs); however, the average proportion of trucks in total traffic is observed to be only about 5% during the day. Similarly, fatalities and serious injuries by LCVs are 8% and 4% respectively while its vehicular composition is about 4% in the traffic.



Source: Service Level Benchmarks in Urban Transport for Indian Cities-Round 2, MoUD, CoE- UT CEPT, 2016

Fatalities can be interrelated with vehicle kms. Based on the OD data collected, vehicle km has been calculated for private vehicles and trucks (MAVs and MCVs). Overall fatality rate per lakh vehicle km (all modes) is 0.84 whereas fatalities by trucks are 7.06 per year per lakh truck vehicle km which seems very significant.

5.8.2. Urban Freight and Environment

Transport and its impacts on the environment is a major concern. Vehicular emissions such as CO_2 , $PM_{2.5}$, NO_x and CO are very harmful to human health. Their effects are as presented below:

TABLE 5-11: EMISSION AND ITS HEALTH IMPACTS

Pollutant	Health Effects	
Carbon monoxide (CO)	Affects the cardiovascular system, exacerbating cardiovascular disease symptoms, particularly angina; may also particularly affect foetuses, sick, anaemic and young children, affects the nervous system, impairing physical coordination, vision and judgments, creating nausea and headaches, reducing productivity and increasing personal discomfort.	
Nitrogen Oxides (NOx)	Increased susceptibility to infections, pulmonary diseases, impairment of lung function and eye, nose and throat irritations.	
Sulphur Dioxide (SO2)	Affects lung function adversely.	
Particulate Matter (PM2.5)	Fine particulate matter may be toxic in itself or may carry toxic (including carcinogenic) trace substance, and can alter the immune system. Fine particulates penetrate deep into the respiratory system irritating lung tissue and causing long-term disorders.	
Source: Chetana Khandar and Sharda Kosankar, A review of vehicular pollution in urban India and its effects on		

human health

For base year 2016, emissions from private vehicles and goods vehicle have been estimated. As explained in the sections above, from RSI and activity surveys, all goods vehicle trips for the study area and their origin-destination are available by its mode of vehicle. To estimate the total emissions, emission factors⁵ have been adopted from the CMP toolkit prepared by the MoUD, GoI in 2014. Goods vehicle in the study area contributes about 15% of the total PCU demand (private vehicles + goods vehicles) and in terms of vehicle km, it contributes nearly 10% of the total.

TABLE 5-12: EMISSIONS FROM GOODS VEHICLES & PASSENGER VEHICLES

Base year 201	6	Total Emissions (in tons per day)			<i>(</i>)
Modes		PM _{2.5}	NOx	со	CO₂
Pass. Vehicles		1.40 (60%)	5.20 (22%)	35.66 (69%)	1688 (57%)
Goods Vehicles		0.92 (40%)	18.11 (78%)	16.37 (31%)	1257.61 (43%)
	HCV	0.51	16.10	10.55	500.00
	LCV	0.41	2.01	5.83	757.61
Total		2.31(100%)	23.31 (100%)	52.04 (100%)	2946 (100%)

Source: CoE- UT, CEPT University

Among the total goods vehicle, HCVs contribute about 7% whereas their contribution to CO₂ emissions is about 40%, which is quite significant.

⁵ MoUD, GOI, Comprehensive Mobility Plan Toolkit (Revised – 2014), pg. 99

5.8.3. Land Use Conflicts

Surat city has grown very organically, so the location of activities has happened incrementally over the years. The city has a mixture of wholesale market, commercial, informal activities, residential areas etc. and with the passage of years, the suitability of each location with respect to land use has resulted in conflicting situations. Firstly, the block size of the city is large; the land parcels have mixed wholesale trade, residential and office uses. Most of the activities are concentrated in the core area and along the Ring Road. The interaction between wholesale trades, industries are high leading to increased demands of freight movements. Besides the main railway station and regional bus station, there are two major wholesale markets that are located in the core area. Accumulation of these in the city centre has turned this zone into a traffic hotspot. This zone is congested because of high volume of movement of vehicles, passenger and goods, motorised and non-motorised. The problem gets compounded due to haphazard parking, loading-unloading of goods, bus parking, auto-rickshaw parking. There is a loss of comfort to the road users and there are significant impacts on the air quality. Contrasting activities such as the markets and other freight generators, the vehicular movement, parking have slowly led to the deterioration of the environment quality in the area. Managing freight movement and encouraging wholesale markets and industries to move on the outskirts of the city may help manage the issues better.

5.8.4. Congestion

Though the city has imposed partial time restrictions on heavy and medium commercial vehicles, congestion on the streets can be seen due to internal—internal movement of goods vehicles. The overall proportion of goods vehicle is about 15% of the total PCU demand. This number, though a small proportion, in terms of absolute numbers, is quite significant. Moreover, due to on-street parking and loading—unloading activities, the movement of vehicles is difficult along all major markets and industries. Due to loading—unloading activities of goods from trucks which takes place below the Ring Road flyover, the safety of the labourers is compromised while crossing the Inner Ring Road.



FIGURE 5-6: LABOURER CROSSING ROAD



FIGURE 5-7: LOADING UNLOADING OF GOODS BELOW FLYOVER

5.8.5. Industrial Areas and Parking Management

Manufacturing areas attract significant truck traffic. There are large chunks of the industrial estate in the city itself. The critical aspect is the access. All the industrial areas are well connected through the Surat–Navsari Road, Hazira-Sayan, Kadodara and the connecting radials. All the industrial estates/areas do not have sufficient freight handling infrastructure, such as loading—unloading bays, parking area, warehouses, transporters' offices etc. Loading and unloading takes place on the road side and is largely dependent on availability of labour and parking. Parking happens on the Ring Road (below the flyover) and the inner streets disturbing the quality of life in the nearby residential areas.

5.9. Summary

Surat is the hub of manufacturing and wholesale trade. Urban freight movement in Surat city happens on a large scale. High volume of goods vehicles i.e. 2.8 lakhs vehicle trips have been recorded within the study area.

The issues faced include safety, pollution, congestion, parking issues, land use conflicts etc. which have been discussed at length in the sections above. Transporters and truckers also suffer on the account of unorganised freight management because it increases their empty vehicles trips. The absence of transport terminal/logistic hub with planned infrastructure facilities available add to the misery.

Surat has a huge textile industry that contributes about 39% of goods vehicle movement. After understanding the supply chain flow, it can be noted the textile manufacturing process is complex and has different stages. For these stages, textile commodities has to travel back & forth within the city many times as the locations of power looms, process units and consolidation centres are in three different parts of the city. This results in inefficient and unproductive vehicle trips causing safety issues, pollution and increased costs for the textile industry.

Another issue is of non-adherence of traffic rules and regulations as a result of which unauthorised parking in the city creates traffic woes, especially in the textile market area. It is important to tackle these issues and in this regards it is seen that strategies focused around information education and communication (IEC) activities become imperative.

CHAPTER-6

Issues, Challenges and Public Priority in Surat

6. Issues, Challenges and People Priorities

This section summarises the issues and challenges for mobility from the data analysed along with the stakeholder surveys carried out through online consultation and stakeholder workshop.

6.1. Issue Identified through Existing Situation Analysis.

6.1.1. Managing Growth

Surat city continues to be relatively compact, with 88% of the estimated population of 5.9 million in year 2016, residing within the municipal area. The growth pattern analysis in the city suggests infilling within the municipal area, along with some developments towards the Sachin industrial area in the south and along the National Highway towards Palsana, Kadodara and Kamrej towards the east. The movement between these industrial nodes and Surat is expected to increase in the future as the Development Plan is proposing to move the problematic polluting industries outside the city limits. Structuring the growth in the region in such the way that the urban area remains compact would be one of the major challenges

The average trip length for Surat is 5.01 km which is short mainly due to the land use distribution, density and network pattern. Opportunities for ensuring compactness of the urban structure need high priority along with planning of integration between different transports modes. If we observe the trip rates in Surat, it is seen that the motorised trip rate is about 0.96. The change in the trip patterns in Surat also needs to be kept under consideration since the proportion of the non-compulsory trips is on the rise.

With the new economic development centres like industrial areas being planned in the vicinity of Surat, connectivity to these areas will also need to be looked into and options of connecting these through rapid transit mode will be a bigger challenge that Surat is up against in view of the high income levels.

6.1.2. Inadequacies in Road Network

The road network in the city is incomplete with missing links and hierarchy in many places which leads to issues of congestion in the city. Apart from this, inconsistent RoW also results in traffic bottlenecks in the city. Surat is constrained due to the presence of river, canal, khadi and railway line as connectivity across these barriers for efficient mobility in the city is important. Encroachments by the informal sector is another reason which leads to inadequacies in the network, as per the Inventory survey conducted for major rings radials and the bus route network roads (total network 771km) it was found that almost 42 km of the network is encroached by street vending activities and 155 km by parking making the usable carriageway inadequate.

6.1.3. Congestion

Traffic congestion in Surat is high, traffic levels have increased almost 2.5 times in the last 10–12 years. Rapid rate of motorisation has led to very high congestion levels especially in the core city areas. Traffic jams are seen on the major roads during morning and evening peak timings, particularly on the inner

ring road, Katargam Amroli road and the Mota Varachha road. It is also observed that volumes exceed capacities at most of the places.

If we look in terms of speed, it is seen that the average private vehicle speed is around 30 km/hour which has not changed since 2012. However, the speeds for public transport has reduced from 24 km/hr to 22 km/hr. This has reduced further on the inner city network in Surat where the speed for both private and public modes has reduced to below 15 km/hr.

The analysis of traffic composition also reveals that two-wheelers dominate the roads in Surat. Two-wheelers contribute to 67% of the vehicles in the traffic, four-wheelers and three-wheelers add another 28% while public transport vehicle are almost non-existent with only 1% of the share. Even though presently the use of car as a mode does not form a significant number, with the growth in the economy and increase in the purchasing power, this rise could be significant in the future and can lead to severe clogging on the roads.

6.1.4. Safety

Accidents have high economic and social cost. Occurrence of accidents is an outcome of the interplay of a number of factors, which includes length of the road network, vehicle population, human population and adherence/enforcement of road safety regulations among others.

As per 2017 figures, there are 257 road fatalities per year. About 43% of road fatalities involve pedestrians, followed by 40% of two-wheeler users and 4% cyclists. Thus, about 47% of fatalities are attributed to non-motorised travel. In terms of the causal modes for accidents, it is seen that 25% of the fatal accidents are caused by trucks followed by 4-wheelers (16%) and 2-wheelers (11%).

It is observed that adherence to traffic rules and regulations is another factor that results in high accident rates. Rash driving, no helmet, mobile phone use, over speeding and wrong side driving are some of the factors that can result in these accidents, these are further aggravated due to lack of knowledge or ignorance of people on such issues. Hence, the traffic police needs to look into information education and communication activities.

It is also observed that the concentration of the fatal accidents in Surat city is along the inner ring road and the industrial corridors towards Pandesara—Udhna till Sachin GIDC area. The presence of incompatible land uses like residential and industrial area in the city has resulted in high movement of goods traffic and conflict arising between passenger and freight movements.

6.1.5. Lack of Public transport

The mode share of PT in the city is still very low and this can be attributed to the non-existent PT system in the city till recently. This coupled with increasing income levels in the city has resulted in increased usage of two-wheelers. Increased transit supply during the past two years has shown slight improvement in the transit share. A good and quality PT service needs to be put in place to enhance the role of transit further. With the increase in the population in the city, it is also essential that a multimodal transit system is planned well in time before the congestion and traffic snarls become unmanageable.

Seventy-five per cent of the trips in Surat city are work and education related and hence, providing good PT services, connecting work and education areas will be crucial. Along with this, long term planning for connecting new developing areas with efficient public transport will also need attention.

6.1.6. Uncontrolled Parking

Despite the city's efforts in dealing with parking issues, it has become one of the major concerns for Surat, with around 47.5% of the effective road space lost to parking. Due to high concentration of commercial activities, areas especially in the central zone suffer from road encroachments and reduction in the carriageway space, thereby reducing speeds and creating bottlenecks. The demand for short term parking is high in this area. The city has taken up the parking issue seriously and has drafted a parking policy but its success would depend on strict enforcement measures being in place.

Another aspect is the multiplicity of organisations that are involved with traffic management Municipal Corporation; Traffic Police as a result of which coordination between the agencies also create issues of jurisdiction.

6.1.7. Environment

The pollution levels in the city are lower than most of the Indian cities. However, the there is still a high percentage of RSPM and SPM present in the city when benchmarked against the standard norms set by the CPCB. The CO₂ emissions from the transportation sector are on the rise due to rapid motorisation in the city. As mentioned before in section 3.5 of the total 96,000 auto rickshaws in the city about 85% run on CNG however, the rest also needs to be converted as they run on petrol and in some cases kerosene which leads to high pollution. If we are not able to contain the number of vehicles on road, with rapid pace of urbanisation and increasing trip lengths, this situation is expected to worsen in the future.

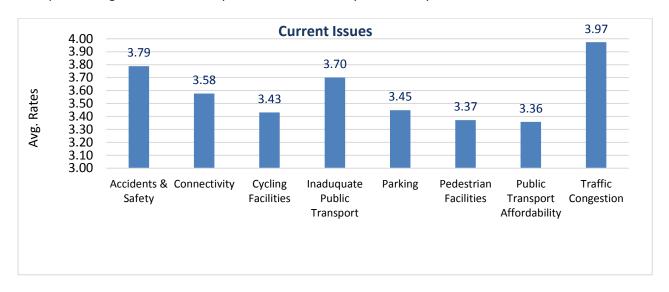
An Integrated Traffic Management System (ITMS) is proposed as a pan City initiative under Smart city mission, whereby the primary goal is to utilize information technology to modernize key functions of Traffic management, Traffic control, Traffic Law enforcement and Traffic information dissemination in the city to build a safer city with smooth traffic flow and inform road users of its status. ITMS consists of implementation of Adaptive Traffic Control System (ATCS), Traffic Enforcement System, Traffic Surveillance System, Variable message and speed control sign board system, Emergency call box system (ECB) and E-Challan system. This system will ensure efficiency of traffic movement in the city thereby resulting in reduction of GHG emissions. The functioning of a good ITMS will require the integrated effort between the police, Surat Municipal Corporation (SMC) and Regional Transport Office (RTO).

6.2. Issues and Priority areas Identified through Stakeholder Consultations

Two rounds of stakeholder consultation were carried out as a part of the CMP. The first one was in the form of an online survey initiated through the SMC website and on social media in June 2017 and the second round in the form of a city workshop on 22 January 2018. Apart from this, a series of

meetings and presentations were also made to the SMC and the SUDA regarding the Plan. This report summarises the findings from both the online survey carried out along with the city workshop.

As per the results analysed, traffic congestion, accident and safety along with inadequate public transport emerged as the most important issues faced by Surat today



GRAPH 6-1: ISSUES IDENTIFIED BY STAKEHOLDERS

Source: Online Consolation SMC website, June 2017

In terms of the priority areas for Surat CMP 2046, safety, efficient mobility and seamless connectivity were outlined as key expectation areas.



GRAPH 6-2: EXPECTATIONS OF STAKEHOLDERS FROM THE CMP

Source: Online Consultation SMC website, June 2017

The Stakeholder consultation workshop also indicated similar priority areas for improvement. Participants were asked to rate the priority areas for CMP 2046. The results were evaluated on a scale of 0–5, with 5 being the highest priority, 1 the lowest priority and 0 for don't know.

In response to the first question on what the priority areas for CMP 2046 are, reducing congestion and air pollution along with managing parking areas emerged as the priority areas along with a focus on public transport systems, safety and walkability.

After the evaluation of the feedback, the following were the highest and lowest priority areas:

Highest Priority Area	Lowest Priority area			
Reducing the air pollution	Improving cycling infrastructure			
Reducing the congestion	Manage and improve intermediate public			
Managing the parking	transport (Auto Rickshaw)			
	Manage freight vehicles			

	Sr. No.	Parameters	Ratings
1	1	Reduce Air Pollution	4.38
	2	Reduce Congestion	4.30
	3	Manage Parking	4.30
	4	Improve Public Transport Accessibility	4.29
	5	Improve walkability	4.27
	6	Improve transport Safety	4.17
	7	Improve Public Transport Quality	4.17
2	8	Reduce Travel Time	3.99
	9	Extend Public transport Infrastructure	3.99
	10	Reduce GHG Emissions	3.87
3	11	Improve Mobility Options for Citizens	3.83
	12	Improve cycling infrastructure	3.78
	13	Manage and Improve Intermediate Public Transport (Auto Rickshaw)	3.75
	14	Manage Freight Vehicles	3.63

FIGURE 6-1: PRIORITY AREAS FOR CMP 2016

Source: Stakeholder Workshop, January 2018

Participants were asked to suggest if separate funds should be created for financing different transport initiatives. The majority of the participants, about 87%, felt the need to have a separate transport fund, whereas 7% of the participants were against any such intervention and 5% were not sure if there should be any such provision.

6.3. Summary

Meeting the demand of rapid urban growth coupled with motorisation and the changing trends of travel pattern in Surat are going to be the major issues for the city. Improving connectivity by completing the network and adding the missing links is needed for the efficient movement in the city. Congestion has emerged as an overall area of concern which would have implications on pollution. Parking and the depleting pedestrian and NMT share in the city has also been highlighted. Dealing with these challenges would require an integrated approach with both demand and supply side strategies being explored. Public transport will be crucial for future mobility in the city and hence, integrating land use and transport will hold the key for efficient, people-centric, sustainable and affordable mobility.

The success of the strategies adopted will also depend on the change in behaviour of people especially adherence to traffic rules and regulations and hence, information, education and communication will certainly play and important role in the overall success of these measures especially towards reduction in the road accidents.

CHAPTER -7Growth Dynamics

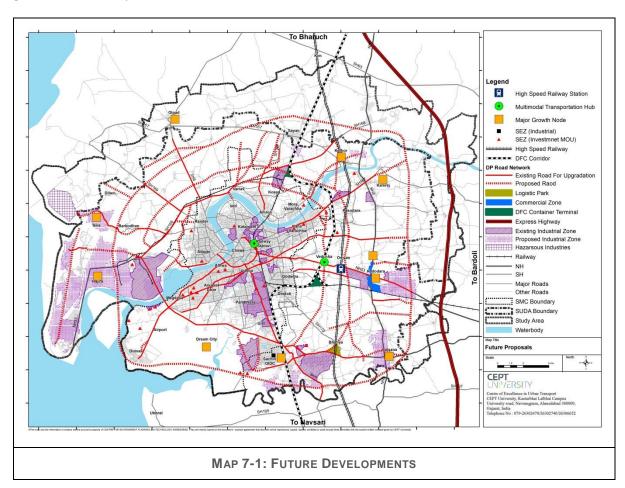
7. Growth Dynamics

7.1 **Growth Direction**

In Surat, growth in the region is more towards the southern and eastern side, owing to the fact that a lot of industrial development is taking place near Sachin, Kadodara and Kapwada. The revised development plan of Surat has identified nine growth nodes. Of these, Kamrej and Olpad (though now outside the new boundary of the SUDA) are envisaged as residential nodes, while Kadodara, Palsana, Sachin, Tena and Hazira are envisaged as primarily industrial nodes. Apart from these, Dream City, Kathor, Amboli, Kansad and Kamrej are identified as nodes for economic activity. The revised development plan has also identified areas for residential development in the vicinity of the SMC area and along the 90 m ORR. Dream City, which is being proposed towards the south of Surat, is expected to have a high concentration of employment in the region and hence it will be important to have good connectivity to this area in the future.

7.1.1 Proposed Future Development

The following presents the proposed developments which are likely to have an impact on the spatial growth of Surat city:



The Dedicated Freight corridor (DFC) passing through the region along with the Delhi–Mumbai Industrial corridor (DMIC) is expected to trigger huge investment and growth in the near future. An industrial growth region zone has also been identified in Surat as part of the recent Development Plan 2035. As a part of the proposal, an industrial belt has been identified towards the west of the SMC, connecting the industrial location in Hazira to the DFC corridor near Gothan. Along with this, an industrial corridor along the broad-gauge railway line near Gothan—Kosad has also been proposed.

A high speed rail corridor between Ahmedabad and Mumbai is also expected to pass through the study area, with a station at Surat. Though the alignment for the same has not been made available, it is expected to pass between the ORR and the NH-8 along the Kadodara Highway parallel to the DFC corridor in that section.

The Vadodara Mumbai Expressway is also proposed to pass along the eastern side of the study area, just outside the SUDA limits but within the study area.

The SUDA has declared Pandesara GIDC, Udhana GIDC, Khatodra GIDC, Udhna Sangh, Katargam GIDC and Navagam GIDC as industrial zones. SEZs were also proposed in Sachin GIDC (SURSEZ Diamond & Gem Development Corporation) and Vanj GIDC (Surat Apparel Park Gujarat Industrial Development Corporation). Apart from these, the GIDC has also developed the Hazira Special Investment Region.

The proposed Draft Development Plan 2035 aims to formulate an efficient and inclusive development of the SUDA region. Some of its salient features are as follows:

- Population is expected to reach 110 lakh by the year 2035. Hence, land use categorisation is framed with a view to accommodate an additional 60 lakh population.
- Major growth nodes have been identified to accommodate development, namely Olpad, Kathor, Kamrej, Kadodara, Palsana, DREAM City, Sachin, Hazira and Tena.
- Increase in percentage of urbanised land from 289 sq. km in the year 2015 to 787 sq. km.
- Total residential area proposed is 358 sq. km, which accounts for about 47.89% of the total urbanised area proposed.
- Existing hazardous industries within Surat city area, measuring about 4.3 sq. km, are proposed to be shifted to the newly added Pinjarat village. Total area proposed as industrial zone is 136 sq. km.
- A 'Dream City' is being planned to provide a global trading platform to the diamond traders. The Dream City will be developed as a smart city which would help in developing skills in the diamond sector. The zone is proposed in one part of Khajod village.
- A new commercial zone has been proposed in Chaltan village, near NH-8, which has a potential
 to be developed as a commercial centre for the APMC. Total commercial zone proposed in the
 Development Plan 2035 is 12 sq. km, accounting for about 1.50% of the total urbanised area.
- A 90 m wide Outer Ring Road (ORR) has already been proposed for Surat city. A new Regional Ring Road of 120 m width and 116 km length in the SUDA area, acting as a gateway for traffic towards Mumbai and Ahmedabad, has been proposed. Another 60 m wide ring road is

proposed between the two ring roads to accommodate the proposed residential zone. All three ring roads are connected to the growth nodes and other major city centres through a network of major radials of 90 m, 60 m and 45 m width.

 Other major proposals include the development of a multimodal transportation hub at Surat Railway Station etc.

The issues stated above would result in inefficiency in the road network, hence, to improve the same an alternative network is proposed as a part CMP.

7.2 **Population Projections**

The Draft Development Plan (DP) prepared for the year 2035 has already projected the population for the years 2021, 2031 and 2035. As the study area is the same as in the Development Plan, the population of the study area for the intermediate years of 2021, 2031 and 2035 has been taken from the DP. The total population of the study area in the horizon year 2046 is projected to be 125 lakhs by considering a slight decline in the growth rate after two decades. The CAGR considered for the region from 2011 to 2046 is around 2.60%.

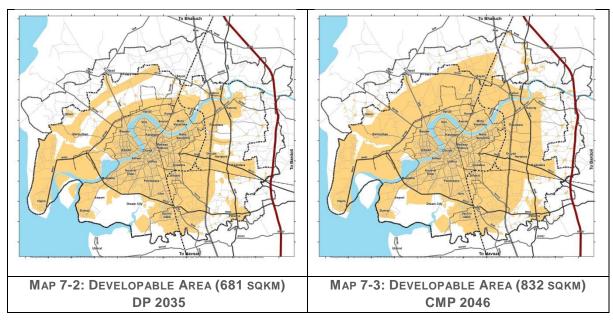
CAGR Year Population 2011* 50,81,856 2016 59,29,821 3.13% 73,00,000 3.69% 2021 2026 85,50,000 3.53% 2031 98,00,000 3.34% 110,00,000 2036** 3.14% 2041 118,50,000 2.86% 2046 125,00,000 2.60%

TABLE 7-1: POPULATION PROJECTIONS

Source: CEPT Estimated, *Census of India, **Surat Development Plan 2035

It is projected that by 2046 the major concentration of population will be in the SMC area. However, owing to the growth envisaged in the surrounding areas, the proportion of the population within the city boundary is expected to reduce. Growth is expected in the SUDA area, with the new growth centres envisaged as a part of the Development Plan along with the other industrial proposals getting realised. It is also anticipated that growth would take place in the eastern side of Surat city towards Kadodara.

The Development Plan 2035 has envisaged the developed area to be around 680 sq. km, as provided in the map below. The gross density of the SUDA area is expected to be around 112 pph whereas the urbanised density is proposed at 162 pph, which is lower than the current urbanised density i.e. 253 pph. The proposed road alignment as per the Development Plan encompasses the developable area, with wide roads planned for the future. Ring radial pattern of development is retained.



Since most of the committed projects are proposed towards the east, especially the High Speed rail with its alignment proposed between NH and the outer ring road of Surat, all these will lead to faster development towards the eastern side. The impact of the same has currently not been taken into account in the Development Plan 2035. As a part of the CMP public transport proposals, the same will be connected with the city through rapid transit. This will trigger further development in the surrounding areas.

Apart from this, a Dream City is also proposed towards the south. Since it is outside the jurisdiction of the SUDA, it is not included as a part of the developed area in the DP. However, it has been considered as part of the CMP area. These shortcomings are addressed in the CMP and an area of 702 sq. km is proposed for the year 2046. It also envisages that, in 2046, the area within the 120 m proposed Ring Road under DP 2035 will also urbanise, and the same is considered while accounting for the developed area in 2046. It is proposed that as a part of the CMP, the proposed area in 2046 would increase to 832 sq. km, with urbanised density of 150 pph and gross density of 93 pph. The table below shows the gross density and developed area density for the study area.

TABLE 7-2: SUMMARY OF GROSS DENSITY AND BUILT UP DENSITY (PPH)

Scenarios	Boundary Gross Density(PPH)		Developed Area Density (PPH)
Exisiting-2016	SMC	160	376
Exisiting-2010	Study area		253
DP - 2035	SMC	299	388
DF - 2033	Study Area	81	162
CMP - 2046	SMC	245	305
CIVII - 2040	Study Area	93	150

7.3 Employment Projections

Employment elasticity method has been used to determine the employment potential of Surat at the district level and it is assumed that around 70% of this is based in the SUDA region. The steps involved in estimating the Employment Generation using the Employment Elasticity Method are specified below.

- Projection of Gross State Domestic Product of Gujarat State based on the likely growth of
 the economy of the state assessed through factors such as investment potential, past trends,
 enabling policy environment.
- Estimation of Sector-Wise Employment Elasticity. The Employment elasticity refers to the percentage increase in employment with 1 per cent increase in the GDP. The Task Force on Employment constituted by the Planning Commission estimated the sectoral Employment Elasticity⁶. The future is assumed based on trend assessment.
- **Sectoral Employment Elasticity** has been applied to sectoral GDP growth in order to arrive at sectoral employment growth rates. Sectoral employment growth rates have been applied to base employment in order to arrive at total employment at the state level.
- **Projection of District Domestic Product of Surat District** is based on the study of the likely growth of the economy of the state vis-à-vis the likely share/contribution of Surat district.
- **Likely Share/Contribution of Surat District** has been applied to state-level employment projections in order to arrive at the employment for Surat.
- The pictorial presentation of employment elasticity method is specified in the exhibit below.

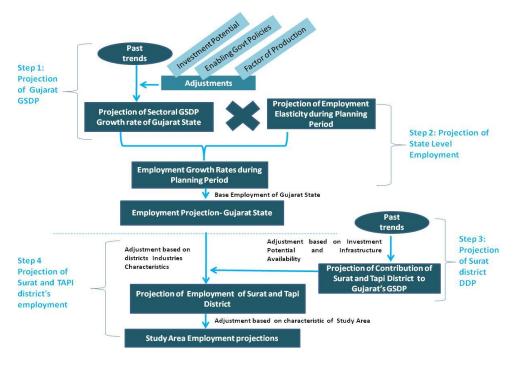


FIGURE 7-1: EMPLOYMENT ELASTICITY METHOD

⁶ Source: Blue Print for Infrastructure for Gujarat, 2020 by Gujarat Industrial Development Board (GIDB)

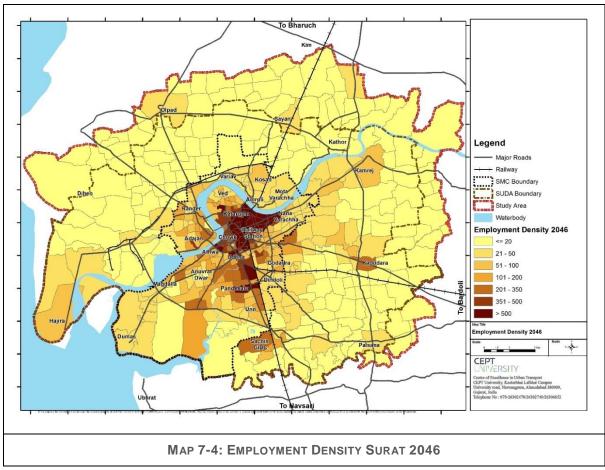
To estimate employment in the study area, a sample survey from non-residential properties was conducted, and data from the Industrial Department and the Chamber of Commerce, IEM and EM was also used for the same. As for the employment rate, the base year employment is estimated to be 29.28 lakhs in the study area and it is projected to 62.50 lakhs for the horizon year by looking at the existing rate and various future proposals in the study area.

The following table shows population and employment projections of the study area.

TABLE 7-3: POPULATION AND EMPLOYMENT PROJECTIONS

Year	Population	CAGR	Employment	CAGR
2011	50,81,856*	-	•	-
2016	59,29,821	3.13%	29,28,559	-
2021	73,00,000	3.69%	36,06,200	4.25%
2026	85,50,000	3.53%	42,32,250	3.75%
2031	98,00,000	3.34%	48,60,800	3.44%
2036	110,00,000	3.14%	54,69,200	3.17%
2041	118,50,000	2.86%	59,10,780	2.85%
2046	125,00,000	2.60%	62,50,000	2.56%

Source: Census of India, SMC, SUDA, CoE-UT



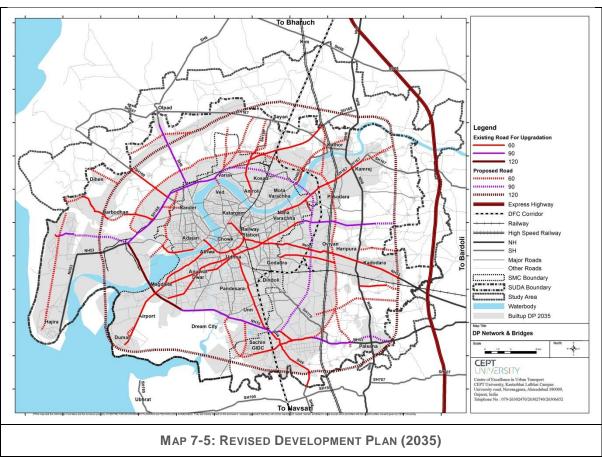
Source: CoE-UT, CEPT University

7.4 Network Development

As a part of the CMP, two alternatives for the road network are considered:

7.4.1 Business as Usual Scenario Based on Surat DP Network 2035

The first option takes into account the ring radial road network proposed as a part of the Development Plan 2035 for SUDA. As part of the plan, a 90 m wide outer ring road is proposed just outside the existing city. Apart from this, a regional ring road of 120 m width and 116 km length is proposed in the SUDA area. However, the area changes in the SUDA area (which reduced from 1351.53 sq.km under Section 13 to 985 sq.km under Section 16) have resulted in this road now being depicted as a discontinuous ring as per the revised DP. However, in the case of base scenario, the same has been taken as the complete ring as proposed under Section 13. This ring will act as a gateway for traffic towards Mumbai and Ahmedabad. A section of the same 120 m wide road has also been extended parallel to the National Highway-8 and the proposed Expressway. The same 120 m road can be extended further towards Bharuch-Ankleshwar Urban Development Authority in the north and towards Navsari Urban Development Authority in the south, which would further improve connectivity to Mumbai in the future. A part of the NH-53, from the proposed Dream City to ONGC circle, is proposed to be upgraded to 120 m. Another 60 m wide ring is proposed between 90 m and 120 m wide ring roads so as to accommodate the proposed residential zone. The part of this 60 m ring road is parallel to NH-8 so that in case of emergency, this can act as an alternative path for going towards Bharuch and Ankleshwar in the north and Navsari, Valsad and Mumbai in the south. All three ring roads are connected to the growth nodes and other major city centres through a network of major radials of 90 m and 60 m width. A combination of rings and radials is planned in such a way that everyone in the region will have access to one of these major roads from anywhere, within a proximity of 3-4 km.



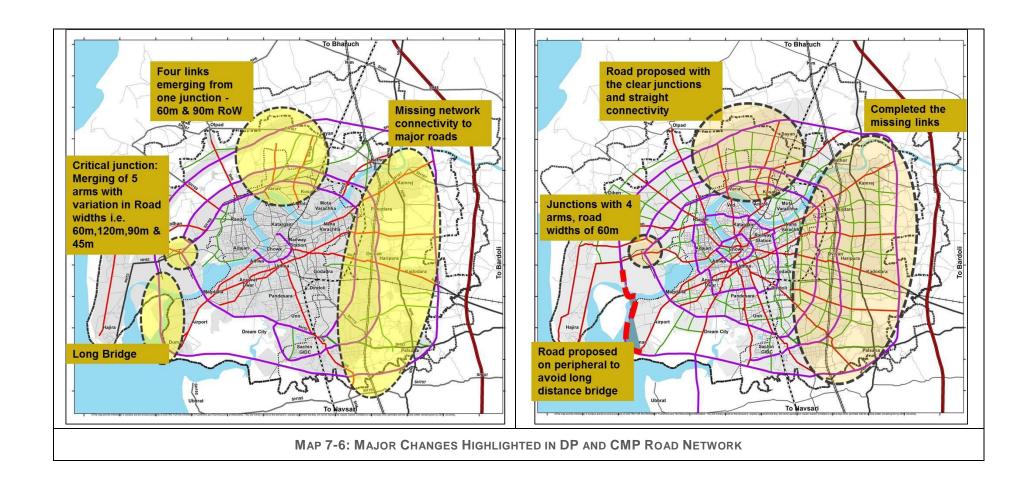
Source: Revised Development Plan 2035

A few issues that were identified with the proposed network are stated below:

- As seen in the map above, only higher order road network i.e. 60 m and above is identified as a part of the DP. However, to improve the efficiency of the network, it is important to identify all the strategic links, which include the second level network.
- The regional ring is proposed to be 120 m as per the DP. However, this seems to be too wide in the context of urban development in Surat. Apart from this, the alignment towards the south east where it connects Dumas to Hazira is problematic from the construction point of view since it passes through sensitive areas of Hazira mangroves.
- The NH-53 section between ONGC circle in Hazira and Diamond City junction (south of the SMC area) is proposed to be upgraded to a 120 m road. As a result of this, the ONGC junction will become critical with five arms of varying ROW (120 m, 90 m, 60 m and 45 m roads) joining it along with a lower order Hazira Adajan road.
- Towards the North West of Surat city at the Vairav Junction, there are three links emerging from the same junction, making this a critical junction which could be prone to accidents.
- Some of the proposed 60 m wide roads under the DP have missing links and do not connect to the proposed ring roads of the city. This further weakens the overall road network.

- The ring road just outside the SMC area is proposed to be 90 m as per the DP. However, this seems to be too wide in the context of urban roads in Surat.
- In last two years the number of commuters to and from Surat has seen as increase and hence there may be a potential to develop the city as a major regional node connecting other cities through air. In this event, this would lead to an increase in traffic along Dumas Airport Road. Provision of a 60 m wide road in DP should be sufficient and if required, the network in this area could be improved further by providing an alternative route through the second level network. The CMP thus proposes alternative network in order to improve the connectivity to the airport.

The issues stated above would result in inefficiency of the road network. Hence, to improve the efficiency of the network, an alternative network is proposed as a part of the CMP.



7.4.2 Alternative Scenario Proposed as CMP Network 2046

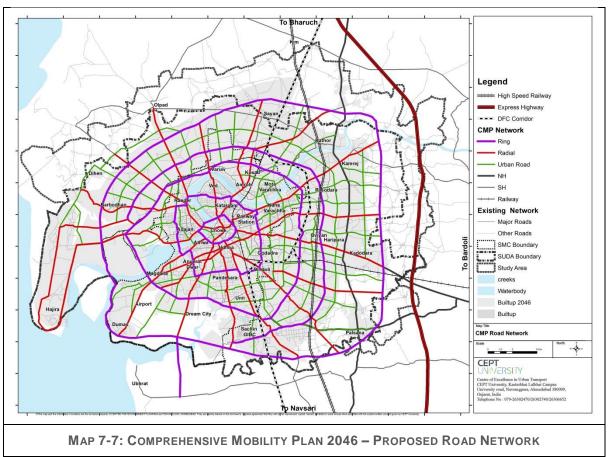
The CMP network takes the DP 2035 proposed network as its base and tries to resolve the issues identified above by completing the network, improving hierarchy and adding second and third level networks. Along with this, the Surat city network has also been upgraded to improve the network performance.

In doing so, the main changes proposed as a part of the CMP network are as below:

- 1. Taking the future growth into consideration, the width of the regional ring road viz. 120m proposed as a part of the DP seems to be too wide and, hence, it is proposed that the width of the same be reduced to 90 m. This reduction in width is also justified through the model developed. Apart from this, the section towards the south west where it connects Dumas to Hazira is also modified to go along the SMC boundary and then cross over where the width of the river is not too wide, thus avoiding the Hazira mangroves.
- 2. The outer ring road is also proposed to be 60 m instead of 90 m. Since this is seen as a city road in the future, having a 90 m wide road would result in a lack of connectivity for people on either side of the road. Moreover, the reduction is further justified with the future demand on the network as per the model developed. Similarly, the width of the 120 m section of NH-53 is modified to 60 m, thus improving the ONGC junction.
- 3. The road alignment of the smaller network links is also modified and improved in such a way that they meet the major network at almost a 90-degree angle.
- 4. The road network is improved towards the eastern side by completing the missing links.

Apart from the above improvements in the existing DP network, it was felt that the second and third level strategic networks are also added to the CMP network to create a complete network especially towards the eastern side where the future growth is envisaged. The road hierarchy of the strategic network was also proposed with standard road widths of 90 m, 60 m, 45 m, 36 m, 30 m and 24 m. Cross sections are proposed for different road widths with provision of the 'Transit Ready Streets' (all streets 30 m and above to have central lane reserved for transit) as shown in Annexure 32.

The detailed road inventory has been carried out to check the feasibility of the proposal as shown in Annexure part 2.



Source: CoE- UT, CEPT University

7.5 Travel Demand Model Development

A standard four stage modelling process has been adopted to project travel demand and estimate public transport ridership in the future. An overview of the modelling approach is presented below. This assessment model has been developed using EMME 4.3.2 software.

7.5.1 Modelling Framework

A detailed four stage modelling has been carried out to analyse the traffic flow in the future. The study area defined has been taken as the modelling area and has been subdivided into 515 internal TAZs and six external TAZs. For the analysis of travel pattern, four trip purposes—Home-based Work, Education, Others, Non-home-based Work, has been taken into account. This modelling exercise has been carried out for the base year 2016 and future horizon year 2046. The model period for assignment is one-hour morning peak. Appropriate expansion factor has been used for computing average daily ridership.

The data inputs used for modelling are as below:

TABLE 7-4: DATA INPUTS FOR MODELLING PROCESS

Type of data	Details
Demand Data	Existing demand – Household Surveys, RSI at cordon points, Terminal surveys Future demand - Population, Employment data (non-residential survey) - existing and proposed, Student enrollment - existing and proposed, Willingness to shift survey
Supply Data	Road network – Physical attributes, Network speeds, Delays at junctions Public Transport network – stops, corridors, routes, service details
Model calibration data	Travel speeds and travel time on major network (2015-16) Classified Volume Counts, Vehicle Occupancy Surveys

7.5.2 Model Software

For the four stage modelling process, MS-Excel and SPSS have been used for Trip Generation and Trip Distribution purposes, while EMME has been used for Trip Distribution and Assignment Process. Mode split has been carried out based on 'Willingness to Shift Survey', conducted as part of this study.

7.5.3 Four Stage Modelling Process

As part of the modelling process, a four stage modelling process has been adopted:

1. Trip Generation

Trip generation model estimates the number of trip productions and trip attractions to each TAZ. Trip productions are estimated based on household socio-economic trip making characteristics. Trip attractions are estimated from employment and student enrolment of each TAZ.

Trip Production Model: Trip production model without walk trip for study area is presented in the following table. Trip production earns show a good fit except for Non-Home-Based (NHB) trips whose proportion (0.001% of all trips) and their estimation may not create significant impact in trip generation model. A relationship between Home-Based Work (HBW) trips with resident workers and Home-Based Education (HBE) trip with resident students was tested.

TABLE 7-5: PRODUCTION MODEL

Dependent Variable (Productions)	Independent Variable	R2	t	Equation
HBW	Resident Workers	0.99	211.4	2.156x
НВЕ	Resident Students	0.99	216.4	1.967x
НВО	Population	0.81	40.27	0.441x
NHB	Population	0.22	3.42	0.0025x

Source: CoE- UT, CEPT University

Trip Attraction Model: The model developed for trip attraction includes variables like employment and student enrolment at TAZ level. The table shows r^2 of Home-Based Work and Home-Based Education trips to be between 0.70–0.80, which seems to be reasonable for the trip attraction models.

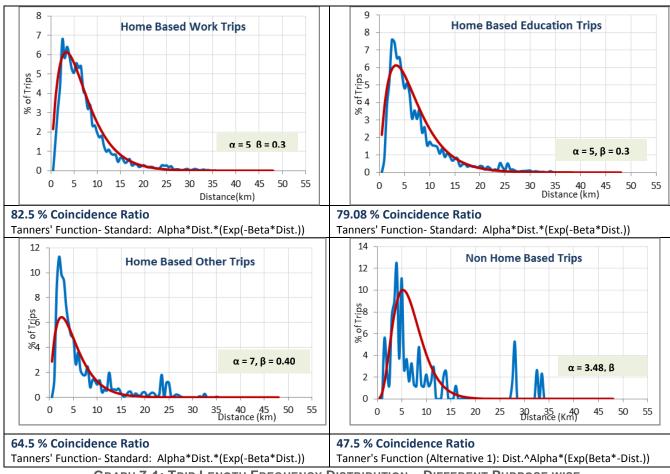
TABLE 7-6: ATTRACTION MODEL

Dependent Variable (Attraction)	Independent Variable	R2	t	Equation
HBW	Employment	0.82	34.81	0.9936x
НВЕ	Students Enrolment	0.67	16.33	3.4004x
НВО	Employment	0.63	17.23	0.7189x
NHB	Employment	0.49	5.74	0.0126x

Source: CoE- UT, CEPT University

2. Trip Distribution Model

Trip distribution works on gravity model which is based on the principle that trip interaction between TAZs is directly proportional to relative attractiveness of each zone, and inversely proportional to spatial separation between the TAZs. This model was developed for each of the four purposes—Home Based Work, Home Based Education, Home Based Other (HBO) and Non-Home-Based trips. The following figure shows the modelled and actual Trip Length Frequency Distribution (TLFD) for all trip categories. A Combined Tanner's function was used for trip distribution.



GRAPH 7-1: TRIP LENGTH FREQUENCY DISTRIBUTION - DIFFERENT PURPOSE WISE

Source: CoE- UT, CEPT University

3. Mode Split

A detailed 'Willingness to Shift' survey has been conducted and analysed through mode shift modelling framework. The attributes taken for analysis are travel time and travel cost, through which

utility equations have been generated through logit model. This helped in estimating the PT share for the future year of 2046.

4. Assignment

Auto and Transit assignment are the final stage of the four stage modeling process. The total demand (internal and external) for private vehicles in the base year 2016 is about 30.24 lakh PCUs and for transit is about 8.13 lakh passengers per day. The internal demand was assessed based on the household surveys conducted, while the external demand was assessed based on regional terminal surveys for PT and RSI survey for private and freight vehicles. One-hour peak demand i.e. 10% of the full demand is assigned on the model.

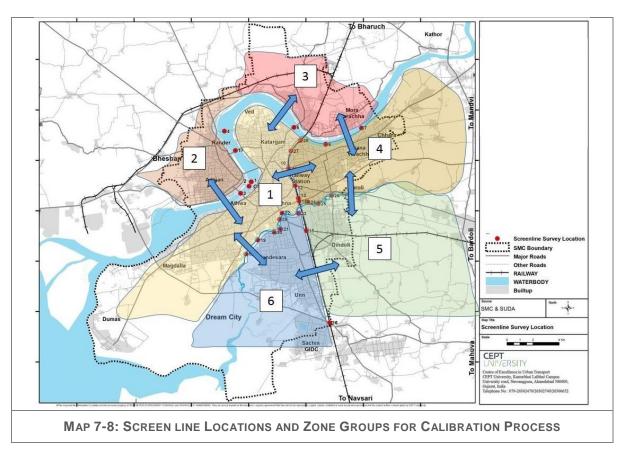
7.5.3.1 Auto Model Calibration

Surat city has about 85% trips made by private modes as per the 2016 household surveys. It is known that increased motorisation leads to traffic congestion and increase in travel time. A strategic private travel demand model was developed for the study area to assess the congestion levels in the study area in future years.

7.5.3.2 Auto (Private) Model Calibration

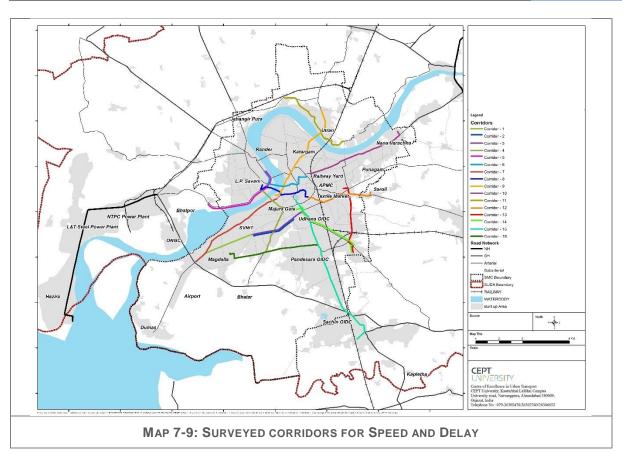
Model calibration refers to the process of ensuring that a model reproduces real-world traffic conditions reasonably well in terms of traffic volume and travel times across the network. Therefore, the base private travel demand was assigned on to the developed network in EMME and the outputs were analysed to check how well these matched with the actual traffic flows and travel time on the ground.

Traffic volume and demand calibration: Classified Volume Counts (CVC) surveys were conducted at 29 screen line locations for 16 hours to observe the base traffic levels. The CVC locations are presented in the map below.



The calibration results by screen line locations are presented in Annexure 22. It can be seen from the Annexure 22 that the model fit was good with GEH values less than 10 in 25 of the 27 locations. The recommended GEH value should be less than 10 for this scale of model.

Travel time calibration: Along with the traffic volume calibration, travel time on different O-D pairs has also been calibrated and matched with actual travel times on the network. Speed and Delay surveys were carried out on the city corridors to estimate existing travel times which were used to check the representativeness of travel time in the model. The map below presents the few corridors which were surveyed.



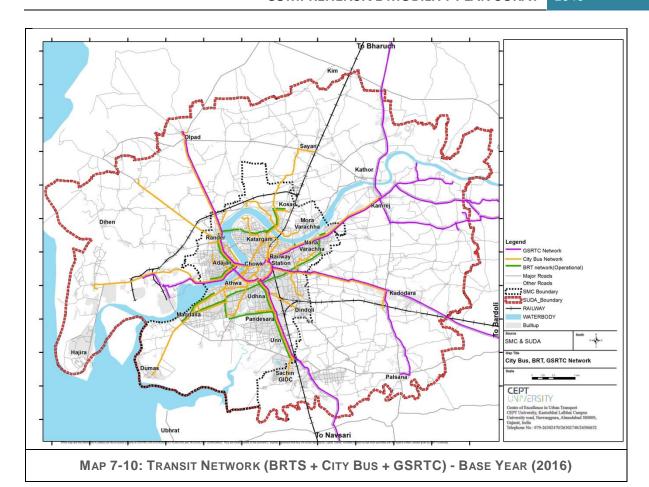
The modelled and observed travel times on surveyed corridors have been presented in Annexure 23; as per the results, the model showed a good level of concurrence.

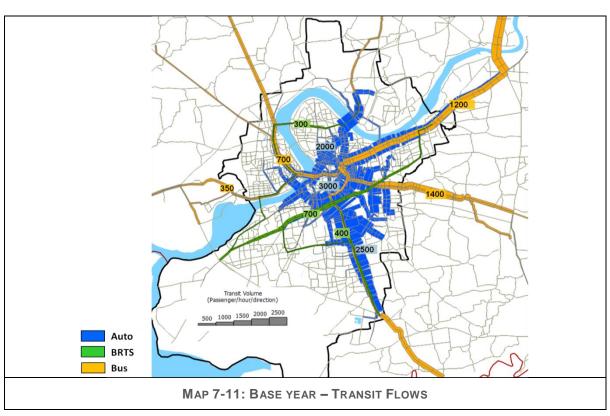
7.5.3.3 Public Transport Model Calibration

In the base year 2016, the operational BRTS network was 58.78 km and 29 city bus routes were operational. Altogether, there were about 398 regional, sub-urban and local GSRTC routes plying or passing through Surat. For modelling purposes, 12 corridors/directional routes have been identified and combined frequency was coded in the model to take care of external PT demand. The use of shared auto-rickshaws was also much higher than city bus services, as a result of which the base year transit model has been developed with PT services as well as with shared auto services. Since the model has been developed for peak hour, only peak hour frequency has been taken for each route.

As discussed in the previous section, household surveys and RSI surveys were carried out within the study area and at cordon location respectively in 2016. These have been used for developing the base year demand matrix. For capturing the external public transport demand, passenger surveys at major bus terminal were also carried out. A total of 8.13 lakh public transport passenger trips were computed —shared auto rickshaw is about 16% of motorised trip as compared to 1.75% of PT trips.

Map 7-10 and Map 7-11 show the PT network and flows in the base year.





Modes	Actual Ridership	Passenger Boardings (Model)	% difference	GEH value
Auto	85000	84564	-1%	1
BUS (city bus + GSRTC)	12200	12963	6%	7
BRTS	4000	4169	4%	3
Total	101200	101696	0%	2

TABLE 7-7: CALIBRATION DETAILS OF PUBLIC TRANSPORT RIDERSHIP (2016)

It can be seen that the observed and modelled flows are very similar and hence the model can be said to be representative of ground conditions.

7.5.3.4 Scenario Specification

The Surat Development Plan 2035 has proposed the strategic road network for the study area considering the future developments and land use. The same has been adopted for the future year road network coding as the 'Business As Usual' scenario. Some issues in the DP network with respect to completeness and hierarchy were observed and hence an alternative road network scenario for CMP was also developed. In line with the NUTP policy, land use transport integration through Transit-oriented development was considered for developing demand for the CMP network.

For the BAU network, demand was based on the land use distribution given in the Surat DP.

Proposed Network	Mode Shift Scenarios (based on Public Transport supply in 2046)				
Scenarios	Assuming only bus network extensions in the new developed areas in future	Assuming extensions in bus network along with MRT network			
Business As Usual (Surat DP network) 2046	PT share 22.50%; Private mode share 77.5%	PT share 32.5%; Private mode share 67.5%			
Comprehensive Mobility Plan network 2046	-	PT share 37.5%; Private mode share 62.5%			

TABLE 7-8: MODE SHIFT SCENARIOS

These two scenarios have been modelled and their impact on private vehicle km (VKT) and private vehicle hours travelled (VHT) has been analysed.

7.5.3.5 Willingness to Shift

The study area is expected to be served with a rapid transit network coupled with more than 350 km of city bus services. Considering the nearly absent PT system, Surat is taking significant steps towards improving the overall transportation system. With growing congestion levels in the city, the new PT system is likely to offer both travel time and travel cost improvement which would influence shift towards PT. Willingness to Shift (WTS) surveys was carried out to estimate the shift from private vehicles if an integrated public transport system comprising metro, BRT and buses was available to them.

A total of about 1400 private vehicles (2-wheeler and 4-wheeler) and IPT (3-wheeler) were surveyed for the WTS estimations at activities' end. Work and education are considered as predominant share

of purposes of trips, which was only captured during the surveys at activity end or education end. Logit models were developed to estimate likely shift to the proposed PT system.

Below is the PT share estimated for future years considering shift from private vehicles and from IPT to public transport system.

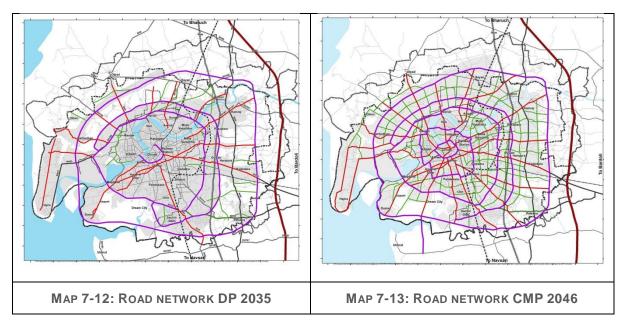
.,,,,,	Growth Scenarios			
Year	BAU Alternative Growth S			
2021	10.6%	-		
2026	15.0%	17.0%		
2036	25.6%	29.1%		
2046	26.8%	32.5% - 34.5%		

TABLE 7-9: ESTIMATED PUBLIC TRANSPORT SHARE FOR FUTURE YEARS

7.5.4 Future year Auto (Private Vehicles) Assignment and Analysis

7.5.4.1 Scenario Analysis

As described in 7.4, two road network proposals – BAU based on Surat DP 2035 and CMP network - were developed. These were coded in the model (refer Map 7-12 and Map 7-13) and analysed to test the efficiency of the network and road congestion levels.



Map 7-6 shows the difference in the two networks. In the DP network, certain issues of missing links, forming of critical junctions and missing road hierarchy levels were observed. The DP network was therefore modified by completing the missing links to form a clear and complete network structure.

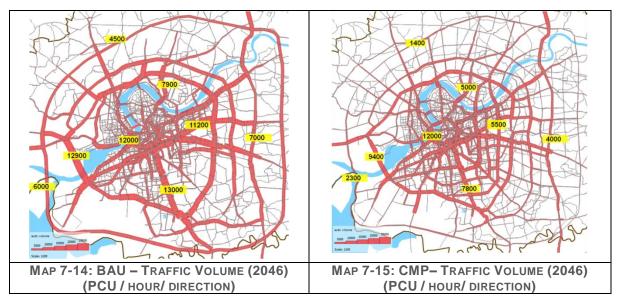
Therefore, both the alternatives have been developed considering the DP network as 'Do Minimum' scenario and CMP network as 'Do Something' scenarios, considering the public transport services would be City bus, BRT and Rapid Transit corridor. The total demand assigned along with mode shares are presented in the table below:

Scenario no.	Scenarios	Scenario Description	Demand Assigned (PCU)	Public Transport share (%)	Private share (%)
	Existing -2016	Existing	30,24,097	11.6%*	88.4%
1	Base – 2046 (Do nothing)	DP road network (Bus + BRT as in existing)	57,46,320	22.50%	77.5%
2	BAU – 2046 (Do minimum)	DP network (Bus + BRT as in existing+ extended Bus network+ proposed Rapid Transit Corridors)	49,43,950	32.20%	67.80%
3	CMP – 2046 (Do something)	CMP network (Bus + BRT as in existing + extended Bus network + proposed Rapid Transit Corridors)	45,48,400	37.50%	62.5%
* Includin	g auto rickshaw as	PT mode			

TABLE 7-10: SCENARIO SPECIFICATION FOR PRIVATE ASSIGNMENT MODEL

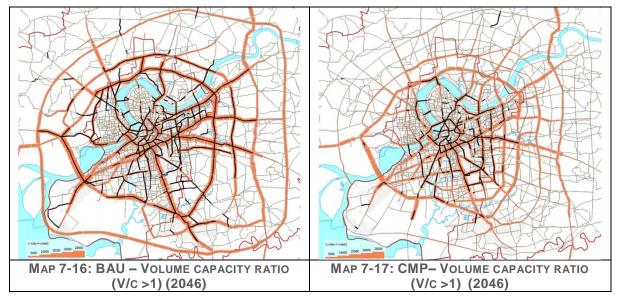
7.5.4.2 Model Output for Auto Assignment

The assignment shows that the traffic volume in the BAU scenario is more dispersed towards the outer ring roads that leads to increase in trip length and travel time; whereas in the CMP scenario, the traffic flow tends to be reassigned on the new infill rings proposed. The average trip lengths in BAU and CMP scenarios are 14.63 km and 13.95 km respectively. Similarly, the average travel time also shows a decrease from 39.4 minutes to 31.7 minutes in the CMP network.



It is also observed that the congested road network length (V/C ratio equal to or greater than 1) is about 46% (375km) in BAU and 14% (154km) in CMP scenario (refer Map 7-16 and Map 7-17). In the BAU scenario, congestion has been observed within the SMC and the intermediate ring road, whereas

in CMP scenario, congestion is observed only for some sections of road network during peak hour within SMC area. The reason is that with alternative routes available, the traffic is better distributed over the network. In comparison, in the BAU scenario, due to missing links, most of the major roads are congested.



The table below illustrates a total savings of 30% in Vehicle Kilometres Travelled (VKT) and 52% in Vehicle Hours Travelled (VHT) in the CMP scenario in comparison to the Base scenario. With respect to the BAU scenario, about 19% savings in VKT and VHT has been observed. This indicates that the CMP network is a better performing one than the others.

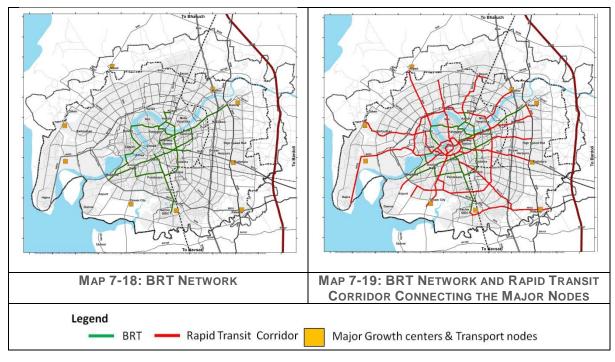
TABLE 7-11: RESULT SUMMARY OF AUTO ASSIGNMENT (2046)

S. No	Scenario	VKT (full day)	% savings in VKT	VHT (full day)	% savings in VHT	Avg. travel time (mins)	Avg. trip length (km)	V/C >1 (length in km)
1	Base - 2046	64,389,563		3,226,052		33.68	10.12	465
2	BAU - 2046	52,006,828	19%	2,605,650	19%	23.04	9.8	375
3	CMP - 2046	45,337,595	30%	1,561,189	52%	20.59	8.8	155

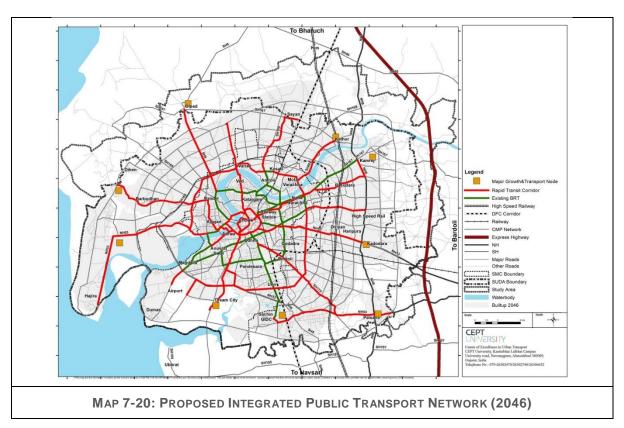
7.5.5 Future year for Integrated Public Transport Assignment and Analysis

Presently, the city is operating city buses on 29 routes and BRT services along 102 km as discussed in Chapter 3. Surat city has planned a network of 550 km for city bus services along with BRTS on 102 km of network.

For the future, rapid transit corridors have been identified based on their connectivity to the major growth centres and proposed transport nodes (as per DP 2035) in the city. Another aspect which was taken into consideration was the corridors with high private vehicular volumes in the BAU and CMP 2046 scenarios. Based on the above, 240 km of the network has been shortlisted as prospective rapid transit network. (Refer Map 7-20).



In addition to the above proposal, city bus services were extended on all the arterial and sub-arterial road networks with the road width above or equal to 18m. The total network of 889 km of city buses services was proposed as a complementary and integrated with the BRT and rapid transit corridors.



7.5.5.1 Scenario Specification for Public transport assignments

The scenarios developed in auto assignment for evaluating road network is the same for public transport as well. The descriptions for scenario specifications are provided below:

- Base scenario considers the DP road network consisting of bus services extended to new proposed arterial/sub-arterial roads along with 102 km of BRTS operational proposed as in the existing scenario.
- **BAU scenario** considers the base scenario along with 240 km of prospective rapid transit network and bus service extension on the major road network of DP.
- **CMP scenario** considers the CMP road network along with bus service extensions on the major road network, rapid transit network of 240 km and 102 km of BRTS operational as in the existing scenario.

The details are mentioned in the table below:

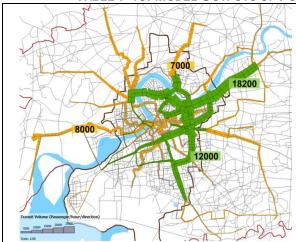
TABLE 7-12: SCENARIO SPECIFICATION FOR PUBLIC TRANSPORT MODEL

Sr. No.	Scenarios	Scenario Description PT network length (km)		Demand Assigned (Person Trips)	Public Transport share (%)
	Existing (2016)	Existing		8,13,365	11.6%*
1	Base – 2046 (Do nothing)	DP road network (Bus + BRT)	564 km (Bus: 450 km, BRT:102km)	29,39,466	22.50%
2	(Do minimum)	DP road network (Bus + BRT + Rapid Transit Corridors)	1265 km (Bus: 923km, BRT:102 km, RTC:240km)	41,51,964	32.20%
3	(Do something)	CMP road network (Bus + BRT + Rapid Transit Corridors)	1231 km (Bus: 889km, BRT:102 km, RTC:240km)	48,11,390	37.50%
* Includin	g auto rickshaw as PT	mode			•

7.5.5.2 Model Output for Public Transport Assignment

The assignment results for the three scenarios have been presented in the table below. As per the Base 2046 scenario, the total public transport boardings for peak hour were observed to be around 4.8 lakh passengers. However, in the BAU and CMP scenarios with prospective Rapid Transit Corridors, the total boarding is expected to be about 10.12 lakh and 10.97 lakh respectively. It can be seen that in the CMP scenario, the passenger boarding has increased by about 9% in comparison to the BAU scenarios. The passenger boarding, transfers and traffic flow for the scenarios are shown in the table below.

TABLE 7-13: MODEL OUTPUTS OF PUBLIC TRANSPORT ASSIGNMENTS (2046)



Mode	Boardings (peak hour)	% Boardings	Transfer rate
Bus	2,59,576	54%	
BRT	2,23,444	46%	1.64
Total	4,83,020	100%	1.04
* Peak hou			

Legend

City bus

BRT

Rapid Transit Corridor

BASE SCENARIO



Mode	Boardings	%	Transfer	
ivioue	(peak hour)	Boardings	rate	
Bus	3,53,183	35%		
BRT	2,48,282	25%		
RTC	4,10,848	27%	2.44	
Total	10,12,313 100%			
* Peak hou				

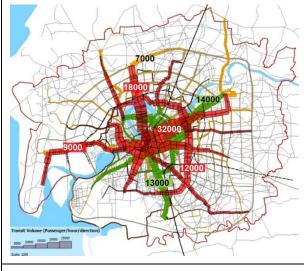
Legend

City bus

BRT

Rapid Transit Corridor

BAU SCENARIO



	Boardings	%	Transfer	
Mode	(peak hour)	Boardings	rate	
Bus	3,61,782	33%		
BRT	2,74,896	25%		
RTC	4,61,220	25%	2.28	
Total	10,97,898	100%		
* Peak hou	ır is 10% of full d	lay		

Legend

City bus

BRT

Rapid Transit Corridor

CMP SCENARIO

Based on the observed traffic flows on the rapid transit corridors, the following have been screened as possible rapid transit corridors. The screening has been done on the basis of flows more than 4000 passengers in the peak hour per direction.

TABLE 7-14: PROPOSED RAPID TRANSIT CORRIDORS WITH FULL DAY RIDERSHIP AND PHPDT (2046)

Sr. No.	Corridor Name	Via	Km	PHPDT	Ridership (Full day)	Potential mode
1	Majuragate to Karamala	Ved	16	24386	5,33,140	Metro
2	Dream city – Kamrej /Vav	Sarsana- Exhibition Centre, Bhatar Char rasta and Sarsana, Majura gate, Rly station and Sarthana	31	34268	10,32,120	Metro
3	Bhesan - Kadodara	Adajan, Majura gate, Kamela Darwaja, Saroli and Sabargam	26	24032	7,82,330	Metro
4	Sherdi to Unn (half ring)	Kapodara, Saroli, Devadh, Saniya Kande	29	14503	4,21,910	BRT
5	Railway Station – Railway Station	Sahara Dharwaja,Udhana, Adajan, Katargam	12	6490	2,19,600	BRT/LRT
6	Pal to Hazira	Icchapur	15	9241	1,58,610	BRT
7	Jahangirpura to Olpad	Talad	11	9497	1,79,880	BRT
8	Kosad to Sayan	Gothan	10	6601	1,22,730	BRT
9	Punagam to Valthan	Kosmada	7	2860	67,890	BRT
10	Unn to Khajod	-	6	1408	46,300	BRT
11	Udhana teen rasta to Palsana	Dindoli	19	725	15,370	BRT
12	Kamrej to Valthan	Vav	2	3559	68,030	BRT
	Total length of Rapid Transit Corridor (Tentative)					

It can be seen that around 184 kms of rapid transit corridors are proposed for the future year 2046. Further, based on the ridership and passenger flow, the following three corridors may be considered for the metro, while the other eight corridors are for the BRTS system:

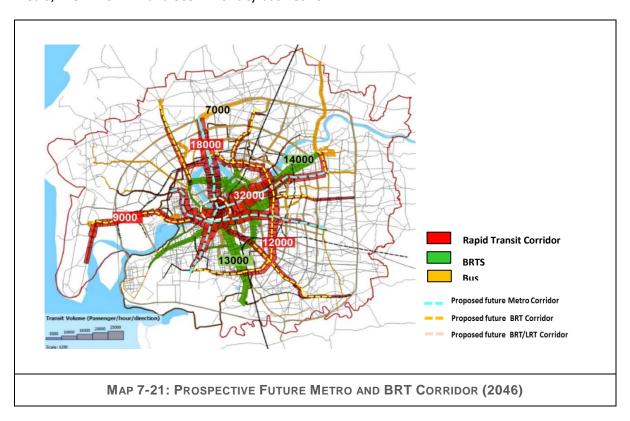
- Majura Gate to Karamala
- Dream City to Kamrej
- Bhesan to Kadodara

It is recommended that the airport connectivity could be served by feeder buses as demand on this segment observed is not very high in the year 2046. In case of a very high demand generation along this corridor, in future a connection through BRT system could be considered and assessed.

The corridor along the Inner Ring Road (Railway Station–Railway Station) may be considered as an LRT corridor in the future for which a detailed feasibility analysis may be undertaken. In the short term, a

high frequency bus service/BRT is proposed, which would be able to provide the much-needed public transport connectivity in the inner city area.

The map below shows the metro and the BRT corridors for the future years. Thus, in the year 2046, the CMP scenario proposes an integrated public transport system consisting of around 73 km of metro; 213 km of BRT and 889 km of city bus network.



It should, however, be noted that an alternative analysis followed by the detailed project report would have to be prepared for deciding on the feasibility of these rapid transit corridors in the future.

7.5.6 Evaluating the Scenarios

The proposals discussed above will have varying impact on the quality of life of the people in Surat and the physical environment. To analyse these impacts, the proposed scenario has been evaluated based on the following indicators:

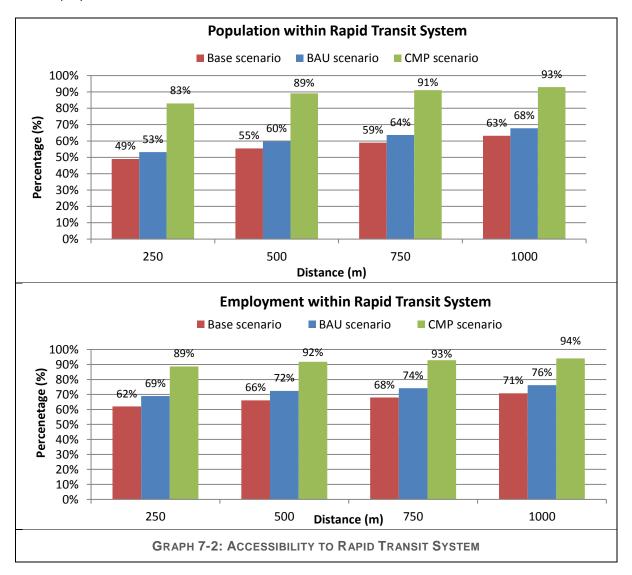
- 1. Access to Transit
- 2. Environmental Impacts
- 3. Road Congestion Levels and Travel Times
- 4. Transfer Rate and Average Trip Length
- 5. Safety

7.5.6.1 Access to Transit

The graph shows the percentage of population residing and employment centres accessible within 1 km buffer of the Rapid Transit Corridor. It has been observed that the transit accessibility has improved in the CMP scenario by an average of 23% as compared to the BAU scenarios. It shows that within the

buffer of 250 m, about 83% of population is accessible in CMP scenario which is quite high in comparison to the 53% population coverage in the BAU scenario. Similarly, the job locations accessibility is about 89% in the CMP and 69% in the BAU scenario.

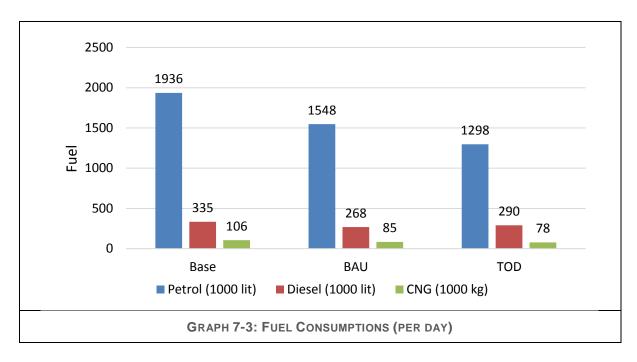
This indicates that the CMP scenarios have more accessible transit systems both in terms of population and employment.



7.5.6.2 Environmental Impact

The fuel emissions from the vehicles lead to major environmental concerns in the transport sector. Therefore, saving in fuel consumption is an essential parameter considered for evaluating the scenarios. Also, the vehicle emissions indirectly pollute the atmosphere by emitting hazardous particles such as CO₂, PM, NOx and CO etc. which lead to health issues.

The graph below shows that in the CMP scenario, the fuel consumption is lower than that in other scenarios. It is also observed that the savings in fuel consumption in CMP scenario are about 30% and 12% as compared to Base and BAU respectively.



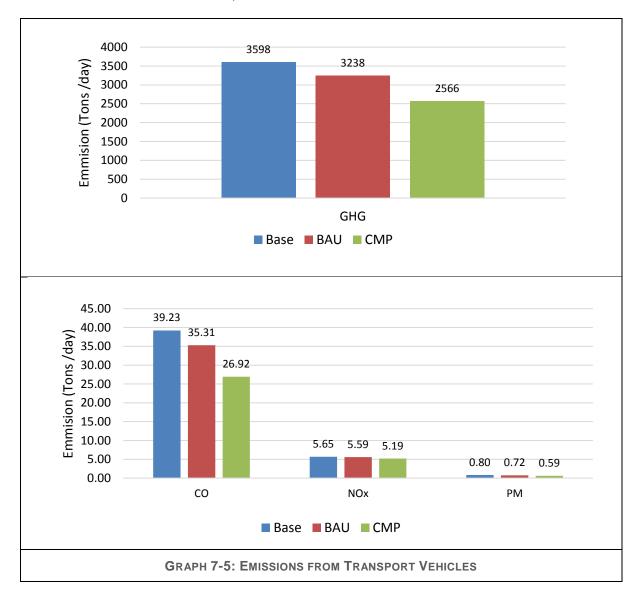
In order to understand the past growth trends in emission through passenger transport vehicles, the analysis done for 1988, 2004 and the present year 2016 has estimated for the horizon year 2046 as well as intermediate years 2026 and 2046 based on the growth scenarios (refer Section 7.5).

The graph below shows the growth pattern in GHG emission over the period of time under consideration. It is observed that since 1988, there has been a 4.9 times increase in GHG emissions in the year 2004, whereas it has reduced to 2.3 times from 2004 to 2016 due to the upgradation in vehicle technology. As compared to the present year 2016, in Do Nothing (Base) scenario, the growth in GHG emission would increase by two times; whereas in Do Something scenario it would reduce to 1.4, considering the growth would be more towards policy intervention and other transport initiatives. The detailed calculation and assumptions are provided in Annexure 64.



Source: Data used for calculations are from CRRI 1998 report; CRRI 2005 report; Household Survey2016

In future scenarios, GHG emissions in the Base and BAU scenarios are much higher than the CMP scenario (refer graph 7.5). These could be due to longer trip lengths and high level of congestion on major roads. Savings in GHG emission is about 29% and 21% in the CMP scenario as compared to the Base and BAU respectively. Other particles which are emitted are also less in the CMP scenario. Hence, in terms of environmental concerns, the CMP scenario seems to be more viable.



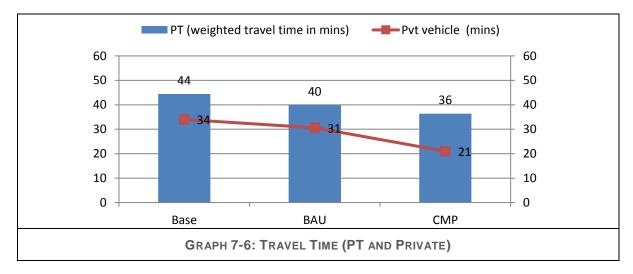
7.5.6.3 Road Congestion Levels and Travel Times

As discussed in previous section 7.5.4.2, the congested network in CMP scenario is lower than the other scenario. Table 7-15: Percentage of Higher Order Network Congested illustrates the category for volume capacity ratio (V/Cwhich shows that in the Base and BAU scenario, the congested network proportion increases as the congestion increases. This, however, is reserved in case of the CMP

Table 7-15: Percentage of Higher Order Network Congested				
V/C Category	Base	BAU	СМР	
>1	57%	46%	14%	
>0.7	28%	29%	29%	
<0.7	15%	25%	57%	

scenario. The percentage of congested length in the CMP scenario consists of only 14% higher order roads as compared to the Base and BAU scenarios which are about 57% and 46% respectively.

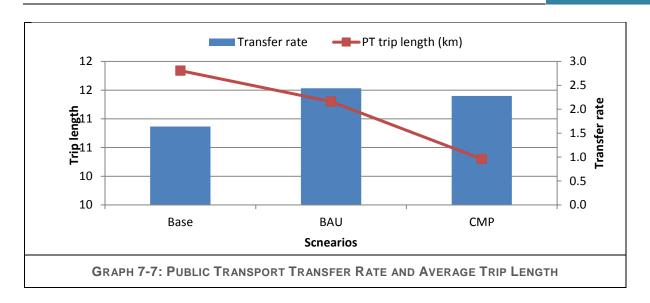
Similarly, the difference in average travel time has also been observed for both public transport and private vehicles. In the CMP scenario, the average travel time for PT is about 36 minutes and for private vehicles is about 21 minutes, which is less as compared to other scenarios (refer graph 7-6). This could be because the CMP road network has a complete pattern with a defined hierarchy and also provides an alternative route to travel that helps in reducing travel time and congestion on the road network.



7.5.6.4 Transfer Rate and Average Trip Length

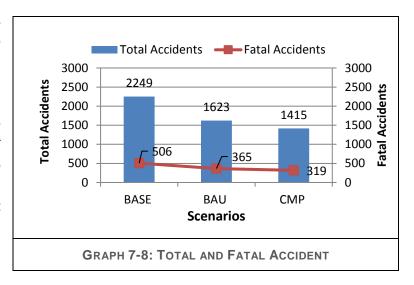
Transfer rate and average PT trip length are calculated based on the model outputs. Both these indicators depend on the distribution of population and employment along the transit corridor with proper accessibility and connectivity. To assess these indicators, the BAU and CMP scenario were compared because both the scenarios have the same network of public transport except that of bus services which were extended on the respective road network.

The graph below shows that in the CMP scenario, the average trip length is about 10 km whereas in the BAU, it is about 12 km. Consequently, the transfer rate is also less viz. 2.28 whereas for BAU it is 2.44.



7.5.6.5 **Safety**

In terms of safety, road accidents are the major concern. As Vehicle Kilometre Travelled (VKT) increases, accidents also increase. For the future, the total and fatal accidents are calculated by the ratio method with respect to VKT for each scenario obtained through the model. This, however, is just an indication, as it is not possible to project accidents in future since accident reduction would also be possible through other strategies adopted.



The graph provides a rough indication with respect to the trend that in the CMP scenario, the proportion of total accidents (i.e. 1415) and fatal accidents (i.e. 319) drastically reduces as compared to the BAU and Base scenarios. The total savings in accidents is about 37% and 13% in the CMP scenario as compared to the Base and BAU scenario respectively.

CHAPTER -8

Mobility Vision for the City

A vision statement provides direction for a city's growth. Without an overall vision, collecting information and formulating strategies would not be meaningful. Thus, the vision provides a rationale and a framework for developing future growth scenarios. It also facilitates the identification and prioritisation of current issues and problems.

Stakeholders are recognised as an important part of the plan-making process, and to this end, the Comprehensive Mobility Plan preparation process for Surat has involved stakeholders to get their views and inputs during different stages of the plan.

A visioning exercise was carried out for the CMP. Regular interaction and meetings between stakeholder agencies like the SUDA and the SMC were undertaken during the course of this study to formulate the vision, objectives, growth strategies and transport proposals. Two rounds of stakeholder consultations were carried out as a part of the CMP. The first one was in the form of an online survey initiated through the SMC website and social media in June 2017. The second round was in the form of a city workshop on 22 January 2018. The details of the stakeholder consultations are presented in Annexure 24.

8.1. Vision Statement

Based on the inputs received in the stakeholder consultation, the vision and strategic goals were revised. These are discussed in this section.

The vision for the Surat region for the year 2046 and beyond has been coined as:

"SARAL - Safe Accessible Reliable Advanced and Low-carbon mobility in Surat".



SARAL in Indian languages means 'simple' and the vision of the Surat is to make people's mobility in Surat simple, which, in essence, would also be sustainable.

This vision is based on consultation with various stakeholder organisations in Surat and is in line with the vision of the Draft Development Plan 2035 of the SUDA:

'An economically vibrant and sustainable Surat with diverse opportunities and rich culture; where all citizens enjoy a safe and liveable environment with good connectivity and infrastructure of global standards.'

This is also in line with the National Urban Transport Policy 2006 and the 12th Five Year Plan focus areas of:

- Reducing the need for travel
- Provide equitable road space
- Enhanced safety for the transport system users
- Reducing automobile dependence through promoting the use of public transport and NMV.

In line with the vision of **'SARAL Mobility 2046'**, five strategic goals for the plan have been outlined as:

- Improving quality of life of people by providing for a Safe and Sustainable transport system
- Supporting the economic growth in the city by enhancing Accessibility for people and goods to major activity centres
- Ensuring efficient connections by providing Reliable multi-modal travel options
- Optimising transport system operations and enhancing travel experience of people through Advanced Technological Applications in transport.
- Contributing to the environment by promoting *Low carbon* mobility.

8.2. Goals

The outlined strategic goals of the plan would be supported by policy directions. These are outlined below:

8.2.1. Strategic Goal 1

Improving the Quality of Life of people and providing for Safe and Sustainable Transport System

Providing a clean, efficient, safe and sustainable transport system is important as it impacts the overall well-being of the people. In this regard, the CMP of Surat strives towards developing a safer transportation system as a priority area. The number of fatal accidents in Surat (273 accidents in 2016) is lower than that in other metropolitan cities in India. However, the numbers have increased slightly (240 fatal accidents in 2011) compared to those five years ago. With 47% of the fatal accidents

involving pedestrians and cyclists, the plan intends to develop a safer transportation system with a focus on non-motorised modes. Measures to reduce pedestrian-vehicular conflicts along major roads through segregation of movement would be taken up at an area level with the assistance of the local government.

The policy directions for a safe and sustainable transport system for the city are:

- Provision of enhanced infrastructure at the local level to make walking and cycling attractive and convenient
- Creation of complete streets and places facilitating non-motorised movements
- Improving access to bus stations and designing of interchanges for seamless transfers between different public transport modes/services
- Accident management plan for the city identifying critical areas and strategies to reduce the same.

8.2.2. Strategic Goal 2

Supporting the economic growth in the city by enhancing Accessibility for people and goods to major activity centres

Surat has a high growth rate of population and the study area population is expected to reach 12.5 million by 2046. This will also result in substantial growth in the economy as well as employment in the region, which is expected to double by 2046 from 2.9 million to 6.2 million jobs.

The growth in the region is expected to be towards the east, owing to large-scale projects like high-speed rail, expressway and Dedicated Freight Corridor (DFC) coming up in the region. Apart from this, the SUDA has also planned for industrial and commercial areas in the region. The Surat railway station will itself be one of the landmark stations in the country. It is proposed that the same will be connected to the high-speed rail station through Metro rail in the future as part of the CMP proposal. Apart from this, residential areas are also being proposed in the SUDA region. The Diamond City towards the south of the SMC is another growth centre in the region, which is likely to become a hub of the global diamond industry.

At the regional level, a cluster development approach is proposed, which would provide good connectivity between the employment centres, residential nodes and the Surat city area. The ring radial system of Surat city extends towards the SUDA area connecting the urban nodes with arterial roads. These corridors are also identified as 'Transit Ready Streets', which would be developed by reserving a central green buffer of 9–12 m width for future transit development. The transit could be BRT, MRT or any other rapid transit depending on the demand along that route.

The investments planned in the SUDA region would also lead to increased freight movements. The DFC passing though the SUDA area would definitely help facilitate easy movement of goods. For distribution of goods within the planning area, provision of additional capacity for freight movements

on the regional roads would also be made. A DFC along with the Delhi Mumbai Industrial Corridor (DMIC) is being planned which would be passing through the SUDA area towards the east of the city.

These developments in the Surat area are going to double the population of the study area by 2046. This will also result in increase in trips in the study area, with trips to the industrial centres around the city increasing.

In terms of the road network, it is observed that linkages to these growth nodes are not very strong and the same would need to be strengthened in order to improve the efficiency of the system. The radial roads in the city will need to be strengthened for improving efficiency of the system as a whole. It is also observed that many roads in the city areas would need upgradation. Apart from this, the barrier created by the rail network and DFC network towards the eastern side will need to be addressed for the future. Finally, emphasis on developing a robust public transport service would be critical to meet the future transport demand.

For a more sustainable growth pattern, land use and transport proposals would need to be integrated. This would mean investing in rapid transit network in the city area and connecting the activity nodes. Along with this, TOD is also envisaged as a process to organise densities in the city and support public transport by providing avenues for better connectivity and accessibility in the catchment area. At the same time, the major investment areas in the Surat region would be connected by public transport network along with a regional road network.

The freight transportation system in the city of Surat is witnessing serious issues, impacting the city infrastructure, environment and quality of life of the people. Concentration of commercial activities in the city centre along with location of major transportation nodes like the railway station, regional bus terminals etc. has increased conflict between pedestrians, passenger traffic and goods movement. The textile industry itself is one of the major contributors to the congestion in the city centre area and allied industrial areas in Udhana, Sachin and Pandesara. Inadequate parking provisions, lack of enforcement of traffic rules, indiscipline, no/few monitoring measures, all contribute to safety concerns and the ever rising congestion on the streets.

Urban freight vehicles represented about 15% of total demand in 2016. Freight vehicles contributed to around 24% of total fatalities and 10% of serious accidents in the city of Surat in the last 5 years. The impact of emissions from vehicles on the environment also demands attention - urban freight accounted for 47% of GHG emissions in 2016.

The policy directions therefore are:

- Develop transportation system to be able to accommodate population and employment growth in the Surat region.
- Develop a regional public transportation system to enhance accessibility levels to existing and proposed activity centres in the planning area.
- Improve freight connectivity to facilitate efficient movement of goods within the region through freight management plan.

8.2.3. Strategic Goal 3

Ensuring efficient connections by providing Reliable multi-modal travel options

An efficient transport system is critical to provide access to jobs, education and other services. Currently, the mode share for public transport in the city is very low at 3% and about 1.6 lakh passenger boardings on Siti Link City Bus and BRT services.

The BRT system, which was introduced in 2014, currently has around 102 kms of operational length. With the implementation and operationalisation of the new BRT corridors, PT ridership is expected to get a significant boost. To cater to the travel demand in 2046, a multi-modal public transport system is being considered, which would include metro apart from enhancements in BRTS and regular bus services.

Surat has recently started investing in its public transport system and the focus is now gradually shifting from road network and efficient movement of motorised traffic to public transport. The share of public transport in the city is still very low at around 3%. However, efforts are being made to improve the same by introducing new PT routes and investing in BRT. It is seen that a city with a practically non-existing public transport system 5 years back has improved its PT within a year from 1.4% in 2016 to around 3% in 2017.

Apart from this, GSRTC services that operate regional routes need to be integrated with public transport modes. Integrating connectivity of the Surat railway station and the proposed high-speed rail with the public transport network also becomes critical. In this regard, multimodal interchanges need to be planned so as to enable efficient and seamless mobility. While planning multi-modal public transport systems, the design of interchanges for making transfers from one mode/service to another convenient, easy and quick, is important. In addition, measures like integrated ticketing, design initiatives to facilitate unimpeded movement of passengers, well-designed spaces, appropriate signages with requisite information would also be provided. This will help in providing passengers with a better journey experience. Local Area Plans Framework will be used to develop the TOD for Surat. The focus will be on organising densities and, in the process, improving the accessibility and connectivity to transit stations in the zone.

The policy directions for facilitating efficient movement of people and goods therefore are:

- Ensure efficient access to jobs, education and other services within Surat by providing improved public transport system in terms of better area coverage and integrated transit options.
- Planning for multi modal interchanges.
- Capacity enhancements and improved service frequencies.

8.2.4. Strategic Goal 4

Optimising transport system operations and enhancing travel experience of people through Advanced Technological Applications in transport.

Planning for future transportation would also require improvements in the IT systems to make them efficient and user friendly. These will be necessary to enhance the overall quality of services provided in the city.

One way of improving public transport services is by increasing the efficiency of the system. Information technology systems can play an important role to assess the performance of the system and also indicate areas of improvement. In this regard, Surat is selected as one of the SMART cities and is already improving its public transport facilities. However, more efforts would be required to facilitate integration between modes and services, for which a data, intelligence and automation driven transport system is proposed for the city. This would include all sectors of transportation ranging for traffic management to public transport to personalised transport improvements.

8.2.5. Strategic Goal 5

Contributing to the environment by promoting Low carbon mobility

Surat has a compact city structure having poly-centric nodes. Trip patterns are dispersed as a result of which the average motorised trip lengths (6.04 km) are lower than those in Indian cities of comparable size. The core city area is one of the major activity nodes, with the textile market, railway station and regional bus station located in this area. Commercial activities in Surat are mostly seen as part of mixed land use spread throughout the city along major roads. The basic necessities are located at convenient distances from residences and therefore provide an opportunity for ensuring that such trips are undertaken by NMV modes.

It is envisaged that by 2046, as a result of increase in the size of the city, the average motorised trip length will increase, and it is envisaged that there would be a shift from both NMT and private modes to PT. For ensuring the most optimal use of road space in Surat, this plan focuses on efficient and sustainable modes like public transport, walking and cycling.

Mode Shares	2w	4w	3w	PT	Others		
2016	62%	13%	17%	2%	6%		
2046	35%	18%	7%	37.5%	3%		
* School rickshaw/ School Van/ Company Bus/ Pvt. Bus							

TABLE 8-1: MOTORISED MODE SHARES

In order to facilitate the movement of pedestrians to activity areas near residential areas and access to public transport modes, initiatives like design of pedestrian-friendly streets having continuous and well-maintained footpaths, providing direct connections to activity centres and minimising conflicts

with motorised traffic will be taken up. This will be adopted as a standard road design as a part of complete network strategy for network development.

To meet the above goals, the following strategies are proposed as a part of the plan:

- Planning for complete streets and ensuring that pedestrian infrastructure is universally designed.
- Promoting electric vehicles especially for public transport and IPT use in the future.
- Providing investment options in the form of environment improvement tax for the city and congestion charging in future years.
- Managing parking demand through strict provisions in the parking policy.
- Marketing public transport as a preferred mode to attract people towards PT.

CHAPTER-9

Mobility Improvement Measures

9. Mobility Improvement Measures

9.1. Proposal for Integrated Land Use and Urban Transport

The concept of land use transport integration is based on the nature of interaction between spatial and transport development. While allocation of land use impacts the demand for travel as people need to access different activities, transport infrastructure adds to the attractiveness of a location by improving accessibility and leads to a change in land value. Locations with improved accessibility become attractive for investments, and this results in further development of these locations.

Integrating land use and transport thus involves two simultaneous, mutually supportive processes:

- Organising the physical form and land use pattern of a city such that travel demand, trip lengths and travel times are minimised, while accessibility, comfort and efficiency are maximised.
- Organising all systems of transportation, from pedestrian pathways to mass transit systems, such that they integrate well with each other and enable the harmonious establishment of land uses around them and in the process generate a city form that is sustainable.

Recent Development Plan proposals were considered while planning for transportation systems in Surat to ensure land use transport integration. Apart from this, future transport proposals were also considered to integrate public transportation into the network plan and plan high density developments along the transit corridors.

The following aspects were considered for integrating Land use and transport:

1. Enabling Urban Structure - the recent Development Plan has identified nine growth nodes to be developed around Surat. These are Olpad, Kathor, Kamrej, Kadodara, Palsana, Dream City, Sachin, Hazira and Tena. All these areas will need good connectivity to support the economic development as well as improve accessibility to/from these areas to other parts of the city. Further, to keep the city size compact for developing these areas, the SUDA would need to plan TP Schemes in these areas as a priority. Hence, the two-tier planning approach is proposed, one for the city and its immediate surroundings and the other for developing the growth nodes.

The figure below depicts the two following scenarios for growth:

a. Scenario 1 Sprawl Scenario: It is assumed that most of the growth is envisaged in the city with economic development and opportunities coming up in the city itself. As a result of this, people will prefer to stay in and around Surat which will eventually result in the city growing in size due to more horizontal development, resulting in large areas around the city getting urbanised with low density developments which will eventually engulf the growth nodes in the region. As a result of this, the trip lengths, travel times and pollution in the region will result in a demand for large infrastructure

- investments to cater to the future needs along with transport-related externalities of pollution and increase in accidents in the region.
- b. Scenario 2 Growth Management Scenario: In the alternate scenario, which is envisaged as a growth management scenario, the focus of development will be on the growth nodes, by strengthening them not only in terms of having more opportunities of employment but also in terms of quality of living. As a result of this, the growth will be directed to these nodes and the core urban area will remain compact. These growth nodes will in turn be linked to the core urban area through strategic links (preferably developed as rapid transit links) which will further provide efficient mobility to the core area. Hence, the area to be urbanised will remain small, resulting in reasonable infrastructure investments.

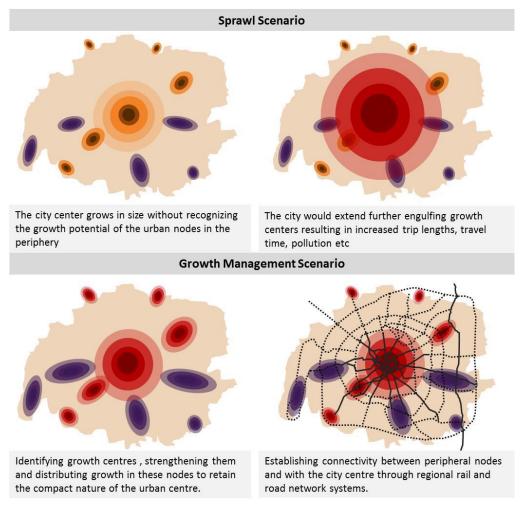


FIGURE 9-1: CONCEPTUAL DIAGRAM OF SPATIAL GROWTH SCENARIOS

2. **Strategic Alignments:** As discussed above, the growth nodes and the future employment centres need good connectivity to Surat. Hence, radial road networks are being proposed that will connect these areas to the city (details on the same are provided in the road development

Section 7.4). These radials are proposed to be developed based on the concept of 'Transit Ready Streets' wherein a wide median is reserved in the road cross-section for rapid transit like BRT/Metro/LRT which the city may want to develop in the future.

3. Complete Network and Complete Streets: When cities are compact in terms of physical form and in terms of functional interrelationships (mix of uses), trip lengths reduce and the mode share favours public transport and non-motorised modes. In that situation, the efficiency of the road network at macro and micro levels becomes very important. In order to facilitate a compact development in Surat, two sets of network strategies have been proposed:

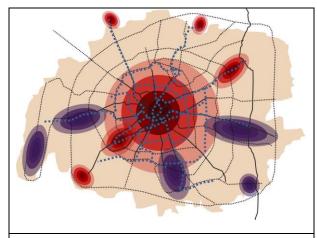


Figure 9-2: Conceptual Diagram of Road Network Completeness

- 1) all the incomplete ring and radials are completed along with identification of new connections including new bridges and underpasses in the city,
- 2) Emphasis on NMT and pedestrian facilities is also given importance while drawing up the road sections.
- 4. **TOD and Value capture:** The concept is based on the principle of maximisation of access to public transport through mixed use and compact neighbourhoods.

The main elements of this concept include:

- High densities around transit stations
- Mixed land use
- Pedestrian friendly and walkable neighbourhoods
- Provision of multiple transportation choices by multimodal integration

Transit oriented development is not only high-density development but it is also a lot of other things that can enhance the use of transit in the area. In the case of Surat, TOD is referred to in this context and hence, it is proposed that the zoning regulation will look into the same and define transit zones for encouraging mix use, pedestrian friendly neighbourhoods where people have multiple choices for transportation. TOD as a tool will be used to organise densities by providing incentives for redevelopment in the area and thereby creating avenues for improving accessibility and connectivity in the area. Though most of the area is already

built up, there is scope for improving the pedestrian infrastructure to support transit through the Local Area Plan.

Value capture as a mechanism in line with the recently issued value capture policy of the MoUD should also be adopted to fund these developments. The need to set up a separate urban transport fund is also proposed and the same is discussed in Section 11.3.

- 5. Integrated Multimodal Public Transport Facility: The Surat railway station is being developed as a state of the art interchange facility where bus/metro/GSRTC/private vehicles will be integrated to function as one unit with seamless connectivity across modes. Along with this, other level 2 and level 3 interchange points are also identified as a part of the PT proposals in Section 9.3.7. The focus will be on both physical and financial integration and hence, a proposal for a common mobility card is already under consideration. Since Surat has also been selected as a smart city, PT is the focus area for pan-city proposals. As a result, IT integration is already under process between BRT and city bus. The same is proposed to be extended to the metro. Integration can also be achieved if the information is easily and freely available to all users. The emphasis on journey planning where a person is able to make an informed decision on the mode and route one takes is also proposed.
- 6. Accessibility Improvements and Local Area Plans: These are proposed to improve connections between existing land uses and the existing or proposed public transport systems. These plans will improve the existing street network by adding new connections within currently developed areas by incentivizing redevelopment. The Local Area Plans will identify mid-block connections to reduce block sizes and will improve existing streets to facilitate pedestrians and NMT. As a part of the NMT proposals where in the local areas identified for pedestrians and cyclists will be developed. This would also include safe movement routes connecting residential areas to work areas, schools, colleges, and PT stations. The LAPs will be prepared by the appropriate authority, and submitted to the government as per the Provisions under section 76A and other sections of Gujarat Town Planning and Urban Development Act 1976.
- 7. **Redevelopment and Re-vitalisation of Vacated Industrial Areas**: The SUDA in its Revised Development Plan has proposed the shifting of hazardous industries from residential areas to the proposed special hazardous industries zone. This will free up space in the city for mix use development. Integration with public transportation is also proposed as a part of the plan. Apart from this, a commercial zone is also being proposed near Chaltan Village as a potential site for a commercial centre for the APMC as this could also ease congestion in the city centre area.

In order to achieve integration, it is important that the various stakeholder agencies come together and work towards this in a coordinated way. There are a number of aspects involved in transport planning, including planning for various modes of transportation, provision of infrastructure such as road network, street furniture, bridges, bypasses, parking facilities, pedestrian and bicycle facilities, waterways, rail transit etc. All these aspects are managed by different agencies. The multiplicity of agencies results in piecemeal and fragmented working, improper distribution of funds for various transport projects, lack of clarity in the roles and responsibilities of different agencies. In the case of public transport, agencies often work in competition with one another, thus resulting in the development of inferior quality of public transport system. The low standard of public transit services fails to fulfil the demand and discourages people from using public transport and instead pushes them towards using personalised vehicles.

Ownership plays a key role in the success of any plan. The clarity on ownership ensures that the plan is prepared and implemented properly. Hence, the SMC is proposed as the agency, along with the SUDA, to anchor the Mobility Plan.

To achieve this, inter-agency collaboration needs to be undertaken to carefully manage the requirement of different stakeholders along with their expectations. Instead of formulating a new agency, it is proposed that the SMC take up the task of coordinating between agencies.

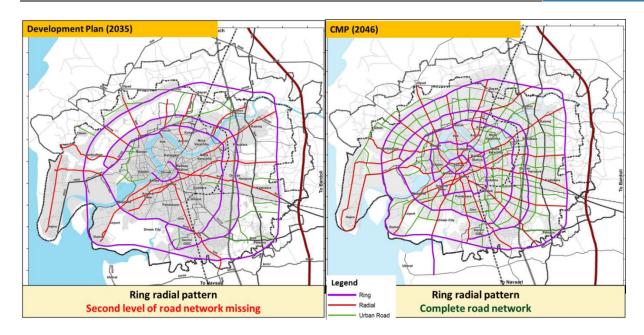
9.2. Proposal for Road Network Development Plan

9.2.1. Principles for CMP Road Network Development

The road network for the city of Surat was developed based on the following principles:

9.2.1.1 Adopting the Existing Road Network Pattern of 'Rings-Radials':

Surat has a ring-radial street network pattern with most radial streets originating from the historic walled city core. The proposed road network adopts this '*Ring-Radial*' network pattern for the future development of the arterial and sub-arterial roads of the city. The inner (first) ring encircles the walled city core. There exist sections of roads in the city that hold potential for development into complete rings. Similarly, there are existing radial roads that hold potential to be developed as arterials (radials) of the city and that could establish strong peripheral connectivity. This existing road network pattern is adopted as the base for developing the future road network.



MAP 9-1: COMPARISON OF DP VS CMP ROAD NETWORK

9.2.1.3. Road Hierarchy:

The road network hierarchy defined by the SMC is based purely on the road widths. However, the functionality of the road network is not considered. Hierarchy of roads is required so as to cater to various levels of mobility needs in the city. The hierarchy is predominantly defined by the function that roads cater to. The hierarchy adopted for the design of Surat road network is as follows:

- Level 1 Arterials: These roads formulate the pattern or form of the city. Arterials provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic, of which some could be strategic freight routes. They may often by-pass the city in order to avoid entry of freight traffic into the inner parts of the city. Arterials that pass through the city carry traffic between industrial, commercial and residential areas and, generally, connect to the sub-arterials. These are likely to be truck routes, and hence, certain sections of these roads provide only limited access to adjoining property. These roads carry urban and regional traffic that needs to connect to city centres. They are ideally spaced approximately 5 km apart and have widths ranging from 36m to 90m.
- Level 2 Sub-Arterials: These carry traffic from multiple specific areas to the arterials. Generally, these roads run between land-use cells and not through them. Sub-arterials formulate patterns by further dissecting level 1 roads and form urban grids of 2.5 km. They have a width of 24 m to 36 m.
- Level 3 Collectors: These streets form urban blocks and connect level 1 and level 2 roads. They carry no traffic external to a specified area/grid. They define urban blocks of a city, forming 1.5 km grids. In Surat, all roads of width 9 m to 24 m have been classified as collectors.
- Level 4 Distributors: They are neighbourhood level roads that provide access to residents.

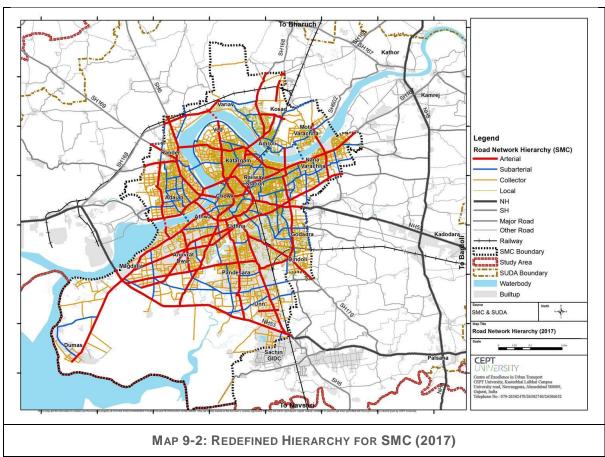
 The route of distributors should discourage through traffic so that the grid formed by these

roads carry only traffic specific to that area. In Surat, roads that are 9 m wide and lesser are classified as distributors.

The details of the redefined road hierarchy for the existing network in the SMC for the year 2017 is provided in the table below:

TABLE 9-1: REDEFINED HIERARCHY FOR SMC (2017)

Road Type	Description	Length (Km)	% of roads
Level 1- Arterial - Formulates the pattern or form of the city	 All National highways and State highways passing through the city completeness All the radials originating from the centre of both the cities Rings / Orbitals Roads that are wider than 36m to 90m 	366	9%
Level 2 Sub arterial- Formulates patterns by further dissecting level 1 roads / Forms grids - patterns	 Major district roads. Roads that are long/ continuous and cut across about half of the city Roads that are wider than 24m to 36m 	298	8%
Level 3 Collector— creates blocks	 Roads that connect level 1 and level 2 roads Roads that are wider than 9m 	1117	29%
Level 4 Local roads – Access to the residents	 Roads that are connect to residential units. Roads that have right of way < 9m 	2079	54%
Total		3859.73	100%



Source: CoE-UT, CEPT University

9.2.1.4. Transit Ready Streets

A concept of transit ready streets is adopted while designing higher order roads. As per the concept, the middle lane on arterial and sub-arterial roads is reserved for future transit. Hence, when the demand for rapid transit emerges in the future, space would be available and issues of land acquisition are avoided in the process.



FIGURE 9-3: CONCEPTUAL PLAN FOR TRANSIT READY STREETS

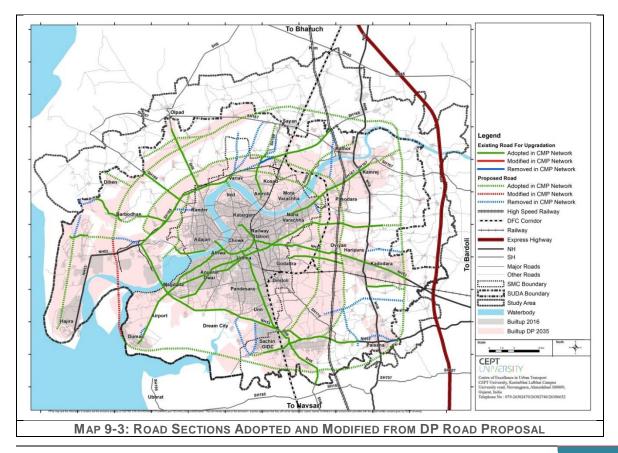
9.2.1.5. Road Way Design Considering Adjoining Land Use

The third principle of road development is proposing road designs that consider and adapt to adjoining land use. It is important to understand that roadway design of a road falling under one particular hierarchy or of a particular road width will not remain the same for the entire road length. The function and characteristics of the road changes as it passes through varying land uses. For example, a 45 m wide arterial road passing through an industrial area will need design solutions that support the related activities such as heavy freight parking, resting areas for truck drivers, bus stops that can accommodate larger number of workers who commute to the factories by public transport, resting areas for workers (roads are often a platform for eating, sleeping etc. during break time), dedicated bicycle tracks in the case of higher number of bicycle users etc. This requirement would vary in a scenario where the same arterial road passes through an agricultural land in the periphery. Similarly, the design of the same road passing through a wholesale market will require a different set of design solutions.

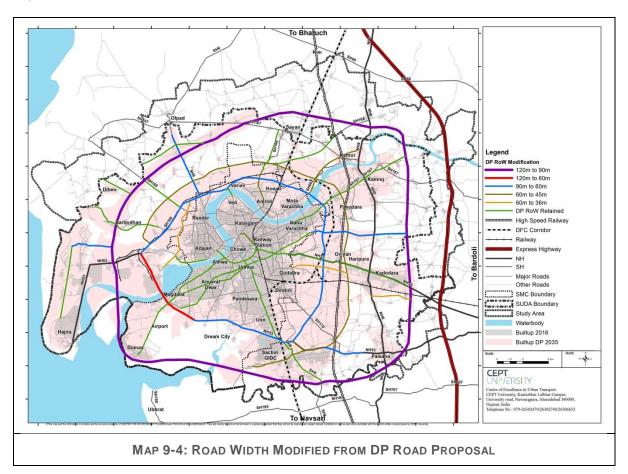
9.2.2. CMP Network Development

9.2.2.1. Road Section Adopted and Modified from DP Road Network Proposal

The initial step towards arterial/regional road planning was to identify the road sections under the DP proposal that are to be retained and the ones that require modification. A total of 172 km of roads are adopted from the DP road proposal, 9.30 km of roads are proposed to be modified and 79 km of DP roads are proposed to be removed from the CMP proposal. The map below shows the arterial road sections which were adopted from the DP proposal and the modified sections.



Secondly, the existing and proposed landuse development was considered for the preparation of arterial road network of the city as discussed earlier in Section 7.1. It is important to take into consideration the activity distribution within the city area and develop a network that enables efficient traffic movement within the city, besides aiding in bypassing the traffic that is not destined for the city.



The map above shows the modifications suggested in terms of road widths for the CMP road network proposal with respect to the Revised Development Plan 2035. Planning the outer ring road with 120 m RoW would not be feasible keeping in view the accessibility aspect for pedestrians and the future demand; hence the same has been reduced to 90 m wide road. Similarly, the 90 m wide Outer Ring Road proposed in the DP around the existing city boundary is suggested to be reduced to 60 m wide road. The same also applies to the section between Khajod and Icchapur on the Outer Ring Road which is now proposed to be 60 m.

9.2.2.2. Rings and Radials

1. **Rings: The** CMP classifies all national highways and state highways passing through Surat, all the radials originating from the walled city core and the ring roads as arterials. Also, all roads that are wider than 36 m and as wide as 90 m (both existing and proposed) are classified as arterials. The regional **'Ring-Radial'** road network thus formed by a network of arterial roads is discussed in the following sections.

 Ring
 Avg. Distance (km)

 C1 - C2
 3.4

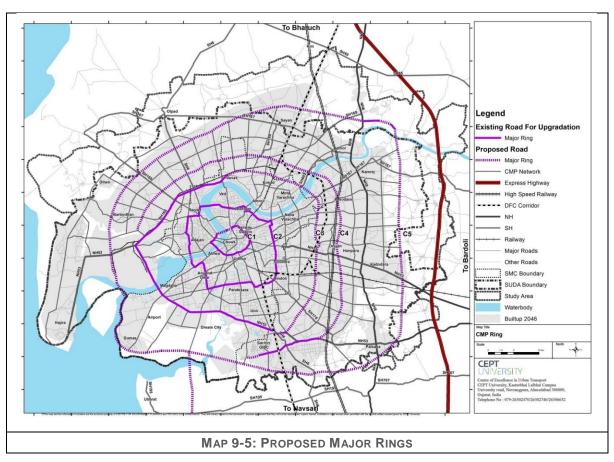
 C2 - C3
 4.5

 C3 - C4
 2.7

 C4 - C5
 5.7

TABLE 9-2: AVERAGE DISTANCE BETWEEN RINGS (CMP)

The proposed rings of the city along with the existing inner ring (C1) are as shown in the figure below. Whereas the average distance between the rings are show in the Table 9-2.



The complete network of arterial rings consisting of existing and proposed roads consists of the following links:

TABLE 9-3: DETAILS OF THE FUTURE MAJOR RINGS

Sr. No	Code	Ring Name	Existing Length (km)	Proposed new road link length (km)	Total Length (km)	Existing ROW (m)	Proposed ROW (m)
1	C1	Inner Ring Road	10.24	1.67	11.91	18-24-36-45-60	24-60
2	C2	Middle Ring Road	36.15	0.85	37.0	24-30-45	45
3	C3	Middle Ring Road – 1	34.45	27.87	62.32	18-24-30	60
4	C4	Middle Ring Road – 2	6.84	47.12	53.95	12-24	45
5	C5	Outer Ring Road	2.35	107.99	110.33	9	90
Total			90.03	185.5	275.5		

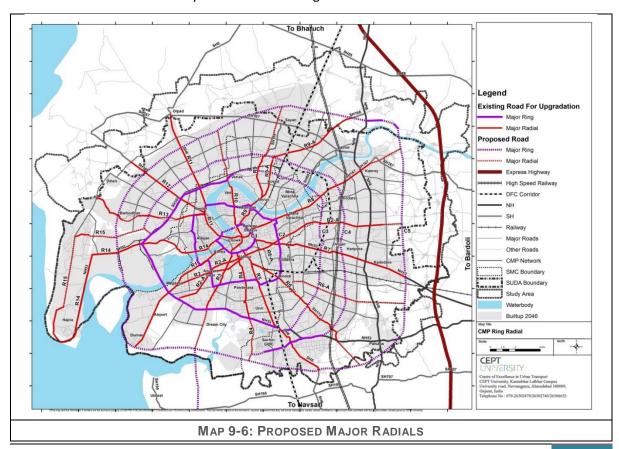
The recommended cross section accommodating a mass transit in the centre is shown in Annexure 32.

2. Radials: The radials in Surat are roads that originate from the walled city core and terminate at the outermost ring (C4). 21 such radials were identified (as presented in Table 9-4 and and Map 9-6). These roads fall under two categories based on their varying characteristics with respect to alignment (within the urbanized area or outside the built fabric).

They are categorized as;

- Within the urbanised areas: Radial roads that exist within the developed area of the city. The
 roads are narrow and face congestion due to vehicles and land use related activities in the inner
 areas of the city. The proposal is to strengthen these roads wherever possible inside the city
 either by redesigning them to accommodate various uses across the entire available RoW or by
 road widening schemes.
- Outside the urbanised area: Most of the identified radials are wide enough to meet the
 requirements of an arterial or have the potential to be widened as they extend further out and
 pass through the agricultural/industrial land use outside the developed area of the city. These
 could be existing state highways, sections of the proposed road under DP and new missing links
 that complete the network. New roadway designs are proposed for these road sections.

The identified radials of the city are shown in the figure below.

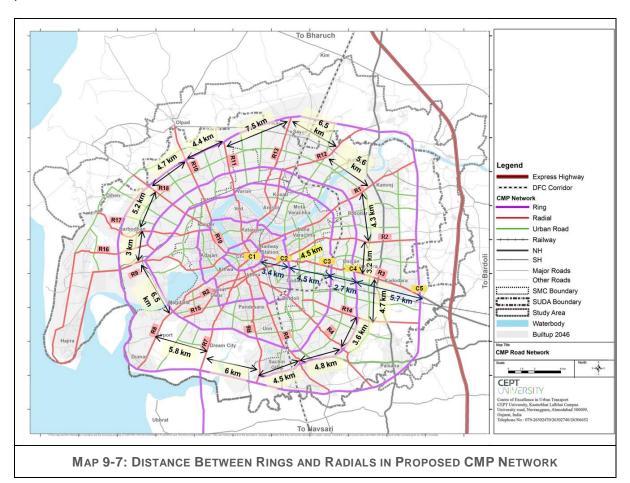


The recommended cross section accommodating a mass transit in the centre is as shown in Annexure 32. The network of arterial radials proposed for the city varies with respect to the road network proposed in Development Plan 2035 and TPS; therefore the variations suggested in the CMP needs to be incorporated in the DP and TPS. The details are as shown in below table.

TABLE 9-4: DETAILS OF FUTURE MAJOR PROPOSED NEW ROAD LINK LENGTH

Sr. No.	C	ode	Radial Name	Existing Length (km)	Proposed new road link length (km)	Total Length (km)	Existing ROW (m)	Proposed ROW (m)
1	Inne	r Link-1	Chowk to station road	3.3		3.3	14-18	18-24
2	Inne	r Link-2	Katargaam - Bhagal Char rasta	1.4	-	1.4	18-24	18-24
3	Inner	Link-2A	Bhagal Char rasta - Majura Gate	2.5	-	2.5	18-24	18-24
4		R1	Athwa Gate-Dumas	15.8	0.2	16.0	45-60	60
5	R2	R2	Udhana Magdalla road	8.7		8.7	60	60
6		R2-A	Canal Road	25.7	2.6	28.3	36-60	60
7		R3	Majura Gate-Sarsana	7.4	4.9	12.3	18-24	24-36
8	8 R4		Sub Jail-Pandesara Road- Sachin GIDC- Umber Gam Road	8.4	5.3	13.7	18-24-30	24-36
9	R5		Udhna-Navsari Road	17.3		17.3	45-60	60
10	D.C	R6	Dindoli Road	14.0	3.9	17.9	24-30	36
11	R6	R6-A	Godadara-Tundi		13.0	13.0		45
12		R7	Surat - Bardoli Road	17.7		17.7	45-60	60
13		R8	Varacha - Kamrej Road	15.6	3.9	19.5	36-45-60	45-60
14	R9	R9	Katargaam - Amroli Road-Kosad Road	9.9	5.9	15.8	18-24-45	24-45-60
15	N.S	R9-A	Mansarovar-kosad Gam Road	13.7	1.6	15.3	18-30-45	45-60
16	ı	R10	Ved Road	4.7	7.2	11.9	18-24-30- 36	24-36-45
17	ı	R11	Rander Road	17.3		17.3	18-45	45-60
18	ı	R12	Dandi Road	10.2		10.2	12-30	36-60
19		R13	Bhesan Road	9.9	4.1	13.9	9-30	36-60
20	ı	R14	Hazira road	32.1		32.1	30-45	60
21	I	R15	Hazira road (ViaSunvali,Dmaka)	1.6	16.0	17.6	9	60
		To	otal	237.2	68.6	305.7		

The map below shows the average distances obtained between the two rings and radials. These show that the future road network has a uniform ring radial pattern which enhances connectivity and promotes alternative routes.



9.2.3. Future Urban Road Network

The urban roads of the city are proposed within the urbanisable area for year 2046. The extent of these roads defines the future developable area and vice versa. The widths of these roads range from 18 m to 60 m and are broadly classified as: Arterial, Sub-arterial, Collector and Distributor.

Further, as a part of the road development concept, road widths \geq 30m would be provided with "Transit Ready Streets" or with median lane reserved for mass transit service; therefore alternative cross sections with different road widths has been provided in Annexure 32 (1-9). While the road widths \geq 18m wide could be proposed as "Bus Priority" corridor with priority given to busses at the junction; cross sections for the same are provided in Annexure 32 (10, 11, 12 & 13). In case of the road widths <18 only mini bus/small bus would be allowed to ease congestion and facilitate easy turning movement for buses.

9.2.3.1. Arterials

These correspond to the ring and radials in the city which provides the basic structure to the city as discussed in section 9.2.2.2.

9.2.3.2. Sub-Arterials

These roads feed traffic from multiple specific land use areas to the arterials. They carry city level traffic and hence are recommended to be developed as transit ready streets, though not of the same scale as arterials. These are the radials that are continuous for long stretches, but do not directly lead from the city centre to outer neighbourhoods. In many locations, these roads may connect two rings directly. Other than these radials, roads that are part ring or parallel to rings may also be considered as sub-arterials. These roads run between land use cells and generally not through them. They often form grids of 2 km x 2 km (block size) and consist of roads of two categories:

- The road sections within the existing built area of the city that abuts built fabric and has limitations of expansion. A proposal for widening has been recommended in whichever areas it is possible. The RoW would be between 18 m and 45 m. However, in the case of existing sub-arterials that are less than 18 m, the existing RoW would continue with an attempt to increase them to at least 18 m through a new road line.
- The roads that are extensions of the identified sub-arterials that extend into the proposed developable area 2046. In Surat, all roads that are long/continuous and cut across about half of the city and those which are wider than 24 m to 45 m are classified as sub-arterials.

The total major road network proposed in the CMP at strategic level is about 3104 km. About 308 km road network length is upgraded in RoW and 526 km is that of newly added links with respect to the existing road network. The road network density within the SMC is about 12.1 km/sq. km and that within the study area is about 4.7 sq. km/km, whereas in the base year, the road density is about 11.8 km/sq.km and 4.3 sq.km/km respectively. The network of sub- arterial radials proposed for the city varies with respect to the road network proposed in Development Plan 2035 and TPS in certain areas; therefore the variations suggested in the CMP needs to be incorporated in the TPS.

Area	Existing 2016 (length in km)	CMP 2046 (length in km)
SMC	664	751
SUDA	1411	1839
Rest	503	514
Total study area	2578	3104

TABLE 9-5: SUMMARY OF ROAD NETWORK LENGTH (EXISTING 2017 AND PROPOSED CMP 2046)

In the case of the ring radial network and bus route network in Surat, a detailed survey was carried out to identify issues which could be taken into consideration while upgrading the system. The results of the same are provided in Annexure (Part 2).

The table above shows the road network grid sizes at level 1, 2 & 3 for the cities; details of the same are provided in Annexure 33.

For the CMP road network proposal, consistency in block sizes with grid size of approximate 2 km X 1.6 km has been proposed so as to maintain a proper hierarchy of road network and connectivity as shown in the map above.

TABLE 9-6: ROAD NETWORK GRID SIZES (KM X KM)					
Case Studies Inferences of Road Network Block sizes (km x km)					
Cities	Level 1	Level 2	Level 3		
Gandhinagar	1.05 x 0.83	0.60 x 0.45	0.45 x 0.3		
Chandigarh	1.2 x 0.80	0.85 x 0.30	0.37 x 0.20		
Bhubaneshwar	4 x 3	2 x 2	0.9 x 0.9		
Surat (proposed)	2 X 1.6	1 x 0.85	0.5 x 0.4		

The recommended cross section accommodating a mass transit in the centre is shown in Annexure 32.

9.2.3.3. Collectors

All roads that provide connection between blocks/neighbourhoods are classified as collector roads. These roads are meant to collect traffic from neighbourhoods and feed them to arterials and subarterials. They form urban blocks of 1 km x 1 km grid. The widths of these roads within the existing built up area range from 12 m to 18 m. However, the widths of collectors proposed in the newly developed areas is of width 18 m. The identified collectors within the already developed city area need widening wherever possible, if they are too narrow and congested. The collectors as per the CMP-2046 are proposed to be developed as 18 m wide roads.

In case the road is specifically planned as part of the NMT master plan, additional measures to reduce speed through traffic calming measures would be taken. The cross section may not have a median. In any case, footpaths would be provided at the edge of the road.

9.2.3.4. Distributors:

The distributors are internal roads within neighbourhoods. They would be the last link to residential destinations and would join level 3 collector roads. On no account should they directly connect with arterials or sub-arterials. These roads have the following characteristics:

- They would allow access to private properties.
- They would not have local bus routes running through them.
- The RoW would be between 9 m and 12 m.

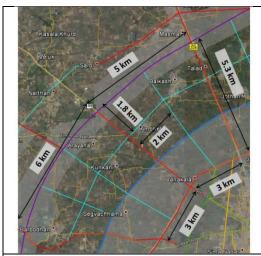


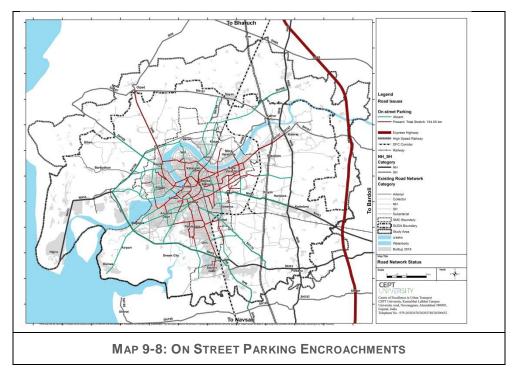
FIGURE 9-4 : EXAMPLE FOR DISTRIBUTOR
ROADS

9.2.4. Road Upgradation

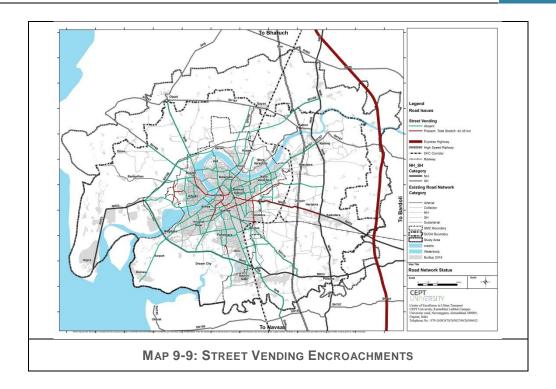
Detailed surveys were conducted for 771 km to identify issues on the major ring radial and the city bus network roads in SMC area. Based on the survey following issues were identified for intervention as a part of road upgradation in addition to road widening. Details regarding the same are presented in Annexure part 2.

Sr. No	Road	Total Length (km)	Encroachme nt due to on Street Parking (Km)	Encroachments due to Street Vending (Km)	Issues with Lane marking (Km)	Issues with pavemen t condition (Km)	Landscape/ tree cover missing (Km)
1	Rings	177	22	8	60	18	9
2	Radials	315	50	23	190	46	41
3	Bus network Roads	279	83	12	255	71	102
	Total	771	155	42	505	135	152

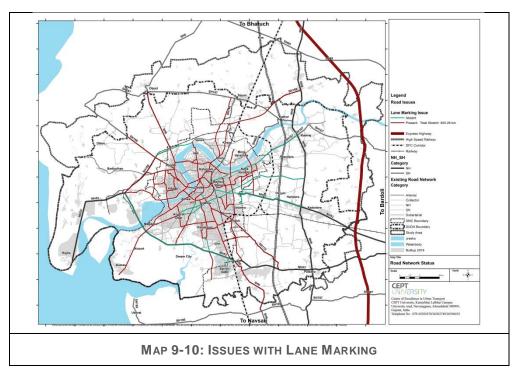
1. Encroachments due to parking: It was observed that about 20 % of the network surveyed had issues of on street parking encroachments that resulted in the underutilization of the carriageway.



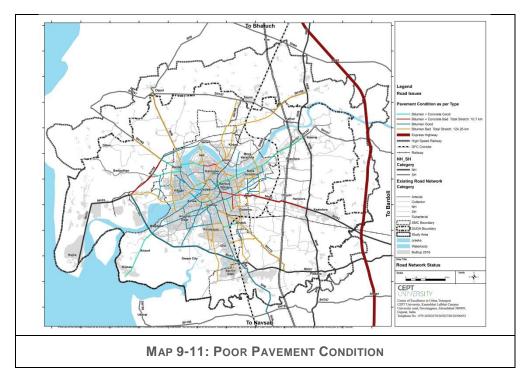
2. Encroachments due to street vending: street vending was observed on 5% of the total surveyed network, most of the network around the core area suffered because of the vending activities.



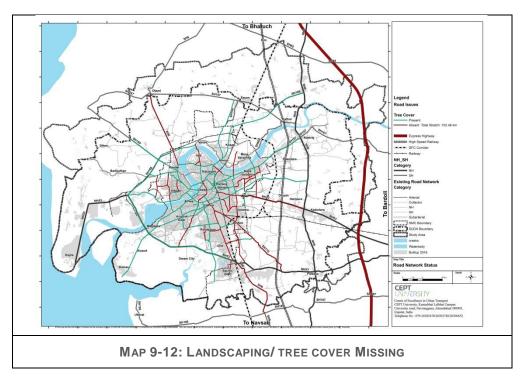
3. **Issues with lane marking:** Lane markings are important to provide direction to the flow of traffic thereby improving safety. It was found that majority of the network (66%) had either invisible or no lane markings.



4. **Issues with pavement condition:** About 18% of the surveyed network reported to have poor pavement condition, impacting the overall performance of the network.

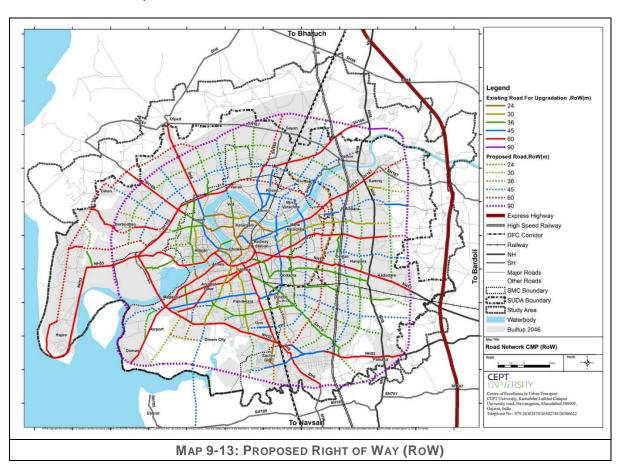


5. Landscaping and tree coverage along the road: landscaping and vegetation improves the aesthetics and overall quality of environment. It was found that about 20% of the network had no tree cover along the network.



9.2.5. Proposed Right of Ways (RoWs) of Road Network

The map below shows the proposed RoWs for the road network proposed for Surat. However, the RoW does not determine the hierarchy of the roads. Primarily, it is the function and the role each road/road section plays in moving traffic and in accommodating land use related activities that determine its hierarchy.

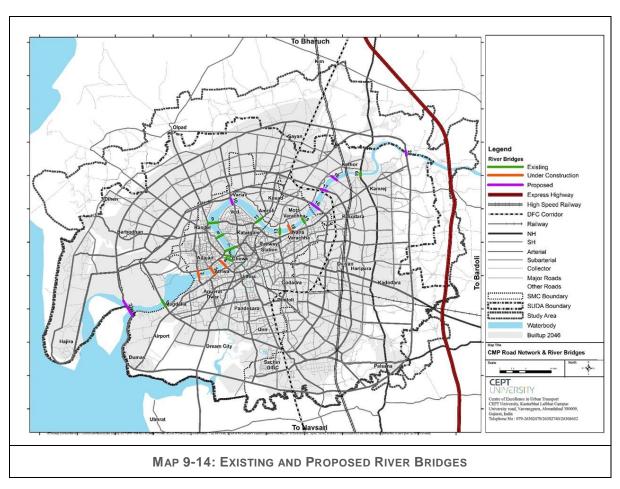


9.2.6. Proposed River Bridges, Rail under Bridges/Rail over Bridges

To ensure smooth connectivity in the city, network completion through bridges and underpasses is proposed in the future. The connection across River Tapi is proposed to be improved with six new bridges being planned. The details of the same are provided in the map below and in Annexure 38.

TABLE 9-8: EXISTING AND PROPOSED RIVER BRIDGES

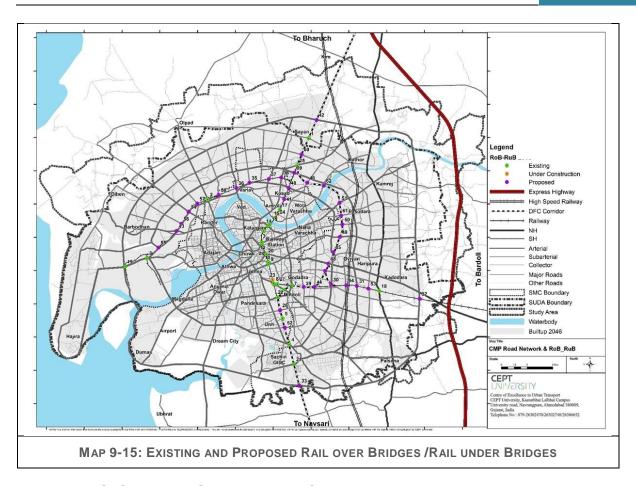
River Bridges	No. of Bridges	
Existing	12	
Under Construction	4	
Proposed(SMC)	1	
Proposed(CMP)	5	
Total	22	



Apart from this, RoBs and RuBs are also planned to take care of efficient movement across the railway lines and the DFC corridor. A total of 61 RuBs/RoBs have been proposed, details of which are provided in the table and the map below; also see, the details in Annexure 41.

TABLE 9-9: EXISTING AND PROPOSED RAIL OVER BRIDGES /RAIL UNDER BRIDGES

RoB-RuB	No. of Bridges		
Existing	22		
Under Construction	3		
Proposed(SMC)	1		
Proposed(CMP)	35		
Total	61		



9.2.7. Road Alignment along DFC Corridor

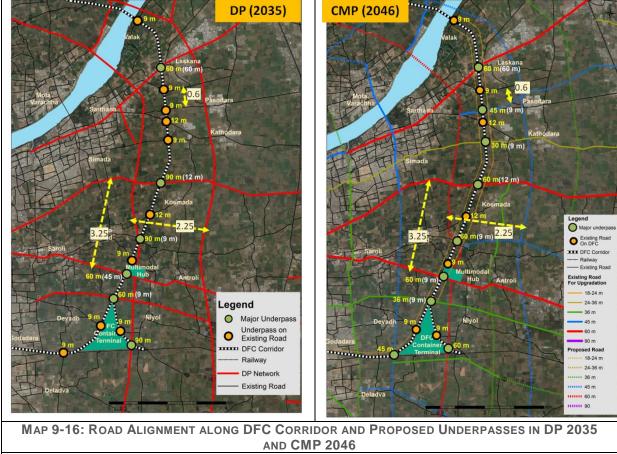
A Dedicated Freight Corridor is proposed along the Delhi-Mumbai railway line which will pass through the city on the eastern periphery. The section of road proposed in the map below needs further attention since the DFC alignment is proposed parallel to this section along the 60 m Ring Road which intersects various radial road sections. There is also a proposal of multimodal hub and DFC Logistic Park which would increase the movement of freight traffic, and hence, the approach towards junction or underpasses needs to be designed carefully so as to avoid conflicts.

Considering the DFC alignment, the road network proposed is as shown below. Map 9-16 shows the major and minor underpasses which have been identified. For the completeness of the network, all the underpasses are important and need to be considered for improving the connectivity and avoiding congestion.

As shown in Map 9-16 below, the encircled underpasses are critical to design since the 90 m Outer Ring Road passes through the DFC diagonally as per the DP alignment. Therefore, minor changes have been suggested to avoid conflicts. The proposed alignment has been shifted slightly to a desired angle to remove the complexity in designing of the underpasses.

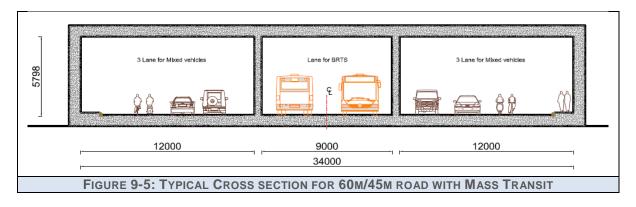
In the DP 2035 road network along the DFC, a total of 16 underpasses have been identified with six major and 10 minor ones, whereas in the CMP 2046 road network, there are a total of 16 underpasses with nine major and seven minor bridges. It is important for the SUDA to discuss the same with the

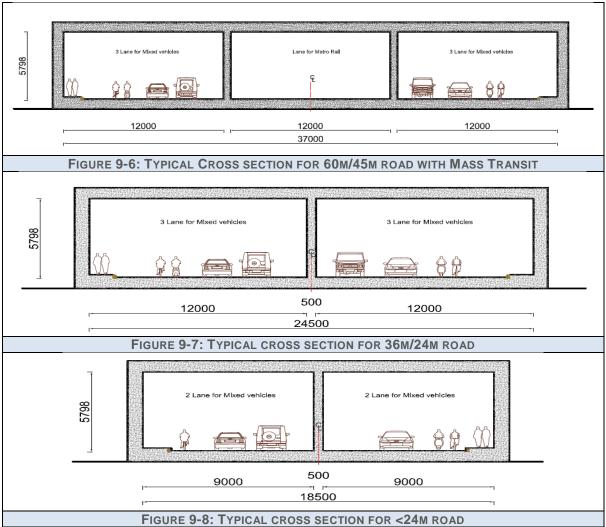
DFC and ensure that connectivity to the eastern side is not hampered due to bottlenecks being created at these crossings because of their inadequate width.



NOTE: NUMERICAL TEXT WRITTEN ARE ROW OF ROAD NETWORK; WHEREAS:
YELLOW COLOUR TEXT IS PROPOSED ROW AND
WHITE COLOUR TEXT IS EXISTING ROW

The recommended cross sections for underpasses for different mass transit systems cutting across the DFC corridor are shown in the figure below.





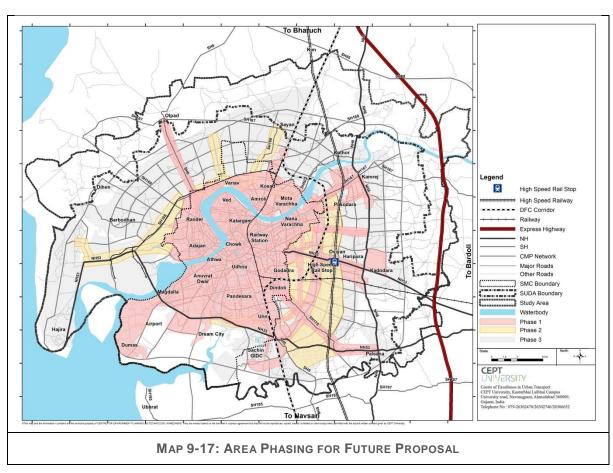
*Note: All measurements are in mm

9.2.8. Project Phasing for Road Infrastructure System

9.2.8.1. Phasing of Road Network

The CMP road network prepared for the horizon year 2046 has been proposed to be implemented in phasing based on future potential growth area, draft TP schemes available and buffer area of about 250 sq. km along with the proposed rapid transit corridor. As shown in the map below, the criteria for area phasing are:

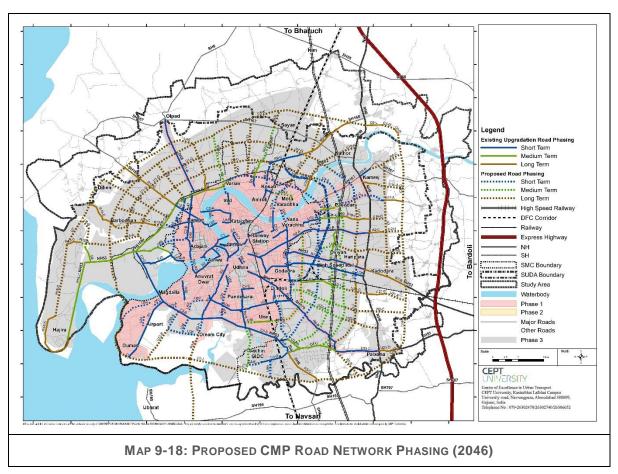
- Phase 1 (Short term 2–5 years): Draft TP Schemes Areas and LAP areas (in the SUDA and the SMC areas) (265 sq. km)
- Phase 2 (Medium term 5–10 years): Future Rapid Transit Zone area and infilling towards the eastern side along the HSR (122 sq. km)
- Phase 3 (Long term above 10 years): Rest of the Area (445 sq. km)



Therefore, considering the area phasing as a base, the total 834 km of CMP road network including existing upgradation and new links has been proposed to be implemented in phasing. Of this, 371 km of network is proposed to be implemented in the short term, 112 km in the medium term and 351 km of network in the long term, the details of which are shown in the table below.

TABLE 9-10: SUMMARY TABLE OF PROPOSED CMP ROAD NETWORK PHASING

Phasing	SMC (Km)	SUDA(Km)	Outside SUDA (km)
Road Upgradation	140	168	•
Short Term	140	65	-
Medium Term	-	42	-
Long Term	-	61	-
New Roads	87	428	11
Short Term	87	79	-
Medium Term		70	-
Long Term		279	11
Total	214	596	11



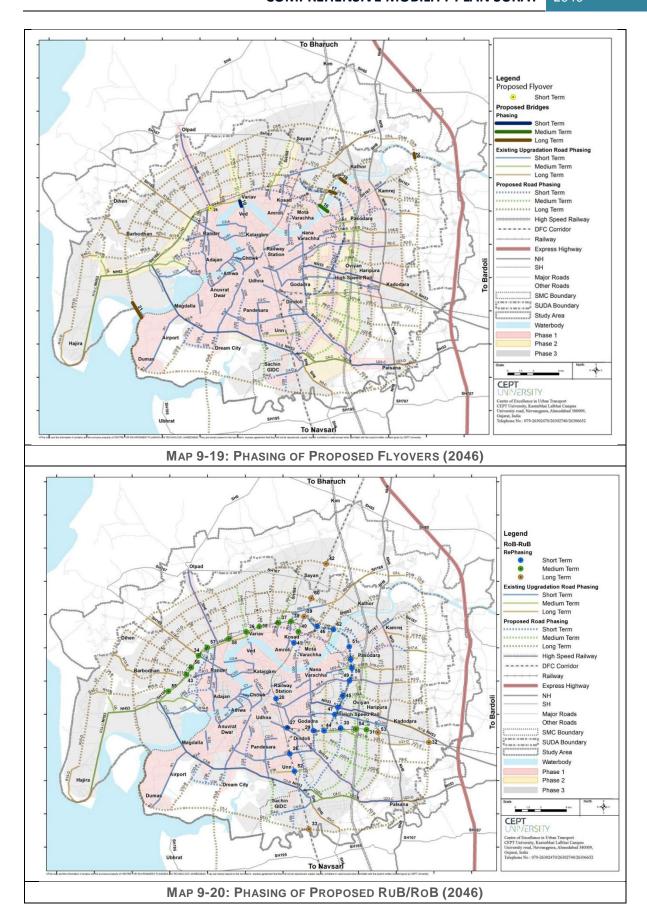
The above map illustrates the phasing of the road network development by segments, and the details of the same with cost estimation have been provided in Annexure 35.

9.2.8.2. Phasing of Bridges

As shown in the table below, the summary of the implementation of bridges within the SMC and the SUDA area has been proposed with respect to road network phasing. Map 9-19 and Map 9-20 shows the location of bridges; the detail list and cost estimated has been provided in Annexure 37 and annexure 41.

TABLE 9-11: SUMMARY TABLE OF PROPOSED PHASING OF BRIDGES AND ROB/RUB

		SMC		SUDA		Outside SUDA	
Phasing	Flyover	River Bridges	RoB/ RuB	River Bridges	RoB/ RuB	RoB/RuB	Total
Short Term	1	2	4		12		19
Medium Term			6	1	8		15
Long Term				4	5	1	10
Total	1	2	10	5	25	1	44



9.3. Proposal for Integrated Transport System

Presently, Surat city is in the process of improving its public transport system through the introduction of a new bus service for the city. This service is being planned in such a way that these buses act as a feeder and are complementary to the BRT services in the city. Route rationalisation and operations planning for the existing BRT and city bus routes is already underway.

With rapid growth of the city being envisaged, it is important to plan for the requirement of the transit system to be able to cater to the future demand. Therefore, alternative future scenarios were analysed to identify the potential high mobility corridor. Based on the model outputs, suitable modes have been suggested (Section 7.5.5). This chapter presents the proposals for the public transport system.

9.3.1. Regional Bus Service - GSRTC

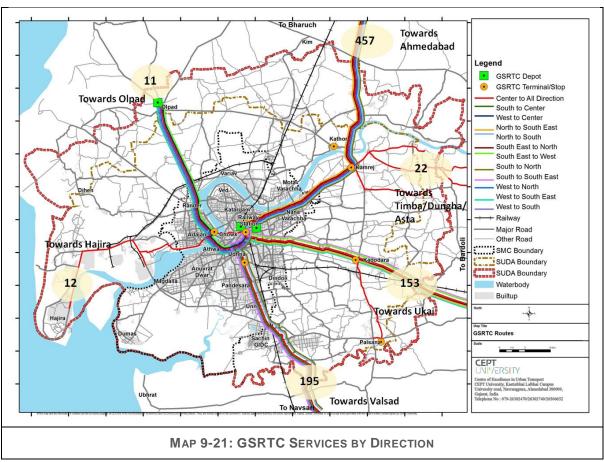
GSRTC services are the regional bus services connecting Surat city with other states and sub-urban regions. The details of the existing operations of the GSRTC are presented in Section 3.3.2.

The table below shows the number of buses originating, terminating and passing through Surat city. About 69% of buses are through services which pass via Surat and 31% originate/terminate in Surat. In the future, to ease vehicular traffic, the routes which pass through Surat city could be diverted through NH, with interchange nodes at Kamrej and Kadodara. These routes can be integrated with the city services at proposed interchanges at Kamrej (refer Map 9-29) and at the terminal and depot at Kadodara (refer Map 9-28). This would also help decongest city roads.

TABLE 9-12: DETAILS OF GSRTC BUS SERVICES (2016)

Direction	Total No. of Buses				
Direction	Origin/Destination at Surat	Via Surat	Total		
Towards Ahmedabad	172 (38%)	285(62%)	457 (54%)		
Towards Timba /Dungha/Asta	22(100%)	0	22 (3%)		
Towards Ukai	46 (30%)	107 (70%)	153 (18%)		
Towards Valsad	9 (5%)	186 (95%)	195 (23%)		
Towards Hajira	12 (100%)	0	12 (1%)		
Towards Olpad	1 (9%)	8 (73%)	11 (1.3%)		
Total	264 (31%)	586 (69%)	850 (100%)		

Source: GSRTC survey



Source: CoE-UT, CEPT University

A proposal to develop a **Multimodal Transport Hub** at **Surat Railway Station** that conforms to international standards and its integration with the surrounding developments has been proposed in the Development Plan 2035. The existing GSRTC terminal at the railway station would thus have to be developed as a part of the multi-modal hub, providing an opportunity to integrate GSRTC services with the railway station and the proposed rapid transit mode and bus services.

9.3.2. Proposal for Integrated Ferry System

As Surat city is situated at the bank of the river Tapi and since it used to be a large seaport, a proposal of ferry transport has been initiated for connectivity with the city centre and other major important centres, for ease in commuting. Therefore, an alternative analysis was done to assess the requirement of the ferry system in future in the year 2046. Hence, in addition to the CMP scenarios, a scenario with 'CMP alternative 1' was tested with ferry network integrated with the other proposed future public transport network in the model.

9.3.2.1 Proposed Ferry Network and Station Details

For the future, the proposed ferry network length is about 46 km connecting the north-east and south-west areas within the study area. The only constraint observed was the Causeway Bridge which acts as physical barrier and hence does not allow the ferry to pass under the bridge due to height and water level differences. Therefore, instead of one continuous ferry route, two routes have been proposed. They are:

Route 1: Dumas to Causeway Bridge (22 km) and

Route 2: Causeway Bridge to Kathor (24 km)

Here, the causeway bridge would act as the major interchange station for ferry-to-ferry transfers. The map below shows the proposed ferry dock station and ferry routes, with details being shown in the table below.

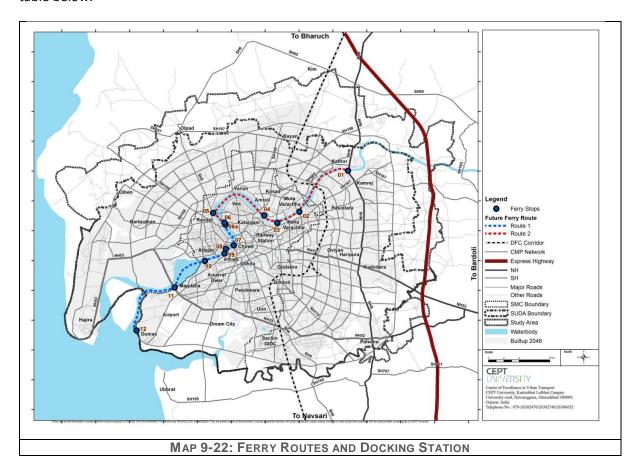


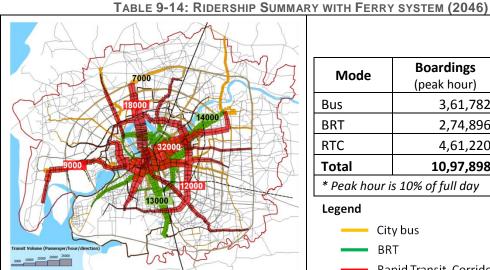
TABLE 9-13: LIST OF FERRY DOCK STATION AND FACILITIES

Sr No.	Ferry Dock Stations	Terminals/Interchange
01	Kathor (N)	Terminal
02	Sarthana Nature Park	Interchange (Ferry –BRTS -RTC)
03	Uttran Bridge	Interchange (Ferry –BRTS-RTC)
04	Amroli Bridge	Interchange (Ferry –BRTS -RTC)
05	Jahangiripura	Interchange (Ferry –BRTS)
06/06a	Causeway	Terminal & Interchange (Ferry-Ferry)
07	Chowk	Interchange (Ferry –BRTS-RTC)
08	Sardar Bridge	Interchange (Ferry –BRTS)
09	Chowpati	Interchange (Ferry –RTC)
10	Umra	Interchange (Ferry –BRTS)
11	ONGC Bridge	Interchange (Ferry –BRTS)
12	Dumas Beach	Terminal

9.3.2.2 System Performance

To check the feasibility of ferry transport, the scenario was developed in the model (EMME software). As discussed in Chapter 7 Section 7.5, in addition to the CMP scenario, an alternative scenario i.e. CMP scenario alternative 1 was tested for peak hour, assuming an average headway of 12 mins and average speed of 30 km/hr. In the model, the time taken by the ferry to dock at the station was not fed in as a separate parameter. Hence, the weighted time was adjusted in headway and boarding penalty.

The same CMP demand was assigned in the alternative scenario so as to maintain consistency in both the scenarios thus enabling the evaluation of the potential of the system as compared to the CMP scenario. The table below shows the transit flows and transit ridership in both the scenarios.



Mode	Boardings (peak hour)	% Boardings
Bus	3,61,782	33%
BRT	2,74,896	25%
RTC	4,61,220	25%

10,97,898

100%

Legend

Total

City bus

BRT Rapid Transit Corridor

SCENARIO 1: CMP SCENARIO (2046)



Mode	Boardings (peak hour)	% Boardings		
Bus	3,57,409	32.6%		
BRT	2,71,582	24.8%		
RTC	4,60,298	42.0%		
Ferry	6,620	0.6%		
Total	10,959,09	100%		
* Peak hour is 10% of full day				

Legend

City bus **BRT**

Ferry

Rapid Transit Corridor

SCENARIO 2: CMP SCENARIO ALTERNATIVE1 (2046)

^{*} Peak hour is 10% of full day

It has been observed that in scenario 2, only 6,600 passenger boardings per hour were in ferry (i.e. 0.6% of total boardings) in 2046. Whereas, in the year 2026, the passengers boarding is about 2,345 per hour (i.e. 54 pass boardings/km) which is too low for the system to initiate. Further, there are no such major changes observed in transit flows as well as boarding in BRT, Bus and Rapid transit corridor as shown in the table above. The average PT travel time and trip length were also similar.

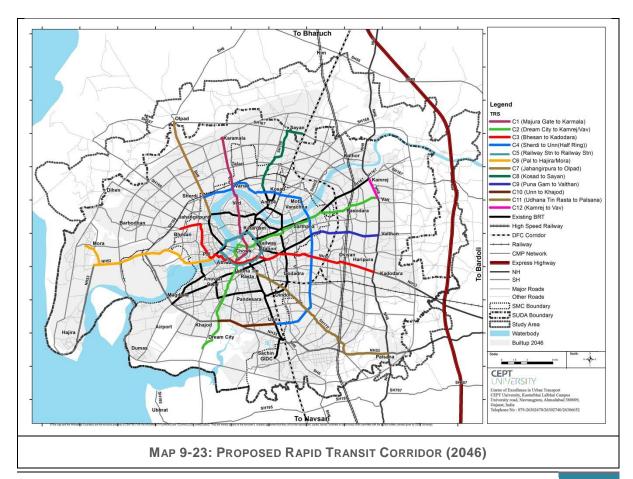
9.3.2.3 Recommendation

Therefore, based on the existing condition, the demand has been estimated for the future for the integrated rapid transit network such as bus, BRT and ferry. The demand observed for ferry is not very high in 2026 and 2046. However, a further detailed alternative analysis may be undertaken in the future for feasibility assessment of ferry services.

9.3.3. Rapid Transit Corridor

Table 7-14 shows the transport model outputs for the potential rapid transit corridors for the year 2046. It can be seen that among the 12 corridors shortlisted after the screening process, Dream City to Kamrej, Bhesan to Kadodara and Majura Gate to Karamala are the three corridors with high ridership per km and PHPDT flows, and hence these are proposed as potential metro corridors in the future.

For these identified corridors, the cross sections with transit ready streets are provided in Annexure 32.

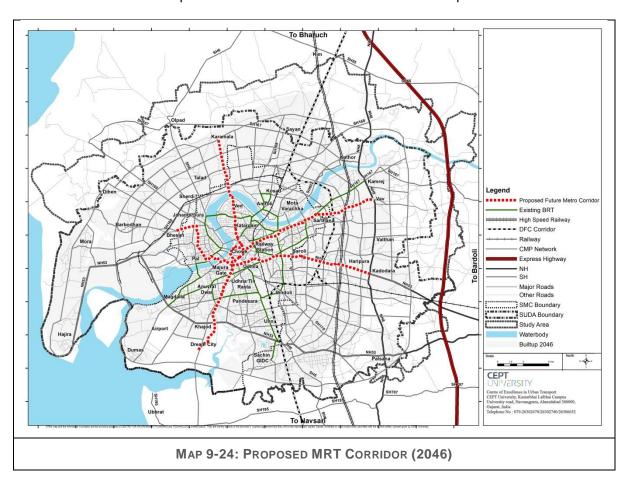


9.3.3.1. Metro Corridors

As discussed above and based on Table 7-14, the following three corridors are proposed as potential metro corridors:

- 1. Dream city Kamrej/Vav (31 km)
- 2. Bhesan Kadodara (26 km)
- 3. Majuragate to Karamala (16 km)

A total of 73 km of metro network has been proposed. The tentative distance between two stations would be around 1 km. The potential metro corridors are shown in the map below.

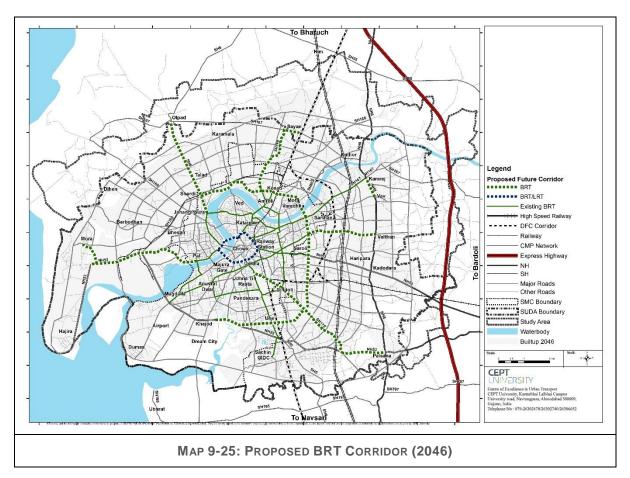


9.3.3.2. Bus Rapid Transit System

Currently, the city is operating a BRT network of 102 km. In the future, based on the alternative analysis, an additional 99 km of potential BRT corridor has been identified. Further, the 12 km of inner ring road is proposed as a potential BRT corridor in the short term, whereas in the future, based upon feasibility analysis, it could be taken up as an LRT corridor.

The BRT system with the dedicated corridor is proposed as a complementary service to the metro system. This is to avoid competition between the two systems. On the stretch from the railway station to the Sarthana corridor, the passenger demand is very high. Therefore, to avoid overcrowding of the system and to provide easy commute, the metro corridor has been proposed along with the existing BRT network, so as to cater to the future demand.

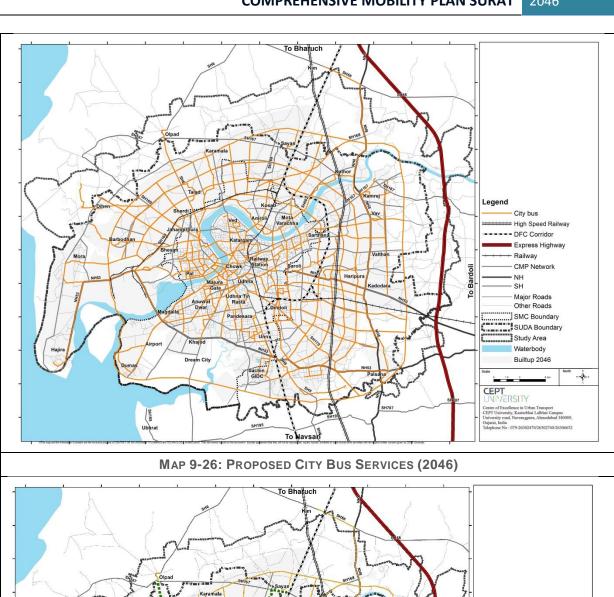
The potential BRTS corridors are shown in the map below and the corridor details have been provided Table 7-14.

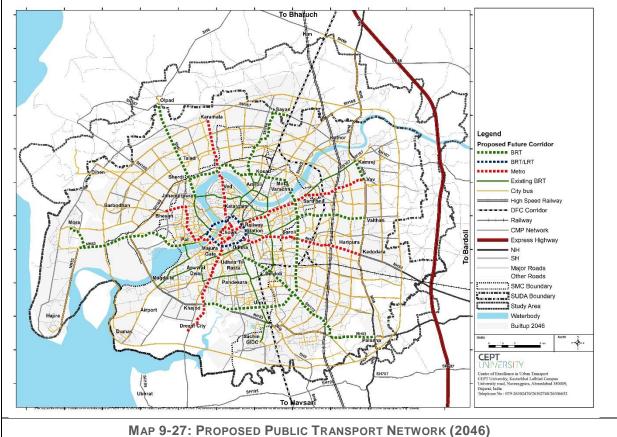


9.3.4. City Bus Services

City bus services are the primary mode of travel and also work as a feeder service to the rapid transit system. In the future, city bus is planned for around 714 km network (including the existing network) covering all the major roads which are of 18 m RoW and above (refer Map 9-26). As discussed in Section 9.1.3, RoW ≥18m are proposed to have 'Bus priority' network based on the demand, whereby the city bus stop would be planned in the middle of the road. The cross sections illustrating the city bus stop at the centre for the RoW 18 m and 24 m are provided in Annexure 32 (10 & 12). In the case of roads with RoW less than 18m, only mini buses/small buses would be allowed.

A concept of integrated services is proposed, which would allow the city bus services to use the BRT corridor for short sections in order to provide seamless transfer opportunities for passengers. As per the future projections of passenger ridership of 36 lakh/day on buses in the year 2046 (refer Section 7.5.5), a total fleet of around 5000 buses would be required (assuming 700 passengers/bus/day). Presently, route rationalisation activities have been undertaken for the city bus services. However, as the city grows and the city structure also undergoes a transformation, the route structure would need to be updated regularly. It is proposed to undertake a route rationalisation and operations planning exercise every five years, so that the public transport system responds to the travel demand pattern of the residents of the city.





The map above shows the public transport network of all the modes—city bus, BRT (existing and proposed) and metro (proposed) —for the year 2046. About 24% of higher order road network has been covered by rapid transit network, whereas about 76% is proposed to be catered by the city bus network.

9.3.5. Electric Buses

The City Corporation will require an increase in the fleet size from the present (about 400) to about 5000 buses. The City has already initiated the acquisition of a fleet of electric buses and it intends to gradually make 100% of the fleet green by adopting electric and other such emerging options. To ensure accessibility to the last mile, a feeder system adopting electric rickshaws/micro buses is proposed as part of the plan. An initial fleet of 40 rickshaws popularly known as 'Pink Autos', operated exclusively by women, is being structured as a feeder system in the old city.





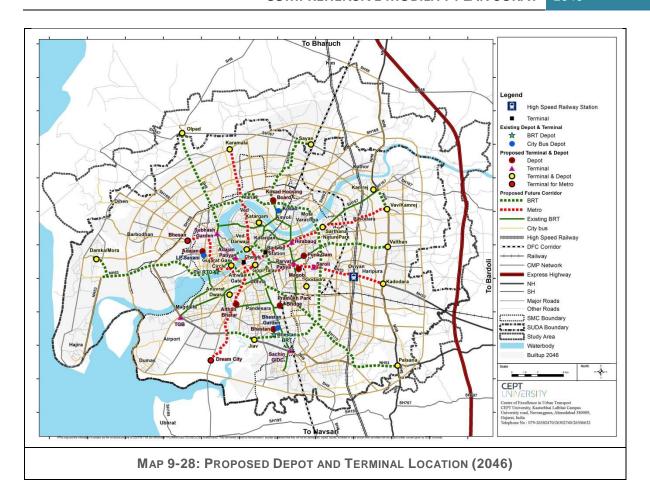
FIGURE 9-9: PINK AUTO

9.3.6. Depots and Terminals

The regular maintenance of bus fleet at depots is important to ensure longer life of buses. The design components of the depot would include fuelling stations, minor inspection pits, major inspection pits, washing area, painting and denting areas, spare parts storage, engineers' cabins and administration unit as well as bus parking. Terminal locations are those where bus services terminate or originate and hence need to be planned in such a way that these are close to the depot locations in order to minimise dead-kms of buses.

The map includes proposal of the terminal and depot location as per the report 'Operational Plan for Integrated Urban Transit Services', for the year 2021. In addition to that, based on the extension of the public transport network, future terminal and depot locations have been proposed. Total 32 depots/ terminal are proposed as a part of this plan in addition to the existing 7 depots and 3 terminals.

The details of the terminals and depots are shown in Annexure 50.



9.3.7. Proposal for Interchanges

9.3.7.1. Transit Nodes-Activity Nodes and Interchange Nodes

Interchanges are usually developed at major activity centres or at transit nodes where various public transport services meet so that one can transfer from one transit service to another to reach the desired destination. These would primarily include stations involving an interchange between two mass transit lines or a mass transit line and a regional transport facility. Examples of such interchanges are:

- MRT-MRT (junction of two metro lines)
- BRT-BRT (junction of two BRT lines)
- MRT-BRT (interchange between a metro line and a BRT line)
- MRT–Regional (interchange between a Metro line and a regional railway station or a regional bus station)
- MRT/BRT-Regional (interchange between a BRT line and a regional railway station or a regional bus station)

The combination of transit station with a major activity area (i.e. high intensity commercial or educational area) can also be a transit node. Accordingly, the influence area around the interchanges

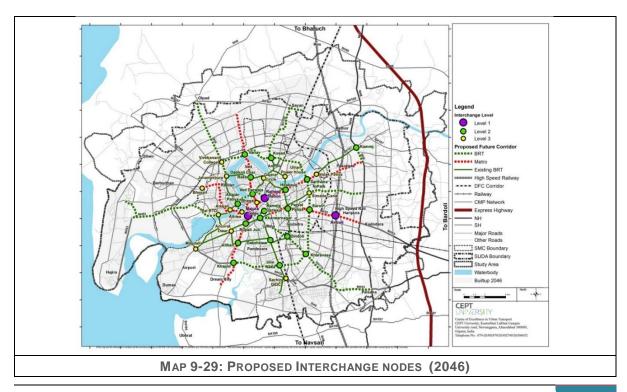
will depend on the level of interchanges and number of modes intersecting at a particular location. Modes of mass transit with high passenger capacity will have wider influence area whereas the lower passenger capacity mass transit options will have lower influence area.

The CMP proposes three levels of interchanges accommodating regional rail, GSRTC, metro, BRT, RTC and city bus services. Based on the number of modes interacting, interchanges are identified and their levels determined. Thus, level 1 interchange has been identified as Surat city railway station consisting of regional nodes of Surat city railway station and GSRTC city bus terminus along with the proposed metro and BRTS stations. The level 2 interchanges include regional nodes like Udhna with metro and/or BRT stations. Integration of city bus services is considered at each level of interchange.

TABLE 9-15: LEVEL OF INTERCHANGES

Interchange Level	Modes	Total
Level 1	 Rail + Regional Bus + BRT/LRT + City Bus Metro + Metro + City Bus High Speed Rail + Metro + City Bus 	3
Level 2	 Metro + BRT/LRT + City Bus BRT/LRT+ Regional Bus BRT + BRT/LRT + City Bus 	19
Level 3	 BRT/LRT + City Bus Metro + City Bus Metro Terminal BRT/LRT + Metro + City Bus 	14
	Total	36

The map below shows the location of interchanges at different levels. A total of 36 interchanges are proposed, three at Level 1 and nineteen Level 2 interchanges. A list of the interchanges are provided in Annexure 53.



9.3.7.2. Planning Principles of Interchange Zones

Transit interchange zones are to be developed based on principles of Transit Oriented Development (TOD) as these zones provide the opportunity of using public transit for the people residing/employed in close proximity to the interchanges. The concept is to develop these zones based on the principles of TOD to maximise the number of people with access to public transport in the city and to encourage them to use public transit facilities. These principles⁷ include density, land use mix, public space and NMT priority.

9.3.7.3. Delineation of a Transit Development Area (TDA)

Different levels of interchanges will have different influence areas and will stimulate the type of activities happening around them. In order to plan the adjacent areas better and to improve the catchment area of the interchange, it is important to delineate the influence area around it. Three levels of buffer have been identified. They are:

1. Station area

Station access supporting surrounding activities

2. Primary catchment area

- Within walking distance to station
- Influence on land use and densities

3. Secondary catchment area

• Influence on transit ridership

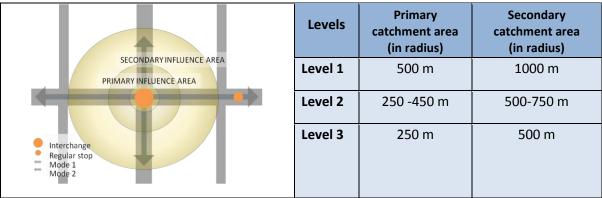
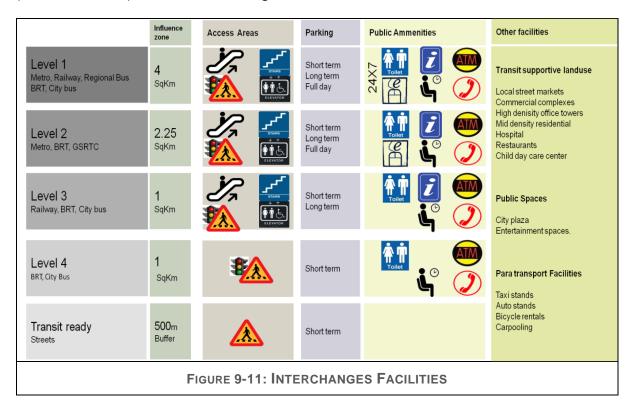


FIGURE 9-10: INFLUENCE AREA FOR INTERCHANGES NODE

Designing of proper accessibility to station within walkable distance is important and could be further improved by providing infrastructure facilities such as segregated lanes for NMT, pedestrian footpath, foot over bridge, signages etc. The study of influence area varies based on the type of interchanges level proposed, as described below.

⁷ http://www.tod.org/placemaking/principles.html

The facility requirements are based on the level of interchanges proposed. The facilities provided could be transit supportive (i.e. access, parking, public amenities) and non-transit supportive facilities (i.e. other facilities), as described in the figure below.



9.3.7.4. Multi Modal Transit Hub - Surat Railway Station

Background:

For the last five years, the Indian Railways, the GSRTC and the SMC are exploring the development of passenger facilities at individual strength near Surat Railway Station/GSRTC terminal. The Government of India, in July 2015, expressed an interest to develop a multimodal hub utilising locational opportunity of contiguous land parcel of three parties and centrality of their passenger services. A series of meetings between the three parties with a high powered committee have been conducted in the past few months for arriving at a consensus on developing a multimodal facility, prioritising passengers' convenience and improving efficiency with smart utilisation of land resources.

Concept of Multimodal Hub:

A Multimodal Hub is identified as a transport node which integrates various modes of public transport systems and which is integrated with passenger transit based activities. The hub serves as a single system that enables seamless passenger transfers. The major advantages of multimodal transport hub are the shared resources and passenger facilities which decreases the land use requirements while increasing the overall capacity of the system. The availability of a seamless multimodal interchange not only increases the accessibility, convenience and safety of the passengers but also increases the operational efficiency of the public transport. This integrated service as a multimodal hub also improves the efficiency of land, infrastructure and other resources.

A multimodal interchange is a step taken towards promoting the use of public transport. In India, where a major share of intercity and interstate public transport is accounted for by train and regional bus services, developing a multimodal hub integrating the railway station and regional bus service gives a boost to the city's public transport network and decreases its dependability on private vehicles. Thus, it enables the reduction of the city's traffic congestion and pollution while increasing safety on the streets.

Surat provides an ideal opportunity to develop a multimodal hub at the railway station area, which directly connects to regional services (i.e. train and regional buses) as well as urban public transit systems (bus rapid transit system, city bus and sub-urban bus service). Currently, there are about 2.5–3 lakh users of regional services with a potential of 80% transfers to/from public transport services. This is expected to grow in the future to 4–4.5 lakh regional passengers per day and 1–2 lakh new users on account of development of the hub.

The Multimodal Hub shall house various activities utilising floor space. These activities are categorised as follows:

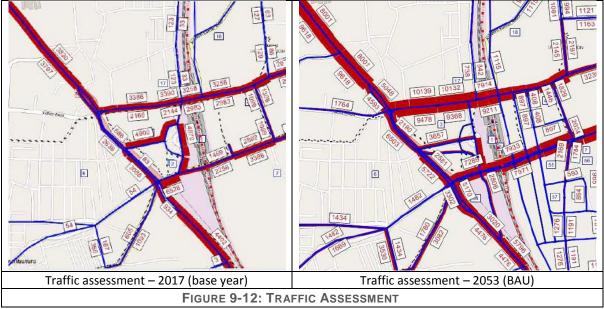
- a) Administrative Zone area utilised under administrative and operation control facilities for transport organisations.
- Operational Zone this shall be identified as tracks for railways, bus movement area for GSRTC, BRTS and City bus.
- Passenger Facility Zone platforms for railways and terminal/station area for bus passenger facility.
- d) Passenger Transfer/Transit Zone area utilised for passenger transfer including passenger plaza, gangways and vertical circulation.
- e) Infrastructure Zone these activities shall include space for hub infrastructure including roads for area accessibility improvement, physical infrastructure and public open spaces.
- f) Commercial Zone this is identified as floor space that shall be leased or rented for private purpose. Parking space is also considered as a commercial commodity.

Traffic Impact Assessment:

The proposed MMTH is expected to generate high traffic on account of passenger transit activities, commercial activities as well as the growth of the surrounding areas. The existing network in the impact zone of the hub is limited in terms of accessibility, missing links and limited connectivity across the railway line. The CEPT has highlighted the need for a network improvement study as the hub area would be subjected to a potential increase in traffic due to the hub as well as due to major through traffic handled by the zone. Also, to cater to the expected demand, the CEPT has suggested strengthening of the road network in the impact zone.

The IRSDC has conducted a traffic impact assessment study along with DIMTS for analysing mobility impacts over the horizon period. The study analysed the available transport capacities on the transport network and the traffic circulation system for the impact area which would cater to the traffic requirements of the proposed hub. Traffic Assignment Model for assessing impact of network improvement developed by IRDC identified increase in traffic congestion levels in traffic impact zone with no improvements in road network; i.e. BAU scenario. The Traffic Assignment Model for assessing

the impact of network improvement developed by the IRDSC has identified an increase in traffic congestion.



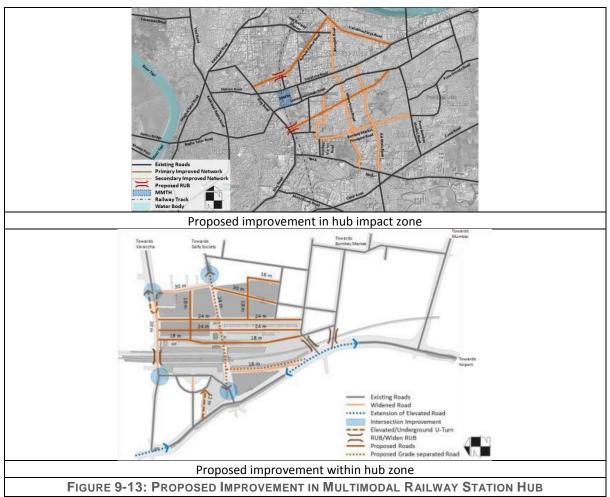
Source: TIA study for Re-development of Multi-Modal Transport Hub in Surat City: IRSDC

Recommendations:

The study was discussed jointly by all stakeholders for ensuring efficient mobility in hub impact zone. The key recommendations included:

- Strengthening of road network by road widening, completing missing links and developing new connections.
- Improving East-West connectivity across the railway line, by developing a minimum of two cross links (north and south of hub) to avoid through traffic in the vicinity of the hub.
- Intersection improvement in the impact zone.
- Additional entry for railway station on the western side, preferably grade separated.
- Providing additional roads in the hub area for supporting commercial development.
- Defining parking limit policy for TOD specific zone, reducing requirement as compared to general norms so as to encourage more use of public transport and reduce traffic congestion
- Providing multiple entry and exit to the hub i.e. 4–6 entry-exit points.
- Grade separating bus movements in the vicinity of the hub to avoid traffic bottlenecks at junctions.
- The design of the hub should ensure opportunities for seamless interchange.
- The design of the hub should prioritise connection of regional and urban transport over private transport modes.

The following figure shows the manner in which the network is to be improved in the hub impact zone and within the hub area.



Source: Traffic Impact Assessment Study for Re-development of Multi-Modal Transport Hub (MMTH) in Surat city (Interim Report), Indian Railway Station Development, Corporation Limited (IRSDC), June 2017.

It is also proposed that at the time of design development, the consultant of the hub design should submit a network performance study due to the impact of the hub activities in the context of detailed design including network improvement measures being adopted by the SMC.

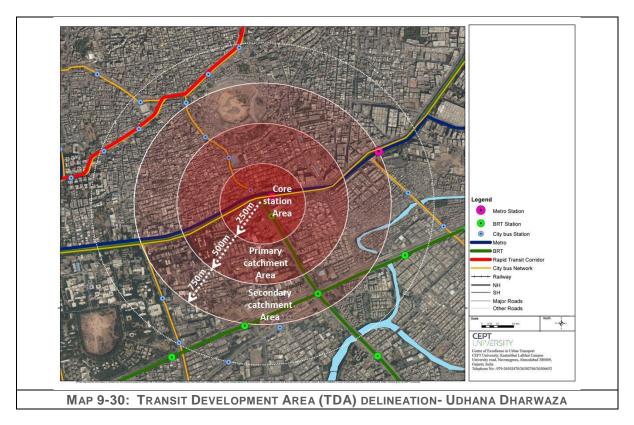
9.3.7.5. Interchange detail - Udhana Interchange Hub

The Udhana Darwaza interchange falls under the level 2 category of interchanges in the city and is formed by the interchange between city bus services and the BRT system functioning at-grade and an elevated metro system. Located at the intersection between two arterial roads of the city (the outer periphery of the walled city of Surat and Udhana Sachin), this interchange is expected to cater to a good percentage of passengers and is to be designed as an **iconic landmark** of the city.

A. Area delineation

The Transit Development Area (TDA) defined for Udhana Darwaza interchange is as shown in the map below. The core station area accommodating the city bus station, metro station and BRT bus station falls within a zone of 250 m radius. The primary catchment area falling under a zone of radius 500 m

defines the area around the interchange hub that can be accessed by foot. The secondary catchment area that influences the transit ridership is defined by a radius of 750 m.

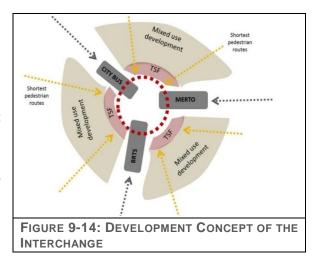


B. Station Area Design Proposals and Recommendations:

1. Design concept

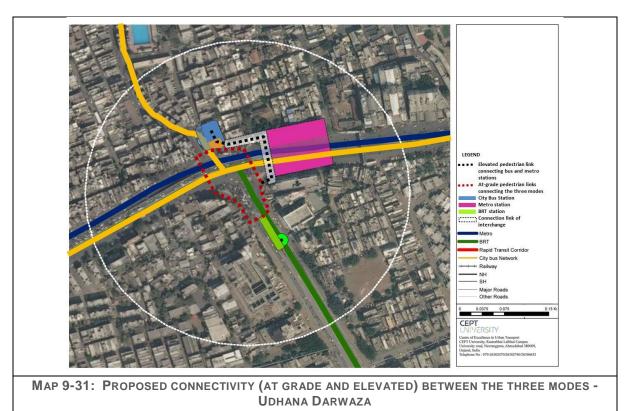
The Udhana Darwaza interchange falls under the category in which the surrounding land is fully developed and land acquisition will be costly and time consuming. Hence, the idea is to develop public spaces (including roads) within the immediate surroundings of the interchange and the catchment areas, thereby enhancing the connectivity to the station. The idea is to encourage high density, mixed use development within the interchange zone.

The docking stations of the three modes are to be physically connected, to the extent possible. This will depend on the possibilities of land acquisition within 250 m radius of the station area zone. Quality pedestrian/passenger links have been proposed, connecting the three modes. Transit supportive land use/facilities are to be developed in the immediate surroundings of the interchange, preferably along the pedestrian connections. The interchange development is expected to catalyse the overall development of the zone into a more liveable urban realm.



2. Passenger connectivity

In the case of Udhana Darwaza, where the land is already developed, the possibility of developing a unified interchange is limited. Hence, it is recommended that the stations of the three modes intersecting at this junction be developed independently and linked effectively by strong pedestrian connections that enable transfer from one mode to the other within the shortest time and distance.



Two types of passenger connectivity are proposed for the interchange as shown in the figure above. The details of the passenger connectivity between the modes are discussed in the following sections.

i. Elevated Connection

It is proposed to acquire a land parcel between the bus and the metro stations and link the stations with a station block that connects the city bus station to the metro station and further to the BRT station, as shown in the map above. This is to help develop the bus and metro stations as a single unit. The passengers alighting at the bus station would be able to access the metro station through elevators, escalators and stairs, which would be required for accessing the metro docking points at an elevated level. This space is to be developed in a manner that it accommodates the proposed pedestrian link between the stations, along with commercial outlets. This space has the potential to accommodate 'transit supportive facilities' on either side of the pedestrian link (refer Section C). The concept for developing the space is as shown in the reference images below.







FIGURE 9-15: PEDESTRIAN CONNECTIVITY BETWEEN THE METRO AND BUS STATION

ii. At-grade Passenger Connectivity between Metro, Bus and BRT stations

High quality at-grade pedestrian access is proposed between the metro, BRT and city bus stations, as shown in Figure 9-16. Since this portion of the interchange is highly developed and land acquisition may be expensive and time consuming, at-grade pedestrian connectivity is proposed along the existing footpath. The following are recommended for the development of this type of passenger connectivity.

- The footpaths are to be 3 m wide with provision for shade.
- It has to be distinct in design and character that visually conveys the idea of high priority pedestrian pathway connecting the metro and BRT stations.
- No parking facility on the roadside along the entire stretch of this pedestrian link.
- Public facilities such as seating spaces, drinking water facilities, street lights etc. should be provided along the pedestrian connectivity.
- The landuse/activity of the plots abutting the pedestrian connectivity is recommended to accommodate the transit supportive facilities (refer Section C below)

The basic concept for the development of this passenger connectivity is as shown in the reference images below.







FIGURE 9-16: SHADED PASSENGER CONNECTIVITY BETWEEN THE METRO AND BRT STATIONS

C. Interchange Facilities

The interchange is to be developed based on the government land availability and the possibility of adjacent land acquisition. Depending on space availability, the interchange is to accommodate various facilities other than the docking stations of the various modes. These facilities are sub-categorised as follows:

1. Basic Terminal Facilities

These pertain to the mandatory facilities which are to be provided at the stations such as: ticketing counter, ticket vending machine, enquiry counter/information kiosk, waiting/sitting area, washroom, first aid, security, accessibility for the disabled etc. Passenger information facilities such as: passenger information centre/kiosk, direction signs, route/destination display, departure time indicator etc. To enable passengers to transfer between modes, an efficient message display and directional signs or public announcement system is to be provided, which would help transfer passengers to their required destinations.

2. Transit Supportive Facilities

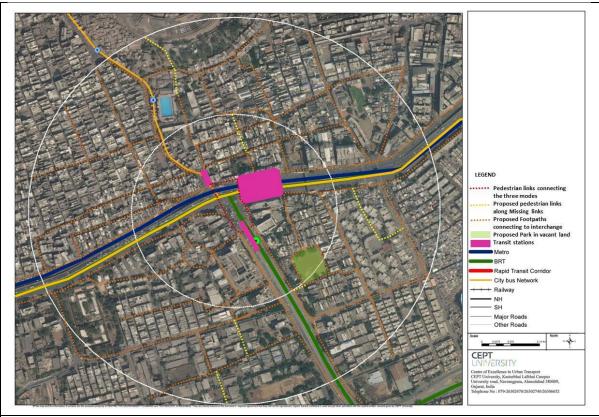
These are the facilities which add to the comfort and ease of the passengers during their access or egress from any of the modes or between transfers. These facilities may include passenger parking, para transit parking, pick-up and drop, telephone booth, ATM, cloak room, computer/printing, emergency, tourism desk, travel agency counter, food court/coffee shops, retail shops, book shops etc. Hence, it is recommended that these facilities be provided.

3. Additional Facilities

Certain combinations of mixed land use within the terminal building or within the influence area encourage public transport as it helps integrate basic activities with mobility. These include presence of institutions (schools, colleges etc.), offices, library, money exchange, medical and health centres/hospitals, banks, postal service, photocopying, printing, restaurant/hotels, supermarket/shopping malls, offices, rental car service, florists, gaming zone, photo studio, saloons etc.

4. Primary Catchment Area

The NMT connectivity to the interchange from the neighbourhood is to be strengthened within the primary catchment area on a priority basis. A few direct and shortest routes have been identified, as shown in the figure below. Some missing links have also been identified, which when connected, would function as the shortest routes to the interchange. It is proposed to develop these routes with quality footpaths and active street edge.



Map 9-32: Proposed Street Improvements within the Primary Catchment Zone of the Interchange - Udhana Dharwaza

9.3.8. Fare Integration

Fare integration involves ensuring that the public transport user pays for the entire journey once rather than paying separately for different legs of the journey. This helps in reducing travel time from origin to destination. The single fare system attracts passengers to use buses and MRTS because of the comfort and also the time saved in buying separate tickets for travel at bus/BRT Stops and MRTS stations. This type of single fare system can be implemented either through pre-paid travel cards or smart cards which help in reducing and eliminating the need for enforcing a financial penalty imposed by the interchange, thus enabling users to select the most appropriate route through the network.

As a multimodal public transport system is being proposed for Surat, an integrated fare structure for the PT system is important. The single fare system should be adopted for rapid transit system as well as for city buses.

9.3.9. Intelligent Transport Management System (ITMS)

The ITMS helps improve efficiency of operations as well as provide customer oriented services. The features like GPS/GPRS based vehicle location tracking integrated with passenger information system and mobile application provides the customer a reliable service and the opportunity to plan their trip. Security cameras within/at bus stops ensure safety and security.

Some of the applications of the ITMS system which should be considered are:

- Automated Fare Collection System (AFCS)
- GPS based Automatic Vehicle Locating System (AVLS) which helps in better fleet management through fleet planning, tracking and performance monitoring.
- Passenger Information System which provides real-time information to passengers about the schedule of buses.
- Vehicle Scheduling & Dispatch System which helps in fleet optimisation through schedule allocation, route allocation, crew allocation and rostering etc.
- Depot Management System which helps track day-to-day maintenance of vehicles, preventive
 & predictive maintenance schedules, inventory management etc. in order to monitor the health of the vehicles.
- Incident Management System which helps in improving the response time to any undesirable incident
- Control Centre and Call Centre operation which hosts the central systems and facilitates centralised monitoring of operations.
- Business Intelligence Software System which builds reports from operation data to have a
 better insight into performance parameters thus enabling better decision making for
 operational efficiency.
- Web portal and mobile app for providing passengers information on public transport services.

9.3.10. Phasing of Public Transport Network and Infrastructure

9.3.2.4 Public Transport Network Phasing

As discussed above, the rapid transit corridors were identified as potential metro and BRT corridor based on future ridership (refer Table 7-14). Hence, with reference to the demand and potential growth areas, the corridors shown in Table 9-17 and Map 9-33 below were prioritised.

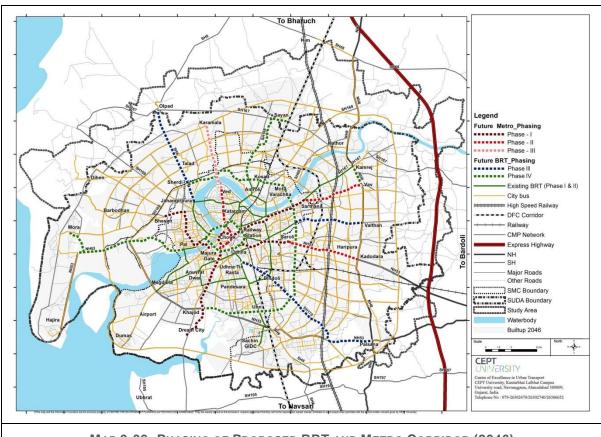
For phasing of the BRT corridor, 102 km of the existing BRT corridor was considered as phase 1 and phase 2; future proposed BRT corridors were planned to be implemented in phase 3 and phase 4. The phasing detail with the cost estimation has been provided in Annexure 47.

Table 9-16: Phasing Summary of Proposed of Public Transport Network						
Corridors	Length (km)					
Metro Network						
Phase 1	42					
Phase 2	23					
Phase 3	8					
Total	73					
BRT Network						
Phase 1 & 2 (Existing)	102					
Phase 3	37					
Phase 4 (including inner ring)	74					
Total 213						

TABLE 9-17: PROPOSED PHASING OF PUBLIC TRANSPORT NETWORK

Sr.	Rapid Transit Corridor Name	Km	Elevated /	Phasing
No			Underground	
Prop	osed Future Metro corridor (7 km)			
1	Dream city – Kamrej/Vav (Sarsana- Exhibition Centre, Bhatar Char rasta and Sarsana, Majura Gate, Rly station and Sarthana)	31		
	a. Dream city - Majuragate	11.5	Elevated	Phase- I
	b. Majuragate- Kapodra	9.5	Underground	Phase- I
	c. Kapodra -Sarthana	3.5	Elevated	Phase- I
	d. Sarthana - Kamrej/Vav	6.5	Elevated	Phase-II
2	Bhesan - Kadodara (via Adajan, Majura gate, Kamela Darwaja, Saroli and Sabargam)	26		
	a. Bhesan - Saroli	17	Elevated	Phase- I
	b. Soroli - Kadodara	9	Elevated	Phase-II
3	Majuragate - Karamala (via Ved)	16		
	a. Majuragate - Ved	8	Elevated	Phase-II
	b. Ved - Karmala	8	Elevated	Phase-III
Prop	osed Future BRT corridor (111 km)			
4	Jahangirpura to Olpad (via Talad)	11	At grade	Phase-III
5	Udna teen rasta to Palsana (Dindoli)	19	At grade	Phase-III

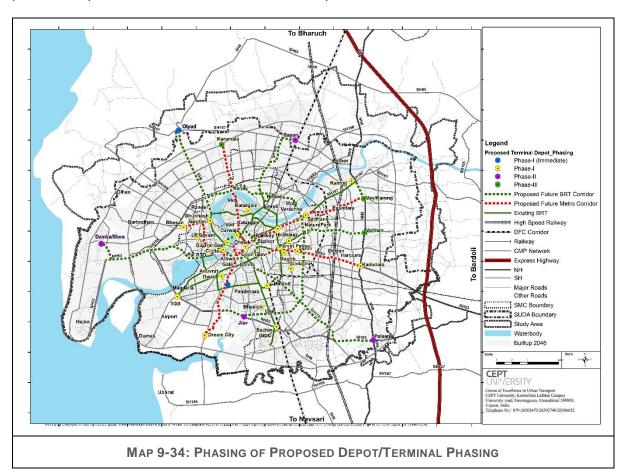
Sr. No	Rapid Transit Corridor Name	Km	Elevated / Underground	Phasing
6	Punagam to Valthan (via Kosmada)	7	At grade	Phase-III
7	Kosad to Sayan (via Gothan)	10	At grade	Phase-IV
8	Pal to Hazira (via Icchapur)	15	At grade	Phase-IV
9	Sherdi to Unn (half ring) (via Kapodara, Saroli, Devadh, Saniya Kande)	29	At grade	Phase-IV
10	Unn to Khajod		At grade	Phase-IV
11	Kamrej to Vav	2	At grade	Phase-IV
12	Railway station loop (inner ring) (via Sahara Dharwaja,Udhana, Adajan, Katargam)	12	At grade	Phase-IV



Map 9-33: Phasing of Proposed BRT and Metro Corridor (2046)

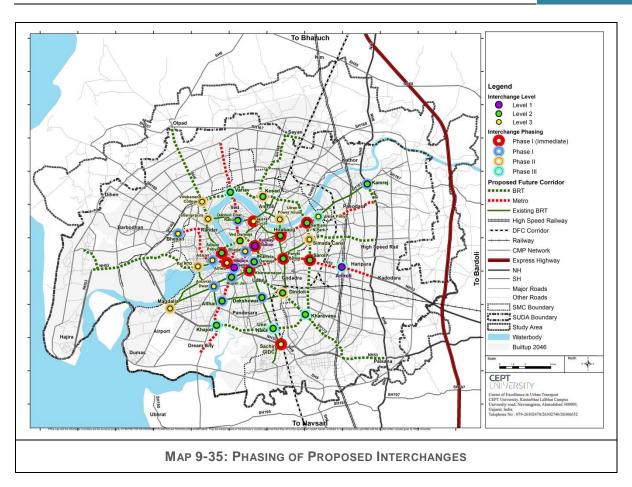
9.3.2.5 Depots and Terminal Phasing

The map below shows the phasing of depot/terminal proposed based on the existing and proposed public transport service. A total of 32 new depots/terminals are proposed in addition to the 7 depots and 3 existing terminals. Out of the 32 proposed facilities, 25 will be implemented in phase 1 (period of 2–5 years) are in the SMC area, while one of them which is outside the SMC (i.e. Olpad), would need to be developed immediately within two years. The remaining six are proposed to be implemented in phase 2 and phase 3. The detailed list of the same is provided in Annexure 50.



9.3.2.6 Proposed Interchanges Phasing

The interchange facilities phasing has been done based on the development priority. A total of 36 interchanges have been proposed, out of which 21 locations are proposed to be implemented in phase 1, in which 10 locations need to be implemented on an immediate basis (i.e. within two years). Similarly, in phase 2 and phase 3, nine and six locations respectively have been proposed, as shown in the map below. The list of the same is provided in Annexure 53.



9.4. Transit Oriented Development

9.4.1. What is Transit Oriented Development (TOD)

9.4.1.1. Transit Oriented Development

Transit Oriented Development (TOD) is one of the approaches adopted globally to optimise the benefits of public transport by encouraging/allowing higher concentration of activities around transit stations and along transit corridors, thereby encouraging higher use of public transport and reducing dependence on private vehicles. Though there are various definitions in use around the world for TOD, there is common agreement that transit oriented development is characterised by:

- a rapid and frequent transit service
- easy accessibility to the transit station
- high quality, walkable street network with small, walkable block sizes
- comparatively higher density development within walking distance from the transit stations
- mix of various uses such as residential, retail, commercial and community amenities to reduce the need for long travel
- high quality public spaces, plazas, streetscape and public amenities
- reduced use of private cars and automobiles on a daily basis.

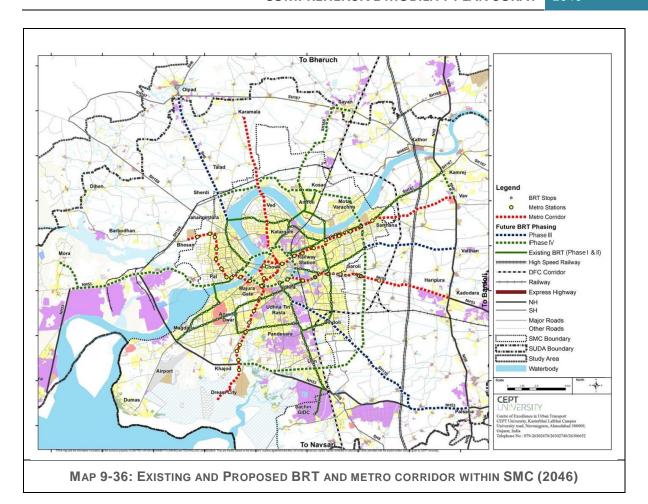
TOD is a sustainable alternative to low density sprawl, which is dependent on the use of private automobiles that results in long commutes, more cars, higher congestion and higher pollution. TOD promotes the use of public transport and non-motorised transport, provides a choice between different modes to the people, especially to those of a certain age group who cannot drive.

Often, Transit Adjacent Development (TAD) is confused with Transit Oriented Development (TOD). While a TOD is a development within the station-area precinct that is compact, mixed-use, walkable and encourages use of public transport through its design, a TAD is physically near transit but fails to capitalise upon this proximity. The term transit-oriented development is often used incorrectly to describe a single development adjacent to or above a transit station. TODs present a symbiotic relationship between public transport and the surrounding development. Other than TOD, this integration is presently carried out in many ways, which are variants of TOD. Some of these variants include transit adjacent development (TAD), development-oriented transit (DOT) and transit joint development (TJD).

- Transit Adjacent Development (TAD) is a development that is physically near transit but fails
 to capitalise upon this proximity to promote transit riding and other economic benefits. A TAD
 lacks any functional connectivity to transit, be it in terms of land-use composition, means of
 station access or site design.
- 2. **Development Oriented Transit (DOT)** is built to serve the development. Here transit follows the development rather than vice-versa.
- 3. Transit Joint Development (TJD) is the development that is joint with transit, and not before or after transit. Either in exchange for the right to develop a real estate project at, above, below or adjacent to a mass transit facility, a private developer assumes some of the cost of developing the facility or makes a direct payment to the transit operator. Importantly, TJD improves financial sustainability due to increased revenues from the partnership in real estate development and from the increased ridership on the transit network.

9.4.2. Transit Oriented Development in Surat

Surat is developing new metro and expanding its BRTS. Once fully developed, the city will have about 213 km of BRTS network and about 73 km of metro network within the study area for which TOD has been detailed. The focus of the TOD plan will, however, be to improve the walkability in the transit areas so as to make transit an attractive mode for people.



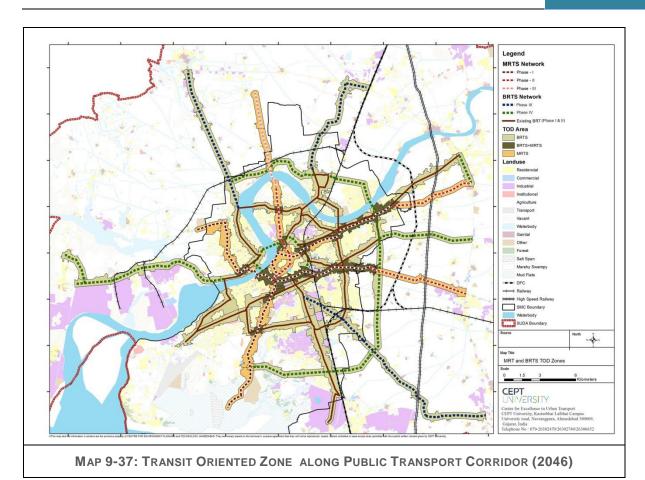
9.4.2.1. **TOD Zone**

It is crucial to encourage a greater number of people to live and work in close proximity to this new, high quality public transport in order to maximise the benefits from this new infrastructure and to reduce congestion, travel costs and pollution in the city.

This requires identifying and planning for Transit Oriented Development (TOD) in close proximity to the public transport network.

Considering TOD corridor width of 200 m on either side of public transport, this will bring about 140 sq. km of area within the TOD zone. This means that, with proper Local Area Planning of the TOD zones, approximately 140 sq.km of area will fall within 2.5 minutes' walk distance from the public transport corridor.

The Outer Ring road is also proposed to be a part of Phase IV BRT and hence, 200 m on either side of the road covering part of area of 11 TPS along the Outer ring road will also be developed as a part of the TOD Zone.



9.4.2.2. Need for TOD in Surat

Currently, some of these proposed TOD areas are underdeveloped or undeveloped suburban areas, whereas others are older city areas that have grown in density, but still have the same old, inefficient street network and infrastructure, thus resulting in congestion and chaos.

All these areas need to be improved to maximise the number of people who can benefit from this public transport infrastructure and to maximise the ridership of public transport. This requires a sensitive Local Area Planning that will incentivise redevelopment within TOD, allow value capture from the increased development potential, and improve the existing street network and infrastructure to be able to accommodate more residents and employment within the area and result in improved environment and quality of life.

Such TOD Local Area Plans will offer significant benefits to Surat City, including:

- increased use of public transport
- larger number of people benefiting from increased choice of travel modes
- lower dependency on private automobiles resulting in lower congestion, lower pollution and lower costs of travel
- increase in overall affordability due to lower living cost due to economical options for transport

- revitalisation of local economies due to increased pedestrian traffic and vibrant centres
- reduced social isolation due to increased opportunity for public interactions, resulting in reduction in crime and associated costs
- reduced healthcare costs associated with lack of physical activity and air quality issues.

9.4.2.3. Types of TODs

In general, TODs can be categorised in different types in many different ways i.e. based on their locations, based on their modes, based on their character etc. As Surat is in the process of developing public transport in the existing developed areas as well as in the developing areas, the TODs in Surat can be categorised into primarily two types: (i) TODs in currently developed urban areas (i.e. core areas and TP Scheme areas) and (ii) TODs in developing areas (i.e. suburban areas without TP Scheme).

i) TODs in currently developed urban areas

These areas are older urban areas with existing development. They include core urban areas such as old city and gamtal, as well as relatively newer surrounding areas typically developed through TP scheme mechanism. These areas, however, were developed when there was no public transport. Therefore, they were not planned to benefit from public transport infrastructure in the best possible manner. Many of them have high density but insufficient area street network, insufficient connectivity and accessibility to public transport and insufficient area in public domain to facilitate higher quality of life. Therefore, with insertion of public transport such as Metro and BRTS, these areas must be improved to reduce chaos and congestion while accommodating more number of people.

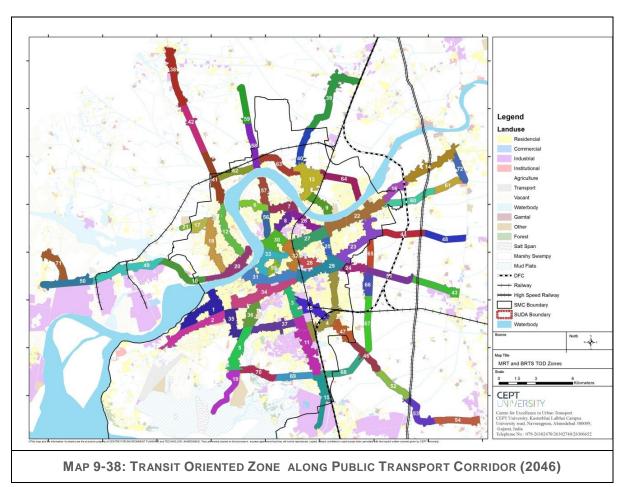
ii) TODs in developing areas:

These areas are still new and developing, and the street network and infrastructure are either still not fully developed or are in the process of development. Therefore, they need to be planned by factoring in public transport needs right from the outset. This means that these TOD areas will have to be developed through well-planned TP Schemes which will maximise the access to public transport, will have walkable development, and will accommodate maximum number of residents and employment within walking distance from public transport stations and corridors..

9.4.2.4. Local Area Plan (LAP) for TOD

Local Area Plan (LAP) is a tool that allows adding new streets, improving road network, parking management, infrastructure, public spaces urban form and environment of existing developed areas through use of incentives and regulations, and without forceful acquisition. Local Area Plan mechanism is also enabled through the new sections under Section 76 (A) added in Gujarat Town Planning and Urban Development Act 1976. Local Area Plans differ from Town Planning Scheme mechanism primarily because it can be used to plan and redevelop areas where TP Schemes are already done. LAPs enable the authority to improve existing areas and add new connections in public domain through incentives and regulations to create win-win situation, and provide a good alternative to forceful acquisition where generally local property owners lose while the others benefits.

For ease of planning and implementation, the TOD Zone in Surat is proposed to be divided into multiple Local Area Plan (LAP) areas based on their character, location, context etc. The map below shows a set of proposed TOD LAPs. The total number of proposed LAPs in the TOD zone is 72, with the average LAP size of 1.9 sq. km.



9.4.2.5. Conceptual Approach for preparing TOD LAP

Below is a conceptual approach for preparing TOD Local Area Plan which includes multiple steps.

- a) Delineating TOD LAP boundary
- b) Identifying improvements in street network and walkability
- c) Incentivizing redevelopment and improving urban form
- d) Improving infrastructure
- e) Value capture and self-financing

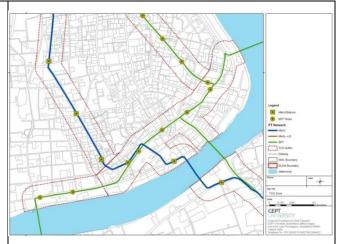
a. Delineating TOD LAP boundary

As a principle, the area within 200 m of the public transport network is proposed to be included in TOD. However, if strictly followed, such a line would split individual plots from the middle and put them in different zones. Therefore, for ease of implementation, all plots falling fully or partially within this 200 m from public transport routes (i.e. BRTS or Metro) shall be included in the TOD. In some cases, the boundary needs to be rationalised considering natural, physical features such as river front,

lake, railway, airport etc. Below is a set of maps illustrating the delineation of TOD boundary for a small part of TOD in a step-by-step manner.

1. Preparing the base map showing public transport and plot boundaries

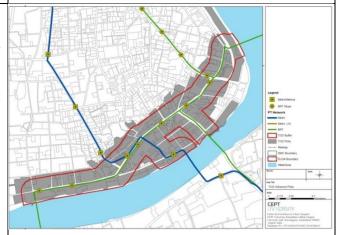
The map highlights the BRTS and MRTS network with stops and plots. The area along this network has potential for better development through redevelopment or new development.



2. Identifying 200m buffer for TOD corridor

The next step should be identification of transitoriented zone along the public transport network. The image shows the TOD zone with 200 m buffer along the public transport network.

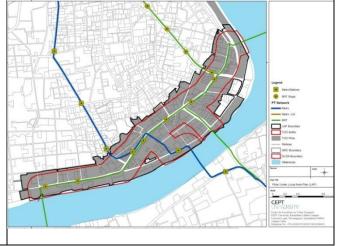
The TOD zone can be further divided based on the area, existing land use, physical and natural features such as river, canal and railway line.



3. Identifying plots falling under TOD zone

The next step is to identify the plots under TOD zones. The map shows the plots under TOD zone

The clear demarcation of Local Area Plan boundary needs to be carried out. The image shows the TOD zone and LAP boundary, which includes the plot inside or on the edge of the TOD zone. A few of the plots which are bigger in size towards the river, fall outside the 200 m buffer.



4. Rationalizing the TOD Boundary based on natural and physical features

The next step is the delineation of Local Area Plan (LAP) boundary. There are some plots which were missed out between two consecutive influences zones and some other plots along the river were missed out as they were just beyond the 200 m buffer. In both such cases, the TOD boundary has been extended to include these areas.

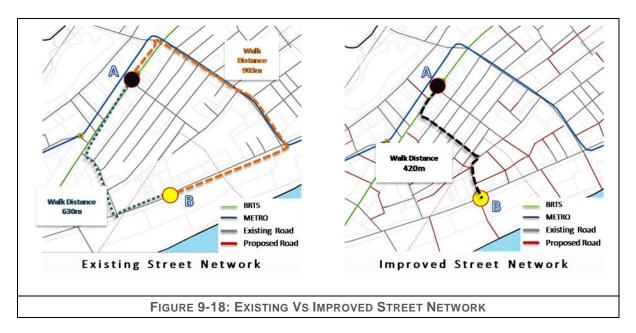


FIGURE 9-17: DELINEATING TOD LAP BOUNDARY

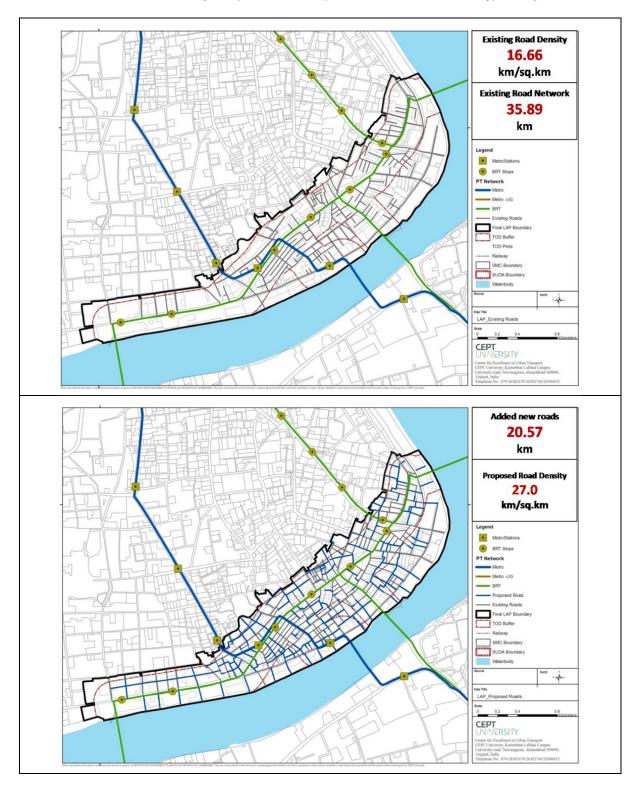
Further, the TOD zone is divided into LAP based on major land use, natural features. The total number of LAPs under TOD zone is 72, with the average LAP size being 1.9 sq. km. The boundary of LAP is delineated based on the area, density, land use and physical barriers (railway and river).

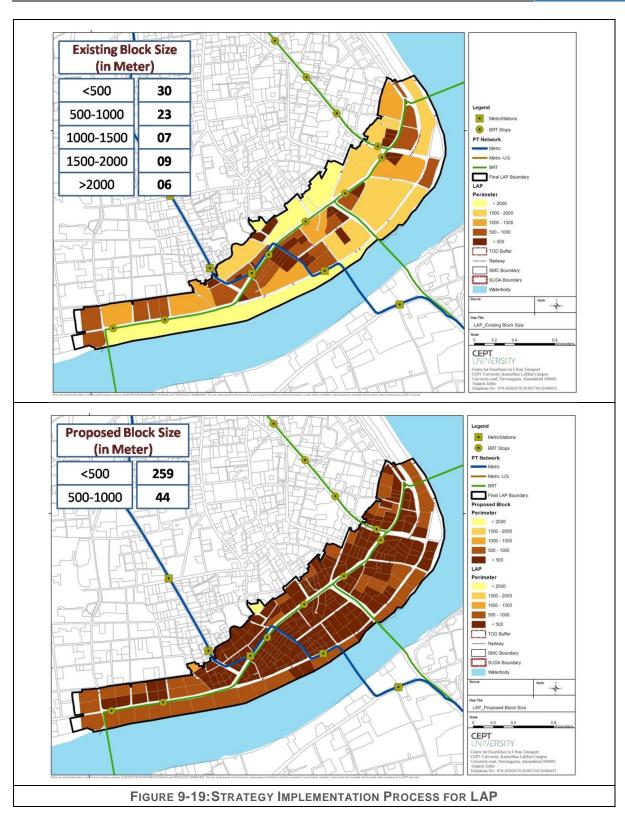
b. Identifying improvements in street network and walkability

In order to transform the area within the zone into a transit-oriented development it is crucial to improve the walkability within the area and increase the accessibility to public transport. This will require well thought out strategy to insert new streets or modify existing streets using combination of incentives and regulations. At present, selected LAP has 36 km of roads with road density of 13.19 km/sq.km. There are many missing links at present, which increase the block size and reduce the accessibility to transit stops. The major focus should be on increase pedestrian and bicycle friendly street and network.



The above images illustrate the strategy for road network improvement by connecting missing links and new roads. The below images represent the implementation of this strategy at larger LAP.





Improvement in road network by connecting missing links and new roads can reduce the block size in that area. The improvement in street network directly influences the travel distance to access transit stops and other amenities in the TOD area, which may lead to a reduction in motorised trips and an increase in public transport and non-motorised trips.

c. <u>Incentivizing redevelopment</u>

It is not possible to redevelop an existing area, such as a TOD area, in a short time span. Transformation of existing developed area is gradual and takes a long time. It may also depend on the attractiveness of the incentives offered to individual landowners. In the case of Surat TOD, the incentives such as increased permissible FSI are likely to result in various amounts of redevelopment based on the development demand in different areas.

Under this step, a set of legal maps and clear incentives and regulations will be prepared to ensure that the streets identified under step 2 are implemented when individual property is redeveloped, so as to take advantage of the incentives such as increased FSI.

The regulations will clearly identify the FSI, the uses permitted on the ground floor and upper floor, permissible margins, permissible uses in margins.

d. Improving infrastructure

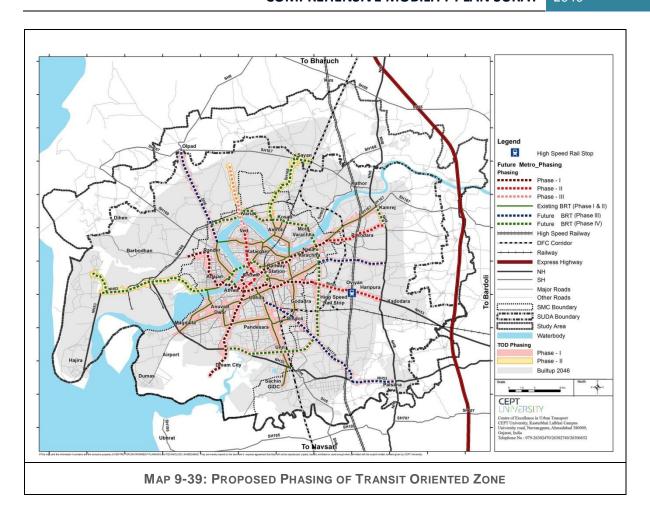
The improvement in street network and increase in population in TOD areas due to higher permissible FSI will require improvements in existing infrastructure such as drainage, water supply, storm water etc. Therefore, the LAP will also need to estimate the cost of such infrastructure improvements. The cost is calculated for basic infrastructure such as water supply, drainage network and new road development TOD area. The assumptions used to calculate the cost of infrastructure development and improvements are:

- Proposed road network under TOD is 35% of the existing road network
- The proposed base FSI 1.8 and chargeable 2.2
- The residential development under TOD is 85% and Commercial is 15%
- Only 33% plots will be eligible to avail the extra FSI 2.2
- 40% of Jantri rates will be charged to purchase FSI

In the case of Surat, the authorities can go in for three different models of TOD, though the basic assumptions made are the same for all three models. The infrastructure cost details for each zone are provided in Annexure 56.

9.4.3. Phasing of Transit Oriented Development

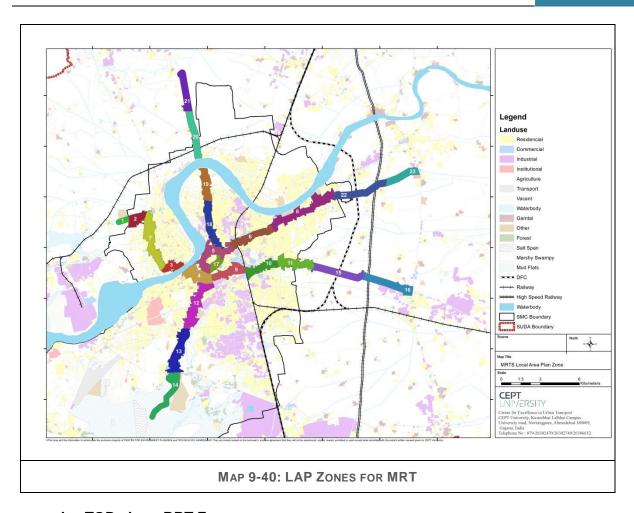
TOD phasing is proposed with regard to the area phasing as discussed in Section 9.1.7 and also shown in Map 9-17. The map below shows the TOD development along the existing BRT, and the proposed BRT and metro corridors s.



9.4.4. Infrastructure cost for Transit Oriented Development

a. Metro TOD

The area under the 200 m influence zone of the metro is considered for LAP. The area is divided into 23 smaller zones with average size of the zones being 1.7 sq.km. Around 40 sq. km of area is envisaged for development. Below map depicts Metro LAP zones as polygons with LAP number displayed.



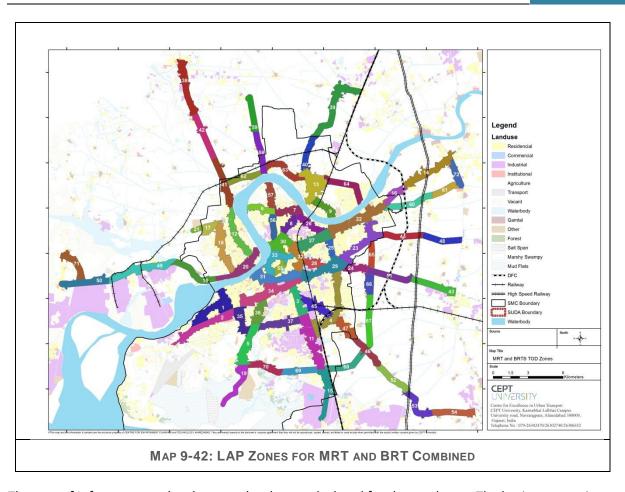
b. TOD along BRT Zone

The area under the 200 m influence zone of the BRT is considered for LAP. The maps show the 56 LAP along the BRTS TOD zone. The LAP along the BRTS TOD zone had been demarcated considering the natural features (canal), physical features (railway line), and concentration of land use. Fifty-six smaller zones have been carved out, with average size of the zones being 2 sq. km. Around 114 sq. km of area is envisaged for development. Map below depicts BRT LAP zones as polygons with LAP number displayed.



c. TOD along both Metro and BRT Zone

The area under the 200 m influence zone of the combined MRT and BRT is considered for LAP. The maps show the 72 LAPs along both MRT and BRTS combined zone, with average size of the zones being 1.9 sq. km. Around 140 sq. km of area is envisaged for development. Map below depicts combined Metro and BRT LAP zones as polygons with LAP number displayed.



The cost of Infrastructure development has been calculated for the total area. The basic assumptions taken for calculation are as following:

- 1. Cost of water supply udgradation- Rs.15,00,000/ ha
- 2. Cost of sewage network upgradation- Rs. 12,50,000/ ha
- 3. Cost of storm water drainage upgradation- Rs.4,50,000/ha
- 4. Cost of road improvements Rs. 2,000/sqm

TABLE 9-18: COST OF INFRASTRUCTURE IMPROVEMENTS FOR TOD ZONE

Type of TOD	LAP Area(sq.km)	LAP Area(Ha)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Cost (Cr)	Total Cost (Cr)
MRT	40	3995	599	499	180	926	2204
BRT	115	11477	1722	1435	516	2878	6550
MRT and BRT Combined	141	14074	2111	1759	633	3415	7919

Details for each zone are provided in Annexure 56.

4

9.4.5. Value Capture and Self-Financing for Transit Oriented Zones

It is difficult for any local body to finance all the infrastructure improvements from its regular funding sources. Therefore, it is crucial for local bodies such as the SMC and the SUDA to implement value capture strategies to self-finance the infrastructure development.

The development of TOD areas with better streets and amenities, increased FSI, mixed use, public plazas would result in increased land value and real estate value. This value can be captured through various strategies to finance the infrastructure improvements. One such strategy is to increase the permissible FSI and make some portion of it as chargeable FSI. This would incentivise development and redevelopment, and subsequently allow the generation of additional revenue for the local body. The table below shows the proposed FSI for TOD zones. In addition to this, the land value capture strategies can include land value tax, betterment levy, impact fees, Transfer Development rights (TDR) etc.

Base FSI **Chargeable FSI Total FSI Non-Transit Oriented Zones** 1.8 0.9 2.7

1.8

2.2

TABLE 9-19: PROPOSED FSI FOR TRANSIT ORIENTED DEVELOPMENT ZONES

Source: Model DCR

Zones

Revenue Generation from Chargeable FSI

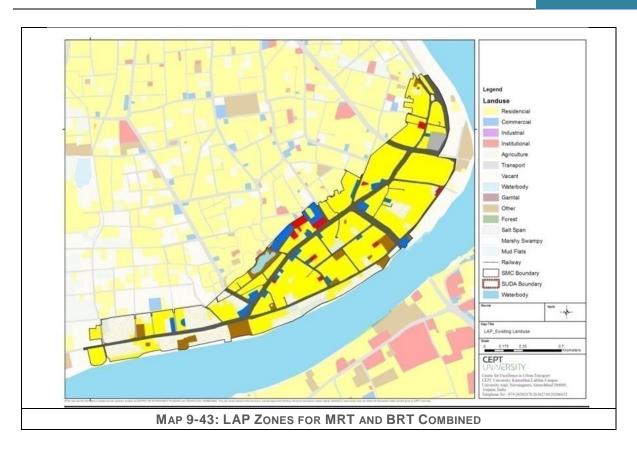
Transit Oriented Zones (Metro & BRTS)

At present, the selected LAP has an average 1.3 consumed FSI, which has the potential to consume more FSI under TOD benefits through redevelopment. But, with the increase in density, there is a need to upgrade the existing infrastructure considering future demand. The cost of infrastructure development can be generated through Chargeable FSI. The FSI is sold on the 40% of Jantri rate per sq. m and Jantri rate is different for residential and commercial development. The revenue calculation for sample LAP is calculated assuming that only 50% of the plot owners will buy FSI. The revenue generated from chargeable FSI for sample LAP is Rs. 1185 crore. But the process of revenue generation depends on the demand of the new development/redevelopment in that area.

The revenue is also calculated separately for the area under BRT, MRT and area under BRT & MRT both for the development. The source of the revenue under TOD is chargeable FSI. There are a few assumptions used to calculate the revenue.

- The development under TOD has 85% residential and 15% commercial.
- Only 33% plots are eligible to avail extra FSI.
- The extra FSI rate will be charged based on 40% of Jantri rate for residential and commercial.
- The existing consumed FSI is 1.3 in Surat city.
- Jantri rates for residential development is taken as Rs. 7800.*
- Jantri rate for commercial development is taken as Rs. 11,000.*

(*Please note that the Jantri rates will change from area to area the above rates correspond to the sample area of Adajan.)



Total Plot Area:	1,002,250 sq.mt	
Existing Floor Area	1,091,025 sq.mt	
Existing FSI Consumed	1.3	
Proposed Permissible FSI	4.0	
Proposed Chargeable FSI	2.2	
Proposed Base FSI	1.8	
Total Floor Are as Per Proposed FSI	22,04,951 sq. m	
Total Floor Are as Per Chargeable FSI	7,27,634 sq. m	
Revenue Generation	602 Crore	

TABLE 9-20: REVENUE POTENTIAL THROUGH TOD VALUE CAPTURE (ESTIMATES)

Sr.	Type of	Area with	Area under	Residential	Commercial	Total	Total
No	TOD	Chargeable	Chargeable	Revenue	Revenue	Revenue	Revenue
		FSI (sq.Km)	FSI (sq.Km)	Amount	Amount	Amount	@50%
				(Cr.)	(Cr.)	(Cr.)	realisation
1	MRT	76.02	25.09	16632	4139	20772	10386
2	BRT	244.24	80.60	53437	13299	66736	33368
3	MRT &						
	BRT	268.69	88.67	58788	14630	73418	36709
	Combined						

Details for each zone are provided in Annexure 57. However, it is estimated that the total collection will be in the range of 20,000 to 30,000 cr. by 2046.

9.5. Proposal for Non-Motorised Transit Facility Improvement Plan

9.5.1. Non-Motorised Transit (NMT) Approach in India

Footpaths are either absent or poorly designed and maintained in many Indian cities. In addition to this, footpaths are encroached upon by adjoining shops, hawkers, and homeless people and by vehicles parked. The notion of unobstructed, continuous, comfortable and safe footpaths for pedestrians is yet to be recognised in our cities. The plight of bicycle users in Indian cities is also the same. The concept of dedicated bicycle tracks has been explored in cities across the country. However, the introduction of physically segregated and dedicated bicycle lanes in the Indian context where people are unaccustomed to 'lane segregation' was a failure in many cities.







Vehicles parked along quality footpaths in Surat forces pedestrians to share carriage way Existing wide footpaths in a dilapidated condition in Surat

Utilities such as sign boards placed on wide footpaths in Surat block its usage and reduce its effective usable space.

FIGURE 9-20: IMPROPER FOOTPATH IN SURAT

9.5.2. Alternate Approach to Planning Non-Motorised Transit (NMT)

Indian cities are decades away from accepting dedicated bicycle lane culture. The CMP proposes to adopt steps that will inculcate the following:

- the habit of cycling and walking in the city
- the practice of reserving the right of space for pedestrians and bicyclists in the city

This is to be achieved through awareness measures and strict monitoring and regulations. CMP proposes new footpaths and widening of existing ones on all PT routes. Footpaths are to be provided on all the remaining streets in the city in stages. Removing encroachments from existing footpaths and following strict regulation and monitoring is proposed.

The plan proposes to provide lane markings for bicycle tracks along all public transit routes wherever possible. The idea of bicycle lane markings on all PT routes is based on the principle that major investments are not required in the initial stages of plan implementation. Unlike in the past, this approach only invests in lane markings and signage on the streets to allocate space for bicyclists along identified routes in the city.

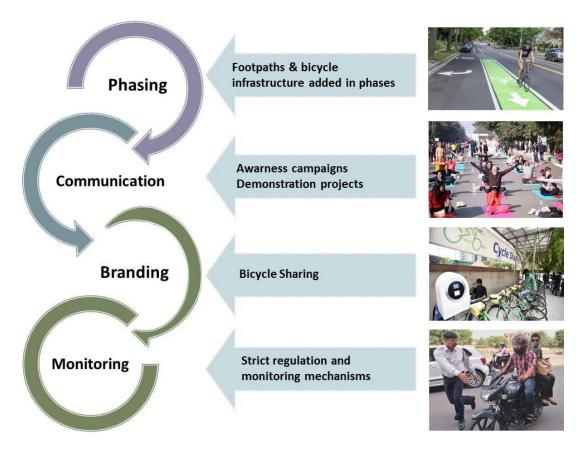


FIGURE 9-21: ALTERNATIVE APPROACH FOR NON-MOTORISED TRANSIT

9.5.3. Planning Process and Strategy

Ideally, all road networks in the city should have pedestrian facilities. The planning approach is based on the following aspects:

- The roads along which footpaths are to be added or widened are selected based on priority.
 Accident prone areas and streets with high pedestrian volumes are to be identified as high priority.
- The existing wide footpaths in the city are to be renovated. The plan proposes provision of footpaths and bicycle lanes along all PT routes.
- Awareness campaigns and initiatives that help propagate the idea of walking and bicycling in the city is to be taken up by the city government. Involvement of concerned NGOs in this regard is to be encouraged.
- Bicycle sharing systems are to be introduced in the city.

Keeping in view the above, a two phase strategy is developed in the case of Surat to improve the NMT network, as illustrated in the figure below:

Phase 1

 High priority Streets like all mass transit routes and last mile connectivity to interchanges

Phase 2

 Future development areas (Road cross sections to incorporate walking and cycling)

Further, the identification of the network is also based on the following principles:

Shortest Distance Identifying the NMT routes that connect important origins and destinations by the shortest distance possible. Connected and Continuous A network that is well connected and continuous in itself. However it should also connect to mass transit interchanges thereby ensuring seamless travel.

FIGURE 9-22: PRINCIPLES FOR IDENTIFYING BICYCLE NETWORK

9.5.4. Network Selection for Bicycle Lanes

The factors that influenced the selection of bicycle routes in the city are as discussed below.

9.5.4.1. Existing Segregated Bicycle lanes

The existing 23 km of segregated bicycle lanes implemented as part of the BRT corridor design (as shown in figure below) is considered while planning the future bicycle routes for the city. These stretches are to be incorporated in the NMT Network in order to help utilise the NMT infrastructure already implemented. It is recommended that encroachments along these bicycle lanes be discouraged, and that maintenance be carried out through strict regulations.

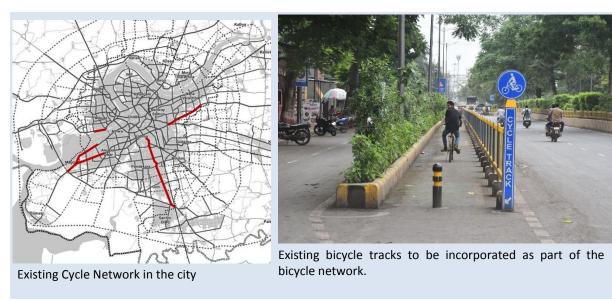
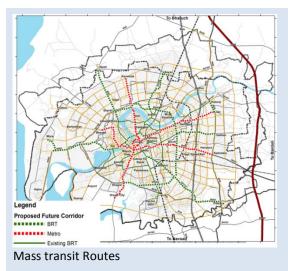


FIGURE 9-23: EXISTING BICYCLE TRACKS

9.5.4.2. Mass Transit Routes

The city has an existing BRT system with proposals for extension, city bus services and a metro proposal. Refer Section 9.3 for mass transit proposals in the city. The plan proposes bicycle lane markings on all mass transit (BRTS, metro and city bus services) routes in the city. The existing footpaths constructed along these public transit routes in the city are to be considered for renovation, widening and maintenance, as required.





The encroachment along the existing bicycle tracks and footpaths needs to be strictly forbidden.

FIGURE 9-24: EXAMPLE FOR BICYCLE TRACKS ALONG MASS TRANSIT ROUTES

9.5.4.3. Proposed Bicycle Network

The provision of bicycle lanes in the city is proposed in two stages as discussed below.

i) Proposal within the Existing City: Typology 1

It is proposed to select all mass transit routes as part of the bicycle network plan. The proposal is to add bicycle tracks in the form of lane markings on carriageways along all the public transit (BRTS and metro) routes. The existing segregated bicycle lanes (along 23 km of BRT corridors in the form of segregated lanes) are to be effectively integrated with the proposed lane markings on the carriageway, at places where it meets the new lane markings.

Bicycle lanes are to be painted with any bold colour (red/blue/green etc.) on the road surface, with cycle lane markings in white that define the reserved space for bicyclists. These lane markings will enable strong visual communication of space reservation, while keeping the cost of implementation low.



PARK NEXT TO BIKE LANE NEW TRAFFIC PATERN

Example of bicycle lane marking in Marechal Floriano, Brazil and lane marking at an intersection, Netherlands

Signage used as a branding tool to reserve both footpaths and cycle lanes.

FIGURE 9-25: EXAMPLES FOR BICYCLE LANE MARKING AND SIGNAGE

ii) Proposal for areas of Future Expansion: Typology 2

As the city expands, in the areas of future development (as per the development plan) for the provision of mass transit systems in the future, certain arterials roads have been selected as 'Rapid Transit Corridors'. This NMT plan proposes to provide raised cycle tracks in combination with footpaths along these future transit corridors when they are to be developed. The routes along which future mass transit will be proposed has been identified in this CMP, as shown in the figure below, as 'Rapid Transit Corridors'.

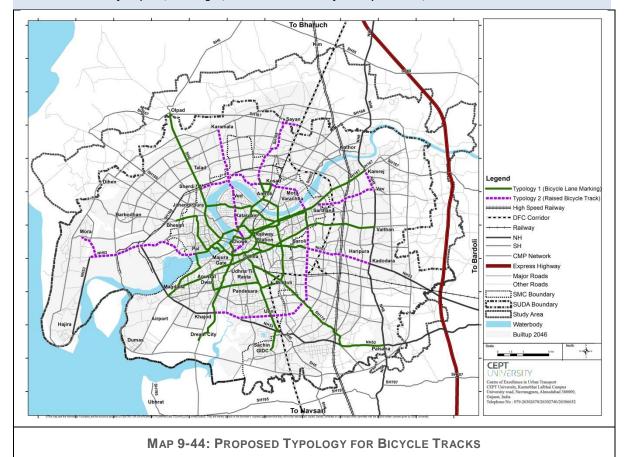
Raised bicycle track in combination with footpath: The design of the bicycle track is proposed to be at a level higher than the carriageway and in combination with the footpaths. This is similar to the arrangement in German and Dutch cities. Some Indian cities have also adopted this model.



Raised cycle tracks at the same level and in combination with footpath, KK nagar, Chennai



The clear segregation from vehicular traffic is defined by bollards, Chennai.



As shown in the map above, design typology 1 will be followed for the implementation of bicycle tracks (lane marking) along BRT (existing, proposed inner ring road and phase 1) and metro (phase 1) in the city, as stage 1. The design typology 2 is proposed to be followed along Rapid Transit Corridor, as stage 2.

The following tables provide details of the urban roads along which bicycle lanes are proposed.

Typology of Bicycle tracks

Length in Km

Typology 1 lane marking along the existing, proposed inner ring road and phase 1 transit Routes (BRT and metro)

Typology 2 raised bicycle tracks along future rapid transit corridors

94

TABLE 9-21: PROPOSED TYPOLOGY FOR CYCLE TRACKS AND ITS LENGTH

9.5.5. Network Selection for Footpaths

The selection criteria for roads which need new footpaths or improvement of existing ones, on priority basis for the city, are discussed below.

9.5.5.1. Selection Criteria of Roads for Footpath Improvement/Addition:

i) Along Rapid Transit Routes

The city has an existing BRT system with proposals for extension, a city bus service and a metro proposal. Stage 1 of the plan proposes quality footpaths to be provided on priority, along all mass transit routes (BRTS, metro and city bus services) in the city. The CMP proposes some of the arterial roads as 'Rapid Transit Corridors' for planning mass transit systems in the future. The plan proposes footpaths in combination with raised bicycle tracks as stage 2 of the NMT plan.

The ULB has over the years, provided quality footpaths along a good percentage of the roads in the city. It is documented that footpaths of width 1.5m or more exist along 61 km of the major arterials in the city as shown in figure above. The majority of the footpaths are along the existing or proposed public transit corridors. Hence, these existing footpaths have been considered while planning this NMT plan. It is proposed to widen these footpaths along these stretches to 1.8 m, wherever the width falls short of 1.8m.

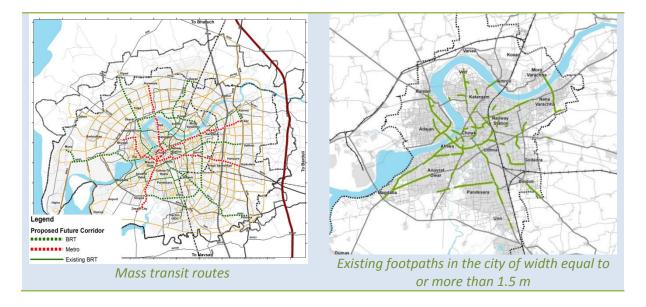




FIGURE 9-26: EXISTING FOOTPATHS

ii) Footpath Proposal Based on Road Accident Locations:

It is observed that the road traffic accidents occur on some of the arterial and sub arterial roads of the city, as shown in the maps above. The NMT plan proposes new footpaths or improvement of existing ones along all roads within these zones, on a priority basis. However, some of the arterial roads in these zones have been considered for footpath improvement based on existing or proposed mass transit systems in the city. For road stretches which do not fall under any public transit corridor (collectors and distributors) in the highlighted areas, it is proposed to provide quality footpaths, if missing, and widen and renovate existing ones, besides undertaking other necessary road improvement measures. This accounts for a total of 130 km of road network (distributors and collectors) in the accident prone areas. Hence, 260 km of footpaths are proposed apart from the footpaths proposed along public transit routes.

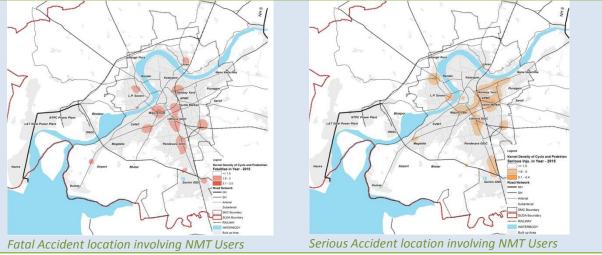


FIGURE 9-27: ACCIDENT LOCATION INVOLVING NMT USERS

9.5.5.2. Proposed Footpath Improvement

The proposal for footpath improvement for the city follows the same principle as the bicycle lane proposal. Quality footpaths are proposed along all mass transit (BRTS and metro) routes (refer image above). There are two typologies of footpaths proposed. All existing public transit routes will have separate footpaths (Typology 1). However, in the case of 'Rapid Transit Corridors' identified in the city, the footpath design is proposed in combination with bicycle tracks.

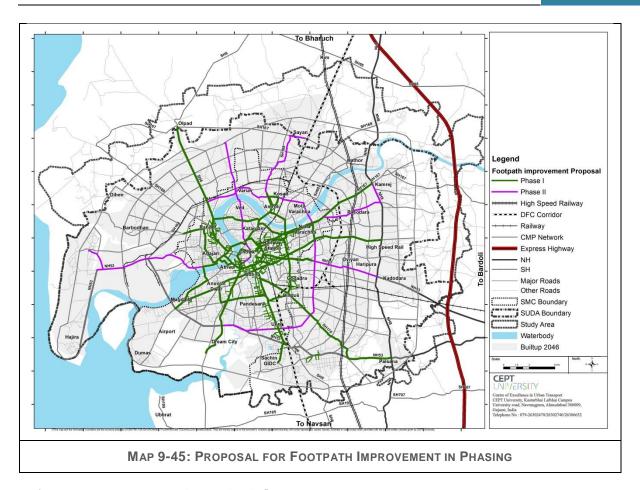
The following tables provide details of the urban roads along which footpaths are proposed to be implemented on a priority basis.

TABLE 9-22: PROPOSAL FOR FOOTPATH IMPROVEMENT IN PHASING

Description of Footpath	Length in Km
Phase 1 Improvements	332
Existing footpath 1.5 m for widening up to 1.8 m	4.3
Existing Footpath above 1.8 m encroached	5.8
Remaining Footpaths along public transport corridors (Existing BRT, Phase 1 – BRT, proposed inner ring road and Metro)	191
Footpath along accident prone areas	130
Phase 2 Improvements	86
Footpath long Rapid transit corridors in Future	86

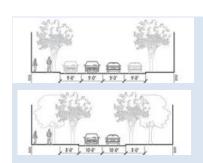
A total of 418 km of footpaths are proposed as part of this plan for improvement/construction. Of these, around 332 are covered as part of stage 1 of the NMT plan. Footpath improvement is proposed along 130 km of collector roads and distributor roads falling within the accident prone areas in the city, as shown in figure below, while 191 km PT network roads would need new footpaths.

A large proportion of footpaths across the city face issues of encroachment and poor maintenance. It is recommended to remove encroachments and strictly regulate future encroachments.



9.5.6. NMT Street Design Principles

For design of the NMT network, a set of basic principles are presented below:



Varying Street Design templates Roadway design of identified NMT streets to be flexible to accommodate site conditions and requirements.



To design streets that is safe for all types of users



Universal Design

Street design to follow universal design standards which support use of streets by people of all age and ability.



Bicycle User Supportive Land use

The NMT street designs are to accommodate the wide range of activities that take place on streets



Connected and continuous designs

The NMT infrastructures need to be continuous to allow seamless travel.



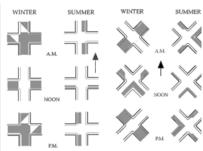
Greens

Prioritising existing green zones for pedestrians, bicyclist and activity zones.



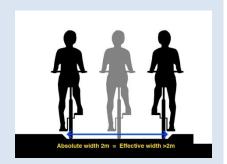
Signage

Signage that support NMT lanes are to be encouraged and efficiently placed.



Sun path: Comfort Zones

Identifying the comfort zones in street sections based on sunpath and reserving space for NMT infrastructure.



Capacity

Sidewalks and bicycle lanes should not require people to walk or cycle in a single file, but allow pairs and groups to comfortably walk and cycle.

FIGURE 9-28: DESIGN PRINCIPLES FOR NON-MOTORISED TRANSIT NETWORK

9.5.7. Supporting Initiatives

Apart from the network improvement other initiatives that can be undertaken are as below:

9.5.7.1. Bike Share

Public Bicycle Sharing (PBS) is a term for the use of bicycles on a need basis for short trips without having to own one. Users can check out a cycle from any cycle station at any time of the day, use it to go anywhere they want to, and then return it to any cycle station located near their destination, not essentially the one from where the cycle was allotted. Such stations are usually placed near popular destinations, BRT or other bus stops, train stations, and other areas where errands or journeys close-by can be easily made on a cycle. Some of the successful schemes are presented below:



Bengaluru: ATCAG – Bike Share, launched on a public scale at Bengaluru in 2011 by Kerberon Automations in association with Bangalore Metro Rail Corp Ltd., Bruhat Bangalore Mahanagar Palike (BBMP) and Directorate of Urban Land Transport (DULT), a multiple unit automated bicycle sharing infrastructure and completely automated bicycle sharing platform. The BBMP has provided land for the docking stations, while DULT has helped Kerberon in making the pilot project and planning the stations.

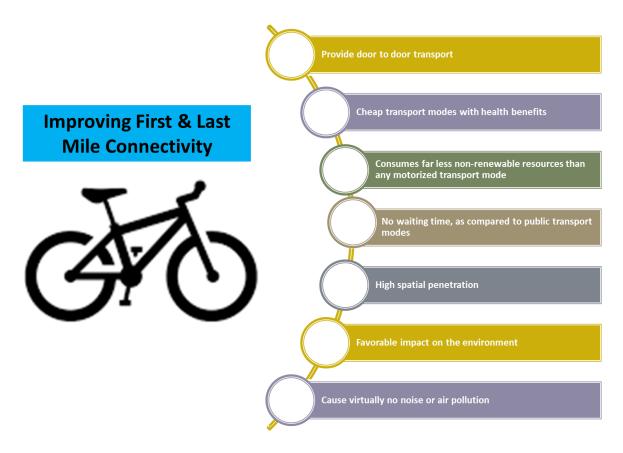
Delhi: The Delhi Metro Rail Corporation (DMRC) launched the first software based 'Public Bicycle Sharing scheme (PBS)' as per which commuters can take cycles on rent from a residential area and travel to the nearest Metro station and then again rent a cycle from a station departing Metro the to nearby localities. 'Greenolution' has eight bicycle renting facilities at metro stations - Vishwavidyalaya, Hauz Khas, and Saket, which also houses a stand at Neb Sarai Sub-station, Akshardham, MG Road, Shastri Park and Dwarka Sector 14.



Bhopal: Under the project, registered users will be able to use Bike Sharing facility for a fee, covering the three most important areas of the city — New Market, M.P. Nagar and Hoshangabad Road. The first fully-automated bicycle-sharing system is designed for a total of 24 km long. As part of the project, 50 docking stations backed by a state-of-the-art IT system has been designed from where bicycles can be picked up and dropped off after use.

Bicycle rental Schemes

Bicycle rental systems allow rental bicycles to users from a designated station. The cycle rental system is primarily for recreational and tourism purposes as people have to return the cycle at the same point from where they collect it. They work well when integrated with PT.



Two schemes are envisaged for the city of Surat are as follows

9.5.7.1.1 S1 – Old City Mobility Revitalization Scheme (Old City)

It is proposed to implement a Public Bike Sharing (PBS) scheme for the old city area of Surat. The walled city area of Surat, once designed to facilitate mobility by foot, with narrow and well-shaded streets, is now congested with different types of motorised vehicles. However, there is no further scope for expansion of available road infrastructure. It therefore becomes necessary to look at alternatives for improving the accessibility levels in this area.

Land Use Potential:

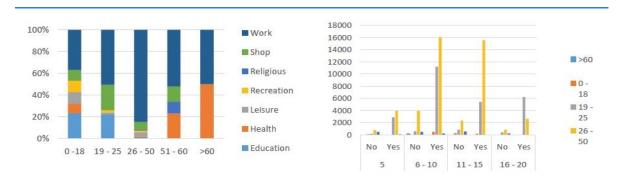
The old city has been taken as a demonstration area for the PBS Scheme. This area is 5% of the SMC area catering to 15–20% population and 26–30% employment units. This area is densely developed with mixed land uses resulting in predominantly short trips. The old city area is in close proximity to the three GSRTC terminals—railway station on the east, Adajan on the west and Udhna towards the south, Surat railway station on the east as well as recreational areas like Riverfront and Gopi Talav.

Accessibility:

The mobility in this area is also supported by the recently inaugurated city bus services on major roads. As the public transit access is limited to major roads, to improve accessibility and last mile connectivity, a proposal for PBS has been considered.

User Group:

The CBD is the hub of commercial activities in the city attracting largely work trips apart from shopping trips. Below figure shows the results of a sample survey in the Old City area, which depict that most of the work trips falls under 19–50 age group category. Shopping trips are spread across all the ages. Most of the recreation and health trips fall between 50–60 age group.



Trip Purpose

Willingness to shift

Source: Surat bicycle project (DPR) Studio 2016, MURP (Transport) Students

Proposal:

As per the infrastructure assessment, there is a requirement of 40 bike docking stands spaced over 300 m for about 1160 bicycles, of which 10% bicycles are for spare in Phase 1 of the project. The project is proposed as a bike sharing scheme where users would be able to pick up and drop a cycle at any docking point. The system is proposed to be supported by ITS features for bike tracking, information on bike availability and fare charging.

The proposal shall be efficient if coupled with enforcement of parking policy, and integrated approach

with public transit system. Various PBS systems offer free ride for first 15–30 minutes of usage for encouraging the use of shorter trips by bicycle. The SMC may explore such initiatives for getting the desirable mode shift.

Currently, the SMC and the SVNIT are undertaking a detailed feasibility analysis for the same.

Integrated PBS approach

In terms of intermediate public transport, the Surat walled city area has an unregulated informal autorickshaw and *chhakda* sector with 17 major autorickshaw stands along major corridors and nodes.

The PBS stands are placed along the mass and para

BRTS Auto-Rickshaw
City Bus
Stops

Auto-rickshaw stands along mass transit routes and adjacent to mass transit stations

transit routes so that it is advantageous for the users of the system in the following way:

- Last mile connectivity to people coming to the CBD by PT and IPT modes
- Mode shift to PT and cycle from private vehicles and IPT owing to better connectivity and lower travel cost.

PBS locations:

The locations where PBS stations could be situated are based on the following factors:

- Existing attraction and production areas
- PT and IPT stands and routes
- Level of activities during different times of the day
- HMC corridor

Cost: The total cost of the project is estimated to be Rs. 240.24 lakh

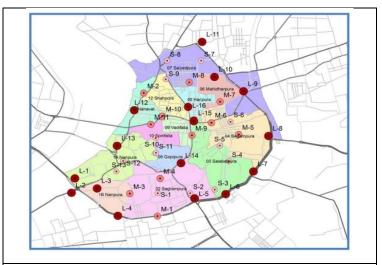


FIGURE 9-29: PUBLIC BIKE SHARING LOCATIONS IN CBD Source: PBS Summary, Central Zone office, SMC

9.5.7.1.2 S2 – Educational Area Scheme (VNSGU – SVNIT)

Students have been identified as the potential users of the PBS system. They are categorised as users who undertake regular trips and would be interested in such a system, if offered at affordable rates.

Educational Trips:

The total number of schools in Surat is 1355, with 7,63,424 number of students enrolled. This accounts for about 13% of the total population. Educational trips in Surat constitute 29% of total trips. Within these educational trips, about 47% of the trips are by NMT transport modes, i.e. 31% are walk trips and 14% are cycle trips.

Identified demonstration area:

Southwest Zone - Canal Corridor and Dumas Road between City Light Road and ONGC.

Potential Landuse:

The Southwest Zone of the SMC caters to various institutional areas including SVNIT, VNSG University, Pithawal College, Narmad Library etc. Also, this area is lined with commercial and recreational activities.

Accessibility:

The Southwest Zone is well connected by BRTS and city bus. The connectivity also provides potential to develop PBS as last mile connectivity to the major academic centres along this corridor.

PBS Scheme Proposal:

The scheme is proposed to be developed in association with educational institutes which will ensure subscription from the students. The idea is to connect the campuses and the newly-built commercial area of VR mall. The PBS is to act as a last mile connectivity option with the BRT for students in these campuses. The scheme is proposed to be initiated with a minimum of 500 bicycles, to be further scaled up depending on the response. In addition to bicycles, safe parking infrastructure is also necessary, for which 8 major docking stations are proposed and 16 minor docking areas are proposed at different activity nodes.

Cost: The total cost of the project is estimated to be Rs. 363.2 lakh.

Apart from this, Information Technology System (ITS) as a component will also be required to integrate all the above schemes. The total cost for ITS is estimated at Rs. 125 lakh.

Hence, the total project cost of Public Bicycle Sharing Scheme (including S1 and S2) is 603 lakhs. Awareness Campaigns and Initiatives for NMT Promotion

Creating awareness is another way of making the NMT initiative attractive to the public. In this regard, information communication and education campaigns provide opportunities for the public to get an experience of NMT, which would make it easier to implement the projects. Some of the initiatives are listed below:

Streets for people



Bhopal: The Public Bike Sharing system developed in the city of Bhopal is not a one-off project but is part of a targeted campaign to promote walking and cycling in the city, which was kicked off with the weekly open streets movement—Raahgiri Day in September 2014. This campaign has resulted in sections of the main streets being closed for vehicles, so that people can engage in various physical activities like walking and cycling. The traffic police and officials patrol the stretch on cycles

Bicycle Rallies



Cycle Rally (Climate Ride) – December 2009

Delhi: DIMTS used to organise cycle rallies frequently in collaboration with different groups on the BRT stretch to motivate people to use cycles. Each cycle rally was organised around a specific theme. For example, the World Wildlife Fund (WWF) organised a bicycle rally on the BRT Corridor (starting from Ambedkar Nagar GreenBIKE Station) to support the 'Earth Hour 2010' campaign.

Source: DIMTS Ltd

9.6. Mobility Management Measures

9.6.1. Parking

Growth in private vehicle ownership and lack of dedicated parking spaces have resulted in haphazard parking on the roads. Private vehicles require enormous terminal capacity, as they are parked for long periods. A private vehicle, typically stays parked for 20–22 hours in a day (80–92% of time). Other modes of transport spend more time in transit than in parking. A car parked on the street consumes 15 sq. m, while a car parked off street requires 23 sq. m. These figures are startling when seen in the context of minimum sizes of dwelling units specified in Development Control Regulations (DCR) of most cities—18–25 sq. m. If we consider that each car requires three parking spaces per day, the total area required by a car each day is between 45 to 70 sq. m. certainly, it proves that providing for more and more parking is not a sustainable solution.

The absence of a comprehensive parking policy in Surat has resulted in independent dealing of the parking issues by multiple stakeholders. This lack of a coherent approach has led to plans and projects that are contradictory in nature and often end up becoming infrastructure projects that require a high investment to solve a short-term parking problem. In this regard, Surat has proposed a parking policy that has a holistic vision with strategic objectives and is in sync with the overall transport policy and objectives of Surat, as well as the statutory Development Plan. The same has been adopted as a part of the CMP plan.

9.6.1.1. Strategic Intent

The strategic intent of Surat Parking Policy is:

- 1. To manage demand through pricing and other means.
- 2. To reduce private vehicle usage and dependency through "Travel Demand Management (TDM)" strategies.
- 3. To support public transport use wherever possible.

9.6.1.2. Guiding Principles

'To progressively reduce the demand for parking and facilitate organised parking for all types of vehicles'

It recognises that parking is not only an infrastructure issue, but also an economic issue and needs to be tackled through economic measures and demand management.

- Surat set to pursue policy of demand management rather than capacity augmentation.
- Surat shall promote high quality public and non-motorised transport.

9.6.1.3. Parking Policy Directives

The actions of the parking policies aim to address on-street parking, off-street parking, loading bays, bus bays, parking permits, reserved parking, motorcycle and bicycle parking.

POLICY 1: CHARGING FOR PARKING

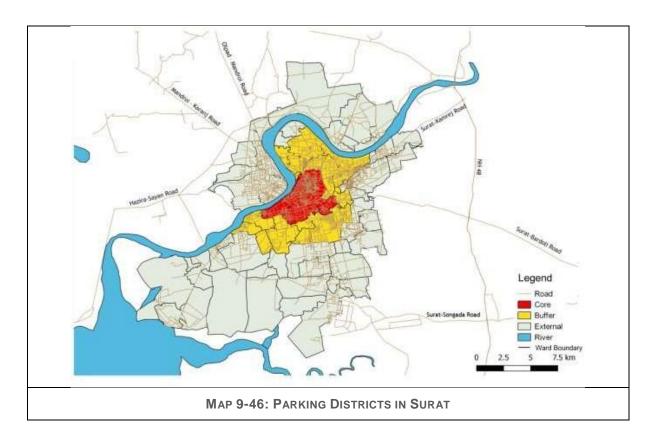
All parking in Surat shall be charged. A special formula shall be devised for determining parking charges. To determine the parking charges, the following criteria will be used:

- Land Value
- Right of Way
- Vehicle Type and Duration of Planning
- Parking Pricing-formula

1. Land Values:

- Parking prices must reflect land value of the surrounding area
- Dynamic base parking prices can be calculated based on nearby average and values (through Property tax or jantri rate or rental value)

The area under the SMC shall be demarcated into three distinct parking districts—core, buffer and external. The base pricing shall reflect parking prices in the external district. Parking charges in the buffer and core districts will be higher. These districts are based on land values sourced from the SMC, which are derived from 'jantri' rates. These charges shall be subject to revision once every three years. The map below shows the three parking districts—core, buffer and external.



2. Right of Way

Higher RoW means higher parking demand. The land rates along such roads would also be higher. There will be presence of Public Transportation on such route. Parking on such roads would be charged higher than other roads.

For Surat, the roads are classified into three categories—roads with RoW greater than 24 m, roads with RoW between 12 m and 24 m and roads with RoW less than 12 m. For roads below 9 m RoW, on street parking shall not be recommended. In any case, on street parking shall not be provided if footpath width is less than 2.4 m.

3. Vehicle Type and Duration of Parking

Differential pricing is proposed based on vehicle size and duration of parking. Short term parking will be encouraged through higher charges for longer duration parking. The parking charges shall be directly related to the on-street space occupied by the vehicles and the demand. There will be no charges for bicycle parking. The rates will be differentiated for the following types of vehicles:

- Motorcycle/scooter
- Cars (hatchback/sedan), jeeps
- Light Commercial Vehicle
- Heavy Commercial Vehicle

4. Parking Pricing Formula

Parking charges shall be determined as per the following formula. This formula is the basic formula for the external district parking charges. As the land value increases in the buffer and core districts, a district factor (DF) is included, which increases the charges. Since land rates themselves are dynamic, a land value escalation factor (LVEF) can be applied, preferably every three years. This shall be dependent on the actual increase in rates. As the RoW changes, a street width factor (SW) is included that influences the charges. In the end, an equivalent car space (ECS) factor is added to differentiate for types of vehicles.

Base formula:

Parking Charges per hour (A) = Land value/Parking Turnover

Parking Turnover: As per survey results, the parking turnover in Surat is 4.9. For purpose of the formula, it is rounded off to 5.

Other factors added to the parking charge formula include:

District Factor (DF): Since the land values in the buffer and core area are twice and thrice respectively that of the external district, the following DF is proposed:

Parking District	Factor
Core	3
Buffer	2
External	1

Land Value Escalation Factor (LVEF): As land value itself changes over time, we use the LVEF to account for that. The LVEF is calculated by comparing the value in the current year to that of the previous year.

Street Width Factor (SWF): This is done as per the following table:

Right of Way (m)	Factor
< 12	1.00
12 < RoW < 24	1.25
> 24 (Mass Transit Corridor)	1.50

ECS factor: The ECS factor is taken from IRC and shown in the following table:

2-Wheeler	0.25
Car	1.00
LCV	1.75
HCV	2.50

The final formula reads:

Parking charges per hour = (Land Value X DF X LVEF X SWF X ECS)/ Turnover

Off-street parking shall be pegged lower for the equivalent criteria by at least 15%. The SMC shall reduce it even further depending on usage. Parking revenue shall not be considered as a source of revenue and profit making. The revenue shall be used for local road improvement schemes within the area, in consultation with local stakeholders. The traffic cell in the SMC shall manage the revenue generated from parking.

POLICY 2: ENFORCING PARKING

Unregulated and illegal parking are widely rampant in Surat. The provision and maintenance of streets, among other public infrastructure, is under the purview of the SMC. Surat's parking policy shall enable the SMC to enforce parking through the following mechanisms:

1. Legal Framework for the to Enforce Parking Management

Legal provisions for empowering the SMC to enforce parking management in the city shall be done by framing new rules and regulations under Sub-section 36 of Section 458 of the Gujarat Provincial Municipal Corporation (GPMC) Act of 1949.

2. Traffic Cell within the SMC

The Municipal Commissioner shall form a 'Traffic Cell' within the SMC. It shall be headed by the Director (Traffic), having the rank of Executive Engineer/Senior Town Planner or above. A team of Traffic Enforcement Officers (TEOs) shall be appointed and shall report to the Director. All cases of parking violations in the SMC area shall be monitored by the TEOs through frequent surveys.

The SMC shall declare the permitted and prohibited areas for parking. The places for parking of different kinds of vehicles and the rules shall be prominently displayed in local newspapers and published in the official gazette. Leaving a motor vehicle at rest in any public place in such a way as to cause or likely to cause danger, obstruction or undue inconvenience to other road users will be considered an offence. Such vehicles can be towed away or clamped by the SMC.

The SMC shall determine the towing and fining charges. The charges for towing and the offence shall be borne by the defaulter. Traffic Enforcement Officers of the SMC shall have the authority to tow away and/or clamp vehicles which violate parking norms. Towing vehicles and/or clamps shall be procured by the Director. The vehicle shall be unclamped after the correct fine has been deposited to the TEO. In case of towing, the vehicle shall be removed to the nearest impound lot and released after the correct fine has been deposited to the TEO.

Private agencies can be appointed through transparent and competitive bidding process for collection of fees, penalties, towing and no-parking charges in the city. The SMC shall ensure that all on-street parking areas, parking lots, under-bridges and flyovers, parking lots in municipal plots are clearly marked and easily identified. Specifically, the following standards shall be followed:

- 1 On-street parking spaces shall be designed as per IRC:SP:12:2015
- 2 Boundaries of all on-street parking spaces will be marked by white line as indicated in IRC:35-1997
- 3 Signage clearly marking parking and no-parking areas shall be marked as per IRC: 67-2001
- 4 10% of all parking space—off street or on street—shall be reserved for senior citizens and people with disabilities

The SMC will follow certain guidelines while defining no-parking areas. These will include:

- 1 Prohibition of parking for at least 75 m from all junctions
- 2 Prohibition of parking at least 10 m from all zebra crossings

To bring clarity to road users, the SMC shall begin a process of demarcating on-street parking areas. All roads with RoW greater than 24 m shall be taken up first, followed by 12–24 m and finally less than 12m.

POLICY 3: REDUCING PARKING MINIMUMS

Surat shall aim to progressively reduce its minimum parking requirements. Minimum parking standards shall be linked to land use, transit proximity, presence of off-street parking facilities in the vicinity, and sharing of parking, and would be reduced in the following ways:

 The prevailing practice of linking standards with land use shall be discouraged. The parking standards will be lowered through a systematic study of land use, distance from transit, distance from city centre and densities.

- It shall not be mandatory to sell dwelling units with an attached parking lot. The developer
 may build the required parking lots and sell separately based on demand. This will ensure
 that there is no oversupply of parking spaces in the market.
- Developers may further reduce the amount of parking along transit corridors by 25%. This
 will ensure that public transport is incentivised.

The current parking minimums in the city's DCR shall be used to benchmark the limit for the coming five years. This shall be set as the parking minimum standards for the external district in the city. The parking minimums so established shall reduce by 15% in the buffer district, and by 25% in the core district.

The SMC shall publish a map of Surat indicating the revised parking minimums. The Commissioner may, with the approval of the Corporation, amend the DCR. All new developments in Surat shall supply parking as per the revised minimums.

POLICY 4: PROVIDING PROOF OF PARKING

Surat shall implement a proof of parking concept for all vehicle owners who purchase a new or an old car. Such buyers shall have to provide proof to the SMC that they have a place to park in a 250 m radius of the address mentioned during purchase. Vehicles shall be registered after providing parking space availability certificate to the SMC. This policy directive shall not apply to motorcycle and scooter users.

While purchasing a car, it shall be mandatory to provide a proof of parking attached to the buyers' residential location. Such a proof cannot be issued to any other address apart from the registered residential address. However, the city's core area may be exempt from furnishing a proof of parking. Residents in the core area shall receive incentives for utilising shared parking facilities as detailed further. The proof of parking shall not be transferable. In the case of a resale, the buyer must furnish a proof of parking to the SMC in exchange for a no-objection certificate. A proof of shared parking as detailed in directive 5 shall also suffice as parking proof.

POLICY 5: SHARING PARKING

The SMC shall encourage sharing of parking space amongst different buildings and facilities which are in the same locality or proximity. For example, schools, hospitals, factories and banks have peak parking demand during weekdays while places like parks and malls have their peaks during weekends. Shared parking in the nearby areas will allow efficiency in terms of parking management and space allocation. The SMC can encourage and guide institutions to open their parking lots to the public after work hours. They can facilitate this by providing model agreements for owners and users. Shared parking shall be promoted largely in the core area. Institutions and commercial centres being used only for a specific duration in the day, shall be utilised to develop such facilities. Shared parking can also be shown as proof of parking explained earlier in policy directive 4.

POLICY 6: ISSUING PARKING PERMITS

The SMC shall issue parking permits to authorise vehicle owners to park in designated parking zones near their home or work area. People shall be able to purchase parking permits on a monthly or annual payment basis. The parking permit will be renewed yearly. It will serve as an authorization to occupy the designated parking areas in the locality. Surat shall adopt an exhaustive system of parking permits by identifying the varying needs of different user groups. These will include:

Resident permits: The SMC shall issue a residential parking permit in the following cases:

- The applicant's residence is situated in a section of the road where parking is regulated by time and price.
- The applicant's residence does not have access to adequate off-street parking facilities.
- The applicant's residence is in an area hosting an event—example stadium, or any such facility where there might be frequent cordoning-off of vehicles.

Work Zone permit: The SMC may issue work zone parking permit to an applicant if it is convinced that:

- The applicant's work place is adjacent to or near the parking space under consideration.
- The applicants shall display the permit on their windshield while the vehicle is left parked in the parking space.
- Work zone permits shall be valid for specified duration on specific days of the week.

General clauses for all parking permits:

The following clauses shall be applicable to all the parking permits:

- All residential parking permits shall remain valid for a given residential address and shall cease
 to be valid when the residence is changed. The city corporation may set an upper limit of one
 parking space per residence.
- No work zone permit shall be used to leave vehicles parked overnight.

Parking permits shall be linked to a specific vehicle. All vehicles except 2-wheelers must possess a permit. The vehicle owner may choose to link the permit to either the residence or the workplace. In summary, a parking permit entitles a vehicle owner for one free parking space, whether work or home.

The traffic cell within the SMC shall issue parking permits to users. The parking permits maybe procured on an annual or semi-annual basis. Car owners shall have to furnish either residential or workplace address, against which the SMC shall issue permits. Within the old city, free on-street parking shall be permitted against the display of a residential permit attached to a nearby address. Permit holders shall display their permits on the windshield failing which they shall be liable for appropriate action. A residential parking permit shall also serve as proof of parking.

POLICY 7: REGULATING INTERMEDIATE PUBLIC TRANSPORT SYSTEM (IPTS) PARKING

Surat shall have designated on-street spots for parking taxis and auto rickshaws. These spaces shall be specifically demarcated by the SMC. No IPTS parking shall be provided near junctions. No charges shall

be recovered from IPTS for using these spaces. Other vehicles shall not be permitted to park in these areas. IPTS shall not be allowed to park in spaces designated for other vehicles.

Higher priority shall be given for IPTS parking in areas within 300 m of transit stations. Any IPT parking in an undesignated area shall be liable for appropriate parking charges or suitable measures.

The SMC shall initially demarcate IPT parking areas on all streets within its jurisdiction. IPT parking near commercial and transit hubs such as malls, bus terminals and railway stations shall be prioritised over parking for other modes. Such parking shall be restricted to only auto rickshaws and city taxis.

POLICY 8: MANAGING FREIGHT

- The SMC shall demarcate select on-street parking spaces for loading and unloading purposes.
- No vehicle apart from such cargo vehicles shall be allowed to remain stationary in such parking bays for more than 15 minutes.
- Such cargo vehicles must bear a commercial registration plate, also displaying the owner's name and registered address on the windshield.
- All cargo vehicles must be parked parallel to the kerb.
- If select corridors are restricted for commercial vehicle parking, freight vehicles must pay and park if need be.
- Under no circumstance shall a freight vehicle be permitted to park in any area, especially in a residential area for more than two hours continuously.

Freight vehicle parking shall be allowed only in such demarcated zones as described earlier. In order to ensure efficient utilisation of street capacities, freight parking shall be limited to specific hours of the day as follows:

Core zone: 1 am to 5 am
Buffer zone: 12 am to 6 am
External zone: 12 am to 7 am

For the first phase, the SMC shall outline streets on which movement of heavy freight vehicles shall be completely restricted. Subsequently, a detailed freight management plan shall be prepared. This shall also entail a system for providing vehicle parking certificates that manage all registered freight vehicles.

POLICY 9: PROMOTING NON-MOTORISED TRANSPORT NEAR TRANSIT AND OFF-STREET PARKING FACILITIES

The SMC shall facilitate transit users by planning a city-wide Public Bicycle Sharing system (PBS) or a bicycle rental scheme. Such stations may also benefit users who wish to park and ride. The SMC shall work towards implementing an appropriate bicycle scheme. All planned parking facilities within 300 m of transit facilities shall have free parking for bicycles.

In certain cases, especially around the old city and congested areas, the SMC shall promote bicycle schemes around off-street parking facilities to enable visitors to park their vehicles there and use bicycles to access such areas.

POLICY 10: INCREASING INSURANCE PRMIUMS

Parking violations shall be recorded for each vehicle by the enforcement team of the SMC. In case there are more than three violations by the same vehicle in one year, the insurance premium for the next year shall be increased. The quantum of increase shall be finalised by the SMC. This data shall be shared with insurance companies on a regular basis.

9.6.1.4. Parking Technologies - Smart Parking

The SMC shall implement ITS strategies as detailed in this section. The overarching objective shall be to charge the users of parking facilities, while also incentivising those who are successful in reducing their demand for parking.

Smart parking management in Surat shall have three main objectives:

- a) To control access to parking areas and to set up advanced payment systems
- b) To reduce the time spent while searching for available parking space
- c) To improve the service efficiency of parking lots

In line with the objectives of smart parking management, mechanised multi-level parking is provided at 10 designated locations of need and the details are given below:

TABLE 9-23: DETAILS OF LOCATIONS FOR PAY AND PARK

	TABLE 3-23. DETAILS OF ECCATIONS FOR FAT AND FARK			
Sr. No.	Pay and Park Name	Zone	Location	
1	Opposite to Mastaki Dharmarth Hosital	Central Zone	Mahidharpura	
2	Khan sahebno delo	Central Zone	Mahidharpura	
3	Near Rang Upvan	Central Zone	Makkaipul, Near Rang Upvan	
4	Chauta Bazaar, Opposite to Sai Baba Temple	Central Zone	Chauta Bazaar, Sai Baba Temple	
5	Near Nanpura Pumping Station	Central Zone	Kadarshani Nal	
6	Near Gandhi Smruti bhavan	Central Zone	Nanpura	
	T.P.Scheme No - 4 (Ashwani kumar - Navagaam)	Varachha	Mini Bazaar, Varachha	
7	F.P.No M-5, Mini Bazaar	Zone	Road	
	T.P.Scheme No - 4 (Ashwani kumar - Navagaam)	Varachha	Varachha, Near Sardar	
8	F.P.No M-3, Sardar Smruti Bhavan	Zone	Smruti Bhavan	
		Limbayat	Behind Millennium	
9	T.P.Scheme No - 8 (Umarwada) F.P.No 147	Zone	Market	
		Katargaam	Near Paras Police	
10	T.P.Scheme No -18 (Katargaam) F.P.No 12	Zone	Chowki	

The following section details out the possible applications of smart parking technology.

9.6.1.4.1. Advance Information on Availability of Parking Lots

By displaying dynamic information on the availability of parking spaces in Surat, the extent of driving around in search of parking areas can be significantly reduced. These can be installed at critical decision points such as malls, commercial centres and even around shared parking facilities. Such information can also be disseminated to users through the internet and the phone. The SMC shall actively implement the parking meter technology to charge parking fees and to maintain transparency in the transactions. These parking meters shall display the dynamic prices varying with the time of the day. The mode of payment shall range from cash to online payments, including smart cards.

The SMC may, in the long run, also consider seamless integration of public transport facilities with a travel card that could also be used to pay parking charges. The SMC shall also consider pay-by-phone technology through a dedicated web and mobile application. This offers additional benefits, including lower costs since the SMC can do away with the cost of meters on the kerb.

9.6.1.4.2. Parking Guidance and Information System

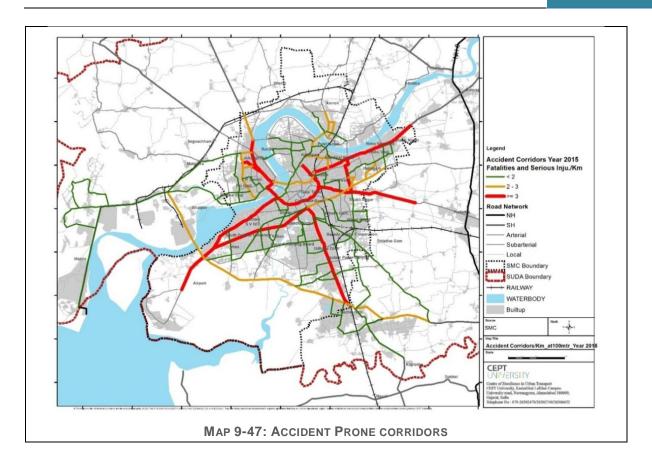
Parking Guidance and Information (PGI) systems are based on the use of message signs to give drivers information regarding parking availability. PGI systems are designed to aid in the search for vacant parking spaces by directing drivers to car parks where occupancy levels are low.

For Surat, the PGS aims to encourage a more efficient use of existing parking facilities and to reduce the amount of parking search traffic by providing information to drivers concerning the locations and availability of parking spaces.

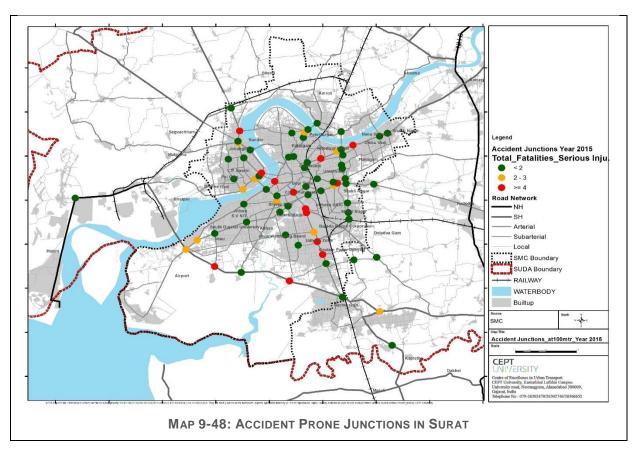
9.6.2. Safety and Security

In 2016, road traffic accidents cost 273 lives and seriously injured 327 people in the city of Surat. More than 30% of the fatalities were pedestrians and bicyclists. Two wheelers, cars and heavy vehicles were responsible for 75% of the fatal accidents. This loss of lives imposes a severe socio-economic cost on the city. The analysis of accident data through information collected from the police shows that there were multiple reasons for accidents. They include poor road and junction design, high speeds, poor driving skills and behaviour. Further analysis shows that responsibilities of road safety are not clearly defined amongst various organisations working in urban transport. In this regard, accident-prone corridors and their characteristics along with accident prone junctions and hotspot locations for accidents have been identified.

a. Accidents prone corridors – A total of 69 corridors have been identified based on location of fatal and serious accidents which contribute to 85% of the total major accidents in the city. All corridors are state highways, arterial and sub arterial roads. The Ring road has the highest number of accidents (51 nos.) in the year 2015 (6 accidents/km). The Kharwarnagar to Sachin GIDC corridor has the highest fatalities due to movement of goods vehicle and mixed land use along the corridor. Details of the major accident-prone corridors are provided in Annexure 58.



a. Accidents prone Junctions – Seventy-three junctions have 22% major accidents. Of them, 15 major junctions have 20 fatalities and 52 serious injuries. Hence, each junction has a minimum of three accidents per year. Udhana Teen Rasta and Dabholi bridge junctions have the highest fatalities, while the Kapodara Patiya Teen Rasta has seven serious injuries in the last year. Details for the same are provided in Annexure 59.



b. Accidents Black spot – Based on the spatial distribution of fatal and serious accident locations in the year 2015, 38 black spots have been identified; 30% of the total fatalities and serious injuries occurred at these black spots. These locations are categorised in three different classes based on accident severity. The ranking of these locations is based on the number of fatalities and serious injuries that occurred in the previous year, and 22 junctions have been identified to be improved as they are classified as 'most severe locations'.

The list and map of all the hotspots in provided in Annexure 60 and 61.

As a part of the proposals, three strategies are suggested:

- a. Design improvements both at junctions and midblock
- b. Junction improvements and signalisation
- c. Setting speed limits
- d. Setting up of an accident monitoring cell

9.2.1.1. Design Improvements at Junction and Midblock

Surat has 115 major junctions where the speeds are required to be reduced. Of these, only 47 junctions are signalised (in working condition). Some critical junctions, which are accident prone spots, need raised pavements, humps, speed breakers etc. As per IRC 99-1988 the use of speed breaker is justified primarily under the following circumstances:

- 1. T- intersections of minor roads with rural trunk highways, characterised by relatively low traffic volumes on the minor road but very high average operating speed and poor sight distances.
- 2. Intersections of minor roads with major roads, and mid-block sections in urban areas where it is desirable to bring down the speeds.
- 3. Selected local streets in residential areas, school, college or university campuses, hospitals etc. Also in areas where traffic is observed to travel faster than the regulated or safe speed in the area.

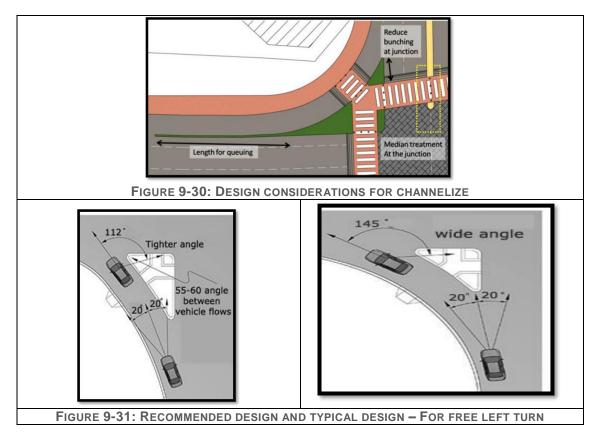
It is known that a driver requires time and distance to take decision at junctions and hence, there is a need for clear signages without any obstructions to be placed at relevant distances for maximum speed of 50/30 km/hr.

Distance from stop line (meter)	Descriptions
30	No parking and No hawking zone
30	Signage pole
75	Signage visibility

Many signage poles are placed at a location which not only creates clutter and chaos but also uses unnecessary landscape and advertising material. Hence, the minimum distance for speed limit signage poles should be 30 m and clearly visible from 75 m ahead of the junction stop line. The incorporation of key land marks, links to public transport and other public facilities like toilets, local attractions, parks in the directional/way finding signage helps in improving access for the pedestrians.

a) Road Infrastructure Improvements: Channelize

- **Bollards** to create a continuous pedestrian crossing zone.
- It should be **non-mountable** to avoid the bunching by two wheelers and cyclists.
- It should **not be barricaded or landscaped** disallowing its use.
- Adequate signages for pedestrians as well as vehicles should be provided for vehicles turning left.
- The turning radius along the channelize should be designed in such a way that it gives
 adequate yielding distance and reduces the speed at the channelize.
- Compound curves should be used for left turning radius at channelize with clear visibility.



b) Road Infrastructure Improvements: Raised Intersection at junction

- Reduction of vehicle speed at the junction
- Reduction in stop line encroachment at junction
- Reduction in the U turns without the signal
- Reduction in signal jumping

c) Road Infrastructure Improvements: Raised Pedestrian Crossing

Raised pedestrian crossings are needed where high traffic speeds are prevalent this helps in decreasing the speed of the vehicles.

Design criteria for raised crossing:

- The slope for vehicles should be 1:10
- Material treatment at the raised cross walk should be similar to the adjacent footpath
- Design should be such that vertical transition does not cause unnecessary harsh or discomfort to the vehicles or the drivers
- Design according to the drainage.

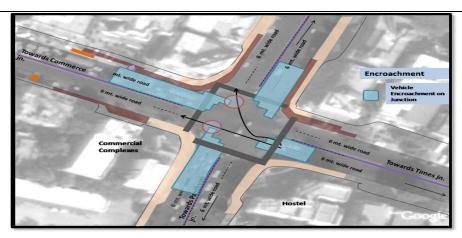


FIGURE 9-32: VEHICLE ENCROACHMENT AT JUNCTIONS





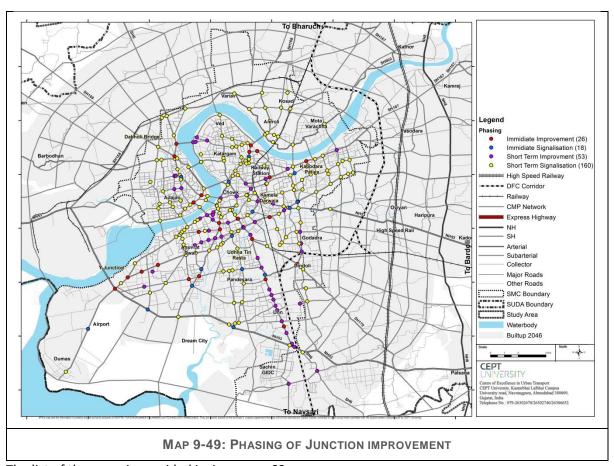
FIGURE 9-33: RAISED INTERSECTION

9.2.1.2. Junction improvement and signalization

It is proposed that junction improvement be carried out for all the critical junctions. Recently SMC has assigned the work for improvement of 24 critical junctions to SVNIT Surat on immediate basis apart from improving another 81 in the short term. As a part of the CMP, 257 junctions have been identified for improvement in the short term, these include critical accident-prone junctions and junctions to be signalised. Out of which 44 junctions are proposed to be implemented on immediate base as phase1 (including 24 assigned to SVNIT) and rest of 213 junctions in Phase 2 as shown in below table and map. A demonstration project for the same is provided below.

TABLE 9-24: SUMMARY TABLE OF JUNCTION IMPROVEMENT

Phasing	Description	Total No. of Junctions
Phase 1 (Immediate)	Improvement	26
Thase I (illinediate)	Signalisation	18
Phase 2 (Short term)	Improvement	53
Thase 2 (Short term)	Signalisation	160
Total		257



The list of the same is provided in Annexure 63.

9.2.1.2.1. Hirabag Junction, Surat

a) Existing Situation

Hirabag junction in Surat is a major junction and one of the busiest too. It is situated on the Railway station to Kamrej BRTS corridor and is a five-arm intersection, always occupied by heterogeneous traffic movements of auto rickshaws, two-wheelers, four-wheelers and buses.

Two BRTS corridors—Railway station to Kamrej and Gajera circle to Parvat Patia—intersect at Hirabag junction and work as interchange. Due to a range of different land uses around the junction, it has a large volume of pedestrian activity.



BEFORE DEVELOPMENT

FIGURE 9-34 JUNCTION BEFORE DEVELOPMENT



FIGURE 9-35 JUNCTION AFTER DEVELOPMENT

b) Issues

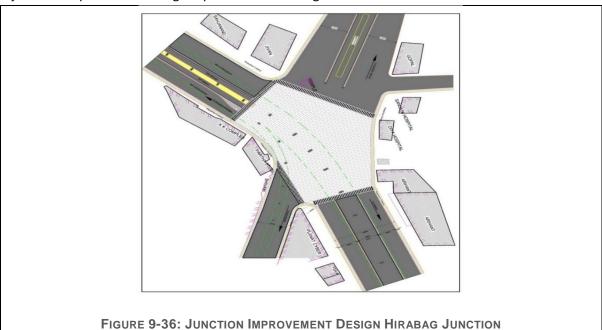
- Jaywalking vehicle's incongruous/wrong movements leads to serious or fatal accidents – non-channelized traffic.
- ii. Footpath encroachments near junction by hawkers.
- iii. Signals are installed but not functional.
- iv. No/mostly invisible Zebra crossing and STOP marking.
- v. No proper footpath defined.
- vi. Inadequate traffic police numbers for traffic control.
- vii. Inadequate signages.
- viii. Shuttle auto rickshaws parked near junction. Stops for auto rickshaws not defined/not provided/not properly followed.
- ix. Inadequate public vehicle parking space.

- x. Inconvenience to traffic due to labour market (daily wages market) at junction.
- xi. Due to the Evening Market near junction:
 - a. Encroachment near junction and on footpath
 - b. Conjunction of traffic at peak time of market time due to lake of adequate space

c) Remedies

- i. Junction improvement in terms of infrastructure/improvement in present implemented design
- Requirement of proper directional traffic movements at all 4 leg nodes—specific traffic path at four nodes
- iii. Proper operational signal system and rigorously monitored by traffic department
- iv. Visible lane marking STOP and Zebra crossing
- v. Proper specified auto rickshaw stop(s) locations/improvement
- vi. No parking in 100 meter radius of junction

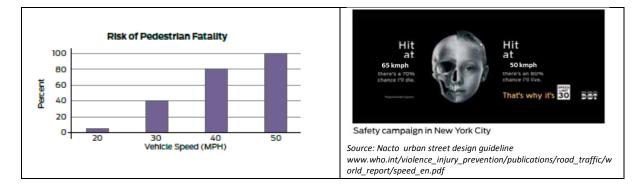
A junction improvement design is presented in the figure below:



9.2.1.3. Setting up Speed limits for the city

The relation between vehicle speed and accidents is well established. According to a study conducted by the OECD and the ECMT, speeding was recognised as the number one issue resulting in accidents in most countries in the world; a reduction in speed by 5% would result in reducing the fatalities by 20% (OECD/ETMS, 2006). Research has also found that reduction in speeds, particularly in the urban areas, results in reduction of accidents of vulnerable user groups like pedestrians and cyclists. The

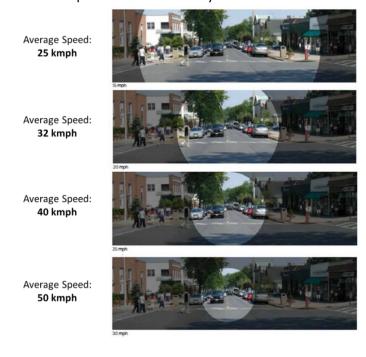
higher the speed of a vehicle, the shorter the time a driver has to stop and avoid a crash. It is found that in a crash with an impact speed of 80 km/hr, the likelihood of death is 20 times what it would have been at an impact speed of 30 km/hr.



9.2.1.4. Factors that result in Speeding

- a) **Driver-related factors:** These include the age of driver, gender, alcohol level, number of people in the vehicle/overloaded vehicle.
- b) Factors relating to the road and the vehicle: These are classified as road layout, surface quality, vehicle power, maximum speed.
- c) **Traffic and environment factors:** These include traffic density and composition, prevailing speed, weather conditions.

The main issue with speed is that of visibility:



Higher speed reduce visibility focus

Source: NACTO urban street design guideline

Speed Limit City Area 45 km/hr London Urban area 30 km/hr Downtown city **New York** 37 km/hr Downtown city (Manhattan) Urban area 45 km/hr. Highways 80 km/hr**Paris** All over city 30 km/hr 50 km/hr Singapore All over city Hong Kong Low Band (Developed Urban Area) 50 km/hr Middle Band (New town / Outside 70-80 km/hr urban area) High Band (Express way) 100 km/hr

TABLE 9-25: SPEED LIMITS IN MAJOR CITIES IN THE WORLD

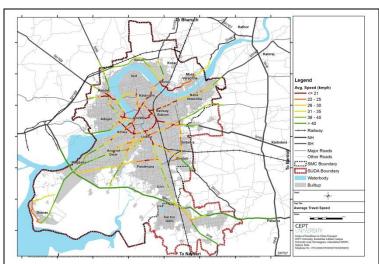
It is observed that most developed cities adopt 40–50 km/hr as the speed limit in urban areas.

In the case of Surat, the average journey speed on major corridors of the city is around 27 kmph.

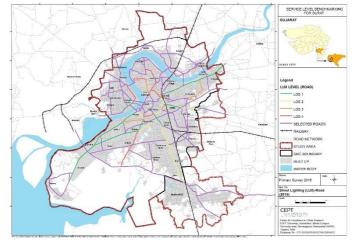
However, it is observed that even though the speeds in the city are not very high, low visibility is one of the vital factors that results in accidents especially during the night time. The Level of Service for street light in city is low.

Apart from this, Surat being an industrial city, has high movement of freight vehicles in the city which further makes it more vulnerable to accidents.

At the moment, there are no speed limits set for various category of roads in Surat. As a part of the CMP, it is proposed that since arterial roads and major highways have a function of moving people efficiently, the authorities need to look into the issue of setting up standards for speed limit for the city roads.



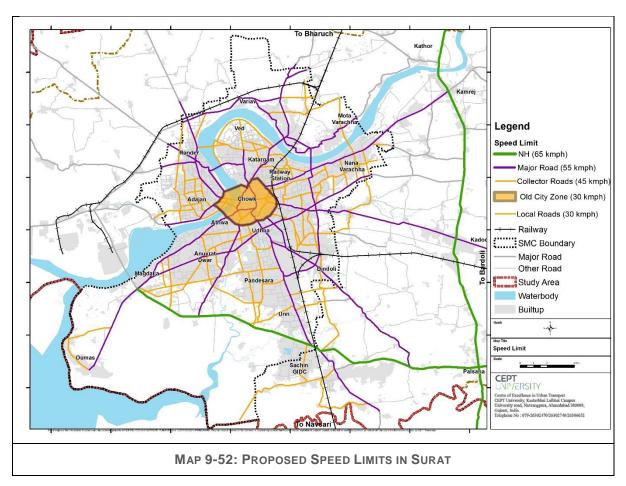
MAP 9-50: AVERAGE SPEED ON MAJOR CORRIDORS



MAP 9-51: LUX LEVELS ON MAJOR CORRIDORS

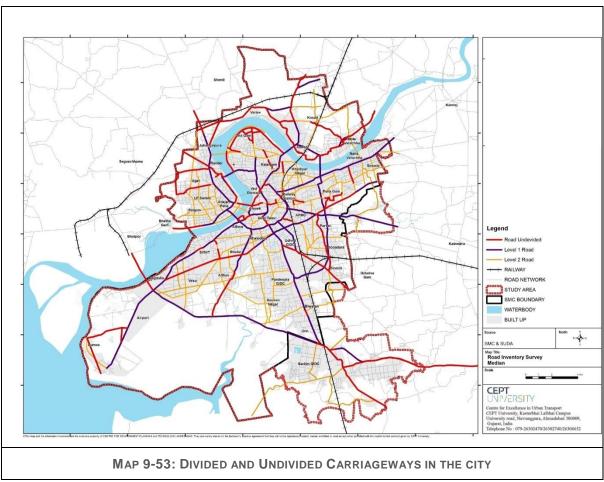
Source: Service Level Benchmarks in Urban Transport for Indian Cities-Round 2, MoUD, CoE- UT CEPT, 2016; SMC 2017

In this regard, it is proposed that all arterial roads will have a limit of 55 kmph whereas in the case of sub-arterial roads, the same can be reduced to 45 kmph. These limits are set for all the roads except special areas like city centre area, GIDC area, gamtal areas, schools & institutes, university, hospitals, major religious places, parks and lakes, public places like shopping malls, transport nodes (airport, railway stations, GSRTC, AMTS & BRTS) etc. In the case of these areas, the maximum limit needs to be 30 kmph.



NH roads in Surat have bypass traffic and serve as freight corridors except in some developed area near Kamrej, Palsana, Kadodara, Sachin GIDC and ONGC colony etc. Here, the speed limits can be set as 80 kmph. The speed for all passenger vehicles can be set at 65 kmph whereas in the case of goods vehicles, the same can be further reduced to 60kmph.

Places where roads are without median have a higher chance of accidents. Hence, it is proposed that roads with undivided carriageways will have speed limits up to 30 km/hr, which are 32% of road network. Speed limit for roads with medians should be as given in the above proposal.



Source: Service Level Benchmarks in Urban Transport for Indian Cities-Round 2, MoUD, CoE- UT CEPT, 2016; SMC 2017

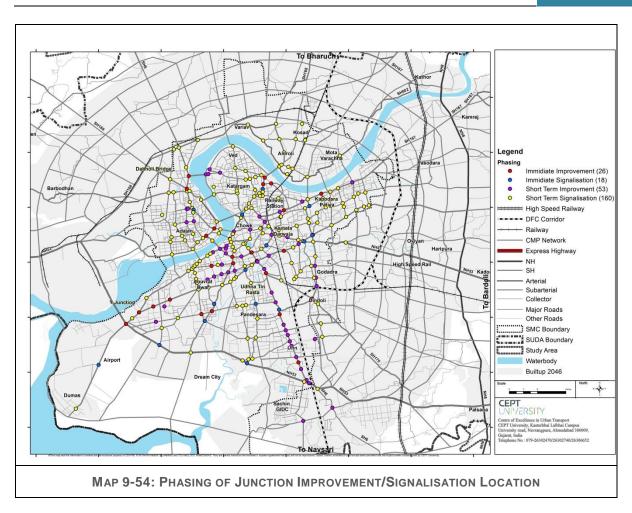
Special care is also needed for areas where traffic merges or creates bottlenecks such as flyover, ROB, RUB, River bridges etc. and gamtal area. Hence, in these cases, the speed limit needs to be set as 30 kmph.

9.2.1.5. Accident monitoring cell

A GIS based accident management system needs to be developed to record accidents spatially and temporally. The Traffic Police Department needs to institute a cell which would look at analysing accidents, monitoring and devising strategies to reduce the same.

9.2.1.6. Phasing of Junction improvement

As discussed above, based on the analysis, a total of 257 junctions have been identified as major accident-prone locations which need to be carried on in phasing for the improvement/signalisation. Out of these, 44 junctions are proposed to be taken up for action on an immediate basis in phase 1, while 213 junctions can be considered in phase 2 as a short-term improvement as shown in the map below. The detailed list of the junctions is provided in Annexures 63.



9.6.3. Integrated Transport Management System

Surat city is currently implementing the ITMS as a city-wide integrated platform for its diverse set of transportation needs, which include operations of public transportation, management of vehicles operating for other civic services like solid waste, engineering and emergency services. The aim of implementing the ITMS is to bring in the best-in-class operational efficiency and automation to its operations capability to ensure that services are delivered on a consistent basis and in a manner that meets service excellence.

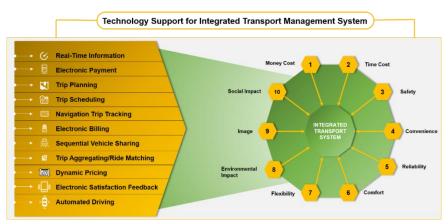


FIGURE 9-37: TECH SUPPORT AND TRANSPORT SYSTEM OUTCOMES

ITMS, in its current form, is expected to meet the objectives of enhancing service standards, bring about a paradigm shift in service quality and availability, better organisation of planning and operations, integration of transit systems and overall improvements in line with service excellence.

ITMS enables the SMC to automate its operational processes with respect to mobility management of its vehicles, better insight into operations and thereby achieving a balance in demand & supply issues, perform analytics to optimise system capability to increase operational efficiency, bring in service sustainability, and enable a forward-looking environment which facilitates a policy environment that meets the needs of the corporation and the citizens on a continual basis.

The CMP looks at adding more modes of transportation such as metro, NMT, bus systems etc. besides broad basing the ITS systems to manage vehicles, road and urban infrastructure in a more integrated manner.

The figure below provides a detailed view of the expected transformation framework which would be used to deliver integrated services.

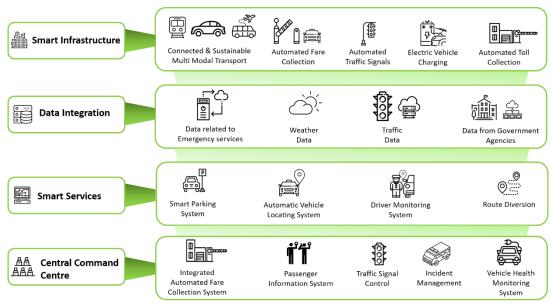


FIGURE 9-38: INTEGRATED ITS FRAMEWORK

Surat city shall look forward to implementing connected transport systems as a framework and integration of all the transportation infrastructure such as vehicles, roads, junctions, buildings and pedestrian facilities into a single operating system. Going forward, the city shall be looking to implement 'Congestion charging' system through an open tooling system, integrating the vehicle information and mobility characteristics to provide automated revenue and operations management. The system also envisages adoption of touchless fare management techniques to reduce the human and machine interface to ensure a more seamless travel experience.

The system shall deliver noticeable economic benefits through reduced journey times and increased reliability, improvements in safety and reduction in pollution, easier service consumption systems,

increased citizen trust in civic services, higher operations management capability for authorities, faster responses to emergency situations and integrated work management and delivery scenarios.

9.6.3.1. ITMS Implementation Benefits

- 10. Making travel within city seamless and more efficient (safer, less polluting, economical, better informed travel) increased PT usage
- 11. Improving access to public transit system by augmenting easier access to service and information
- 12. Improved and scientific decision making
- 13. Deliver accurate real time information about services
- 14. Aid policy decision by availability of analytics platform
- 15. Faster and efficient management of incidents within the city
- 16. Higher economics within transport service by increased use of electronic fare services
- 17. Enhanced and easier service platform for emergency and engineering services
- 18. Optimized fleet management for higher availability
- 19. Safe fleet availability by implementing control of operations and SLAs
- 20. Improved communication between operations staff and management resulting in coordinated and managed service environment

9.6.3.2. Technology Perspective

The primary aim of ITMS is to create an enterprise management system which would allow the city along with its host of service providers to manage their individual activities in a highly coordinated manner leading to a high productivity environment and reliable services to the users. The system also aims at creating process-based system which continually allows the operations to be monitored against accepted service levels and provide improvement opportunities to transit managers to offer services at best operational levels.

9.6.3.3. ITMS comprises of the following components

Solution Landscape

- 1) Automated Fare Collection System
- 2) Automated Vehicle Location System
- 3) Vehicle Scheduling and Dispatch System
- 4) Passenger Information System
- 5) Bus Depot and Terminal Management System
- 6) Financial Management and Central Clearing House System
- 7) Incident Management System
- 8) Automated Boarding Gates and Electronic Docking System
- 9) Video Surveillance System

- 10) Business Intelligence Platform
- 11) ERP (Electronic Road Pricing)
- 12) Traffic Management
- 13) Environment Sensors
- 14) Traffic Advisory

Infrastructure Landscape

- 1) Data Centre, Disaster Recovery Site
- 2) Control Centre, Training Centre
- 3) Bus Station Infrastructure
- 4) Bus Infrastructure
- 5) Communication Infrastructure
- 6) Traffic Management
- 7) Road Management

Operations, Management & Maintenance Services

- 1) Ticket Operators, Control Centre operations
- 2) System Administration and Database Administration
- 3) Ticket Terminal Operations
- 4) Integrated AFC Operations Open Loop
- 5) Vehicle Monitoring and Communication Services
- 6) Incident Management System
- 7) Vehicle Scheduling & Dispatch Service
- 8) Passenger Information System
- 9) Bus Terminal Management System
- 10) Depot Management System

9.6.3.4. Future Urban Transit Systems

The urban transportation systems are going through a disruptive phase globally and in the future, our cities will look at greener, technologically sophisticated and integrated transit systems which are commuter-oriented and provide end-to-end travel experience.

Integrating fairly seamlessly into the existing city infrastructure, making use of renewable energy and solving the 'last mile' problem plaguing most public transit systems, the future transit options provided in this section make some major advancements compared to the buses and trains already in use today. With some already in practice around the world and others representing ideas that could

provide inspiration for real-life solutions, these futuristic urban transit systems aim to get around traffic congestion and provide safer, more efficient rides.

Particularly in Indian context, where last mile—first and last mile connectivity issues are inhibiting people from using public transit systems, the transit systems of the future would address these issues and provide inclusive, accessible and available solutions matching user aspirations.

The futuristic urban transportation systems like hyper loop, self-driving buses, PRT, sky trains etc. could potentially offer viable solutions for Surat city in the future and could potentially alter the mass transportation strategy for the city. The city administration shall look at these opportunities at the appropriate time and examine its feasibility so as to assess the applicability in the context of Surat city and the benefits that these systems could bring in so as to achieve the overall objective of connected, sustainable, green and highly commuter centric mass transit system to meet the city's mobility aspirations.

9.7. Urban Freight Proposals

This chapter focuses on the proposals suggested for the urban freight management issues identified in section 5. As per MSME 2016-17 reports, over the last decade from 2001 to 2011, the registration of industries in Surat has recorded a growth of about 8–9% annually. This trend is expected to continue for the next two decades. Therefore, it becomes necessary to address current urban freight management issues and plan for the future freight related activities so as to boost efficiency in freight movement and at the same time reduce externalities.

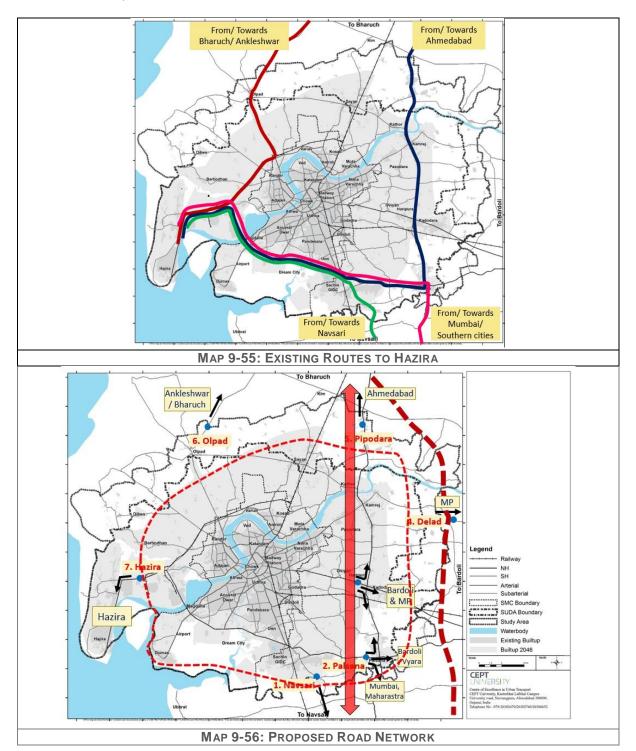
9.7.1. Proposed Road Network to Manage Through Freight Movements

Surat needs to expand its current road network. The reason for this is two-fold. Firstly, the analysis of RSI surveys reveals that about 29% (around 15500 vehicles) of the vehicular trips are external to external. This traffic predominantly passes through the study area via NH-8. Over the next twenty years, the city is expected to grow upto and beyond the NH-8 and the external traffic is expected to grow 2.5 to 3 times. This growth will result in increased congestion and accidents, and thus affect the environment adversely.

Secondly, as discussed earlier, Hazira is an important industrial zone. Due to the developments in port connectivity, this port is expected to expand in the coming future. At present, the Hazira region caters to about 1.05 lakh tons (43% of total tonnage) of commodities that are either destined for or are exported out of Surat. More than 8500 trucks (40% of total trucks in study area) interact daily with the Hazira region. As per the MSME growth trend, this figure is expected to grow by 2.5 times by 2046. Hence, it can be seen that these two factors will put pressure on the present road network.

Thus, to relieve this pressure and to maintain the level of service of the network, a new outer ring road is proposed as part of the road network proposal. It should also be noted that there is an existing proposal for extending National Expressway NE-1 from Vadodara to Mumbai. This development is expected to shift a significant amount of traffic from the National Highway to the National Expressway (refer Map 9-55). Therefore, the existing through traffic (E–E) commuting on NH would have an

alternative route of the proposed ring road as well as the NE1. The proposed ring road also provides direct connectivity to Hazira from both the northern and southern directions.



9.7.2. Provision of Farm to Market

In view of the growing demand for agriculture produce in the region, especially horticulture produce, the need to strengthen the linkages between the farm and the market is imperative. A new APMC (Agriculture Produce Market Committee) market facility is proposed to be located the market to the

outskirts, which would provide efficient mobility of farm produce. At present APMC market located near Sahara Darwaja on the Kadodara road, which has been proposed to be shifted in new location near Kadodara at NH 8 (refer Map 9-58) as per the APMC office. This would also help in bringing relief in congestion levels due to heavy goods vehicle passing through the inner city area and additionally provide better connectivity to the movement of farm produce due to its proximity to DFC corridor, National Highway and the Expressway

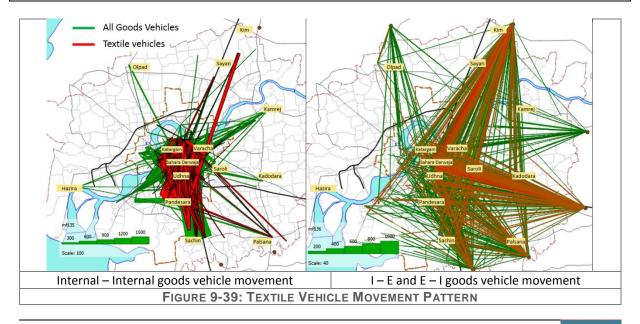
9.7.3. Relocating Textile Industries

As explained in section 5.7, Surat is the textile hub of the country and contributes nearly 38–40% of goods vehicle trips within the study area. As per Table 5-9 and Map 5-9, the central part of the city and the Sachin–Udhna belt have more than 6900 trucks incoming and outgoing per day, out of which about 31% (2119 trucks) cater to the textile industry.

Apart from external interaction, this area also has a significant amount of internal–internal textile goods vehicle trips. Since most of textile industries (power looms and ancillary industries) are situated in the Sachin–Udhna area, 38–40% of goods vehicles ply on the road network around this area.

TABLE 9-26: GOODS VEHICLES FLOW IN SURAT CITY

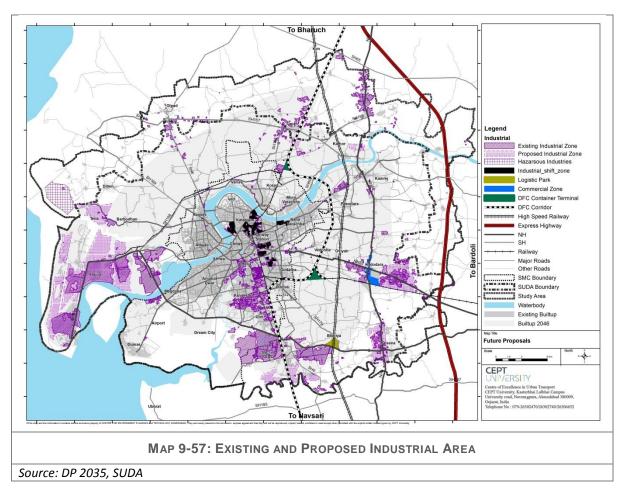
Surveys	Activity Surveys	RSI and Cord (Study area		Total
Type of Interaction	Internal - Internal (within Urban Area)	Internal - External	External - Internal	Total
Total Goods Vehicles trips	269122	9819*	12884*	291825
Trucks (MCVs, MAVs)	8041	5845	7039	20925 (100%)
LCVs	261081	3974	5845	270900 (100%)
Textiles Total Vehicles trips	108595	1501	1774	111869
Textiles: Trucks (MCVs, MAVs)	3487	1198	921	5607 (32%)
Textiles: LCVs	105108	303	852	106263 (40%)
% of Textiles Vehicles	40%	15%	14%	38%
* Includes empty vehicles.				



With the city growing organically, the textile activity centres have been located in such a way that there are multiple back and forth interactions between the textiles market and the processing industries, leading to inefficiency in freight operations in terms of increased vehicle-kms and conflicts with regular traffic.

9.7.3.1. Proposal for Relocating Textile Industries

DP 2035 has proposed to convert identified toxic and hazardous zones and industrial areas into commercial/residential area and shift these industries out of the city limits. This recommendation aims to reduce goods traffic in the central area of the city. The DP recommends industrial zones in Katargam, Singapore, Sahara Darwaja and textile market area etc. to be considered for shifting. As per the DP, the areas identified in black are toxic industries and are recommended to be shifted. Other existing and proposed industries are also marked in the map below. The proposal in the DP has further identified land for shifting these industries near Chaltan and the logistic park near Palsana, shown in the map below.

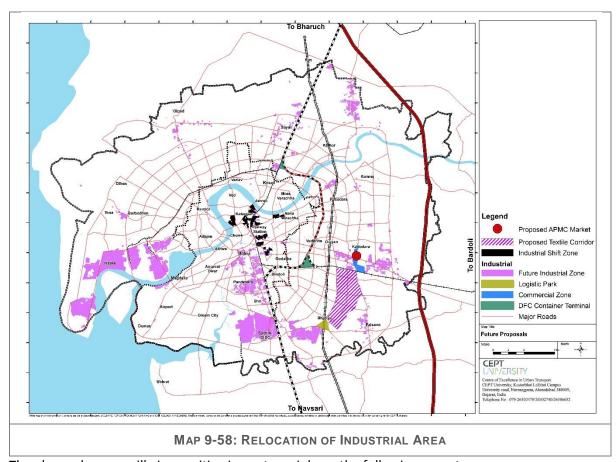


In continuation of the DP proposal, this chapter recommends a larger area as the zone for considering shifting of industries, especially for the textile industry and its ancillary units.

This zone includes following as shown in the Map 9-58;

Weavers/power loom industries in the central city area (as per DP)

- Udhana GIDC and surrounding Udhana
- Textile markets where physical quality checks happen for greige cloth and also for processed cloth
- Value addition units which are over spaced in the city centre
- Consolidation centre at Bhatena



The above changes will give positive impacts mainly on the following aspects:

- As shown in textile manufacturing process on stage 1, yarn coming to weavers/ power looms mostly in HCVs and MCVs from outside of the study area will not penetrate the city,
- As shown in stage 2, 3 and 4, greige cloths and processed cloths that come to the textile market, at least for 3 times for physical quality checks at each stage, measuring & cutting etc. would not need to come to city centre.
- After completing all stages at Textile market, material goes to consolidation centre mostly by HCVs and MCVs, the externalities due to these trips would also be reduced if consolidation centre would also be outside.

The proposed textile logistic park would be an integrated area and should be planned and designed after understanding the manufacturing process and their stages along with quantum of production estimated in future. It should be designed and planned in such a way that, it can cater almost all the stages of process within limited area. This would reduce the transportation need, increase the

efficiency and would be economically beneficial. This textile logistic park may include weavers/ power looms, textile market where quality checks happen at each stages, processing units, value addition units, consolidation units and also transporters with parking spaces for their vehicles. The park should also be designed for loading/ unloading activities, parking facilities etc. In nut-shell, this zone would be the textile hub and can be branded as the "Textile Corridor".

The proposed locations for shifting of industries have been identified as below; new upcoming industries should be allowed to be located only in this particular zone. Looking at the existing DP and CMP road network proposal, area near Palsana seems more appropriate to shift textile industries over the space. This proposal provides various opportunities as listed below;

- Proximity to both NH and NE;
- Proximity to proposed ring road which directly connects Sachin and Pandesara, where most
 of the textile processing units are located;
- Proximity to the container yard proposed by DFC;
- Minimising intrusion of freight vehicles into the city as all the external interaction related to textile will need not to come to the city centre.
- Instead of Sachin Pandesara Sahara belt, this proposal would create opportunity to develop Pandesara – Sachin – Palsana – Chalthan as the "Textile Corridor".

9.7.3.2. Evaluation of Relocation Proposal

Apart from the qualitative factors listed above, impact on vehicle km travelled, accidents and environment were also analysed. Externalities such as fatalities and emission/pollution level due to existing goods vehicle movement within the study area have been discussed in Chapter 5.

According to the Southern Gujarat Chamber of Commerce and Industries (SGCCI) report 2016, the fabric production in Surat is expected to grow at 3.6% annually for the next 10 years. Currently, Surat produces about 356 lakh meter of fabric daily, which is expected to be around 900 lakh meter of fabric by 2046. The fabric production/manufacturing is explained in Chapter 5. The growth in the textile industry would result in an upsurge of vehicular traffic and related externalities within the study area. To quantify this further, future goods vehicle trips and vehicle kms have been estimated for Business As Usual scenario and have been compared with the scenarios after the proposal execution. Table 9-27 presents the textile goods vehicle km comparison across the two scenarios.

TABLE 9-27: ESTIMATED VEHICLE KM - TEXTILE GOODS VEHICLE

Vehicle Type and	Base Year		Scenario 1		Scenario 2	
Type of Interaction	2016 - Goods Veh. Km	BAU Scenario	30% Shift	Savings	50% Shift	Savings
LCVs - RSI (E-I, I-E)	32947	100283	82210	18%	81324	19%
LCVs - Activity (I-I)	695515	2116977	1827750	14%	1377841	35%
HCVs - RSI (E-I, I-E)	56869	173096	134261	22%	127638	26%
HCVs - Activity (I-I)	34344	104535	117868	-13%	138392	-32%
Total	819675	2494892	2162090	13%	1725195	31%

Business As Usual (BAU): It is a trend-based scenario, based on the existing situation. No shifts of textile industries have been considered in this case.

Scenario 1: It is assumed that about 30% of textile industries from the identified zone would shift to the proposed location near Palsana. The estimated savings in vehicle km for this scenario is about 13% as compared to BAU.

Scenario 2: It is assumed that about 50% of the textile industries from the identified zone would shift to the proposed location near Palsana. The estimated savings in vehicle km for this scenario is around 30% as compared to BAU.

9.7.3.3. Area Requirement Proposed Location

Developing the textile corridor as mentioned in the section above, would be branded in a way that may attract more textile and ancillary activities. With GoG's support, authorities may also develop the logistic park exclusively for textiles and supporting industries.

Hence, it becomes important to estimate the land requirement for the same. The DP proposes 4.3 sq. km of land to be shifted out of the city limits. The CMP recommends extending this area till Udhna GIDC and the surrounding industries adding 3.4 sq. km of land area. Therefore, a total of 7.7 sq. km of land area is required. Considering that the shifting of 100% land area is a big challenge, assuming the shifting of 50% industries at the recommended location, would mean the need for about 3.5 sq. km of area in today's context. Systematic planning and hi-tech machineries may even give higher productivity with lesser area. Assuming average annual growth rate of textile industries to be 5–6% for the horizon year, nearly 10–12 sq. km of area would be needed along the proposed New Textile Corridor.

9.7.4. Policy Intervention

These are a few policy level proposals that are recommended based on the inferences from detailed study of freight movement and externalities related to it:

- Currently, the time restrictions on freight vehicles is largely non-existent, as Kadodara corridor
 allows the entry of freight vehicles throughout the day. To minimise the externalities, it is
 recommended to allow freight vehicles (HCVs and MCVs) from 9pm to 6am only. This will reduce
 passenger and goods vehicular conflicts, decrease congestion and accidents in the city. Even for
 the permitted hours, speed limits should be imposed so as to avoid major casualties.
- Systematic planning of logistic park on the proposed textile corridor would help to reduce the
 vehicular trips by bringing a few stages of textile manufacturing such as weaving, dyeing,
 processing, printing, value addition, packaging and consolidation etc. at one place within the
 textile/logistic park. Under the scheme of GoG Financial Assistance to Logistic Park (2015), the
 government provides support to develop this kind of infrastructure on a PPP basis.
- Strong enforcement of vehicle technology in accordance with Bharat Stage (BS) phasing would bring down the emission levels.
- Introduction of electric buses for public transportation in cities have been initiated by the Govt. of India. Similarly, electric vehicles technology for goods transportation could also be implemented. This would again reduce the emissions in the city.

- ITMS facilities are already in place in Indian cities. Freight transporters should also adopt the same technology for their goods vehicle monitoring. This will improve the efficiency of transport management and also reduce the empty vehicle trips, and hence reduce the externalities.
- Strict enforcement for regulating on-street parking for goods vehicles and restricting their parking in residential and commercial land use area is recommended to minimise conflicts with vehicular and pedestrian flow

9.8. Fiscal Measures

Managing travel demand is an important strategy to deal with congestion in the city and in this regard both pull and push measures are required. In this regard, economic measures such as road pricing, congestion charging, fuel tax, transport tax, vehicle taxes can be introduced in the city. This will result in discouraging private modes of transportation and reduce congestion. If designed well, these measures would help in recovering the unaccounted costs of transportation generally borne by NMT and public transport users. Hence, revenue collected through such measures could be further used to improve the PT and NMT infrastructure in the city. Such measures are also designed to incentivise the use of environment-friendly modes in the city. Measures such as public transport pricing, differential parking charges, incentives for public transport users, ride share, subsidies on purchase of environmental friendly vehicles are some of the instruments that can be considered.

Enforcement of these measures poses the biggest challenge and hence, it is imperative that the design of these instruments follow a participatory approach with various stakeholders and strict enforcement by the government. Apart from this, the success of these instruments would also depend on the availability of alternatives with the public for their travel needs, and hence, the government needs to ensure that the PT system in the city is seamless and integrated, and that it matches the quality of the private modes of transport.

Regulatory measures such as vehicle quota system, vehicle registration bidding system, number plate scheme, car free days, proof of parking and parking restrictions can also be introduced. However, the success of these drastic measures will also depend on the alternatives provided to the public as in the case of economic measures.

In this regard for the city of Surat the following are proposed:

9.8.1. Introduction of Transport Impact Charge

Due to the transport challenges being faced by the city (refer Section 6.1) and the externalities of environment degradation and road accidents, a focus on projects which facilitate people-movement is being proposed as part this plan. The SMC is therefore investing heavily on improving the public transport scenario in the city. However, to maintain a good quality PT system, subsidies for operations would be required, as can be seen in the table below.

TABLE 9-28: MEASURES FOR IMPROVING PUBLIC TRANSPORT SYSTEM

Type of Bus service	Bus Management	Total Nos. of	Nos. of Route	Daily Total Nos. of Passenger	Income per KM Rs.	Expenditure per KM	Subsidy per KM	Yearly Income (Rs. In Crore)	Yearly Expenditure (Rs. In Crore)	Yearly gap (Rs. In Crore)
City Bus service	Private Bus Operator	275	29	80,000	12.80	38.29	25.29	11.29	40.98	29.69
(BRTS)	Private Bus Operator	116	08	88,210	25.50	48.00	22.50	20.65	57.44	36.79
Total		391	37	1,68,210	·				98.42	66.48

Note: All supporting bus service related infrastructure facilities such as bus stop, depot space, workshop space etc. are provided by Surat Municipal corporation

The above table depicts the deficit Rs. 66.48 crores yearly. To fill this gap SMC provides a subsidy of Rs. 25.49 per km for the city bus service and Rs. 22.50 per km for the BRTS. In addition to this, the increase in fuel cost, repair costs, and other expenses are also expected to grow over time. Such financial gap may also affect other municipal services.

Considering the above, it is desirable to maintain the bus and BRTS service at the best which would require continuous financial support and self-sustainability of the services. This can be achieved by introduction of transport users' charge.

As per the GPMC Act, Clause No. 127 and 129, transport user charge can be levied in integration with property tax. It is proposed to levy the transport users' charge named as 'Transportation impact Charge' similar to the current charges that are levied for solid waste management in the city. It is also suggested to exempt residential property having carpet area less than 50 sq. m and commercial, others & industrial properties less than 25 sq. m to pay the transport users' charge. Proposed Transportation Impact Charge can be summarised as under:

	Proposed Environment Improvement Charge (Rs. Per Year)				
Property area	Residential Property	Commercial and other Properties	Industrial Properties		
< 15 sq. mt.	0	0	0		
16 to 25 sq.mt.	0	0	0		
26 to 50 sq.mt.	0	600	3000		
51 to 100 sq. mt.	720	900	3000		
101 to 200 sq.mt.	960	1080	3000		
201 to 500 sq. m	1350	1620	3000		
> 500 sq. m	1800	2700	3000		

Considering data of all kinds of properties registered in the SMC tax branch ending November 2017, and applying the above said rate it is estimated total of Rs. 90.13 crore can be initially recovered. Property- wise details in each category can be estimated as shown below:

Property area (in Sq. m)	All type of properties area in Sq.m	Total area of all Residential properties in Sq.m	Propos ed Road User charge for residen tial proper ties (Rs./ Year)	Total Expected Income from all Residenti al property (Rs. In Lac/Year)	Total area of all Commerci al properties (Sq.m)	Propos ed Users charge s for comm ercial proper ties (Rs./y ear)	Total Expected Income of road user charges from Commerc ial propertie s (Rs. In Lac/Year)	Total area of all Industrial properties in Sq.m	Propose d Users charges for industri al properti es (Rs./yea r)	Total Expected Income from Industrial property (Rs. In Lac/Year)	Total Resident ial and all non- residenti al properti es (Rs. In Lac/year
< 15 sq.	40,05,956	2,61,967	0	0	89,841	0	0	3,392	0	0	0
16 to 25 sq. m	56,08,160	2,06,811	0	0	62,927	0	0	4,968	0	0	0
26 to 50 sq. m	1,92,92,311	4,47,092	0	0	60,006	600	360	17,691	3,000	531	891
51 to 100 sq. m	2,74,27,198	3,27,505	720	2,358	32,613	900	294	29,926	3,000	989	3,549
101 to 200 sq. m	2,22,07,746	1,02,317	960	982	23,407	1080	253	40,378	3,000	1,212	2,447
201 to 500 sq. m	1,84,81,269	23,445	1,350	317	11,612	1620	188	30,098	3,000	903	1,408
> 500 sq. m	17,53,55,251	4,290	1,800	77	17,758	2700	479	5,398	3,000	162	719
	27,23,77,891	13,73,427		3,734	2,98,164		1,574	1,31,860		3,705	9,013

9.8.2. Fare Policy for Public Transport Use

An integrated fare policy is being proposed for Surat. Currently, the city bus and the BRT services in Surat have a common ticketing system, and it is proposed that the future rapid transit modes will also be integrated within the system. In this regard, the city is already working on a common mobility card and hence, for seamless integration, it is necessary that the same will also be applicable for any future transit systems in the city. Apart from this, automated fare revisions will also need to be taken up at regular intervals for the transit systems to operate efficiently.

9.8.3. Parking Charges

In line with the recommendations made in the parking policy, the parking charges are proposed as below. The tables show on and off street parking charges in normal and premium areas.

	On Street Parking - All areas						
Modes	0 to 3 hours						
3-wheelers	20	25	35	45	60		
Cars	25	30	45	60	80		
LCV	35	50	70	90	110		
HCV	60	100	150	200	250		

	On Street Parking – Premium Areas						
Modes	0 to 3 hours	0 to 3 hours 3 to 6 hours 6 to 9 hours 9 to 12 hours 12 to 24 Hours					
3-wheelers	25	30	45	65	80		
Cars	30	40	60	90	110		
LCV	40	60	80	110	130		
HCV	90	110	165	250	300		

	Off street Parking - All areas					
Modes	0 to 6 hours 6 to 12 hours 12 to 18 hours 18 to 24 hours					
3-wheelers	15	25	35	45		
Cars	20	30	45	60		
LCV	30	50	70	90		
HCV	50	100	150	200		

	Off Street Parking – Premium Areas						
Modes	0 to 6 hours 6 to 12 hours 12 to 18 hours 18 to 24 hours						
3-wheelers	20	30	45	65			
Cars	25	40	60	90			
LCV	35	60	80	110			
HCV	75	110	165	250			

On and Off Street Parking - All areas					
Modes	0 to 3 hours	3 to 6 hours	6 to 9 hours	9 to 12 hours	12 to 24 Hours
2 wheelers	10	15	20	25	40

Note: For more than 24 hours, parking charges shall be computed based on the additional duration of parking as increment from 0. Bicycles and Handicapped Modified Vehicles shall not be charged for parking.

The tables below shows parking permit charges.

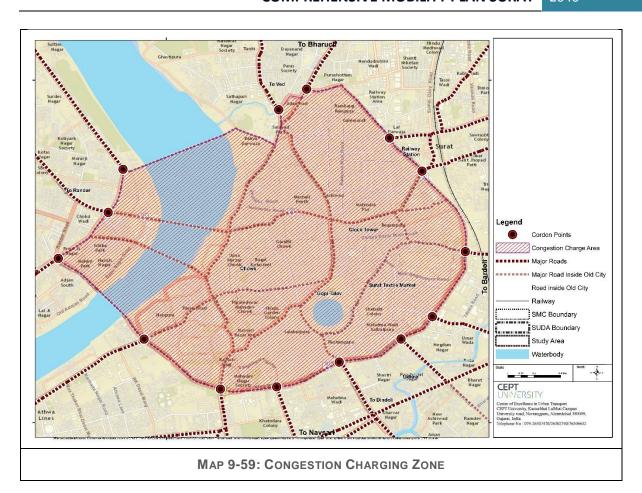
TABLE 9-29: PARKING PERMIT IN EXTERNAL AND CORE ZONE

		Subsidy Scenarios							
Parking	Vehicl		90% Subsidy			95% Subsidy			
District	es	Cost_RP/ year	Cost_WP/y ear	Cost / month	Cost_RP/ year	Cost_WP/y ear	Cost / month		
External	2W	2920	1600	243	1460	800	122		
	Car	8760	4800	730	4380	2400	365		
	LCV	14600	8000	1217	7300	4000	608		
	HCV	20440	11200	1703	10220	5600	852		
Core	2W	5840	3200	487	2920	1600	243		
	Car	17520	9600	1460	8760	4800	730		
	LCV	29200	16000	2433	14600	8000	1217		
	HCV	40880	22400	3407	20440	11200	1703		

RP: Residential Permit WP: Work Permit

9.8.4. Congestion Pricing

An area-based congestion pricing is proposed as a medium and long-term proposal for the old city area. In area-based pricing, all the roads that come under the old city area will be liable to be charged congestion pricing. The congestion pricing is generally implemented for a specified time period within a day. Some of the cities in the world that have implemented congestion pricing are London, Stockholm, Milan etc. and they all have electronic congestion pricing as the method of collection. The pricing can be implemented through electronically collected toll systems with automatic number plate recognition cameras. This long-term proposal is expected to decongest the old city area.



9.8.5. Strengthening PTA Finances

It is accepted the world over that fare box revenue alone will not be adequate to fully cover the operational expenditure of public transport. In addition to the enhancement of fare box revenue, additional sources of revenue would have to be assigned to cover the PT operational expenditure gap.

The following are the measures which are to be/being explored:

1. Private sectors investments for capital investment

To exploit the efficiency gains brought by the private sectors in PT operations, the SMC has already involved the private sector in carrying out various unbundled PT activities such as bus supply, operations, fare collections system and collection, ITS management, etc. Land based PT infrastructure development through PPP is currently being examined.

2. Inflation linked fare revisions

The SMC, with the approval of the State, has already adopted a formula for annual fare revisions. However, considering the impact of the fare revisions on ridership, especially in the light of existence of cheaper informal service options through shared autos, the full implementation of the formula has not been possible. Re-examination of the formula and complementary measures to curb competition from illegal, informal service is necessary.

3. Reimbursement of social fare concessions (students, blind, etc. to be reimbursed by the State)

A significant portion of the revenue gap is because the city offers concessional fares to various segments of the society. As these are being provided on the basis of equity and other social considerations, it is only fair to expect that the State fully reimburses the concession amount.

4. Introduction of earmarked revenue stream to fund PT operations

It is already stated above that the user pay principle can be applied to a limited extent in the case of public transport service provisions. Alternatively, authorities are exploring the application of 'Beneficiary Pay Principle' and 'Polluter Pay Principle' for raising revenue for PTAs.

Examples of 'Beneficiary Pay Principle' are:

- 1. Employer tax (levied in the cities of France)
- 2. Congestion charge (levied in London, Singapore etc.)
- 3. TOD and value captures through
 - a. Sale of additional FSI (levied in cities like Ahmedabad, Surat etc.)
 - b. Real estate/ property lease (Hong Kong)
 - c. Additional tax/cess on property tax, similar to water tax (levied in US cities)

Examples of 'Polluter Pay Principle' are:

- 1. Additional tax on vehicle registration (Surat- 3% of value on vehicles)
- 2. Parking charges and fines (the world over)

9.8.6. Operational and Financial Autonomy for PTA

The following limitations of the present operating practices need to be addressed to achieve sustainability in public transport operations.

- The present practice of the political wing interfering in operational matters rather than limiting themselves to policy matters, is a major source of inefficient PT services.
- Similarly, the present system of filling the revenue-expenditure gap either by the state or by the local authority without giving due consideration to efficiency of operations, is likely to perpetuate inefficiency.

It is important that PTAs are adequately equipped in terms of human, financial and technical resources as well as autonomy with regard to operational and financial aspects.

CHAPTER-10

Mobility Management Measures and National Urban Transport Policy (NUTP) Objectives

10. Mobility Management Measures and National Urban Transport Policy (NUTP) Objectives

The objective of this policy is to ensure safe, affordable, quick, comfortable, reliable and sustainable access to jobs, education, recreation and such other needs for the growing number of city residents within our cities.

NUTP Objectives for Urban Transport	Mobility Improvement Measures proposed as a part of the CMP Surat
Safe	Safety is one of the focus areas of the CMP Surat and the vision for the city reinforces the same. A total of 26 accident prone junctions were identified and an Accident Management Plan provided in the CMP, which incorporates the following:
	 Setting up of an Accident Monitoring Cell to research accident- prone corridors, junctions and black spots Junction improvements measures for the top six critical junctions in the city (Udhana Teen Rasta, Kamela Darwaja, Majuragate, Kapodara Patiya Teen Rasta, Dabholi Bridge Junction, Y Junction) Specifying speed limits for urban roads in the city Design improvements in the road infrastructure Regulating the timings for entry and exit of freight vehicles Apart from this, vehicle-to-vehicle communication network to reduce accidents and traffic management in the future have also been suggested.
Affordability	Affordability of public transport is an important aspect. The city already has one of the lowest fares in the country: Rs. 4 for 2 km. Further, the fare of the BRT and the city bus services is also in the process of being integrated through a common mobility card, expected to be launched shortly.
Quick	Improvements in the road network, along with identification of strategic network for rapid transit system for the future, will ensure quick mobility in the region. Land use transport integration is, therefore, an important strategy of the plan. Developing activity nodes and linking them with strategic networks is proposed. For this, 526 km of new network is to be added to connect new development areas, 308 km of existing network needs to be upgraded, roads with 30 m and above widths are to be developed as 'Transit Ready Streets' with the central lane reserved for rapid transit. Apart from this, a Freight Management Plan has also been suggested as a part of the CMP for ensuring efficient mobility in the region, with proposals such as:
	 New outer ring road for through freight and vehicular traffic 'Textile corridor' with logistic park proposed near Palsana to help reduce freight vehicle intrusion into the city Entry-exit restrictions for freight vehicles (HCVs and MCVs) Parking regulations TOD along rapid transit corridors

NUTP Objectives for Urban Transport	Mobility Improvement Measures proposed as a part of the CMP Surat
Comfortable	Rapid Transit Network proposed with around 99 km of potential BRT corridors; 12 km of HMC along inner ring could be BRT/LRT; 73 km network of proposed metro, 5000 new buses are proposed to improve the supply, 36 interchange stations for seamless transfer; 3 major interchanges at Surat railway station, Majura Gate and proposed High Speed Rail station, Integrated fare structure and ITS.
Reliable	Reliability of transportation systems is important, and in this regard, the CMP Surat proposes data, intelligence and automation driven transport system, such as artificial intelligence-based agents for transit planning, Automated Central Control BOTS replacing human interaction at the control centre, device-less account linked ticketing, mobility as a service – aggregator taxi services like Ola and Uber, automated road quality assessment on transit vehicles, vehicle-to-vehicle communication network to reduce accidents and traffic management, Data Driven Traffic and Transit Decision Centre which will help in improved public transport services in terms of coverage and accessibility.
Sustainable	 Sustainability for the Surat CMP is ensured through the following measures: Extensive network of pedestrian footpaths around transit nodes and identified accident prone areas Around 288 km of cycle lane network Public bicycle sharing schemes proposed for the old city area and the institutional area of SVNIT which is to be extended to other areas TOD along transit corridors; 72 blocks with a total area of 140 sq.km to be developed as TOD zone Extensive network of pedestrian footpaths around transit nodes and identified accident prone areas Autonomous and electric vehicles
	Apart from the above, demand management measures to curb the use of private vehicles is also suggested in the form of fiscal measures such as parking charges, environment improvement tax and congestion charging for future years.
	For financial sustainability, resources are being planned to be generated through value capture and the above mentioned fiscal measures.

CHAPTER -11

Implementation Program

11. Implementation Program

The total cost of the CMP proposals is Rs. 45,406 crores of this the breakup of the same is as below:

Sr No		Component	Unit	Total amount
				(Rs. in crore)
1	Road I	nfrastructure	834	10767
	а	Existing Road Upgradation	308 km	1843
	b	Proposed New Roads	526 km	4892
	С	Proposed New Bridges/ROB/RUB	43 (no)	4032
2	Public	Transport Infrastructure		26577
	а	Proposed Metro Corridor	73 km	17962
	b	Proposed BRT corridor	111 km	3780
	С	Interchanges	36 (no)	4520
	d	Electric Transport Infrastructure		250
	е	Proposed Depots/Terminal	33 (no)	65
3	Cost o	f TOD Infrastructure	72 (no)	7919
4	Mobili	ty Management Measures		143
	a	Surat urban Mobility Management Academy		25
	b	Junction Improvement/ Parking/ Signages	257 (no)	118
Total Pro	Total Project Cost (Rs. In crore)			45,406

The projects identified as a part of the CMP can be phased as below

- Immediate priority / actions (0 2 years)
- Short term (2-5 years)
- Medium term (5-10 years)
- Long term (more than 10 years)

11.1 Prioritization and Costing of Projects

Sr. No	Intervention	Type of Intervention	Agency Responsible	Priority	Units	Cost in Crores (Rs)
Α	Modification of DP to accommodate CMP Proposals		SUDA with Support of SMC	Immediate		
1.1	Area to be developed	Planning	SUDA with Support of SMC	Immediate		
1.2	Road Network	Planning	SUDA with Support of SMC	Immediate		
1.3	Rapid Transit Network	Planning	SUDA with Support of SMC	Immediate		
1.4	TOD Areas	Planning	SUDA with Support of SMC	Short Term		
В	Road Network Development- SMC					
1	Road Upgradation -Widening , footpath development and Junction Improvements					
1.1	SMC Roads (140 Km)	Construction	SMC	Short Term	140 km	783
1.2	Footpath Improvement includes ring, radial and PT Network along with critical pedestrian prone network (332 Km)	Construction	SMC	Short Term	332 km	
1.3	Junctions (257)				257 No	
1.3 a	Junction Improvement Signalisation (18)	signalisation	SMC/ Traffic Police	Short Term (Immediate)	18 No	2

Sr. No	Intervention	Type of Intervention	Agency Responsible	Priority	Units	Cost in Crores (Rs)
1.3 b	Junction Improvement Overall Improvement (26)	Improvements	SMC/Traffic Police	Short Term (Immediate)	26 No	3.5
1.3 c	Junction Improvement -Signalisation (160)	signalisation	SMC/ Traffic Police	Short Term	160 No	19
1.3 d	Junction Improvement - Overall Improvement (53)	Improvements	SMC/ Traffic Police	Short Term	53 No	6.5
1.3 e	Parking Management	Management	SMC/ Traffic Police	Short Term		50
1.3 f	Signages	Improvements	SMC/ Traffic Police	Short Term		37
2	Road New Links- New Roads, Bridges, RUB/ROB					
2.1	New Road Links (87Km)	Construction	SMC	Short Term	87 Km	753
2.2	New Bridges (1)	Construction	SMC	Short Term	1 no	84
2.3a	New RUB/ ROB (4)	Construction	SMC	Short Term	4 no	340
2.3b	New RUB/ ROB (6)	Construction	SMC	Medium	6 no	491
2.4	Flyover (1)	Construction	SMC	Short Term	1 no	113
С	Public Transport Improvement					
	SMC					
1	Metro					
1.1	Metro (Phase -I)- Elevated (31)	Construction	SMC	Short Term	31 km	6886
1.2	Metro (Phase -I) - Underground (9)	Construction	SMC	Short Term	9 km	3828
1.3	Metro (Phase -II) - Elevated (9)	Construction	SMC	Medium Term	9 km	2065
1.4	Metro (Phase -III)- Elevated (3)	Construction	SMC	Medium Term	3 km	704
2	BRT					
2.1	BRT (Phase -III) 9	Construction	SMC	Short Term	9 km	180
2.2	BRT (Phase -IV) 27	Construction	SMC	Medium Term	27 km	540
2.3	BRT/ LRT- 12	Construction	SMC	Medium Term	12km	1800
3	Depots/ Terminals					
3.1	Phase 1 (26)	Construction	SMC	Short Term	26 no	50

Sr. No	Intervention	Type of Intervention	Agency Responsible	Priority	Units	Cost in Crores (Rs)
3.2	Phase 2 (7)	Construction	SMC	Medium Term	7 no	15
4	Interchanges					
4.1	Phase 1 (21)	Construction	SMC	Short Term	21 no	2637
4.2	Phase 2 (9)	Construction	SMC	Medium Term	9 no	1130
4.3	Phase 3 (6)	Construction	SMC	Long Term	6 no	753
5	Electric transport Infrastructure	Construction	SMC	Short Term		250
6	Surat Urban Mobility Academy	Research wing	SMC	Short Term		25
D	TOD-44 LAP	Planning	SMC			
1	Infrastructure Development	Construction	SMC	Medium to Long term	44 no	4839
Tota	SMC	·				28385
SUDA	A Area					
E	Road Network Development- SUDA					
1	Road Upgradation -Widening , footpath development and Junction Improvements		SUDA, National Highway, R&B			
				Short Term	20 km	223
1.1	National Highway Improvement	Construction	NH (47Km)	Medium Term	20 km	223
				Long Term	7 km	74
				Short Term	20 km	122
1.2	R&B Roads	Construction	R&B (48 Km)	Medium Term	8 km	43
				Long Term	19 km	106
				Short Term	23 km	84
1.3	SUDA	Construction	SUDA (73 Km)	Medium Term	21 km	77
				Long Term	29km	108
2	New Road Links					

Sr. No	Intervention	Type of Intervention	Agency Responsible	Priority	Units	Cost in Crores (Rs)
				Short Term	40 km	529
2.1	New Roads in SUDA	Construction	SUDA	Medium Term	108 km	590
				Long Term	281 km	2840
2.2	River Bridges (1)	Construction	SUDA	Medium Term	1 no	126
2.3	River Bridges (4)	Construction	SUDA	Long Term	4 no	420
2.4	RUB/ROB (12)	Construction		Sort Term	12 no	1096
2.5	RUB/ROB(8)	Construction	SUDA	Medium Term	8 no	794
2.6	RUB/ROB (6)	Construction		Long Term	5 no	454
3	Public Transport SUDA					
3.1	Metro					
1	Metro (Phase -I)- Elevated	Construction	SUDA	Medium Term	2 km	452
2	Metro (Phase -II)- Elevated	Construction	SMC/SUDA	Medium Term	14 km	2970
3	Metro (Phase -III)- Elevated	Construction	SMC/SUDA	Medium Term	5 km	1057
3.2	BRT					
1	BRT (Phase -III)	Construction	SMC/SUDA	Medium Term	28 km	560
2	BRT (Phase -IV)	Construction	SMC/SUDA	Medium Term	35 km	700
3	TOD SUDA (28)	Infrastructure			28 no	3080
	100 300A (28)	Development			28 110	3080
Total	for SUDA					16727
F	SUDA to coordinate with the DFC for network Improvement					
1	Network alignment changes in the ring road as a result of DFC			Immediate		
2	Ensuring adequate road crossings across the DFC corridor - RUB/ RoB total 16 Underpasses (9 major and 7 other)			Immediate		

Sr. No	Intervention	Type of Intervention	Agency Responsible	Priority	Units	Cost in Crores (Rs)
G	Roads Outside SUDA					
1.1	New road (11km)	Construction	R&B	Long Term	11km	180
1.2	ROB/RUB (1)	Construction	R&B	Long Term	1 no	113
Total Outside Study Area					293	
Grand Total				45406		

11.2 Identification of Funding Agency

For the road infrastructure development, funding would come from the city authority, the SUDA and the state government. Most of the projects are envisaged to be on a PPP mode. Apart from this, revenue from fiscal tools and value capture is also envisaged. The following funding sources have been identified for the plan:

- √ Value capture (through TOD)
- ✓ Environment Improvement Tax (as part of Property tax)
- ✓ Road congestion pricing for future years
- ✓ Parking charges
- ✓ Integrated transit Fare and non-fare box revenue sources such as advertisements etc.
- ✓ Government grants.

11.3 Implementing Agencies

11.3.1 Existing Institutional Framework in the Study area

The study area for CMP is about 1351 sq. km and is an amalgam of:

- an area of 958.16 square kilometres under the jurisdiction of the SUDA and of 326 sq. km under the SMC.
- an area of 365.84 sq. km outside the SUDA, including two urban areas of Olpad and Sayan along with 61 villages.

A number of government institutions and agencies operating in the region are working on various aspects of urban transport. A brief description of some of the key state level agencies is given below:

TABLE 11-1: EXISTING INSTITUTIONAL FRAMEWORK IN THE STUDY AREA

Agency	Roles and Function			
Urban Development Department, Gujarat	Policy formulation, regulation and coordination in the urban sector. The institutions under the department are as follows: The Gujarat Town Planning and Valuation Department The Director of Municipalities Gujarat Municipal Finance Board Gujarat Housing Board Gujarat Slum Clearance Board Gujarat Urban Development Company Limited Gujarat Urban Development Mission			

Agency	Roles and Function		
Transport Department, Gujarat	Regulatory functions such as Issue of Permits for Stage Carriage, Goods Carriage, Contract Carriage and Private vehicles at regional/city level		
Surat Urban Development Area (SUDA)	 Town Planning and preparation of Physical Plan for development of urban areas. To implement the planning proposal city level projects through land acquisition and preparation of Town Planning Scheme (TP Scheme) for detailed planning. To regulate the private development in accordance with the plan proposal. Planning and implementation of Infrastructure and Social facility. The authority prepares Plan of the Scheme and takes responsibility for providing roads and other infrastructure facility. 		
Khajod Urban Development Authority (KUDA)	Preparation of Master Plan under the TUPD Act, 1976		
Surat Municipal Corporation	Provision and management of following services: 1. Water Supply 2. Sewerage and Storm Water Drainage 3. Construction & maintenance of roads 4. Street lighting 5. Primary education 6. Medical services 7. Conservancy 8. Fire services 9. Public transport 10. Parks and gardens SMC is also responsible for management of smaller roads and traffic lights, licensing and control of NMT Surat Sitilink Ltd. Surat Sitilink Ltd., a Special Purpose Company incorporated under the Companies Act 1956, is a fully owned subsidiary company of the Surat Municipal Corporation. It is engaged in mass public transportation—mainly BRTS and City bus. At present, Surat Sitilink Ltd. operates 116 BRTS buses and 275 City buses in Surat City		

Agency	Roles and Function		
Traffic Police	Traffic management and regulation enforcement of traffic laws, regulating traffic and prosecuting violators		
Gujarat State Road Transport Corporation (GSRTC)	GSRTC came into existence on 1 May 1960 upon the formation of Gujarat state. The Gujarat State Road Transport Corporation (GSRTC) is a passenger transport organisation providing bus services both within Gujarat and to the neighbouring states. Currently, the GSRTC has a fleet of around 7000 buses, 125 depots, 226 bus stations and 1,554 pickup stands.		
Gujarat Roads and Building Department	The R&B Department is in charge of all the activities pertaining to planning, construction and maintenance of all categories of roads and all government-owned buildings in the state of Gujarat. These activities constitute a vital component of developmental work in the state. Besides this, the R&B Department also looks after and liaises with the Government of India with regard to Railways, Telephones and Civil Aviation (state-owned Airports)		
Gujarat Infrastructure Development Board (GIDB)	To facilitate higher flow of funds into the infrastructure sector and to ensure coordination among various government agencies, the Gujarat Infrastructure Development Board (GIDB) was set up in 1995. This is a unique organisation of its kind and is an overarching body for infrastructure development in Gujarat. The GIDB itself does not develop infrastructure services but acts as a catalyst for its development. The board is chaired by the Chief Minister and has other Ministers and Secretaries as its members.		
	The GIDB's role is an overarching one, straddling all areas of infrastructure development particularly with public-private partnership.		
	Overall project planning and prioritisation		
	Investor friendly policy initiatives		
	Coordination with sectoral agencies and departments		
	Techno-commercial and financial feasibility studies		
	 Selection of private participant through transparent processes 		
	Project preparation by conducting pre-feasibility and feasibility studies through reputed consultants		
	Drafting of Model Concession Agreements		
	Conceiving the infrastructure projects		
	Project development and preparation		
	Selection of developers through transparent processes		

Agency	Roles and Function
	Framing and approving Concession Agreements
	Monitoring the progress of projects
	 Capacity Building among government agencies and their staff
	Advising the government on policies on infrastructure
	Taking help of outside agencies and multilateral institutions
	Administering the viability gap funding on behalf of the government
Special Investment Region (SIR)	The state government has enacted a legal framework for the SIR—The Gujarat Special Investment Region Act , 2009. It has come into effect from 6 January 2009. This shows the commitment of the Government to set up world-class hubs of economic activity
	The administrative mechanism comprises an Apex Authority (GIDB), a Regional Development Authority (RDA) for each SIR, a Project Development Agency and project specific SPVs. The RDA will look after the ground level issue of development & regulation. The RDA will make its own regulations for building, construction and development
	Power and functions of RDA:
	To prepare Land Use Plan, Town Planning Scheme and Development Plan for SIR
	To supervise, monitor, regulate and ensure the planned development of SIR
	To lay down the infrastructure and civil amenities
	Acquire land and hold properties and sale, lease and transfer the properties including land
	To execute contracts with unit holders, developers
	To levy and collect fees, user charges
	Control the development activities
	To remove unauthorised construction, encroachment
	Manage all ground level work, planning & regulation

It is evident from the above, that diversity of transport organisational/ownership patterns along with diverse decision-making procedures contributes to lower compatibility of transport systems.

The current institutional arrangement for managing urban transport in India was developed at a time when urban transport was not a major problem. As a result, there is a high degree of fragmentation,

with separate enactments covering different modes of transport. In addition, planning and implementation of urban transport infrastructure rests with multiple agencies, which lack coordination. In most states, the Transport Department carries out regulatory functions of setting the fares for public bus systems. Roads are built and managed by the local bodies or the state PWD while the State Transport Corporation operates public buses.

Such a fragmented system of planning and implementation of urban transport projects is not desirable and there should be meaningful coordination amongst all urban transport activities. Several changes need to be made in the existing regulatory and administrative systems. The existing institutional arrangement for urban transport sector at the central, state and local level is given in table below.

TABLE 11-2: EXISTING INSTITUTIONAL ARRANGEMENTS – URBAN TRANSPORT

Level	Function	Roles	Agency Responsible
	Urban Transport Policy and Planning	Framing overall strategic, policy and planning for urban transport across India	Ministry of Housing and Urban Affairs
Central	Technical Planning of Urban Rail Transit System		Ministry of Railways
Level	Administer Motor Vehicles Act	Administer provisions of Motor Vehicles Act and notify vehicle specifications as well as emission norms	Ministry of Surface Transport
	Emission Norms and Standards	Recommend emission norms for motor vehicles	Ministry of Environment and Forests
	Regulation	Licensing and control of all road vehicles, inspection of vehicles, fixing motor vehicles tax rates, fixing of fares etc.	Department of Transport
State Level	Regulation	Issue of State Permits for Stage Carriage, Goods Carriage, Contract Carriage and Private Vehicles	State Transport Authority/ Commissioner of Transport
	Operation	Operation and Maintenance of state buses	State Transport Undertaking
	Construction	Construction and repair of major roads	Public Works Department
	Planning and Regulation	Land use planning and regulating development of urban areas	Department of Town and Country Planning and Valuation Department

Level	Function	Roles	Agency Responsible
Local Level	Regulation	Issue of Permits for Stage Carriage, Goods Carriage, Contract Carriage and Private vehicles at regional/city level	Regional Transport Authority/Commissioner of Transport
	Transport Management	Management of smaller roads and traffic lights, licensing and control of NMT	Surat Municipal Corporation
	Operation	Operation and Maintenance of city buses	Sitilink Pvt. Ltd. Surat/SMC
	Traffic Management and regulation	Enforcement of traffic laws, regulating traffic and prosecuting violators	Traffic Police
	Planning and Regulation	Land use planning and regulating growth of city	Development Authorities (SUDA, Khajod Urban Development Authority or KUDA)

11.3.2 Proposed Institutional Arrangement - Urban Transport

11.3.3 Multimodal Affordable Transport Authority (MATA)

Recently, the Gujarat government has announced the setting up of a Multimodal Affordable Transport Authority (MATA) to develop a holistic and integrated multi-modal systems approach so as to move towards an energy efficient and sustainable future. This authority will work for integrated transport management of sky, land & water routes. This authority will be set up at the state level.

Key Objectives of MATA are as follows:

- 1. MATA will act as the key nodal agency for formulating strategic policies for the transportation of the city to facilitate and ensure integration of strategies at various levels.
- 2. It will provide multimodal integration.
- 3. Formulation of State Level Urban Transport Fund and its distribution would be one among the various other functions of MATA.

Functions of MATA:

- a) Policy and Regulation
 - i. Prepare Vision Document and Strategy for development of urban transport in the cities.
 - ii. Evolve policies and programmes for improvement of public transport including measures such as private sector involvement in public transport in the city.

iii. The Authority may give such directions with regard to the implementation of any transportation system project or operation of any existing transportation system within the region to ensure that such development project is executed in the interest of the overall development of the transportation system in accordance with the zonal plan.

b) Co-ordination and Integration

- i. Be the nodal agency for the co-ordination, development and execution of projects or schemes for transportation in the region.
- ii. Co-ordinate with all transport system administrators operating transportation systems within the zone, to enable integrated public transport services within the Transit Zone.
- iii. Integrate and consolidate all Action Plans of various departments and agencies.
- Recommending suitable measures for inter-connection between different modes of public transport.

c) Financing

- Arranging financing, processing funds for the implementation of the projects, schemes and proposals for the development of public transportation in the region.
- ii. Making recommendations with regard to future investments that need to be made, taking into account the projections of future travel demand.

11.3.4 Special Purpose Vehicle (SPV) for Surat Metro

As discussed in the above sections, a total of 73 km of Surat Metro has been proposed under Phase 1 and Phase 2. To effectively manage the construction and execution works of Surat Metro along with its efficient operation and maintenance, a Special Purpose Vehicle (SPV) should be established. This SPV shall be established jointly by the Ministry of Housing and Urban Affairs and the State Government. The objective of Surat Metro will be to provide safe, reliable, environment friendly and affordable public transport for the people of Surat.

Functions of SPV:

- i. Implementation, Operation & Maintenance of the Surat Metro Project
- ii. Appointing General Consultants, sufficient number of Engineers in SPV organisation to be taken on deputation/market

11.3.5 Bus and BRTS

At present, both the city bus and the BRTS collectively ply on 330 kms. However, to cater to the future demand, the CMP proposes that this network be increased three-folds to 1,112 km (213 for BRTS and 899 for City Bus). Therefore, Surat Sitilink, under the Surat Municipal Corporation should be the key

authority for the operation and maintenance of the city bus as well as the BRTS service. This will also include management of micro buses, electric buses and pink auto rickshaws.

11.3.6 Road Network and Streets

The road network and streets are the responsibility of Surat Municipal Corporation and SUDA under their respective jurisdiction areas. Apart from this Traffic Police Department would work closely with the two organisations to for regulating traffic. Coordination between the three agencies is imperative for the same to work efficiently.

Surat -2046 Comprehensive Mobility Plan

Final

Volume 2

Annexure – Part 1

September 2018

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Annexure 1: Industrial Activities in Surat

1.1 Micro Small and Medium Enterprises

As compared to Gujarat state, the percentage share of enterprises in Surat district has risen from 9.56% in the year 2000, to 32% in the year 2015. Total MSME in Gujarat is 6.03 lakh as on 30th September 2014 providing employment to 38.51 lakh people. Most of the small scale industries in Surat are located in Choryasi, Mangrol, Oplad, Mandvi, Palsana tehsil of the district

Table 1: MSME in Surat

Detail of MSME in Surat up to 31st March 2015											
Total MSME Enterprise in Gujarat State	6,03,000										
Total MSME Enterprise in Surat District	1,91,500										
Share of Surat to State	32%										
Employment in MSME, Surat	9,91,379										
Investment in MSME , Surat (Lakhs)	29,41,597										

Source: Socio-Economic Report 2015

The trends and patterns of growth of the Micro Small and Medium scale industries, from the year 2006 to 2015 is given the figure, the table shows the number of units registered, investment done and number of employees over a period of 10 years.



Figure 1:Micro Industries development

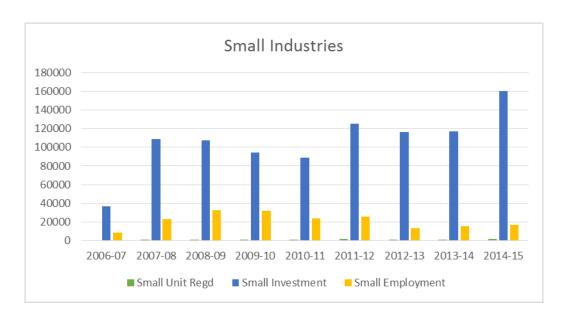


Figure 2: Small Industries development

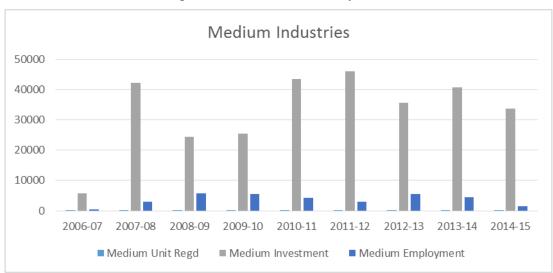


Figure 3: Medium Industries development

Source: Statistics from Industries Commissionerate, Gol

Based on the records of District Industries Commissioner (DIC) and Gujarat Industrial Development Corporation, it revealed that in the year 2012, number of MSME units registered in SUDA area was about 50,180. Out of this, 49,437 units are registered within SMC limits and 743 in SUDA area. This was further divided between four major blocks namely Palsana, Kamrej, Chorasi and Olpad.

No. of MSME Units Area % Share **SMC** 99% 49,437 **SUDA** 743 1% Palsana 302 Kamrej 98 Chorasi 23 Olpad 330 **TOTAL** 50,180 100%

Table 2 Distribution of MSME Units

1.2 Textile Industry

The textile industry is one of the oldest industries in the country and continues to be a significant contributor to value of industrial production, employment generation and to national income. An estimated 4 percent of GDP is contributed from the sector. It adds to about 30% of country's export earnings while adding about 7 to 8% of the gross import bill.

Type of Unit Textile Unit	% Share
Small	23
Medium	35
Large	42

Source: Brief Industrial profile of Surat District, Gol, Ministry of MSME, MSME-DI, Ahmedabad

Surat is a dominant player in the textile sector. The traditional handloom weaving industry has given way to power-looms, printing, and dyeing textiles. Surat is one of the largest centers in the world for production of synthetic fabrics, mainly nylon and polyester.

The textile processing units are the major backbone of the Surat city's economy. They are in a cluster of three types: Small (23%), medium (36%) and large (43%), depending on their daily production capacity. Approximately, there are 5 lakh power looms, 1, 10,000 embroidery units, 400 dyeing houses and about 165 number of textile markets, having 65000 shops. These units are within SMC Boundary, clustered around the ring road area. Zampa Bazaar, Bombay market, JJ textile and Jash markets are the major markets within the area. Palsana, Sachin, Pandesara, Katat Gam, Magdalla and Udhna are the areas of Surat where manufacturing is mostly concentrated.

1.3 Diamond Cutting and Polishing

Surat region is a hub of diamond cutting and polishing industries. The city accounts for 90% of world and 99.9% of India's total rough diamond cutting and polishing. It also accounts for

90% of India's total diamond export. Surat employs more than 1.5 million people in this sector and is the highest workforce of the world diamond community. The emergence of the industry in the region which did not have raw material, markets or worker base is a significant feat. Even majority of the entrepreneurs are from outside. Initially the industry began largely as an initiative of few individuals belonging to a particular community which has now expanded to large section of the society. Under the Import Replenishment Scheme introduced by the Government of India in 1958, diamond traders were allowed to import rough diamonds from Diamond Trading Corporation, London and other sources abroad and export cut and polished diamonds. Added support came from the encouragement offered to small-scale industries during this time. By the late 1950s, about 100 diamond cutting and polishing units had been set up. With the setting up of the Gems and Jewellery Export Promotion Council in 1966, diamond exports received a further impetus and consequently, the number of cutting and polishing units also increased. Today, the contribution of the Diamond Industry in the total foreign exchange of India is 14%

Table 3: Economic Establishment in Surat-2014

Particulars	Textile	Diamond	Weaving	Chemicals		
No. of Units	320	3500	25000	70		
No of Employees	400000	above 40,0000	125000	30000		
Current Investment (Cr.)	1000	25000	127500	500		
Current Annual Turnover	2000	200000	54000	6000		
Area (lac sq.mts)	7.43	45	30	9		
Products	Dyeing and Printing	Diamond polishing, cutting, gems & jewelry	Art Silk cloth Mfg.	Dye Intermediates, Pharmaceutical chemicals Mfg., textile		
Locations	Palsana, Pandesara, Sachin, Kadodara	Varaccha, Katargam	Sachin, Pandesara, Bamoli, Bhetsan, Limbayat, Ved road, Khatodra, Sayan, Pipodara etc.	Pandesara, Sachin Palsana		

Source: Surat Draft Development Plan 2035

Like textiles, diamond cutting and polishing is also a labour intensive industry employing about 5, 00,000 workers in about 25,000 units of all sizes operating within the urban region. India's first private *Special Economic Zone has been functioning near Sachin in Surat since November 2000.* From household industry base, over the years, the structure of the industry

has changed to small, medium and large-scale units. Technical advancements have also contributed to improved productivity. The industry requires a low capital base, is non-polluting, high on employment generation and is a leading contributor to foreign exchange reserve. Export value increased from a mere Rs. 110million in 1966-7 to 32, 0000 million in 2002-03. However, since the last few years there has been a downfall in the Diamond Industry. The production supply of polished and cut diamonds is higher than the consumer demand; as a result, the manufacturers are bleeding dry. This poses a serious threat to the workers running out of their jobs. Also, the decrease in value of Indian rupee has hit the export sectors drastically.

1.4 GIDC Estates

Gujarat Industrial Development Corporation (GIDC) has established industrial estates, providing developed plots and ready built-up sheds to industries all across the state. The ones established in and around the city of Surat are in the areas of Pandesara, Khatodara, Bardoli, Katargam, Sachin and Hazira-Mora, Icchapore, Olpad etc. Textiles, chemicals and diamond are major units located in these estates.

Name of Industrial No. of Units in Land Acqd. and Sr. No Type Developed (Ha) **Production** Area Sachin 1 Chemical, Textile 749.35 2075 218.27 782 2 Pandesara Chemical Surat Apparel Park 3 **Garment Export** 54.96 50 4 Bardoli Art Silk Cloth, textile 4.71 67 5 **Icchapore** Textile, engineering 919.84 337 4 Hazira- Mora Petro chemical 428.04 6 7 Khatodara Textile 3.08 142 8 Olpad Chemical, Textile 31.59 68 Textile engineering, 887 9 Diamond 38.33 Katargam

Table 4: Industrial Estates established in Surat

Source: On basis of the estimates received from Dy, Engg. GIDC Surat, as on June 2016

1.5 Zari Industry

The silver and gold brocade (Zari) industry, embroidery, and weaving of textiles in Surat have a 300-year old history. Since the 1980s, the industry got some boost due to growing exports. There are about 6,610 Zari units that employ approximately 47,500 workers. Difficulties in availability of skilled labour, high cost of raw material, outdated technology and changing preferences of the consumers have led to a severe contraction of the industry.

1.6 Hazira Industrial Development

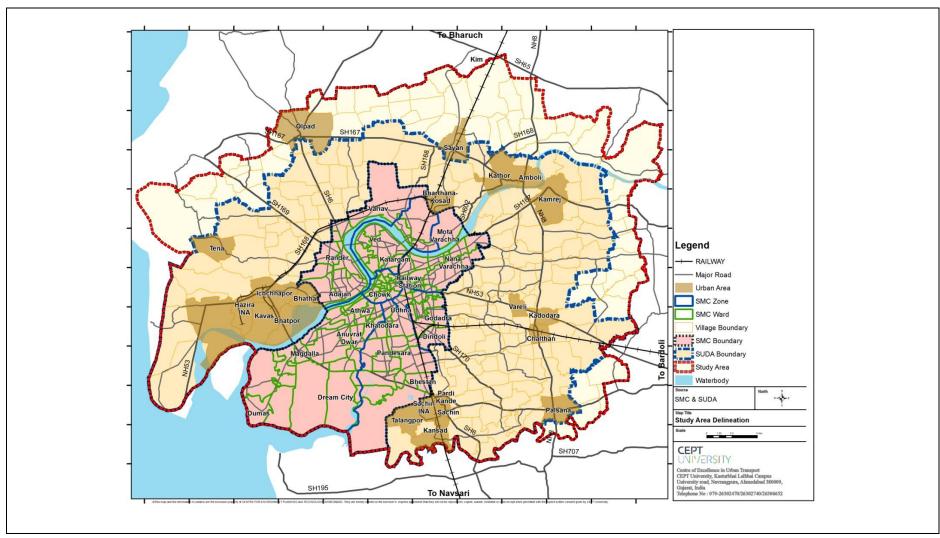
Hazira area spread over 167 sq. kms is a major industrial area located in contiguity with SUDA limits. Magdalla lightrage port which also includes captive jetties of M/S ESSAR, RIL, L&T, GACL, and KRIBHCO provides sea connectivity to the region. Hazira Port Pvt. Ltd was set up by Shell International. The port was commissioned on 2005, as India's first LNG terminal by a global energy company. In the year 2006, the terminal began commercial sale of Re gasified LNG (RLNG) for customers in North & West India on the basis of Spot LNG. Given the nearness to Surat city and the port connectivity, Hazira region accommodates 20 large and medium sized industries. They are producing polymer, heavy engineering products, gas, LPG bottling, steel foils, ammonia etc. The total investment in the Hazira belt exceeds Rs 20,000 crore. If the present expansion plans are implemented, Hazira would emerge as one of the largest ports in India by 2020, with a capacity in excess of 75 MMPTA.

Hazira Port has been developed on BOOT PPP mode and is operational since 2012. As per GMB, Hazira Port has estimated to handle about 84 million MT of cargo by the year 2030. In order to link Hazira Industrial Zone with the rest of the country, there is a need to establish strong dedicated transportation and communication network. In the light of this, and considering the request of Gujarat Maritime Board, an Industrial Corridor along broad gauge railway line near Gothan –Kosad has been proposed in the development Plan 2035. This corridor would link Hazira to the existing Delhi- Mumbai railway line and is about 30km long.

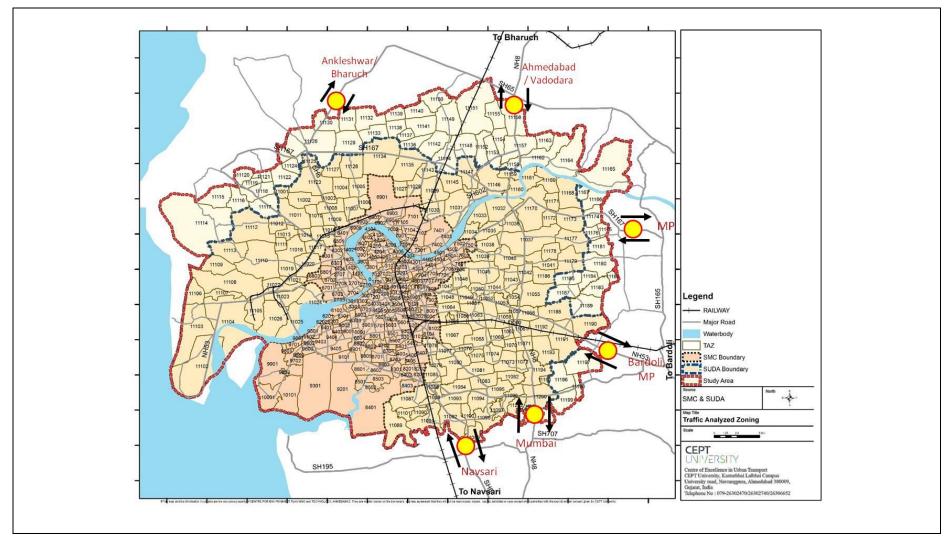
Surat region is one of the leading city-regions in the country that has attracted massive investment proposals. The success rate of converting proposals in to reality has also been very high. Out of total projects for which IEMs were signed in 1995, about 55-60% of the projects had been realised by the year 2001. At present large investments are proposed. According to CMIE, as on August 31, 2006, there are 1819 projects under implementation with investment of Rs. 1, 34,206 Crores with an estimated employment generation of 2, 77,947. Surat district accounts for 26% of units, 21% of investment and 11% of employment being generated through this investment in the state.

In addition, recently, the Government of Gujarat organised an Urban Summit. Large number of entrepreneurs signed MOUs (Memorandum of Understanding) to invest in the state in various sectors. In the Surat region, total worth of MOUs signed is about Rs. 61,450 crores. The majority of MoUs signed belong to urban infrastructure, industrial and real estate sector. The location of these projects is in the areas like Abhava, Kosad, Rundh, Dumas, Vesu, Pal, Magdalla, Kadodara, Amroli and Sachin, which are in the peripheral areas to the municipal boundary.

Annexure 2: Study Area Delineation



Annexure 3: Traffic Analysis Zone (Internal and External)



Annexure 4: Distribution of Population

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
101	Nanpura	SMC	SMC	МС	23	15525	15726	18672	15801	18772	12474	13611
102	Nanpura	SMC	SMC	МС	22	5175	5242	6436	5114	9225	5692	8115
103	Nanpura	SMC	SMC	МС	24	18112	18347	21731	18811	21874	15595	16827
104	Nanpura	SMC	SMC	МС	11	4140	4194	5213	3666	7472	3422	4370
105	Nanpura	SMC	SMC	МС	22	5175	5242	6118	4737	8768	5101	6442
106	Nanpura	SMC	SMC	МС	14	3622	3669	4601	2943	6595	2287	3013
201	Sagrampura	SMC	SMC	МС	48	34792	36699	43148	39891	43593	37446	34430
202	Sagrampura	SMC	SMC	MC	28	13144	13864	16499	13662	16568	10257	12383
203	Sagrampura	SMC	SMC	МС	50	10051	10602	12692	16544	26695	34241	17743
204	Sagrampura	SMC	SMC	МС	31	19329	20389	24113	21156	24290	18025	16154
301	Salabatpura	SMC	SMC	МС	40	35075	33821	39789	36585	40187	34018	30557
302	Salabatpura	SMC	SMC	МС	32	8351	8053	9716	8994	13926	11778	7285
303	Salabatpura	SMC	SMC	МС	14	6681	6442	7837	5136	7784	1420	3895
304	Salabatpura	SMC	SMC	МС	18	5568	5368	6584	5288	9436	5966	7509
401	Begumpura	SMC	SMC	МС	61	13749	12530	14942	19920	31428	41421	17995
402	Begumpura	SMC	SMC	MC	35	32081	29238	34440	31321	34762	28561	29058
501	Haripura	SMC	SMC	МС	29	12564	11378	13597	13585	19489	18978	10119

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
601	Mahidharpura	SMC	SMC	MC	40	19817	17027	20190	21383	28938	31210	18050
701	Saiyadpura	SMC	SMC	МС	67	38625	39204	46071	42769	46558	40428	32647
702	Saiyadpura	SMC	SMC	МС	43	4414	4480	5548	5824	11668	11449	13978
703	Saiyadpura	SMC	SMC	МС	30	6621	6721	8162	9747	17168	19790	9455
704	Saiyadpura	SMC	SMC	МС	23	0	0	0	513	719	1090	548
705	Saiyadpura	SMC	SMC	МС	14	3311	3360	4582	2516	6078	7868	4114
706	Saiyadpura	SMC	SMC	МС	13	2207	2240	2933	1901	6169	9358	330
801	Gopipura	SMC	SMC	MC	19	9655	9398	11286	8531	11282	11189	5987
802	Gopipura	SMC	SMC	МС	19	9655	9398	11286	8531	11282	11189	5918
901	Wadifalia	SMC	SMC	МС	21	7164	6067	7399	6252	10605	13728	7060
902	Wadifalia	SMC	SMC	MC	12	2388	2022	2679	1519	5634	8546	3727
1001	Sonifalia	SMC	SMC	МС	21	7213	6750	8196	7195	11747	15206	7847
1002	Sonifalia	SMC	SMC	MC	16	7213	6750	8196	7195	11747	15206	6845
1101	Nanavat	SMC	SMC	МС	46	19754	21022	24852	21884	25039	25030	16942
1201	Shahpor	SMC	SMC	МС	44	23265	24979	29470	26429	29722	29741	20090
1301	Athwa	SMC	SMC	МС	70	7726	7298	8517	12780	17914	27734	24156
1401	Rander	SMC	SMC	MC	98	4302	5732	6689	10037	14069	21340	22076
1402	Rander	SMC	SMC	MC	45	12907	17195	20386	24115	29218	37823	23271
1403	Rander	SMC	SMC	МС	39	10326	13756	16054	18990	23009	29786	19225

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
1404	Rander	SMC	SMC	МС	62	17209	22926	26756	31650	38349	49643	33685
1405	Rander	SMC	SMC	МС	115	9465	12610	15034	22559	31623	47966	44849
1406	Rander	SMC	SMC	МС	31	4302	5732	6689	10037	14069	21340	14096
1407	Rander	SMC	SMC	МС	81	27535	36682	43128	42372	43573	43675	42693
2701	Adajan	SMC	SMC	МС	94	21318	27576	32182	38069	46126	59710	51865
2702	Adajan	SMC	SMC	МС	37	1523	1970	2299	3449	4835	7334	6526
2703	Adajan	SMC	SMC	МС	36	7614	9849	11494	13596	16473	21325	13624
2704	Adajan	SMC	SMC	МС	84	18273	23636	27584	32630	39536	51180	31721
2705	Adajan	SMC	SMC	МС	44	7614	9849	11494	17246	24175	36669	19953
2706	Adajan	SMC	SMC	МС	61	15227	19697	22987	27192	32947	42650	32003
2707	Adajan	SMC	SMC	МС	77	30455	39394	45974	45141	46391	46444	44921
2708	Adajan	SMC	SMC	МС	95	22841	29546	34481	40788	49420	63975	47554
2709	Adajan	SMC	SMC	МС	73	12182	15758	18390	27593	38680	58670	36838
2710	Adajan	SMC	SMC	МС	45	7614	9849	11494	17246	24175	36669	21894
2711	Adajan	SMC	SMC	МС	48	7614	9849	11494	17246	24175	36669	24271
2801	Nanavarachha Water Works	SMC	SMC	МС	26	173	82	414	622	872	1883	5023
2901	TPS – 1 Rampura Laldarwaja	SMC	SMC	МС	38	11263	9203	11059	13809	15851	21081	20042

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
2902	TPS – 1 Rampura Laldarwaja	SMC	SMC	МС	28	1251	1023	1512	3026	3181	5385	7143
3001	TPS - 2 Nanpura	SMC	SMC	МС	47	9204	8538	10283	12929	21628	32806	22202
3101	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	24	24675	22133	22475	22771	22629	23165	17977
3102	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	9	705	632	1057	2313	2223	3932	3716
3103	TPS - 3 Katargam Gotalawadi	SMC	SMC	МС	21	6345	5691	6961	8961	9977	13476	8670
3104	TPS - 3 Katargam Gotalawadi	SMC	SMC	МС	18	14100	12647	15079	15491	15128	15619	10298
3105	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	21	3525	3162	4009	6742	8432	13350	8063
3106	TPS - 3 Katargam Gotalawadi	SMC	SMC	МС	37	17625	15809	18769	22929	26901	35384	22524

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
3107	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	96	3525	3162	4009	6742	8432	13350	16534
3201	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	59	21772	19740	23357	28356	33477	43897	28744
3202	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	32	17010	15422	18317	18678	18412	18923	13422
3203	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	67	2722	2468	3198	5526	6727	10765	7390
3204	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	23	10206	9253	11118	13878	15935	21189	12134
3205	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	11	1361	1234	1759	3366	3699	6172	5567
3206	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	23	1361	1234	1759	3366	3699	6172	4372
3207	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	38	13608	12338	14717	18137	21094	27867	19042

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
3301	TPS - 5 Athwa – Umara	SMC	SMC	МС	93	21328	20809	24603	36917	51749	79055	46911
3302	TPS - 5 Athwa – Umara	SMC	SMC	МС	23	3764	3672	4285	6430	9014	14233	10370
3303	TPS - 5 Athwa – Umara	SMC	SMC	MC	90	6273	6120	7461	11195	15693	24365	36530
3401	TPS - 6 Majura – Khatodara	SMC	SMC	MC	90	1897	1757	2369	3555	4983	8119	19889
3402	TPS - 6 Majura – Khatodara	SMC	SMC	MC	47	12643	11713	13988	16547	20049	26514	24934
3403	TPS - 6 Majura – Khatodara	SMC	SMC	MC	59	3793	3514	4419	6631	9296	14661	19006
3404	TPS - 6 Majura – Khatodara	SMC	SMC	MC	39	23390	21669	25607	25126	25805	26361	17048
3405	TPS - 6 Majura – Khatodara	SMC	SMC	МС	53	1897	1757	2369	3555	4983	8119	14717
3406	TPS - 6 Majura – Khatodara	SMC	SMC	МС	41	19597	18155	21506	21090	21646	22177	22364
3501	TPS - 7 Anjana	SMC	SMC	МС	34	3917	5254	6451	9679	13568	21142	8650
3502	TPS - 7 Anjana	SMC	SMC	MC	39	2350	3153	3998	5999	8409	13316	12385
3503	TPS - 7 Anjana	SMC	SMC	MC	27	4701	6305	7677	9082	11004	14805	11924
3504	TPS - 7 Anjana	SMC	SMC	МС	54	23503	31527	37111	36450	37471	38098	33024

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
3505	TPS - 7 Anjana	SMC	SMC	МС	36	1567	2102	2772	4159	5830	9403	15375
3506	TPS - 7 Anjana	SMC	SMC	МС	16	14102	18916	19255	18874	19363	19880	14664
3507	TPS - 7 Anjana	SMC	SMC	МС	20	23503	31527	31878	31299	32165	32759	25180
3508	TPS - 7 Anjana	SMC	SMC	MC	26	4701	6305	7677	9082	11004	14805	7903
3601	TPS - 8 Umarwada	SMC	SMC	МС	39	3059	2990	3809	5715	8011	12712	11123
3602	TPS - 8 Umarwada	SMC	SMC	МС	40	36702	35884	36240	36319	36588	37209	28137
3603	TPS - 8 Umarwada	SMC	SMC	МС	35	3059	2990	3809	6442	8011	12712	9658
3604	TPS - 8 Umarwada	SMC	SMC	MC	35	13457	13157	15674	18541	22465	29642	17687
3605	TPS - 8 Umarwada	SMC	SMC	MC	21	4894	4784	6237	7709	8460	11512	5899
3606	TPS - 8 Umarwada	SMC	SMC	МС	16	0	0	0	502	704	1629	3193
3701	TPS - 9 Majura	SMC	SMC	МС	101	16470	18206	21566	32360	45361	69365	47980
3702	TPS - 9 Majura	SMC	SMC	МС	52	5490	6069	7401	11105	15567	24174	26056
3801	Tunki	SMC	SMC	МС	154	30335	48038	56381	67421	80810	105169	52294
3901	Singanpor	SMC	SMC	МС	153	5772	25855	30493	46481	64136	97844	66352
3902	Singanpor	SMC	SMC	МС	43	1443	6464	7862	12524	16537	25644	18448

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
4001	Dabholi	SMC	SMC	MC	97	1195	3024	3848	6501	8093	12837	20969
4002	Dabholi	SMC	SMC	МС	38	2390	6048	7377	11796	15516	24096	15903
4003	Dabholi	SMC	SMC	МС	24	1992	5040	6201	10031	13042	20343	11994
4004	Dabholi	SMC	SMC	МС	16	2390	6048	7377	9453	10573	14248	8456
4101	Ved	SMC	SMC	МС	77	2252	2867	3665	6226	7708	12252	25299
4102	Ved	SMC	SMC	МС	73	1001	1274	1806	3437	3798	6322	27798
4103	Ved	SMC	SMC	МС	31	751	956	1434	2879	3016	5136	12660
4104	Ved	SMC	SMC	МС	33	1001	1274	1806	3437	3798	6322	13588
4201	Katargam	SMC	SMC	МС	40	19259	32847	38652	38694	39034	39670	26938
4202	Katargam	SMC	SMC	МС	53	15407	26278	30986	31148	31259	31848	28624
4203	Katargam	SMC	SMC	МС	73	21185	36132	42486	42467	42922	43581	41371
4204	Katargam	SMC	SMC	МС	54	15407	26278	30986	31148	31259	31848	29049
4205	Katargam	SMC	SMC	МС	38	11555	19708	23319	23602	23484	24026	19000
4206	Katargam	SMC	SMC	МС	28	7704	13139	15652	16055	15710	16205	14643
4207	Katargam	SMC	SMC	МС	46	13481	22993	27152	27375	27372	27937	22230
4208	Katargam	SMC	SMC	МС	35	15407	26278	30986	31148	31259	31848	24322
4209	Katargam	SMC	SMC	MC	65	5778	9854	11819	18461	24859	38268	27787
4210	Katargam	SMC	SMC	МС	54	9630	16424	19486	23777	27928	36714	29552
4211	Katargam	SMC	SMC	МС	21	3852	6569	7985	10173	11445	15377	10267

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
4212	Katargam	SMC	SMC	MC	49	13481	22993	27152	27375	27372	27937	26033
4213	Katargam	SMC	SMC	МС	30	5778	9854	11819	14708	16940	22490	15275
4214	Katargam	SMC	SMC	МС	20	3852	6569	7985	10173	11445	15377	9938
4215	Katargam	SMC	SMC	МС	24	5778	9854	11819	14708	16940	22490	12099
4216	Katargam	SMC	SMC	МС	32	7704	13139	15652	19242	22434	29602	15906
4217	Katargam	SMC	SMC	МС	34	9630	16424	19486	19828	19597	20115	17109
4218	Katargam	SMC	SMC	МС	14	5778	9854	11819	12282	11822	12294	9757
4219	Katargam	SMC	SMC	МС	19	1926	3285	4152	6957	8733	13808	9299
4301	Fulpada	SMC	SMC	МС	74	50843	57976	67979	67558	68774	69589	54044
4302	Fulpada	SMC	SMC	МС	52	42369	48313	48683	48566	49206	49903	38038
4303	Fulpada	SMC	SMC	МС	55	30506	34786	40915	40920	41328	41978	25975
4304	Fulpada	SMC	SMC	МС	41	25421	28988	34149	34261	34467	35075	21856
4305	Fulpada	SMC	SMC	МС	44	11863	13528	16106	19779	23084	30444	19779
4306	Fulpada	SMC	SMC	МС	30	8474	9663	11595	14443	16619	22075	14443
4401	Kapadra	SMC	SMC	МС	68	28478	40619	47723	47621	48233	48924	34342
4402	Kapadra	SMC	SMC	МС	47	5696	8124	9800	15431	20612	31825	22458
4403	Kapadra	SMC	SMC	MC	47	13290	18956	22441	27273	32164	42197	19637
4501	Nanavarachha	SMC	SMC	MC	79	14188	28218	33250	40059	47656	62252	38027
4502	Nanavarachha	SMC	SMC	MC	67	3648	7256	8787	13911	18481	28594	12969

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
4503	Nanavarachha	SMC	SMC	MC	54	11350	22574	26664	32268	38216	50032	30663
4504	Nanavarachha	SMC	SMC	МС	59	11350	22574	26664	32268	38216	50032	28748
4601	Karanj	SMC	SMC	МС	44	35727	37060	43569	43533	44020	44686	23953
4602	Karanj	SMC	SMC	МС	34	27787	28824	33958	34073	34273	34880	22515
4603	Karanj	SMC	SMC	МС	48	33742	35001	41166	41168	41583	42234	24417
4604	Karanj	SMC	SMC	МС	18	11909	12353	14735	15153	14780	15269	12750
4605	Karanj	SMC	SMC	МС	36	49621	51472	51845	51678	52412	53129	34033
4606	Karanj	SMC	SMC	МС	28	39696	41178	41539	41535	41962	42615	36314
4701	Umarwada (Part)	SMC	SMC	МС	36	1023	312	683	1752	1436	2740	18470
4801	Magob (Part)	SMC	SMC	МС	22	1098	2914	3719	6308	7823	12427	8749
4802	Magob (Part)	SMC	SMC	МС	28	12079	32051	32404	32543	32697	33295	28790
4803	Magob (Part)	SMC	SMC	МС	20	8784	23310	23653	23930	23823	24367	22392
4901	Dumbhal	SMC	SMC	МС	72	12901	29949	35270	41721	50551	66000	37887
4902	Dumbhal	SMC	SMC	МС	31	3870	8985	10804	12780	15485	20607	12701
4903	Dumbhal	SMC	SMC	МС	29	5160	11979	14299	16915	20495	27091	14453
4904	Dumbhal	SMC	SMC	MC	28	2580	5990	7309	11694	15373	23879	11691
4905	Dumbhal	SMC	SMC	MC	30	1290	2995	3814	5723	8022	12729	11638
5001	Anjana (Part)	SMC	SMC	MC	9	4435	7221	8746	8531	8706	9159	8422

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
5101	Limbayat	SMC	SMC	МС	70	50318	66256	66644	65518	67420	68228	54522
5102	Limbayat	SMC	SMC	МС	68	32021	42163	49524	48667	50059	50762	34420
5103	Limbayat	SMC	SMC	МС	15	9149	12047	14377	14074	14417	14904	11909
5201	Dindoli (Part)	SMC	SMC	МС	88	29714	53028	62204	61147	62918	63698	58466
5202	Dindoli (Part)	SMC	SMC	МС	113	38204	68179	79885	78551	80848	81737	77045
5203	Dindoli (Part)	SMC	SMC	МС	56	16980	30302	35682	35043	36022	36639	34436
5301	Bhedvad	SMC	SMC	МС	66	6986	10764	12880	19327	27091	41654	24663
5302	Bhedvad	SMC	SMC	МС	50	1233	1899	2535	3804	5333	8650	7847
5401	Bhestan	SMC	SMC	МС	80	1281	2647	3408	5113	7167	11433	12678
5402	Bhestan	SMC	SMC	МС	77	768	1588	2172	3259	4569	7491	11599
5403	Bhestan	SMC	SMC	МС	132	10246	21174	25030	37557	52647	80416	41116
5404	Bhestan	SMC	SMC	МС	51	6404	13234	15763	18647	22593	29808	24263
5405	Bhestan	SMC	SMC	МС	59	1281	2647	3408	5113	7167	11433	15886
5406	Bhestan	SMC	SMC	МС	138	3586	7411	8968	13456	18862	29171	21470
5407	Bhestan	SMC	SMC	МС	253	2049	4235	5261	7894	11066	17346	29433
5501	Pandesara	SMC	SMC	МС	125	47150	65983	77323	76028	78250	79122	64176
5502	Pandesara	SMC	SMC	МС	161	5239	7331	8875	13316	18667	28875	31303
5601	Udhana	SMC	SMC	МС	198	13080	17383	20605	30918	43340	66300	36416
5602	Udhana	SMC	SMC	MC	73	13080	17383	20605	24375	29533	38792	30719

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
5603	Udhana	SMC	SMC	MC	114	52321	69533	81466	80106	82451	83349	67937
5604	Udhana	SMC	SMC	МС	129	28029	37250	43790	51801	62764	81809	53549
5605	Udhana	SMC	SMC	МС	66	33635	44700	52166	51221	52639	53260	38623
5606	Udhana	SMC	SMC	МС	104	46715	62083	72771	71549	73634	74479	51152
5701	Bamroli (Part)	SMC	SMC	МС	144	36283	84104	98152	96374	99043	99717	77435
5702	Bamroli (Part)	SMC	SMC	МС	59	9071	21026	24538	29027	35170	46089	26826
5801	Majura	SMC	SMC	МС	121	2028	2498	2915	4375	6132	9863	24752
5802	Majura	SMC	SMC	МС	26	8112	9993	11981	14172	17172	22790	12216
5901	Bhatar	SMC	SMC	МС	137	12880	20533	24281	36433	51071	78027	42782
5902	Bhatar	SMC	SMC	МС	117	15742	25095	29606	44423	62271	95015	52951
6001	Althan	SMC	SMC	МС	94	9979	18886	22359	33550	47029	71896	42626
6002	Althan	SMC	SMC	МС	66	6272	11871	14173	21266	29810	45778	32086
6003	Althan	SMC	SMC	МС	56	7128	13490	16062	19000	23021	30362	30201
6004	Althan	SMC	SMC	МС	74	5132	9713	11335	17008	23842	36725	37792
6101	Umara	SMC	SMC	МС	84	9364	16232	19262	28902	40514	62014	29859
6102	Umara	SMC	SMC	МС	141	12485	21642	25257	37898	53125	81142	68176
6103	Umara	SMC	SMC	MC	71	4682	8116	9790	14690	20592	31796	35309
6104	Umara	SMC	SMC	MC	28	4682	8116	9790	11581	14032	18726	11881
6201	Piplod	SMC	SMC	MC	72	3105	6158	7187	10784	15116	23490	24277

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
6202	Piplod	SMC	SMC	МС	48	2218	4399	5452	8181	11468	17956	16767
6203	Piplod	SMC	SMC	МС	84	3548	7038	8532	12803	17946	27782	11836
6301	Jahangirabad	SMC	SMC	МС	221	1858	5563	6492	9741	13654	20711	78680
6302	Jahangirabad	SMC	SMC	МС	73	2786	8344	10056	15089	21152	32084	38983
6303	Jahangirabad	SMC	SMC	МС	90	3715	11125	12983	19482	27309	41422	38731
6304	Jahangirabad	SMC	SMC	МС	61	929	2781	3246	4870	6827	10356	15509
6401	Jahangirpura	SMC	SMC	МС	240	1120	2165	2845	4269	5985	9078	39263
6501	Pisad	SMC	SMC	МС	85	1751	4057	5053	7583	10629	16122	28190
6601	Vadod	SMC	SMC	МС	56	235	89	423	634	889	1909	2832
6701	Pal	SMC	SMC	МС	341	1675	5416	6321	9484	13295	20166	40023
6702	Pal	SMC	SMC	МС	111	5583	18054	21069	31614	44315	67218	49854
6703	Pal	SMC	SMC	MC	125	3908	12637	14748	22130	31021	47053	43996
6801	Palanpor	SMC	SMC	МС	149	5748	11757	13721	20588	28860	43775	65061
6802	Palanpor	SMC	SMC	МС	45	4598	9406	10977	16470	23088	35020	19417
6803	Palanpor	SMC	SMC	МС	123	1150	2351	2744	4118	5772	8755	35869
6901	Variyav	SMC	SMC	МС	1452	700	986	1597	2397	3360	5096	85528
6902	Variyav	SMC	SMC	MC	95	2941	4143	5281	7924	11108	16849	27176
6903	Variyav	SMC	SMC	MC	245	280	395	907	1360	1907	2892	19347
6904	Variyav	SMC	SMC	MC	96	3081	4340	5511	8270	11592	17583	24460

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
6905	Variyav	SMC	SMC	МС	109	700	986	1597	2397	3360	5096	20122
6906	Variyav	SMC	SMC	МС	88	700	986	1470	2206	3092	4690	12538
6907	Variyav	SMC	SMC	МС	80	4901	6905	8504	12761	17887	27132	23755
6908	Variyav	SMC	SMC	МС	20	700	986	1470	2206	3092	4690	7861
7001	Chhapara Bhatha	SMC	SMC	МС	104	14049	28092	33103	39885	47446	61980	55559
7002	Chhapara Bhatha	SMC	SMC	МС	77	8195	16387	19443	29901	40895	62591	39319
7003	Chhapara Bhatha	SMC	SMC	МС	18	1171	2341	3051	5305	6417	10294	9925
7101	Kosad	SMC	SMC	МС	405	8599	26467	31334	47744	65907	100530	95156
7102	Kosad	SMC	SMC	МС	280	1433	4411	5594	9121	11766	18409	47246
7103	Kosad	SMC	SMC	МС	98	11465	35290	41503	49822	59485	77565	49139
7104	Kosad	SMC	SMC	МС	165	5733	17645	20911	32103	43983	67275	66419
7105	Kosad	SMC	SMC	МС	40	1433	4411	5467	8930	11498	18002	20347
7201	Amroli	SMC	SMC	МС	30	17138	28501	28850	29045	29093	29669	26915
7301	Utran	SMC	SMC	МС	213	11605	19313	22858	35025	48078	73486	82554
7302	Utran	SMC	SMC	МС	28	1289	2146	2823	4963	5938	9568	12461
7401	Motavarachha	SMC	SMC	МС	521	2311	9792	11874	18543	24975	38443	86363
7402	Motavarachha	SMC	SMC	МС	159	3852	16320	21269	32641	44737	68418	70931

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
7403	Motavarachha	SMC	SMC	МС	91	1541	6528	8065	12828	16963	26290	28809
7501	Sarthana	SMC	SMC	МС	149	59	6427	7946	12650	16713	25912	53887
7502	Sarthana	SMC	SMC	МС	116	119	12853	15446	23904	32488	49840	53179
7503	Sarthana	SMC	SMC	МС	55	59	6427	7819	12459	16445	25506	27364
7601	Simada	SMC	SMC	MC	125	167	1176	1819	3456	3826	6364	28165
7602	Simada	SMC	SMC	MC	68	1171	8234	10056	15816	21151	32644	23790
7603	Simada	SMC	SMC	MC	40	1338	9411	11301	14096	16198	21530	21735
7604	Simada	SMC	SMC	МС	57	669	4705	5810	9445	12221	19097	21372
7701	Puna	SMC	SMC	MC	70	9527	27728	32678	39383	46837	61192	37716
7702	Puna	SMC	SMC	МС	168	4764	13864	16498	25483	34702	53197	65631
7703	Puna	SMC	SMC	МС	35	5955	17330	20543	20870	20670	21195	19773
7704	Puna	SMC	SMC	МС	54	9527	27728	32678	32813	32976	33575	30623
7705	Puna	SMC	SMC	МС	83	7146	20796	24588	29813	35242	46182	40355
7706	Puna	SMC	SMC	MC	78	11909	34660	40768	40776	41179	41828	40904
7707	Puna	SMC	SMC	МС	71	9527	27728	32678	39383	46837	61192	37873
7708	Puna	SMC	SMC	МС	45	3573	10398	12453	15459	17849	23667	20704
7709	Puna	SMC	SMC	MC	47	5955	17330	20543	25028	29444	38677	23997
7710	Puna	SMC	SMC	MC	50	7146	20796	24588	29813	35242	46182	28968
7711	Puna	SMC	SMC	MC	26	3573	10398	12453	15459	17849	23667	14634

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
7712	Puna	SMC	SMC	МС	24	4764	13864	16498	16888	16568	17068	15617
7713	Puna	SMC	SMC	МС	48	35728	103979	104407	103413	105716	106755	85139
7801	Magob (Part)	SMC	SMC	МС	38	1151	4163	5177	8496	10890	17079	19484
7802	Magob (Part)	SMC	SMC	МС	48	863	3122	3963	5946	8335	13203	24617
7803	Magob (Part)	SMC	SMC	МС	21	288	1041	1533	2301	3225	5453	8552
7804	Magob (Part)	SMC	SMC	МС	28	1727	6245	7607	9725	10902	14674	13961
7805	Magob (Part)	SMC	SMC	МС	23	460	1665	2262	4121	4758	7778	10788
7806	Magob (Part)	SMC	SMC	МС	22	1266	4580	5663	8498	11912	18629	9724
7901	Parvat	SMC	SMC	МС	60	8277	22086	26094	30868	37401	48976	28179
7902	Parvat	SMC	SMC	МС	108	3104	8282	9985	14982	21001	32416	43649
7903	Parvat	SMC	SMC	МС	18	2069	5522	6763	8000	9693	13108	7946
7904	Parvat	SMC	SMC	МС	46	7243	19326	22872	27056	32783	42998	23113
8001	Godadara	SMC	SMC	МС	156	10455	50233	58942	69724	84480	109921	65266
8002	Godadara	SMC	SMC	МС	29	2323	11163	13346	15787	19129	25323	15456
8003	Godadara	SMC	SMC	МС	68	4647	22326	26373	31198	37801	49494	29416
8004	Godadara	SMC	SMC	МС	68	5809	27907	32887	38903	47137	61580	35207
8101	Dindoli (Part)	SMC	SMC	MC	134	1301	7509	9082	13628	19103	29537	34395
8102	Dindoli (Part)	SMC	SMC	MC	214	1301	7509	9082	13628	19103	29537	43575
8103	Dindoli (Part)	SMC	SMC	MC	40	2603	15018	17846	21110	25578	33672	20056

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
8104	Dindoli (Part)	SMC	SMC	MC	80	3904	22528	26609	31477	38139	49931	36359
8105	Dindoli (Part)	SMC	SMC	МС	63	3904	22528	26609	31477	38139	49931	32062
8201	Unn	SMC	SMC	МС	195	17292	36913	43397	65117	91279	139014	83308
8202	Unn	SMC	SMC	МС	93	10952	23378	27602	32651	39561	51773	49115
8203	Unn	SMC	SMC	МС	73	576	1230	1755	2633	3691	6159	18999
8301	Sonari	SMC	SMC	MC	138	498	5057	6220	9334	13084	20407	22701
8401	Gabheni	SMC	SMC	MC	1749	1580	4285	5001	7504	10518	16515	9919
8402	Gabheni	SMC	SMC	MC	58	4109	11141	13321	19987	28018	43059	27377
8403	Gabheni	SMC	SMC	МС	246	632	1714	2319	3480	4878	7960	12073
8501	Budiya	SMC	SMC	МС	149	235	244	285	427	598	908	4801
8502	Budiya	SMC	SMC	МС	84	235	244	285	427	598	908	3109
8503	Budiya	SMC	SMC	MC	270	1879	1950	2276	3415	4788	7823	11932
8601	Jiyav	SMC	SMC	МС	225	0	0	225	337	472	716	12378
8602	Jiyav	SMC	SMC	МС	235	388	1501	1751	2628	3684	6149	36386
8603	Jiyav	SMC	SMC	МС	165	1163	4502	5254	7884	11052	17324	36601
8701	Vadod(Part)	SMC	SMC	МС	208	2064	6161	7190	10789	15124	23501	44696
8702	Vadod(Part)	SMC	SMC	MC	57	3441	10269	12303	18460	25877	39811	19759
8703	Vadod(Part)	SMC	SMC	MC	104	3441	10269	12303	18460	25877	39811	27148
8704	Vadod(Part)	SMC	SMC	MC	60	4817	14376	17096	20224	24504	32281	20763

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
8801	Bamroli (Part)	SMC	SMC	МС	144	22485	47912	56233	66519	80598	104895	73351
8802	Bamroli (Part)	SMC	SMC	МС	114	0	0	0	172	241	365	11514
8803	Bamroli (Part)	SMC	SMC	MC	118	6918	14742	17318	25815	36187	55450	40423
8804	Bamroli (Part)	SMC	SMC	МС	39	3459	7371	8602	12908	18093	28005	13401
8805	Bamroli (Part)	SMC	SMC	МС	121	1730	3686	4301	6454	9047	14283	18615
8901	Bhimrad	SMC	SMC	МС	213	1257	2415	2818	4229	5928	9553	75515
9001	Bharthana – Vesu	SMC	SMC	МС	124	1344	3790	4742	7115	9973	15688	20069
9002	Bharthana – Vesu	SMC	SMC	МС	85	576	1624	2214	3322	4657	7625	8668
9101	Sarsana	SMC	SMC	MC	277	849	979	1143	1714	2403	4206	70794
9201	Khajod	SMC	SMC	МС	1368	1434	1737	2027	3042	4264	7028	68423
9301	Abhava	SMC	SMC	МС	2137	2881	3249	3792	5689	7975	12658	55558
9401	Vesu	SMC	SMC	МС	86	1563	6618	8042	12067	16915	26218	23979
9402	Vesu	SMC	SMC	МС	128	938	3971	4953	7431	10417	16362	28131
9403	Vesu	SMC	SMC	МС	209	938	3971	4953	7431	10417	16362	36065
9404	Vesu	SMC	SMC	MC	148	2188	9265	11131	16702	23413	36074	41157
9405	Vesu	SMC	SMC	MC	385	625	2647	3408	5114	7168	11434	58208
9501	Rundh	SMC	SMC	MC	105	1293	2613	3049	4576	6414	10290	14484

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
9502	Rundh	SMC	SMC	МС	86	862	1742	2352	3529	4946	8064	12181
9601	Magdalla	SMC	SMC	МС	66	2629	3052	3562	5344	7492	11924	16175
9602	Magdalla	SMC	SMC	МС	39	1051	1221	1425	2138	2997	5106	7115
9603	Magdalla	SMC	SMC	MC	149	1577	1831	2137	3207	4495	7379	11473
9701	Gaviyar	SMC	SMC	МС	130	245	259	302	453	635	962	13071
9702	Gaviyar	SMC	SMC	MC	277	2204	2327	2715	4074	5711	9223	30946
9801	Vanta	SMC	SMC	MC	83	397	146	171	256	359	545	9178
9802	Vanta	SMC	SMC	МС	33	132	49	57	85	120	182	617
9803	Vanta	SMC	SMC	МС	36	132	49	57	85	120	182	647
9901	Dumas	SMC	SMC	МС	1324	6868	7224	8431	12650	17733	27458	129720
10001	Sultanabad	SMC	SMC	МС	568	3263	3661	4273	6411	8987	14192	43162
10101	Bhimpor	SMC	SMC	МС	825	7553	7862	9175	13767	19299	29810	61903
11001	Sarol	SUDA	Olpad	Village	188	394	416	454	532	703	971	2194
11002	Balkas	SUDA	Olpad	Village	515	794	846	923	1081	1430	1975	7170
11003	Talad	SUDA	Olpad	Village	167	1089	719	784	919	1215	1679	2829
11004	Vadod	SUDA	Olpad	Village	384	668	506	552	647	855	1181	8290
11005	Kosam	SUDA	Olpad	Village	419	1762	1412	1540	1805	2387	3297	6579
11006	Sherdi (suda)	SUDA	Olpad	Village	180	1387	1309	1428	1673	2213	3056	8092
11007	Kanad	SUDA	Olpad	Village	417	846	524	572	670	886	1224	11511

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11008	Jothan	SUDA	Olpad	Village	351	968	728	794	930	1231	1700	10577
11009	Saroli (Olpad)	SUDA	Olpad	Village	388	1752	1946	2123	2487	3289	4544	12555
11010	Sonsak	SUDA	Olpad	Village	303	1764	1128	1231	1442	1907	2634	5729
11011	Ambheta	SUDA	Olpad	Village	714	1611	1713	1869	2189	2896	4000	15953
11012	Ariyana	SUDA	Olpad	Village	296	1010	1419	1548	1814	2399	3313	6465
11013	Kunkni	SUDA	Olpad	Village	239	741	856	934	1094	1447	1999	3915
11014	Chichi	SUDA	Chorasi	Village	184	0	0	184	215	285	393	4771
11015	Vanakala	SUDA	Chorasi	Village	351	0	277	302	354	468	647	17584
11016	Vihel	SUDA	Chorasi	Village	127	0	0	127	149	197	272	6394
11017	Okha	SUDA	Chorasi	Village	309	63	63	309	362	479	662	15966
11018	Segwachhama	SUDA	Olpad	Village	510	1240	1346	1468	1720	2275	3143	13217
11019	Malgama	SUDA	Chorasi	Village	288	915	960	1047	1227	1623	2242	7154
11020	Bhesan	SUDA	Chorasi	Village	583	2011	2195	2394	2806	3710	5125	146556
11021	Asarma	SUDA	Chorasi	Village	211	0	0	211	247	326	451	7159
11022	Ichchhapor	SUDA	Chorasi	Munci pality	478	4146	6049	13196	15462	20449	28246	24393
11023	Ichchhapor	SUDA	Chorasi	Census Town	507	4146	6048	13196	15462	20449	28246	24820

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11024	Bhatha	SUDA	Chorasi	Out Growt h	833	5164	5122	5587	6547	8658	11960	18502
11025	Bhatpor	SUDA	Chorasi	Out Growt h	754	3379	3449	3762	4408	5830	8053	8899
11026	Kavas	SUDA	Chorasi	Out Growt h	725	2366	6500	7091	8308	10988	15177	16771
11027	Segwasyadla	SUDA	Olpad	Village	303	593	805	878	1029	1361	1880	15039
11028	Vaswari	SUDA	Olpad	Village	404	820	949	1035	1213	1604	2216	18285
11029	Gothan	SUDA	Olpad	Village	718	3193	3035	3311	3879	5130	7087	40202
11030	Bharthana Kosad	SUDA	Chorasi	Census Town	439	4743	5679	6195	7725	10639	15367	37996
11031	Abrama	SUDA	Kamrej	Village	978	3041	2682	2926	9618	18335	34236	107522
11032	Kholvad	SUDA	Kamrej	Village	781	10687	15535	16947	19856	26260	36274	118768
11033	Bhada	SUDA	Kamrej	Village	380	1842	1770	1931	2262	2992	4133	49014
11034	Valak	SUDA	Kamrej	Village	258	1644	2153	2349	3637	5612	9026	40478
11035	Laskana	SUDA	Kamrej	Village	394	8452	15318	16710	14717	15054	13798	59515
11036	Navagam	SUDA	Kamrej	Village	388	8612	10945	11940	13989	18501	25556	84985
11037	Vav	SUDA	Kamrej	Village	1343	6649	7053	7694	9015	11922	16468	26853

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11038	Pasodara	SUDA	Kamrej	Village	347	829	860	938	3345	6461	12157	24501
11039	Khadsad	SUDA	Kamrej	Village	294	351	1044	1139	3072	5638	10288	22628
11040	Kathodara	SUDA	Kamrej	Village	549	2411	2625	2864	3355	4437	6129	15926
11041	Kosamadi	SUDA	Kamrej	Village	419	1275	1082	1180	1383	1829	2526	18509
11042	Valthan	SUDA	Kamrej	Village	247	1132	1606	1752	2053	2715	3750	11132
11043	Ladvi	SUDA	Kamrej	Village	408	1546	1310	1429	1674	2214	3059	21888
11044	Oviyan	SUDA	Kamrej	Village	377	766	566	617	723	957	1322	28506
11045	Kosmada	SUDA	Kamrej	Village	753	2127	1650	1800	7088	13890	26352	90431
11046	Saniya Hemad	SUDA	Chorasi	Village	347	2954	3964	4324	5709	8133	12158	54875
11047	Saroli (Choryasi)	SUDA	Chorasi	Village	208	1896	3063	3341	3915	5178	7152	67422
11048	Kumbharia	SUDA	Chorasi	Village	290	4136	5824	6353	7444	9845	13599	113863
11049	Vedchha	SUDA	Chorasi	Village	263	457	514	561	2425	4811	9191	41218
11050	Chhedchha	SUDA	Kamrej	Village	188	367	357	389	1730	3443	6588	29359
11051	Sabargam	SUDA	Chorasi	Village	72	132	262	286	760	1391	2533	10241
11052	Antroli	SUDA	Palsana	Village	496	2376	2114	2306	2702	3573	4936	21678
11053	Vareli	SUDA	Palsana	Village	291	4636	9033	9854	11545	15269	21092	13398
11054	Haripura	SUDA	Palsana	Village	144	1511	1593	1738	2036	2693	3720	8679
11055	Umbhel	SUDA	Kamrej	Village	708	5117	4853	5294	6203	8203	11332	30359

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11056	Kadodara	SUDA	Palsana	Census Town	353	7409	22485	24528	28739	38008	52502	59097
11057	Kadodara	SUDA	Palsana	Census Town	84	7410	4851	5292	6200	8200	11327	12213
11058	Vankaneda	SUDA	Palsana	Village	266	1371	2565	2798	3278	4335	5988	12774
11059	Vankaneda	SUDA	Palsana	Village	28	1372	180	197	230	305	421	1262
11060	Chalthan	SUDA	Palsana	Census Town	31	771	1315	1435	1681	2223	3071	3364
11061	Chalthan	SUDA	Palsana	Census Town	337	12003	20480	22341	26176	34619	47819	51052
11062	Karala	SUDA	Palsana	Village	145	1365	1607	1753	2054	2716	3752	5724
11063	Niyol	SUDA	Palsana	Village	559	1650	1626	1774	5566	10524	19556	21786
11064	Devadh	SUDA	Chorasi	Village	384	1158	1168	1274	1493	1974	2727	57935
11065	Dakhkhanvada	SUDA	Chorasi	Village	148	227	183	200	234	309	427	36960
11066	sedhav	SUDA	Palsana	Village	142	551	596	650	1551	2767	4958	19367
11067	Deladva	SUDA	Chorasi	Village	652	1412	1374	1499	6098	12003	22828	99116
11068	Mohni	SUDA	Chorasi	Village	458	1290	1424	1553	4636	8684	16048	15127
11069	Kharbhasi	SUDA	Palsana	Village	278	800	849	926	1085	1435	1982	12696
11070	Talodara	SUDA	Palsana	Village	174	450	418	456	534	707	976	5675
11071	Karan	SUDA	Palsana	Village	263	1430	1381	1507	1765	2334	3225	9459

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11072	Tantizaghda	SUDA	Palsana	Village	230	800	847	924	1083	1432	1978	9025
11073	Erthan	SUDA	Palsana	Village	430	1396	1436	922	1080	1428	1973	13594
11074	Timbarva(s)	SUDA	Chorasi	Village	357	583	600	655	767	1014	1401	15226
11075	Goja	SUDA	Chorasi	Village	204	425	357	389	456	603	834	4649
11076	Khambhasla	SUDA	Chorasi	Village	167	448	452	493	1634	3120	5831	13324
11077	Saniya Kanade	SUDA	Chorasi	Village	286	1984	1555	1696	3402	5781	10021	45514
11078	Karadva	SUDA	Chorasi	Village	238	164	1437	1568	1837	2429	3355	35890
11079	Eklera	SUDA	Chorasi	Village	213	789	839	915	2289	4130	7456	32161
11080	Kharvasa	SUDA	Chorasi	Village	661	1708	1346	1468	6149	12149	23155	43653
11081	Bonand	SUDA	Chorasi	Village	520	1287	1218	1329	1557	2059	2844	20503
11082	Vadadala	SUDA	Palsana	Village	326	897	995	1085	1272	1682	2323	11086
11083	Ravla Alias Vaktana	SUDA	Chorasi	Village	413	1141	1090	1189	1393	1843	2545	18458
11084	Vanz	SUDA	Chorasi	Village	407	1240	1222	2666	5017	8351	14260	17206
11085	Bhanodra	SUDA	Chorasi	Village	297	774	1138	1241	3171	5751	10414	47301
11086	Pardi Kanade	SUDA	Chorasi	Census Town	142	4422	9167	10000	8078	7384	4963	21409
11087	Sachin,INA	SUDA	Chorasi	INA	653	3293	2680	1930	1608	1538	1397	1958
11088	Sachin	SUDA	Chorasi	Census Town	275	11877	28102	33580	39344	52033	71875	70938

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11089	Umber	SUDA	Chorasi	Village	844	1539	1704	1859	2178	2880	3979	4397
11090	Pali	SUDA	Chorasi	Village	182	2358	1325	7991	9362	12382	17104	27399
11091	Kansad	SUDA	Chorasi	Munci pality	709	17384	28327	30901	36206	47884	66142	73087
11092	Lajpor	SUDA	Chorasi	Village	730	6257	7920	8640	10123	13388	18493	18426
11093	Vanz	SUDA	Chorasi	Village	362	1240	1222	2666	3124	4131	5707	10116
11094	Bhatia	SUDA	Chorasi	Village	497	882	963	1051	1231	1628	2249	1276
11095	Lingad	SUDA	Palsana	Village	389	1994	1779	1941	2274	3007	4154	14528
11096	Taraj	SUDA	Palsana	Village	362	1875	1626	1774	2078	2749	3797	13459
11097	Samrod	SUDA	Chorasi	Village	210	947	1056	1152	1350	1785	2466	2457
11098	Kachholi	SUDA	Chorasi	Village	460	1650	2149	2344	2747	3633	5018	4325
11099	Kapletha	SUDA	Chorasi	Village	310	2408	3312	3613	4233	5599	7733	7705
11100	Popda	SUDA	Chorasi	Village	271	1070	1017	1109	1300	1719	2375	1711
11101	Talangpor	SUDA	Chorasi	Out Growt h	193	3802	11417	12455	14592	19299	26658	25922
11102	Hajira	SUDA	Chorasi	Village	2292	4793	16724	19497	23387	27111	33043	42957
11103	Sunvali	SUDA	Chorasi	Village	1434	2907	4165	4856	5824	6752	8229	10163
11104	Mora	SUDA	Chorasi	Village	2218	6115	13924	16233	19472	22572	27511	27896
11105	Limla (CT)	SUDA	Chorasi	Village	598	6622	3683	4294	5150	5971	7277	7379

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11106	Rajgari	SUDA	Chorasi	Village	409	1276	1300	1516	1818	2107	2569	3339
11107	Bhatlai	SUDA	Chorasi	Village	233	1796	4066	4740	5686	6591	8034	7185
11108	Damka	SUDA	Chorasi	Village	1486	4386	5604	6533	7837	9085	11072	14394
11109	Vansva	SUDA	Chorasi	Village	516	2239	2498	2912	3493	4050	4936	4918
11110	Barbodhan	SUDA	Olpad	Village	1397	2643	3358	3915	4696	5444	6635	58273
11111	Sithana	SUDA	Olpad	Village	156	192	191	223	267	310	377	5282
11112	Dihen	SUDA	Olpad	Village	1270	2458	2636	3073	3686	4273	5208	15266
11113	Tena	SUDA	Olpad	Village	728	1781	1976	2304	2763	3203	3904	8342
11114	Pinjrat	Outside	Olpad	Village	3306	5339	5799	6761	8110	9401	11458	8942
11115	Bhandut	Outside	Olpad	Village	584	1192	1242	1448	1737	2013	2454	2115
11116	Selut	Outside	Olpad	Village	403	1111	1077	1256	1506	1746	2128	1834
11117	Narthan	Outside	Olpad	Village	575	1369	1237	1442	1730	2005	2444	10342
11118	Veluk	Outside	Olpad	Village	479	1245	1371	1598	1917	2223	2709	2699
11119	Kasala Khurd	Outside	Olpad	Village	148	474	476	555	666	772	940	937
11120	Kachhol	Outside	Olpad	Village	281	698	552	644	772	895	1091	1087
11121	Kasla Bujrang	Outside	Olpad	Village	181	502	443	516	620	718	875	872
11122	Orma	Outside	Olpad	Village	651	819	1147	1337	1604	1859	2266	2258
11123	Masma	SUDA	Olpad	Village	993	2850	2811	3277	3931	4557	5554	44919
11124	Jafrabad	Outside	Olpad	Village	226	589	420	490	587	681	830	827

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11125	Asnabad	SUDA	Olpad	Village	211	656	870	1014	1217	1410	1719	7382
11126	Olpad	Outside	Olpad	Village	1628	13046	15898	18534	38953	59967	97686	139690
11127	Isanpor	SUDA	Olpad	Village	343	1261	1271	1482	1777	2060	2511	14765
11128	Karamla	SUDA	Olpad	Village	571	1727	957	1116	1338	1551	1891	23402
11129	Atodra	Outside	Olpad	Village	693	1314	1755	2046	2454	2845	3468	14002
11130	Andhi	Outside	Olpad	Village	462	733	623	726	871	1010	1231	1226
11131	Gola	Outside	Olpad	Village	415	796	832	970	1164	1349	1644	1638
11132	Morthan	Outside	Olpad	Village	588	1071	948	1105	1326	1537	1873	1866
11133	Achharan	Outside	Olpad	Village	418	1031	1025	1195	1433	1662	2025	2018
11134	Sandhiyer	SUDA	Olpad	Village	1359	3263	3207	3739	4485	5199	6336	56326
11135	Paria	SUDA	Olpad	Village	912	2419	2506	2922	3504	4062	4951	42090
11136	Madhar	Outside	Olpad	Village	292	679	607	708	849	984	1199	6769
11137	Khalipor	Outside	Olpad	Village	169	444	421	491	589	682	832	6502
11138	Sithan	Outside	Olpad	Village	303	1247	1144	1334	1600	1855	2260	7539
11139	Kanthraj	Outside	Olpad	Village	256	709	681	794	952	1104	1346	1341
11140	Obhla	Outside	Olpad	Village	384	636	430	501	601	697	850	847
11141	Bharundi	Outside	Olpad	Village	547	1117	1031	1202	1442	1671	2037	12963
11142	Siwan	Outside	Olpad	Village	562	2120	2134	2488	2984	3459	4216	14546
11143	Delad	SUDA	Olpad	Village	283	3102	4028	4696	5633	6530	7959	16940

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11144	Sayan (CT)	Outside	Olpad	Village	690	12847	15324	17865	21430	24842	30277	75106
11145	Umra	SUDA	Olpad	Village	417	2306	2233	2603	3123	3620	4412	21973
11146	Kathor	SUDA	Kamrej	Village	1092	13258	13783	16068	19275	22344	27233	22932
11147	Velanja	SUDA	Kamrej	Village	612	2804	2550	2973	3566	4134	5038	25874
11148	Shekhpur	Outside	Kamrej	Village	553	2251	1432	1669	2003	2321	2829	2819
11149	Kareli	Outside	Olpad	Village	786	1281	1152	1343	1611	1868	2276	13137
11150	Syadla	Outside	Olpad	Village	508	1802	1415	1650	1979	2294	2796	2786
11151	Kudsad	Outside	Olpad	Village	1702	7014	9407	10967	13155	15250	18586	26296
11152	Ghaludi	Outside	Kamrej	Village	389	799	877	1022	1226	1422	1733	1727
11153	Antroli	Outside	Kamrej	Village	406	1088	1068	1245	1494	1731	2110	2103
11154	Tharoli	Outside	Kamrej	Village	290	186	194	226	271	314	383	382
11155	Kanyasi	Outside	Olpad	Village	420	1464	1387	1617	1940	2248	2740	2731
11156	Pipodara	Outside	Mangr ol	Village	822	2611	7765	9053	10859	12588	15342	19724
11157	Navi Paradi	Outside	Kamrej	Village	764	2563	4474	5216	6257	7253	8840	6257
11158	Dhoran Paradi	Outside	Kamrej	Village	181	0	1551	1808	2169	2515	3065	3054
11159	Choryasi	SUDA	Kamrej	Village	219	1143	1153	1344	1612	1869	2278	2270
11160	Amboli	SUDA	Kamrej	Village	342	4186	6137	7155	8582	9949	12126	10220
11161	Bhairav	SUDA	Kamrej	Village	360	1004	961	1120	1344	1558	1899	2098

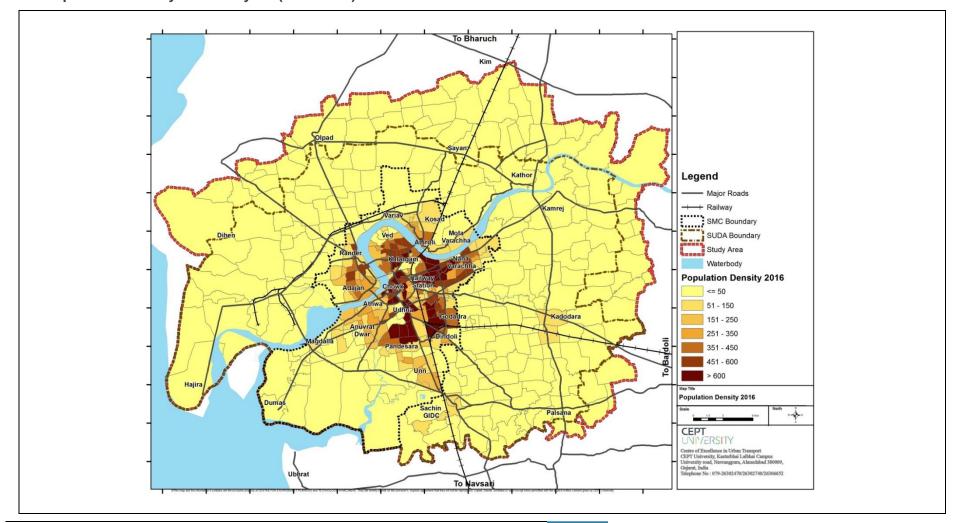
TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11162	Dhoran Paradi	Outside	Kamrej	Village	658	1098	388	452	542	629	766	763
11163	Akhakhol	Outside	Kamrej	Village	293	541	590	688	825	956	1166	1162
11164	Karjan	Outside	Kamrej	Village	1210	2529	2602	3033	3639	4218	5141	5123
11165	Ghala	Outside	Kamrej	Village	2141	4713	4550	5304	6363	7376	8990	8958
11166	Dhatva	Outside	Kamrej	Village	371	1382	1069	1246	1495	1733	2112	2105
11167	Jior	Outside	Kamrej	Village	182	204	219	255	306	355	433	431
11168	Dungra	SUDA	Kamrej	Village	690	2744	2884	3362	4033	4675	5698	5695
11169	Kholeshwar	SUDA	Kamrej	Village	435	1474	1300	1516	1818	2107	2569	2559
11170	Kamrej	SUDA	Kamrej	Village	1151	11329	16078	18744	31899	45318	69084	236478
11171	Delod	SUDA	Kamrej	Village	241	1667	1507	1757	2107	2443	2978	2967
11172	Nansad	SUDA	Kamrej	Village	227	1678	1404	1637	1963	2276	2774	2764
11173	Koli Bharthana	SUDA	Kamrej	Village	654	1963	1989	2319	2781	3224	3930	3916
11174	Netrang	Outside	Kamrej	Village	360	1205	1228	1432	1717	1991	2426	2418
11175	Jat Bharthana	Outside	Kamrej	Village	131	802	562	655	786	911	1110	1106
11176	Dharutha	Outside	Kamrej	Village	202	535	490	571	685	794	968	965
11177	Jokha	SUDA	Kamrej	Village	651	2588	2085	2431	2916	3380	4120	4105
11178	Simadi	SUDA	Kamrej	Village	306	838	874	1019	1222	1417	1727	1721
11179	Morthana	SUDA	Kamrej	Village	654	1732	1448	1688	2025	2347	2861	2851
11180	Segva	Outside	Kamrej	Village	655	1248	1149	1340	1607	1863	2270	2262

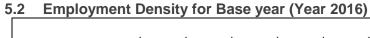
TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11181	Asta	Outside	Kamrej	Village	373	1937	1375	1603	1923	2229	2717	2707
11182	Vansdarundhi	Outside	Kamrej	Village	116	749	661	771	924	1072	1306	1301
11183	Pali	Outside	Kamrej	Village	413	1442	1325	1545	1853	2148	2618	2609
11184	Alura	Outside	Kamrej	Village	256	713	645	752	902	1046	1274	1270
11185	Valan	Outside	Kamrej	Village	352	1218	1091	1272	1526	1769	2156	2148
11186	Mankna	SUDA	Kamrej	Village	358	1520	1408	1641	1969	2283	2782	15328
11187	Parab	Outside	Kamrej	Village	506	1814	1627	1897	2275	2638	3215	3203
11188	Jolva	SUDA	Palsana	Village	624	2010	1754	2045	2453	2843	3466	3941
11189	Haldharu	Outside	Kamrej	Village	697	3122	3002	3500	4198	4867	5931	5910
11190	Dastan	SUDA	Palsana	Village	719	2144	1967	2293	2751	3189	3886	3872
11191	Bagumara	SUDA	Palsana	Village	944	3883	3403	3967	4759	5517	6724	6699
11192	Tantithaiya	SUDA	Palsana	Village	403	821	2910	3393	4069	4717	5750	5093
11193	Sanki	SUDA	Palsana	Village	600	1118	1008	1175	1410	1634	1992	1984
11194	Baleshvar	SUDA	Palsana	Village	723	6727	6962	8116	9736	11286	13756	21645
11195	Isroli	SUDA	Palsana	Village	64	685	969	1130	1355	1571	1915	1862
11196	Bhutpor	Outside	Palsana	Village	603	555	591	689	826	958	1168	1163
11197	Tundi	Outside	Palsana	Village	804	2540	2282	2660	3191	3699	4509	4493
11198	Ghaluda	Outside	Palsana	Village	163	410	440	513	615	713	869	866
11199	Kanav	Outside	Palsana	Village	497	2215	1609	1876	2250	2608	3179	3168

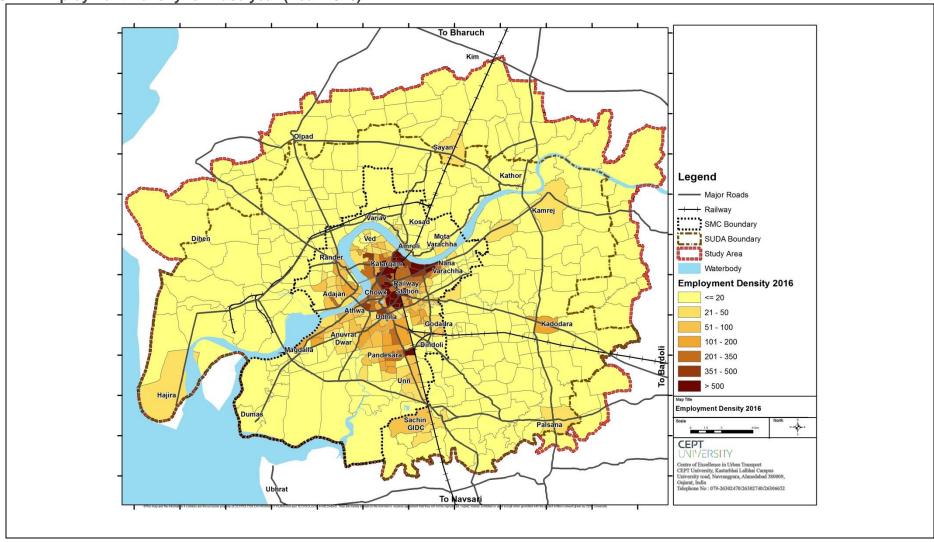
TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2001	2011	2016	2021	2026	2036	2046
11200	Palsana	SUDA	Palsana	Village	711	8577	10945	12760	15306	17743	21625	61558
11201	Makhinga	Outside	Palsana	Village	442	774	874	1019	1222	1417	1727	1721
11202	Intalva	SUDA	Palsana	Village	285	1204	1260	1469	1762	2043	2490	2502
	Total					3350718	5081856	5929821	7000000	8500000	11000000	12500001

Annexure 5: Density Maps for Base Year

5.1 Population Density for Base year (Year 2016)







Annexure 6: Distribution of Employment

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
101	Nanpura	SMC	SMC	МС	23	7617	8276	8790	9861	9768
102	Nanpura	SMC	SMC	МС	22	5071	5512	5853	6563	9009
103	Nanpura	SMC	SMC	МС	24	7617	8276	8790	9861	9324
104	Nanpura	SMC	SMC	МС	11	2525	2747	2917	3265	4468
105	Nanpura	SMC	SMC	MC	22	7617	8276	8790	9861	11680
106	Nanpura	SMC	SMC	MC	14	2525	2747	2916	3265	6122
201	Sagrampura	SMC	SMC	MC	48	8781	9541	10134	11370	14398
202	Sagrampura	SMC	SMC	MC	28	5847	6355	6749	7569	10535
203	Sagrampura	SMC	SMC	МС	50	5847	6355	6749	7569	11719
204	Sagrampura	SMC	SMC	МС	31	8781	9541	10134	11370	13656
301	Salabatpura	SMC	SMC	МС	40	21525	23378	24836	27879	28344
302	Salabatpura	SMC	SMC	MC	32	27682	30063	31938	35854	33889
303	Salabatpura	SMC	SMC	MC	14	6135	6667	7081	7942	7795
304	Salabatpura	SMC	SMC	MC	18	6135	6667	7081	7942	8617
401	Begumpura	SMC	SMC	МС	61	49858	54141	57521	64581	54371
402	Begumpura	SMC	SMC	MC	35	21356	23194	24640	27659	23853
501	Haripura	SMC	SMC	МС	29	14692	15958	16953	19027	18664

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
601	Mahidharpura	SMC	SMC	МС	40	22884	24853	26403	29638	28596
701	Saiyadpura	SMC	SMC	МС	67	27870	30267	32155	36097	38844
702	Saiyadpura	SMC	SMC	МС	43	7782	8456	8981	10075	14290
703	Saiyadpura	SMC	SMC	МС	30	9110	9897	10513	11795	15649
704	Saiyadpura	SMC	SMC	МС	23	344	380	400	440	27850
705	Saiyadpura	SMC	SMC	МС	14	1805	1966	2086	2333	3538
706	Saiyadpura	SMC	SMC	МС	13	1075	1173	1243	1386	15798
801	Gopipura	SMC	SMC	МС	19	2468	2685	2850	3191	4842
802	Gopipura	SMC	SMC	МС	19	1319	1438	1525	1703	4981
901	Wadifalia	SMC	SMC	МС	21	9375	10185	10819	12139	10804
902	Wadifalia	SMC	SMC	МС	12	3111	3384	3592	4024	5413
1001	Sonifalia	SMC	SMC	МС	21	7547	8200	8709	9770	9395
1002	Sonifalia	SMC	SMC	МС	16	3222	3505	3721	4168	5816
1101	Nanavat	SMC	SMC	МС	46	12534	13615	14463	16231	21782
1201	Shahpor	SMC	SMC	МС	44	13918	15118	16060	18024	20482
1301	Athwa	SMC	SMC	МС	70	9810	10658	11321	12702	18371
1401	Rander	SMC	SMC	МС	98	491	539	569	630	888
1402	Rander	SMC	SMC	МС	45	1258	1372	1455	1624	2291
1403	Rander	SMC	SMC	МС	39	747	817	865	961	1390

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
1404	Rander	SMC	SMC	MC	62	6376	6929	7359	8254	11937
1405	Rander	SMC	SMC	МС	115	6376	6929	7359	8254	11639
1406	Rander	SMC	SMC	МС	31	2538	2761	2931	3282	4628
1407	Rander	SMC	SMC	МС	81	7655	8318	8835	9911	13976
2701	Adajan	SMC	SMC	MC	94	12943	14060	14935	16761	24241
2702	Adajan	SMC	SMC	MC	37	2140	2329	2472	2766	3900
2703	Adajan	SMC	SMC	MC	36	2140	2329	2472	2766	4000
2704	Adajan	SMC	SMC	MC	84	2140	2329	2472	2766	4280
2705	Adajan	SMC	SMC	MC	44	10286	11174	11869	13319	19262
2706	Adajan	SMC	SMC	MC	61	2140	2329	2472	2766	4000
2707	Adajan	SMC	SMC	MC	77	2140	2329	2472	2766	4280
2708	Adajan	SMC	SMC	MC	95	2140	2329	2472	2766	4000
2709	Adajan	SMC	SMC	MC	73	6461	7021	7457	8364	12097
2710	Adajan	SMC	SMC	MC	45	6461	7021	7457	8364	10025
2711	Adajan	SMC	SMC	MC	48	4300	4675	4964	5565	7847
2801	Nanavarachha Water Works	SMC	SMC	МС	26	395	434	458	505	731
2901	TPS – 1 Rampura Laldarwaja	SMC	SMC	МС	38	11933	12962	13769	15452	22348

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
2902	TPS – 1 Rampura Laldarwaja	SMC	SMC	MC	28	29863	32431	34455	38680	31967
3001	TPS - 2 Nanpura	SMC	SMC	МС	47	17801	19334	20539	23054	25006
3101	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	24	11933	12962	13769	15452	17933
3102	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	9	1314	1432	1519	1696	2453
3103	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	21	17910	19452	20664	23195	21463
3104	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	18	5956	6473	6874	7710	11632
3105	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	21	59748	64880	68930	77393	62765
3106	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	37	11933	12962	13769	15452	18521
3107	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	96	89632	97328	103406	116105	105921
3201	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	59	19976	21696	23048	25872	37417
3202	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	32	7978	8668	9207	10329	47565

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
3203	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	67	19976	21696	23048	25872	37417
3204	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	23	7978	8668	9207	10329	14938
3205	TPS - 4 Ashvanikumar Navagam	SMC	SMC	МС	11	3978	4326	4593	5148	6170
3206	TPS - 4 Ashvanikumar Navagam	SMC	SMC	МС	23	39973	43409	46118	51776	41538
3207	TPS - 4 Ashvanikumar Navagam	SMC	SMC	МС	38	11977	13011	13821	15510	22431
3301	TPS - 5 Athwa – Umara	SMC	SMC	МС	93	7844	8523	9052	10155	14687
3302	TPS - 5 Athwa – Umara	SMC	SMC	MC	23	1037	1132	1200	1338	1935
3303	TPS - 5 Athwa – Umara	SMC	SMC	MC	90	7844	8523	9052	10155	14687
3401	TPS - 6 Majura – Khatodara	SMC	SMC	MC	90	35711	38781	41201	46175	56763
3402	TPS - 6 Majura – Khatodara	SMC	SMC	MC	47	3911	4253	4516	5061	7320
3403	TPS - 6 Majura – Khatodara	SMC	SMC	MC	59	1945	2118	2247	2514	3636
3404	TPS - 6 Majura – Khatodara	SMC	SMC	MC	39	11890	12916	13720	15396	22267

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
3405	TPS - 6 Majura – Khatodara	SMC	SMC	МС	53	5285	5744	6100	6840	10081
3406	TPS - 6 Majura – Khatodara	SMC	SMC	MC	41	1945	2118	2247	2514	3636
3501	TPS - 7 Anjana	SMC	SMC	МС	34	17476	18981	20164	22633	24937
3502	TPS - 7 Anjana	SMC	SMC	МС	39	4353	4733	5025	5634	8148
3503	TPS - 7 Anjana	SMC	SMC	МС	27	2604	2833	3007	3367	4869
3504	TPS - 7 Anjana	SMC	SMC	МС	54	2604	2833	3007	3367	5210
3505	TPS - 7 Anjana	SMC	SMC	МС	36	1729	1883	1998	2234	3230
3506	TPS - 7 Anjana	SMC	SMC	МС	16	1729	1883	1998	2234	5169
3507	TPS - 7 Anjana	SMC	SMC	МС	20	2604	2833	3007	3367	7791
3508	TPS - 7 Anjana	SMC	SMC	МС	26	17476	18981	20164	22633	23165
3601	TPS - 8 Umarwada	SMC	SMC	МС	39	26225	28481	30257	33966	31803
3602	TPS - 8 Umarwada	SMC	SMC	МС	40	7978	8668	9207	10329	15984
3603	TPS - 8 Umarwada	SMC	SMC	МС	35	64177	69689	74040	83131	65343
3604	TPS - 8 Umarwada	SMC	SMC	МС	35	6978	7582	8053	9034	13065
3605	TPS - 8 Umarwada	SMC	SMC	МС	21	27492	29857	31720	35609	31248
3606	TPS - 8 Umarwada	SMC	SMC	MC	16	3978	4326	4593	5148	18806
3701	TPS - 9 Majura	SMC	SMC	MC	101	3911	4253	4516	5061	7320

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
3702	TPS - 9 Majura	SMC	SMC	МС	52	1945	2118	2247	2514	3636
3801	Tunki	SMC	SMC	МС	154	33352	36219	38479	43199	62476
3901	Singanpor	SMC	SMC	MC	153	6654	7230	7679	8613	12457
3902	Singanpor	SMC	SMC	MC	43	1314	1432	1519	1696	2392
4001	Dabholi	SMC	SMC	MC	97	1314	1432	1519	1696	2453
4002	Dabholi	SMC	SMC	MC	38	2649	2882	3059	3426	4106
4003	Dabholi	SMC	SMC	MC	24	2649	2882	3059	3426	4106
4004	Dabholi	SMC	SMC	MC	16	1314	1432	1519	1696	2453
4101	Ved	SMC	SMC	MC	77	1314	1432	1519	1696	2453
4102	Ved	SMC	SMC	MC	73	1314	1432	1519	1696	2453
4103	Ved	SMC	SMC	MC	31	1314	1432	1519	1696	2453
4104	Ved	SMC	SMC	MC	33	1314	1432	1519	1696	2453
4201	Katargam	SMC	SMC	MC	40	6654	7230	7679	8613	19931
4202	Katargam	SMC	SMC	MC	53	20003	21725	23079	25906	37466
4203	Katargam	SMC	SMC	MC	73	2649	2882	3059	3426	5168
4204	Katargam	SMC	SMC	МС	54	2649	2882	3059	3426	5549
4205	Katargam	SMC	SMC	MC	38	8626	9372	9954	11168	15748
4206	Katargam	SMC	SMC	MC	28	2649	2882	3059	3426	4830
4207	Katargam	SMC	SMC	МС	46	6654	7230	7679	8613	12457

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
4208	Katargam	SMC	SMC	МС	35	6654	7230	7679	8613	13329
4209	Katargam	SMC	SMC	МС	65	1314	1432	1519	1696	2453
4210	Katargam	SMC	SMC	МС	54	2649	2882	3059	3426	4954
4211	Katargam	SMC	SMC	МС	21	1314	1432	1519	1696	2453
4212	Katargam	SMC	SMC	МС	49	2649	2882	3059	3426	5301
4213	Katargam	SMC	SMC	МС	30	1314	1432	1519	1696	2392
4214	Katargam	SMC	SMC	МС	20	6654	7230	7679	8613	12457
4215	Katargam	SMC	SMC	МС	24	3984	4331	4599	5155	7269
4216	Katargam	SMC	SMC	МС	32	6654	7230	7679	8613	12146
4217	Katargam	SMC	SMC	МС	34	29863	32431	34455	38680	33788
4218	Katargam	SMC	SMC	МС	14	11933	12962	13769	15452	13741
4219	Katargam	SMC	SMC	МС	19	89632	97328	103406	116105	94046
4301	Fulpada	SMC	SMC	МС	74	59970	65121	69187	77681	77077
4302	Fulpada	SMC	SMC	МС	52	59970	65121	69187	77681	73043
4303	Fulpada	SMC	SMC	МС	55	19976	21696	23048	25872	37417
4304	Fulpada	SMC	SMC	МС	41	15977	17353	18434	20691	31218
4305	Fulpada	SMC	SMC	МС	44	119516	129777	137882	154818	125753
4306	Fulpada	SMC	SMC	МС	30	89632	97328	103406	116105	94254
4401	Kapadra	SMC	SMC	МС	68	19976	21696	23048	25872	37417

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
4402	Kapadra	SMC	SMC	МС	47	39973	43409	46118	51776	44768
4403	Kapadra	SMC	SMC	МС	47	59970	65121	69187	77681	73313
4501	Nanavarachha	SMC	SMC	МС	79	1374	1498	1588	1774	3822
4502	Nanavarachha	SMC	SMC	МС	67	297	355	458	679	1811
4503	Nanavarachha	SMC	SMC	МС	54	2057	2239	2376	2658	4114
4504	Nanavarachha	SMC	SMC	MC	59	4550	4946	5252	5888	8515
4601	Karanj	SMC	SMC	MC	44	9465	10283	10922	12255	28359
4602	Karanj	SMC	SMC	MC	34	9465	10283	10922	12255	20383
4603	Karanj	SMC	SMC	MC	48	15955	17330	18410	20663	31976
4604	Karanj	SMC	SMC	MC	18	2475	2693	2859	3201	4829
4605	Karanj	SMC	SMC	MC	36	9465	10283	10922	12255	28359
4606	Karanj	SMC	SMC	МС	28	2475	2693	2859	3201	7221
4701	Umarwada (Part)	SMC	SMC	МС	36	2790	3036	3222	3609	5219
4801	Magob (Part)	SMC	SMC	МС	22	3354	3647	3872	4339	6275
4802	Magob (Part)	SMC	SMC	МС	28	1666	1815	1926	2153	4857
4803	Magob (Part)	SMC	SMC	МС	20	2229	2426	2574	2881	4347
4901	Dumbhal	SMC	SMC	MC	72	3630	3947	4191	4696	7607
4902	Dumbhal	SMC	SMC	MC	31	1196	1304	1383	1543	2232
4903	Dumbhal	SMC	SMC	MC	29	2413	2626	2787	3120	4828

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
4904	Dumbhal	SMC	SMC	МС	28	1104	1204	1277	1424	2060
4905	Dumbhal	SMC	SMC	МС	30	6597	7168	7613	8540	12350
5001	Anjana (Part)	SMC	SMC	МС	9	113	105	109	113	261
5101	Limbayat	SMC	SMC	МС	70	6647	7223	7672	8605	19415
5102	Limbayat	SMC	SMC	МС	68	13316	14464	15365	17244	26684
5103	Limbayat	SMC	SMC	МС	15	2202	2396	2543	2846	4616
5201	Dindoli (Part)	SMC	SMC	МС	88	1740	1895	2010	2248	5071
5202	Dindoli (Part)	SMC	SMC	МС	113	1740	1895	2010	2248	3645
5203	Dindoli (Part)	SMC	SMC	МС	56	1488	1622	1720	1922	2900
5301	Bhedvad	SMC	SMC	МС	66	35469	38518	40922	45942	51121
5302	Bhedvad	SMC	SMC	МС	50	2067	2250	2387	2671	7844
5401	Bhestan	SMC	SMC	МС	80	1224	1335	1415	1580	4144
5402	Bhestan	SMC	SMC	МС	77	6644	7220	7668	8601	24421
5403	Bhestan	SMC	SMC	МС	132	5705	6201	6585	7385	11167
5404	Bhestan	SMC	SMC	МС	51	1224	1335	1415	1580	2285
5405	Bhestan	SMC	SMC	МС	59	2967	3227	3426	3837	6156
5406	Bhestan	SMC	SMC	МС	138	9938	10797	11468	12868	38639
5407	Bhestan	SMC	SMC	МС	253	1224	1335	1415	1580	6579
5501	Pandesara	SMC	SMC	МС	125	21153	22974	24406	27396	39622

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
5502	Pandesara	SMC	SMC	МС	161	55010	59759	63489	71283	88113
5601	Udhana	SMC	SMC	МС	198	31812	34548	36703	41205	115327
5602	Udhana	SMC	SMC	МС	73	1330	1450	1537	1717	2421
5603	Udhana	SMC	SMC	МС	114	16696	18134	19264	21623	33461
5604	Udhana	SMC	SMC	МС	129	13500	14665	15578	17483	49374
5605	Udhana	SMC	SMC	МС	66	12712	13809	14669	16462	26665
5606	Udhana	SMC	SMC	МС	104	22262	24178	25686	28834	44619
5701	Bamroli (Part)	SMC	SMC	МС	144	11984	13018	13828	15518	32309
5702	Bamroli (Part)	SMC	SMC	МС	59	3180	3459	3672	4114	9018
5801	Majura	SMC	SMC	МС	121	14265	15494	16459	18473	36332
5802	Majura	SMC	SMC	МС	26	2758	3000	3184	3566	6286
5901	Bhatar	SMC	SMC	МС	137	20787	22577	23984	26923	41760
5902	Bhatar	SMC	SMC	МС	117	8315	9034	9595	10765	15569
6001	Althan	SMC	SMC	МС	94	3525	3833	4070	4560	6832
6002	Althan	SMC	SMC	МС	66	2934	3191	3388	3795	4665
6003	Althan	SMC	SMC	МС	56	570	625	661	733	1033
6004	Althan	SMC	SMC	МС	74	570	625	661	733	7578
6101	Umara	SMC	SMC	МС	84	7595	8252	8765	9833	14221
6102	Umara	SMC	SMC	МС	141	4213	4580	4863	5452	7885

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
6103	Umara	SMC	SMC	МС	71	1567	1707	1811	2024	2927
6104	Umara	SMC	SMC	МС	28	508	558	590	653	920
6201	Piplod	SMC	SMC	MC	72	5943	6458	6859	7693	11125
6202	Piplod	SMC	SMC	MC	48	5943	6458	6859	7693	11125
6203	Piplod	SMC	SMC	MC	84	3490	3795	4030	4515	6530
6301	Jahangirabad	SMC	SMC	MC	221	284	314	331	362	23869
6302	Jahangirabad	SMC	SMC	МС	73	284	314	331	362	2296
6303	Jahangirabad	SMC	SMC	МС	90	1096	1196	1268	1415	6981
6304	Jahangirabad	SMC	SMC	MC	61	284	314	331	362	2385
6401	Jahangirpura	SMC	SMC	MC	240	237	263	277	301	13502
6501	Pisad	SMC	SMC	MC	85	581	637	674	747	2661
6601	Vadod	SMC	SMC	МС	56	8449	9179	9750	10939	12924
6701	Pal	SMC	SMC	МС	341	1451	1582	1678	1874	8819
6702	Pal	SMC	SMC	МС	111	10286	11174	11869	13319	19262
6703	Pal	SMC	SMC	MC	125	7341	7977	8472	9504	13745
6801	Palanpor	SMC	SMC	МС	149	2497	2717	2884	3229	4669
6802	Palanpor	SMC	SMC	МС	45	1028	1122	1189	1326	1918
6803	Palanpor	SMC	SMC	МС	123	608	666	705	782	3214
6901	Variyav	SMC	SMC	МС	1452	75	60	77	170	15970

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
6902	Variyav	SMC	SMC	МС	95	316	252	325	502	3017
6903	Variyav	SMC	SMC	МС	245	90	43	31	108	6218
6904	Variyav	SMC	SMC	МС	96	331	265	341	523	3076
6905	Variyav	SMC	SMC	МС	109	75	60	77	170	240
6906	Variyav	SMC	SMC	МС	88	75	60	77	170	5020
6907	Variyav	SMC	SMC	МС	80	527	421	542	792	2995
6908	Variyav	SMC	SMC	МС	20	75	60	77	170	240
7001	Chhapara Bhatha	SMC	SMC	МС	104	1430	1559	1653	1847	5140
7002	Chhapara Bhatha	SMC	SMC	МС	77	1935	2107	2236	2501	2998
7003	Chhapara Bhatha	SMC	SMC	МС	18	274	303	319	349	492
7101	Kosad	SMC	SMC	МС	405	727	795	842	936	22854
7102	Kosad	SMC	SMC	МС	280	166	186	195	209	7217
7103	Kosad	SMC	SMC	МС	98	1287	1404	1488	1662	4750
7104	Kosad	SMC	SMC	МС	165	727	795	842	936	4545
7105	Kosad	SMC	SMC	МС	40	727	795	842	936	1121
7201	Amroli	SMC	SMC	МС	30	2483	2702	2868	3211	4845
7301	Utran	SMC	SMC	МС	213	2283	2485	2637	2952	8947
7302	Utran	SMC	SMC	МС	28	235	261	274	299	421
7401	Motavarachha	SMC	SMC	МС	521	2280	2482	2634	2948	10471

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
7402	Motavarachha	SMC	SMC	МС	159	3793	4148	4404	4936	5916
7403	Motavarachha	SMC	SMC	МС	91	1513	1649	1749	1954	2291
7501	Sarthana	SMC	SMC	МС	149	393	314	404	608	4523
7502	Sarthana	SMC	SMC	МС	116	474	521	550	609	3716
7503	Sarthana	SMC	SMC	MC	55	227	252	265	288	1793
7601	Simada	SMC	SMC	MC	125	69	58	59	90	2996
7602	Simada	SMC	SMC	МС	68	290	321	338	371	1829
7603	Simada	SMC	SMC	МС	40	152	171	179	191	1153
7604	Simada	SMC	SMC	МС	57	117	133	139	146	1942
7701	Puna	SMC	SMC	MC	70	383	422	445	491	2123
7702	Puna	SMC	SMC	MC	168	906	723	932	1313	8561
7703	Puna	SMC	SMC	MC	35	2001	2178	2311	2586	3646
7704	Puna	SMC	SMC	MC	54	2001	2178	2311	2586	3740
7705	Puna	SMC	SMC	МС	83	1394	1519	1611	1800	4137
7706	Puna	SMC	SMC	МС	78	990	1080	1145	1276	2032
7707	Puna	SMC	SMC	МС	71	1394	1519	1611	1800	4400
7708	Puna	SMC	SMC	МС	45	181	202	212	229	1221
7709	Puna	SMC	SMC	МС	47	585	641	679	753	1436
7710	Puna	SMC	SMC	МС	50	990	1080	1145	1276	2067

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
7711	Puna	SMC	SMC	МС	26	990	1080	1145	1276	2016
7712	Puna	SMC	SMC	MC	24	2001	2178	2311	2586	4084
7713	Puna	SMC	SMC	МС	48	7054	7665	8141	9133	21133
7801	Magob (Part)	SMC	SMC	МС	38	1427	1555	1649	1842	2665
7802	Magob (Part)	SMC	SMC	MC	48	2562	2788	2959	3313	5272
7803	Magob (Part)	SMC	SMC	MC	21	63	50	65	154	222
7804	Magob (Part)	SMC	SMC	MC	28	948	1035	1096	1222	1767
7805	Magob (Part)	SMC	SMC	MC	23	1104	1204	1277	1424	2060
7806	Magob (Part)	SMC	SMC	MC	22	2562	2788	2959	3313	4791
7901	Parvat	SMC	SMC	MC	60	2313	2517	2671	2990	4627
7902	Parvat	SMC	SMC	MC	108	562	616	652	723	6174
7903	Parvat	SMC	SMC	MC	18	1729	1883	1998	2234	3150
7904	Parvat	SMC	SMC	MC	46	6980	7584	8055	9036	12741
8001	Godadara	SMC	SMC	MC	156	7629	8289	8804	9876	13927
8002	Godadara	SMC	SMC	МС	29	749	819	868	965	1456
8003	Godadara	SMC	SMC	MC	68	4229	4597	4882	5472	7716
8004	Godadara	SMC	SMC	МС	68	5079	5520	5862	6573	9269
8101	Dindoli (Part)	SMC	SMC	MC	134	2290	2492	2645	2960	4174
8102	Dindoli (Part)	SMC	SMC	МС	214	1519	1656	1756	1963	6799

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
8103	Dindoli (Part)	SMC	SMC	МС	40	1519	1656	1756	1963	2767
8104	Dindoli (Part)	SMC	SMC	МС	80	749	819	868	965	2823
8105	Dindoli (Part)	SMC	SMC	МС	63	749	819	868	965	1360
8201	Unn	SMC	SMC	МС	195	6733	7316	7771	8716	12606
8202	Unn	SMC	SMC	МС	93	3616	3932	4175	4678	6766
8203	Unn	SMC	SMC	МС	73	88	70	90	188	272
8301	Sonari	SMC	SMC	МС	138	419	334	431	643	3737
8401	Gabheni	SMC	SMC	МС	1749	458	366	471	630	17564
8402	Gabheni	SMC	SMC	МС	58	1191	951	1225	1638	2370
8403	Gabheni	SMC	SMC	МС	246	183	146	188	319	3597
8501	Budiya	SMC	SMC	МС	149	474	521	551	609	859
8502	Budiya	SMC	SMC	МС	84	78	33	17	90	127
8503	Budiya	SMC	SMC	МС	270	133	106	137	250	352
8601	Jiyav	SMC	SMC	МС	225	64	11	14	19	4715
8602	Jiyav	SMC	SMC	МС	235	90	72	92	190	7277
8603	Jiyav	SMC	SMC	МС	165	269	215	277	437	3957
8701	Vadod(Part)	SMC	SMC	МС	208	1947	2120	2249	2516	5405
8702	Vadod(Part)	SMC	SMC	МС	57	6866	7461	7924	8823	12196
8703	Vadod(Part)	SMC	SMC	МС	104	3914	4256	4519	5065	6328

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
8704	Vadod(Part)	SMC	SMC	МС	60	6866	7461	7924	8889	12298
8801	Bamroli (Part)	SMC	SMC	МС	144	7172	7816	8301	9312	16414
8802	Bamroli (Part)	SMC	SMC	МС	114	0	28	10	13	1717
8803	Bamroli (Part)	SMC	SMC	МС	118	11521	12516	13235	14919	17882
8804	Bamroli (Part)	SMC	SMC	МС	39	5750	6249	6637	7443	8921
8805	Bamroli (Part)	SMC	SMC	МС	121	4307	4683	4972	5574	8061
8901	Bhimrad	SMC	SMC	МС	213	3769	4099	4352	4877	33036
9001	Bharthana – Vesu	SMC	SMC	МС	124	3011	3275	3477	3895	4668
9002	Bharthana – Vesu	SMC	SMC	МС	85	679	743	786	873	1232
9101	Sarsana	SMC	SMC	МС	277	1917	2087	2215	2477	84016
9201	Khajod	SMC	SMC	МС	1368	1465	1597	1694	1893	227311
9301	Abhava	SMC	SMC	МС	2137	933	1019	1080	1203	21368
9401	Vesu	SMC	SMC	МС	86	12477	13553	14297	16157	22198
9402	Vesu	SMC	SMC	МС	128	1902	2071	2197	2458	3466
9403	Vesu	SMC	SMC	МС	209	1902	2071	2197	2458	3554
9404	Vesu	SMC	SMC	МС	148	1902	2071	2197	2458	11196
9405	Vesu	SMC	SMC	МС	385	1640	1787	1895	2119	19660
9501	Rundh	SMC	SMC	МС	105	10827	11835	12518	14447	20894
9502	Rundh	SMC	SMC	МС	86	1187	1294	1372	1531	2215

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
9601	Magdalla	SMC	SMC	MC	66	1119	1221	1294	1444	1731
9602	Magdalla	SMC	SMC	МС	39	67	78	80	81	114
9603	Magdalla	SMC	SMC	MC	149	505	554	586	649	3459
9701	Gaviyar	SMC	SMC	МС	130	1134	1238	1312	1464	3526
9702	Gaviyar	SMC	SMC	MC	277	883	965	1022	1139	6350
9801	Vanta	SMC	SMC	MC	83	58	46	67	75	1779
9802	Vanta	SMC	SMC	MC	33	13	10	3	5	830
9803	Vanta	SMC	SMC	MC	36	13	10	3	5	871
9901	Dumas	SMC	SMC	MC	1324	1616	1760	1867	2087	29253
10001	Sultanabad	SMC	SMC	MC	568	582	638	675	748	11642
10101	Bhimpor	SMC	SMC	MC	825	428	471	497	549	16524
11001	Sarol	SUDA	Olpad	Village	188	297	317	367	453	3317
11002	Balkas	SUDA	Olpad	Village	515	92	99	118	153	9075
11003	Talad	SUDA	Olpad	Village	167	305	326	377	467	1607
11004	Vadod	SUDA	Olpad	Village	384	152	160	181	212	6223
11005	Kosam	SUDA	Olpad	Village	419	1527	1653	1951	2476	7463
11006	Sherdi (suda)	SUDA	Olpad	Village	180	1020	1102	1298	1658	2697
11007	Kanad	SUDA	Olpad	Village	417	369	395	459	573	7441
11008	Jothan	SUDA	Olpad	Village	351	110	114	126	141	2462

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11009	Saroli (Olpad)	SUDA	Olpad	Village	388	292	379	506	759	6599
11010	Sonsak	SUDA	Olpad	Village	303	473	509	594	747	2810
11011	Ambheta	SUDA	Olpad	Village	714	300	320	371	458	11566
11012	Ariyana	SUDA	Olpad	Village	296	358	383	445	554	5349
11013	Kunkni	SUDA	Olpad	Village	239	238	254	292	356	1961
11014	Chichi	SUDA	Chorasi	Village	184	16	20	27	40	925
11015	Vanakala	SUDA	Chorasi	Village	351	25	32	43	65	6802
11016	Vihel	SUDA	Chorasi	Village	127	13	16	22	33	2476
11017	Okha	SUDA	Chorasi	Village	309	7	9	66	99	6034
11018	Segwachhama	SUDA	Olpad	Village	510	397	426	496	621	4580
11019	Malgama	SUDA	Chorasi	Village	288	349	373	434	539	2824
11020	Bhesan	SUDA	Chorasi	Village	583	752	811	953	1212	16963
11021	Asarma	SUDA	Chorasi	Village	211	21	28	37	55	911
11022	Ichchhapor	SUDA	Chorasi	Muncipa lity	478	6984	7579	8979	11597	10044
11023	Ichchhapor	SUDA	Chorasi	Census Town	507	769	997	1384	2379	2901
11024	Bhatha	SUDA	Chorasi	Out Growth	833	748	808	948	1206	1470
11025	Bhatpor	SUDA	Chorasi	Out Growth	754	4248	4607	5454	7037	8580

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11026	Kavas	SUDA	Chorasi	Out Growth	725	4851	5262	6231	8042	9806
11027	Segwasyadla	SUDA	Olpad	Village	303	385	413	481	600	3443
11028	Vaswari	SUDA	Olpad	Village	404	502	540	631	795	4582
11029	Gothan	SUDA	Olpad	Village	718	4446	4822	5710	7367	7897
11030	Bharthana Kosad	SUDA	Chorasi	Census Town	439	2151	2331	2755	3543	6317
11031	Abrama	SUDA	Kamrej	Village	978	1166	1261	1487	1902	13415
11032	Kholvad	SUDA	Kamrej	Village	781	91	94	102	111	16409
11033	Bhada	SUDA	Kamrej	Village	380	619	667	782	990	8374
11034	Valak	SUDA	Kamrej	Village	258	591	637	746	944	5917
11035	Laskana	SUDA	Kamrej	Village	394	9379	10178	12062	15587	30773
11036	Navagam	SUDA	Kamrej	Village	388	377	405	471	587	9834
11037	Vav	SUDA	Kamrej	Village	1343	2351	2548	3012	3877	10741
11038	Pasodara	SUDA	Kamrej	Village	347	725	783	919	1168	9435
11039	Khadsad	SUDA	Kamrej	Village	294	162	210	333	801	6245
11040	Kathodara	SUDA	Kamrej	Village	549	1496	1619	1911	2451	7372
11041	Kosamadi	SUDA	Kamrej	Village	419	153	199	265	398	2432
11042	Valthan	SUDA	Kamrej	Village	247	196	208	238	286	1737
11043	Ladvi	SUDA	Kamrej	Village	408	60	60	62	156	8968

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11044	Oviyan	SUDA	Kamrej	Village	377	101	105	115	127	19215
11045	Kosmada	SUDA	Kamrej	Village	753	734	792	930	1182	16560
11046	Saniya Hemad	SUDA	Chorasi	Village	347	678	731	858	1089	9564
11047	Saroli (Choryasi)	SUDA	Chorasi	Village	208	10180	11048	13093	16922	41679
11048	Kumbharia	SUDA	Chorasi	Village	290	1366	1479	1744	2236	29250
11049	Vedchha	SUDA	Chorasi	Village	263	221	235	270	327	6383
11050	Chhedchha	SUDA	Kamrej	Village	188	292	312	361	446	4869
11051	Sabargam	SUDA	Chorasi	Village	72	702	757	888	1128	1045
11052	Antroli	SUDA	Palsana	Village	496	356	381	443	552	3010
11053	Vareli	SUDA	Palsana	Village	291	2806	3042	3598	4635	7300
11054	Haripura	SUDA	Palsana	Village	144	1315	1423	1679	2151	7467
11055	Umbhel	SUDA	Kamrej	Village	708	2323	2518	2977	3830	14868
11056	Kadodara	SUDA	Palsana	Census Town	353	47164	51206	60716	78551	70895
11057	Kadodara	SUDA	Palsana	Census Town	84	657	851	1137	1707	2928
11058	Vankaneda	SUDA	Palsana	Village	266	331	429	573	860	3423
11059	Vankaneda	SUDA	Palsana	Village	28	26	33	44	67	359
11060	Chalthan	SUDA	Palsana	Census Town	31	152	197	262	394	516

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11061	Chalthan	SUDA	Palsana	Census Town	337	4103	4450	5268	6796	5057
11062	Karala	SUDA	Palsana	Village	145	145	152	171	200	633
11063	Niyol	SUDA	Palsana	Village	559	484	520	608	765	5286
11064	Devadh	SUDA	Chorasi	Village	384	475	511	596	750	9906
11065	Dakhkhanvada	SUDA	Chorasi	Village	148	37	49	65	90	3110
11066	sedhav	SUDA	Palsana	Village	142	92	119	213	619	1602
11067	Deladva	SUDA	Chorasi	Village	652	473	509	594	748	16068
11068	Mohni	SUDA	Chorasi	Village	458	313	335	388	480	3667
11069	Kharbhasi	SUDA	Palsana	Village	278	106	138	184	276	1419
11070	Talodara	SUDA	Palsana	Village	174	182	193	219	262	666
11071	Karan	SUDA	Palsana	Village	263	209	222	254	307	1069
11072	Tantizaghda	SUDA	Palsana	Village	230	80	103	138	207	927
11073	Erthan	SUDA	Palsana	Village	430	121	156	209	313	1361
11074	Timbarva(s)	SUDA	Chorasi	Village	357	763	823	967	1229	2430
11075	Goja	SUDA	Chorasi	Village	204	50	65	87	131	1040
11076	Khambhasla	SUDA	Chorasi	Village	167	180	190	216	258	1499
11077	Saniya Kanade	SUDA	Chorasi	Village	286	226	240	276	335	6232
11078	Karadva	SUDA	Chorasi	Village	238	80	82	88	92	4991

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11079	Eklera	SUDA	Chorasi	Village	213	93	121	162	543	4473
11080	Kharvasa	SUDA	Chorasi	Village	661	1002	1083	1275	1628	13771
11081	Bonand	SUDA	Chorasi	Village	520	93	95	104	113	3613
11082	Vadadala	SUDA	Palsana	Village	326	84	91	108	139	948
11083	Ravla Alias Vaktana	SUDA	Chorasi	Village	413	157	165	187	220	3451
11084	Vanz	SUDA	Chorasi	Village	407	541	582	681	859	3118
11085	Bhanodra	SUDA	Chorasi	Village	297	89	96	114	148	3323
11086	Pardi Kanade	SUDA	Chorasi	Census Town	142	1056	1142	1345	1719	3699
11087	Sachin,INA	SUDA	Chorasi	INA	653	47984	52138	61522	79981	135220
11088	Sachin	SUDA	Chorasi	Census Town	275	9974	10825	12628	16579	28941
11089	Umber	SUDA	Chorasi	Village	844	175	227	304	456	556
11090	Pali	SUDA	Chorasi	Village	182	6359	6899	8173	10555	9202
11091	Kansad	SUDA	Chorasi	Muncipa lity	709	4091	4436	5252	6775	8261
11092	Lajpor	SUDA	Chorasi	Village	730	2128	2306	2725	3505	3507
11093	Vanz	SUDA	Chorasi	Village	362	22	29	92	439	3926
11094	Bhatia	SUDA	Chorasi	Village	497	348	373	433	539	10491
11095	Lingad	SUDA	Palsana	Village	389	238	253	291	355	302

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11096	Taraj	SUDA	Palsana	Village	362	244	260	299	366	311
11097	Samrod	SUDA	Chorasi	Village	210	127	133	148	170	170
11098	Kachholi	SUDA	Chorasi	Village	460	897	969	1140	1453	1454
11099	Kapletha	SUDA	Chorasi	Village	310	70	71	75	75	75
11100	Popda	SUDA	Chorasi	Village	271	142	184	246	370	1512
11101	Talangpor	SUDA	Chorasi	Out Growth	193	601	647	758	960	1874
11102	Hajira	SUDA	Chorasi	Village	2292	60901	66041	78406	101442	119195
11103	Sunvali	SUDA	Chorasi	Village	1434	644	694	814	1031	30119
11104	Mora	SUDA	Chorasi	Village	2218	4569	4956	5868	7572	46183
11105	Limla (CT)	SUDA	Chorasi	Village	598	72	73	77	78	98
11106	Rajgari	SUDA	Chorasi	Village	409	669	721	846	1074	1343
11107	Bhatlai	SUDA	Chorasi	Village	233	171	180	204	243	304
11108	Damka	SUDA	Chorasi	Village	1486	1203	1301	1533	1963	2455
11109	Vansva	SUDA	Chorasi	Village	516	161	170	192	227	227
11110	Barbodhan	SUDA	Olpad	Village	1397	1426	1544	1821	2335	23862
11111	Sithana	SUDA	Olpad	Village	156	59	64	76	98	480
11112	Dihen	SUDA	Olpad	Village	1270	362	387	450	561	21700
11113	Tena	SUDA	Olpad	Village	728	222	288	384	577	7306

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11114	Pinjrat	Outside	Olpad	Village	3306	448	481	562	705	14923
11115	Bhandut	Outside	Olpad	Village	584	730	788	925	1175	1176
11116	Selut	Outside	Olpad	Village	403	390	418	486	608	608
11117	Narthan	Outside	Olpad	Village	575	1109	1199	1413	1806	7431
11118	Veluk	Outside	Olpad	Village	479	275	293	339	417	417
11119	Kasala Khurd	Outside	Olpad	Village	148	123	129	143	164	164
11120	Kachhol	Outside	Olpad	Village	281	625	674	790	1000	1001
11121	Kasla Bujrang	Outside	Olpad	Village	181	63	81	109	163	163
11122	Orma	Outside	Olpad	Village	651	1724	1867	2205	2831	2833
11123	Masma	SUDA	Olpad	Village	993	730	788	925	1175	16950
11124	Jafrabad	Outside	Olpad	Village	226	81	105	141	172	172
11125	Asnabad	SUDA	Olpad	Village	211	59	64	76	98	83
11126	Olpad	Outside	Olpad	Village	1628	15738	16933	20250	26184	34182
11127	Isanpor	SUDA	Olpad	Village	343	955	1032	1214	1550	5976
11128	Karamla	SUDA	Olpad	Village	571	671	724	849	1077	9315
11129	Atodra	Outside	Olpad	Village	693	153	161	182	214	11792
11130	Andhi	Outside	Olpad	Village	462	53	58	68	89	89
11131	Gola	Outside	Olpad	Village	415	93	96	104	113	113
11132	Morthan	Outside	Olpad	Village	588	974	1053	1239	1582	1583

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11133	Achharan	Outside	Olpad	Village	418	587	633	741	938	938
11134	Sandhiyer	SUDA	Olpad	Village	1359	287	307	355	437	20319
11135	Paria	SUDA	Olpad	Village	912	1164	1259	1484	1898	10851
11136	Madhar	Outside	Olpad	Village	292	424	456	531	666	5095
11137	Khalipor	Outside	Olpad	Village	169	184	195	222	266	3086
11138	Sithan	Outside	Olpad	Village	303	570	614	719	908	4895
11139	Kanthraj	Outside	Olpad	Village	256	344	368	428	532	532
11140	Obhla	Outside	Olpad	Village	384	179	189	215	257	257
11141	Bharundi	Outside	Olpad	Village	547	389	417	485	606	9302
11142	Siwan	Outside	Olpad	Village	562	253	327	437	657	9738
11143	Delad	SUDA	Olpad	Village	283	1194	1292	1523	1949	3806
11144	Sayan (CT)	Outside	Olpad	Village	690	14835	16032	19087	24678	20686
11145	Umra	SUDA	Olpad	Village	417	2372	2570	3039	3911	6563
11146	Kathor	SUDA	Kamrej	Village	1092	3087	3346	3959	5102	4993
11147	Velanja	SUDA	Kamrej	Village	612	3398	3684	4360	5620	5623
11148	Shekhpur	Outside	Kamrej	Village	553	324	347	402	499	499
11149	Kareli	Outside	Olpad	Village	786	719	776	911	1157	13706
11150	Syadla	Outside	Olpad	Village	508	219	283	378	568	569
11151	Kudsad	Outside	Olpad	Village	1702	6923	7512	8899	11412	32341

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11152	Ghaludi	Outside	Kamrej	Village	389	199	211	241	290	291
11153	Antroli	Outside	Kamrej	Village	406	142	184	246	370	370
11154	Tharoli	Outside	Kamrej	Village	290	18	24	32	48	48
11155	Kanyasi	Outside	Olpad	Village	420	780	842	989	1258	1259
11156	Pipodara	Outside	Mangrol	Village	822	7398	8060	9549	12336	18080
11157	Navi Paradi	Outside	Kamrej	Village	764	1165	1259	1484	1899	5052
11158	Dhoran Paradi	Outside	Kamrej	Village	181	646	696	816	1035	1012
11159	Choryasi	SUDA	Kamrej	Village	219	363	389	452	563	551
11160	Amboli	SUDA	Kamrej	Village	342	2454	2659	3145	4048	3961
11161	Bhairav	SUDA	Kamrej	Village	360	3543	3842	4548	5863	7149
11162	Dhoran Paradi	Outside	Kamrej	Village	658	42	55	73	109	109
11163	Akhakhol	Outside	Kamrej	Village	293	151	159	179	210	210
11164	Karjan	Outside	Kamrej	Village	1210	1387	1501	1771	2271	2272
11165	Ghala	Outside	Kamrej	Village	2141	1389	1503	1773	2273	2274
11166	Dhatva	Outside	Kamrej	Village	371	1744	1889	2231	2865	2866
11167	Jior	Outside	Kamrej	Village	182	28	37	50	73	73
11168	Dungra	SUDA	Kamrej	Village	690	102	106	117	129	129
11169	Kholeshwar	SUDA	Kamrej	Village	435	193	250	334	501	501
11170	Kamrej	SUDA	Kamrej	Village	1151	35497	38437	45693	58709	81213

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11171	Delod	SUDA	Kamrej	Village	241	1386	1500	1769	2268	2269
11172	Nansad	SUDA	Kamrej	Village	227	487	524	612	771	771
11173	Koli Bharthana	SUDA	Kamrej	Village	654	86	88	96	102	102
11174	Netrang	Outside	Kamrej	Village	360	288	307	355	438	438
11175	Jat Bharthana	Outside	Kamrej	Village	131	93	121	161	242	242
11176	Dharutha	Outside	Kamrej	Village	202	860	928	1092	1391	1392
11177	Jokha	SUDA	Kamrej	Village	651	288	374	500	750	751
11178	Simadi	SUDA	Kamrej	Village	306	291	311	360	444	445
11179	Morthana	SUDA	Kamrej	Village	654	569	613	717	907	907
11180	Segva	Outside	Kamrej	Village	655	88	90	98	105	105
11181	Asta	Outside	Kamrej	Village	373	205	266	355	533	533
11182	Vansdarundhi	Outside	Kamrej	Village	116	128	134	149	171	171
11183	Pali	Outside	Kamrej	Village	413	635	684	802	1017	1017
11184	Alura	Outside	Kamrej	Village	256	123	129	143	164	164
11185	Valan	Outside	Kamrej	Village	352	569	613	717	907	907
11186	Mankna	SUDA	Kamrej	Village	358	395	424	494	617	2358
11187	Parab	Outside	Kamrej	Village	506	286	305	352	434	435
11188	Jolva	SUDA	Palsana	Village	624	5158	5596	6627	8554	8117
11189	Haldharu	Outside	Kamrej	Village	697	127	133	149	171	171

TAZ Numbe r	Name	Boundary	Taluka	Census Level	Area (Ha)	2016	2021	2026	2036	2046
11190	Dastan	SUDA	Palsana	Village	719	1254	1356	1599	2048	2049
11191	Bagumara	SUDA	Palsana	Village	944	304	325	377	466	466
11192	Tantithaiya	SUDA	Palsana	Village	403	2575	2791	3300	4250	4544
11193	Sanki	SUDA	Palsana	Village	600	151	195	261	392	392
11194	Baleshvar	SUDA	Palsana	Village	723	1111	1202	1416	1811	2215
11195	Isroli	SUDA	Palsana	Village	64	84	92	109	141	172
11196	Bhutpor	Outside	Palsana	Village	603	22	61	73	94	94
11197	Tundi	Outside	Palsana	Village	804	387	415	483	604	604
11198	Ghaluda	Outside	Palsana	Village	163	68	88	118	177	177
11199	Kanav	Outside	Palsana	Village	497	168	177	201	239	239
11200	Palsana	SUDA	Palsana	Village	711	14681	15834	18877	24022	16847
11201	Makhinga	Outside	Palsana	Village	442	155	163	184	217	217
11202	Intalva	SUDA	Palsana	Village	285	141	147	165	192	192
	Total				135100	2928559	3179834	3435722	3952476	6250000

Annexure 7: Distribution of Workers

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
101	Nanpura	SMC	SMC	МС	23	5828	6774	8112	10449	7485	9958
102	Nanpura	SMC	SMC	МС	22	1943	2258	2704	3483	4658	6197
103	Nanpura	SMC	SMC	МС	24	6799	7903	9463	12191	9357	12450
104	Nanpura	SMC	SMC	МС	11	1554	1806	2163	2787	2053	2732
105	Nanpura	SMC	SMC	МС	22	1943	2258	2704	3483	4658	6197
106	Nanpura	SMC	SMC	МС	14	1360	1491	1785	2299	1372	1826
201	Sagrampura	SMC	SMC	МС	48	12993	15101	18083	23295	31152	41448
202	Sagrampura	SMC	SMC	МС	28	4908	5705	6831	8800	7587	10095
203	Sagrampura	SMC	SMC	МС	50	3753	4362	5224	6730	11668	15525
204	Sagrampura	SMC	SMC	МС	31	7218	8389	10046	12942	11315	15055
301	Salabatpura	SMC	SMC	МС	40	13226	15372	17983	23166	30979	41219
302	Salabatpura	SMC	SMC	МС	32	3149	3660	4383	5646	7550	10046
303	Salabatpura	SMC	SMC	МС	14	2519	2928	3506	4517	1023	1360
304	Salabatpura	SMC	SMC	МС	18	2099	2440	2922	3764	5034	6697
401	Begumpura	SMC	SMC	МС	61	4859	5648	6763	8713	12320	16392
402	Begumpura	SMC	SMC	МС	35	11339	13178	15781	20329	20564	27361
501	Haripura	SMC	SMC	МС	29	4201	4883	5847	7532	10072	13402
601	Mahidharpura	SMC	SMC	МС	40	6361	7393	8853	11405	15251	20292
701	Saiyadpura	SMC	SMC	МС	67	15203	17669	21159	27257	36450	48498
702	Saiyadpura	SMC	SMC	МС	43	1737	2019	2418	3115	4166	5543

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
703	Saiyadpura	SMC	SMC	МС	30	2606	3029	3627	4673	6918	9204
704	Saiyadpura	SMC	SMC	МС	23	0	0	125	161	884	1177
705	Saiyadpura	SMC	SMC	МС	14	1303	1515	1814	2336	3124	4157
706	Saiyadpura	SMC	SMC	МС	13	869	1010	1209	1558	2752	3661
801	Gopipura	SMC	SMC	МС	19	3497	4064	4867	6270	8384	11156
802	Gopipura	SMC	SMC	МС	19	3497	4064	4867	6270	8384	11156
901	Wadifalia	SMC	SMC	МС	21	2527	2937	3517	4531	6059	8061
902	Wadifalia	SMC	SMC	МС	12	842	979	1172	1510	2689	3577
1001	Sonifalia	SMC	SMC	МС	21	2646	3075	3683	4744	6344	8441
1002	Sonifalia	SMC	SMC	МС	16	2646	3075	3683	4744	6344	8441
1101	Nanavat	SMC	SMC	МС	46	7516	8736	10461	13476	18021	23977
1201	Shahpor	SMC	SMC	МС	44	8379	9739	11662	15023	20090	26730
1301	Athwa	SMC	SMC	МС	70	2612	3036	3635	4683	6932	9223
1401	Rander	SMC	SMC	МС	98	2039	2370	2838	3657	5559	7396
1402	Rander	SMC	SMC	МС	45	6118	7111	8515	10970	14669	19518
1403	Rander	SMC	SMC	МС	39	4895	5689	6812	8776	11735	15614
1404	Rander	SMC	SMC	МС	62	8158	9481	11354	14626	19559	26024
1405	Rander	SMC	SMC	МС	115	4487	5215	6245	8044	11426	15203
1406	Rander	SMC	SMC	МС	31	2039	2370	2838	3657	5559	7396
1407	Rander	SMC	SMC	МС	81	13052	15170	18166	23402	31294	41638
2701	Adajan	SMC	SMC	МС	94	10171	11821	14156	18235	24386	32446
2702	Adajan	SMC	SMC	МС	37	727	844	1011	1303	2411	3208

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
2703	Adajan	SMC	SMC	МС	36	3632	4222	5056	6513	8709	11588
2704	Adajan	SMC	SMC	МС	84	8718	10132	12133	15630	20902	27811
2705	Adajan	SMC	SMC	МС	44	3632	4222	5056	6513	9378	12478
2706	Adajan	SMC	SMC	МС	61	7265	8444	10111	13025	17418	23176
2707	Adajan	SMC	SMC	МС	77	14530	16887	20222	26051	34837	46351
2708	Adajan	SMC	SMC	МС	95	10897	12665	15167	19538	26128	34763
2709	Adajan	SMC	SMC	МС	73	5812	6755	8089	10420	14604	19431
2710	Adajan	SMC	SMC	МС	45	3632	4222	5056	6513	9378	12478
2711	Adajan	SMC	SMC	МС	48	3632	4222	5056	6513	9378	12478
2801	Nanavarachha Water Works	SMC	SMC	MC	26	57	66	79	102	806	1072
2901	TPS – 1 Rampura Laldarwaja	SMC	SMC	MC	38	3832	4454	5333	6871	9188	12225
2902	TPS – 1 Rampura Laldarwaja	SMC	SMC	MC	28	426	495	593	763	1690	2248
3001	TPS - 2 Nanpura	SMC	SMC	МС	47	3169	3683	4411	5682	8267	11000
3101	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	24	9129	10610	12706	16368	21888	29123
3102	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	9	261	303	363	468	1294	1722
3103	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	21	2347	2728	3267	4209	5628	7489

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
3104	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	18	5217	6063	7260	9353	12508	16642
3105	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	21	1304	1516	1815	2338	3796	5051
3106	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	37	6521	7579	9076	11691	15635	20802
3107	TPS - 3 Katargam Gotalawadi	SMC	SMC	MC	96	1304	1516	1815	2338	3796	5051
3201	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	59	8093	9407	11264	14511	19405	25819
3202	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	32	6323	7349	8800	11337	15160	20171
3203	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	67	1012	1176	1408	1814	3095	4117
3204	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	23	3794	4409	5280	6802	9096	12103
3205	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	11	506	588	704	907	1882	2504
3206	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	23	506	588	704	907	1882	2504
3207	TPS - 4 Ashvanikumar Navagam	SMC	SMC	MC	38	5058	5879	7040	9069	12128	16137
3301	TPS - 5 Athwa – Umara	SMC	SMC	MC	93	7990	9286	11120	14326	19826	26379
3302	TPS - 5 Athwa – Umara	SMC	SMC	MC	23	1410	1639	1962	2528	4050	5388

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
3303	TPS - 5 Athwa – Umara	SMC	SMC	MC	90	2350	2731	3271	4213	6303	8387
3401	TPS - 6 Majura – Khatodara	SMC	SMC	MC	90	727	845	1011	1303	2411	3208
3402	TPS - 6 Majura – Khatodara	SMC	SMC	MC	47	4845	5631	6743	8686	11616	15456
3403	TPS - 6 Majura – Khatodara	SMC	SMC	MC	59	1453	1689	2023	2606	4154	5527
3404	TPS - 6 Majura – Khatodara	SMC	SMC	MC	39	8963	10417	12475	16070	21490	28593
3405	TPS - 6 Majura – Khatodara	SMC	SMC	MC	53	727	845	1011	1303	2411	3208
3406	TPS - 6 Majura – Khatodara	SMC	SMC	MC	41	7509	8728	10452	13464	18005	23956
3501	TPS - 7 Anjana	SMC	SMC	MC	34	1973	2293	2746	3538	5400	7185
3502	TPS - 7 Anjana	SMC	SMC	MC	39	1184	1376	1648	2123	3507	4667
3503	TPS - 7 Anjana	SMC	SMC	MC	27	2368	2752	3295	4245	5677	7553
3504	TPS - 7 Anjana	SMC	SMC	MC	54	11839	13760	16477	21226	28385	37767
3505	TPS - 7 Anjana	SMC	SMC	MC	36	789	917	1098	1415	2561	3408
3506	TPS - 7 Anjana	SMC	SMC	MC	16	7103	8256	9886	12736	17031	22660
3507	TPS - 7 Anjana	SMC	SMC	MC	20	11839	13760	16477	21226	28385	37767
3508	TPS - 7 Anjana	SMC	SMC	МС	26	2368	2752	3295	4245	5677	7553
3601	TPS - 8 Umarwada	SMC	SMC	MC	39	1461	1698	2033	2619	4171	5550
3602	TPS - 8 Umarwada	SMC	SMC	MC	40	17527	20371	24394	31425	26790	35645

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
3603	TPS - 8 Umarwada	SMC	SMC	МС	35	1461	1698	2033	2619	4171	5550
3604	TPS - 8 Umarwada	SMC	SMC	МС	35	6427	7469	8945	11522	15409	20502
3605	TPS - 8 Umarwada	SMC	SMC	МС	21	2337	2716	3253	4190	5603	7455
3606	TPS - 8 Umarwada	SMC	SMC	МС	16	0	0	225	290	1057	1406
3701	TPS - 9 Majura	SMC	SMC	МС	101	6515	7572	9067	11680	16289	21673
3702	TPS - 9 Majura	SMC	SMC	МС	52	2172	2524	3022	3893	5876	7818
3801	Tunki	SMC	SMC	МС	154	25014	29073	34814	44848	59975	79798
3901	Singanpor	SMC	SMC	МС	153	9669	11238	13457	17335	23851	31735
3902	Singanpor	SMC	SMC	МС	43	2417	2809	3364	4334	6465	8601
4001	Dabholi	SMC	SMC	МС	97	1148	1335	1598	2059	3422	4553
4002	Dabholi	SMC	SMC	МС	38	2297	2669	3196	4117	6175	8216
4003	Dabholi	SMC	SMC	МС	24	1914	2224	2664	3431	5258	6995
4004	Dabholi	SMC	SMC	МС	16	2297	2669	3196	4117	5506	7326
4101	Ved	SMC	SMC	МС	77	994	1155	1383	1782	3052	4061
4102	Ved	SMC	SMC	МС	73	442	513	615	792	1728	2299
4103	Ved	SMC	SMC	МС	31	331	385	461	594	1463	1947
4104	Ved	SMC	SMC	МС	33	442	513	615	792	1728	2299
4201	Katargam	SMC	SMC	МС	40	12276	14268	17086	22010	29433	39162
4202	Katargam	SMC	SMC	МС	53	9821	11414	13668	17608	23547	31329
4203	Katargam	SMC	SMC	МС	73	13504	15695	18794	24211	32377	43078
4204	Katargam	SMC	SMC	МС	54	9821	11414	13668	17608	23547	31329
4205	Katargam	SMC	SMC	МС	38	7366	8561	10251	13206	17660	23497

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
4206	Katargam	SMC	SMC	МС	28	4910	5707	6834	8804	11773	15665
4207	Katargam	SMC	SMC	МС	46	8593	9987	11960	15407	20603	27413
4208	Katargam	SMC	SMC	MC	35	9821	11414	13668	17608	23547	31329
4209	Katargam	SMC	SMC	МС	65	3683	4280	5126	6603	9499	12639
4210	Katargam	SMC	SMC	МС	54	6138	7134	8543	11005	14717	19581
4211	Katargam	SMC	SMC	МС	21	2455	2854	3417	4402	5887	7832
4212	Katargam	SMC	SMC	МС	49	8593	9987	11960	15407	20603	27413
4213	Katargam	SMC	SMC	МС	30	3683	4280	5126	6603	8830	11748
4214	Katargam	SMC	SMC	МС	20	2455	2854	3417	4402	5887	7832
4215	Katargam	SMC	SMC	МС	24	3683	4280	5126	6603	8830	11748
4216	Katargam	SMC	SMC	МС	32	4910	5707	6834	8804	11773	15665
4217	Katargam	SMC	SMC	МС	34	6138	7134	8543	11005	14717	19581
4218	Katargam	SMC	SMC	МС	14	3683	4280	5126	6603	8830	11748
4219	Katargam	SMC	SMC	МС	19	1228	1427	1709	2201	3612	4806
4301	Fulpada	SMC	SMC	МС	74	24298	28241	33818	43565	58258	77514
4302	Fulpada	SMC	SMC	МС	52	20248	23534	28182	36304	35930	47806
4303	Fulpada	SMC	SMC	МС	55	14579	16944	20291	26139	34955	46508
4304	Fulpada	SMC	SMC	МС	41	12149	14120	16909	21782	29129	38757
4305	Fulpada	SMC	SMC	МС	44	5670	6589	7891	10165	13594	18087
4306	Fulpada	SMC	SMC	МС	30	4050	4707	5636	7261	9710	12919
4401	Kapadra	SMC	SMC	МС	68	16747	19465	23309	30027	40154	53426
4402	Kapadra	SMC	SMC	МС	47	3349	3893	4662	6005	8700	11575

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
4403	Kapadra	SMC	SMC	MC	47	7815	9083	10877	14012	18738	24932
4501	Nanavarachha	SMC	SMC	MC	79	9932	11543	13823	17807	23813	31684
4502	Nanavarachha	SMC	SMC	MC	67	2554	2968	3555	4579	6792	9037
4503	Nanavarachha	SMC	SMC	MC	54	7946	9235	11059	14246	19051	25347
4504	Nanavarachha	SMC	SMC	MC	59	7946	9235	11059	14246	19051	25347
4601	Karanj	SMC	SMC	MC	44	13920	16179	19374	24958	33375	44407
4602	Karanj	SMC	SMC	MC	34	10827	12583	15069	19412	25959	34539
4603	Karanj	SMC	SMC	MC	48	13147	15280	18298	23571	31521	41940
4604	Karanj	SMC	SMC	МС	18	4640	5393	6458	8319	11125	14802
4605	Karanj	SMC	SMC	МС	36	19333	22470	26908	34664	46355	61676
4606	Karanj	SMC	SMC	MC	28	15467	17976	21527	27731	37084	49341
4701	Umarwada (Part)	SMC	SMC	MC	36	142	165	198	255	1009	1343
4801	Magob (Part)	SMC	SMC	MC	22	1098	1276	1527	1968	3300	4391
4802	Magob (Part)	SMC	SMC	МС	28	12073	14031	16802	21645	28946	38513
4803	Magob (Part)	SMC	SMC	МС	20	8780	10205	12220	15742	21051	28009
4901	Dumbhal	SMC	SMC	MC	72	10293	11963	14326	18455	24679	32836
4902	Dumbhal	SMC	SMC	MC	31	3088	3589	4298	5536	7404	9851
4903	Dumbhal	SMC	SMC	MC	29	4117	4785	5730	7382	9872	13134
4904	Dumbhal	SMC	SMC	MC	28	2059	2393	2865	3691	5605	7457
4905	Dumbhal	SMC	SMC	MC	30	1029	1196	1433	1845	3137	4174
5001	Anjana (Part)	SMC	SMC	MC	9	2343	2723	3261	4201	5618	7474
5101	Limbayat	SMC	SMC	MC	70	24523	28502	34131	43968	58797	78231

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
5102	Limbayat	SMC	SMC	MC	68	15605	18138	21720	27980	37416	49783
5103	Limbayat	SMC	SMC	MC	15	4459	5182	6206	7994	10690	14224
5201	Dindoli (Part)	SMC	SMC	MC	88	21541	25036	29980	38621	51647	68717
5202	Dindoli (Part)	SMC	SMC	MC	113	27695	32189	38546	49656	66403	88351
5203	Dindoli (Part)	SMC	SMC	МС	56	12309	14306	17132	22069	29513	39267
5301	Bhedvad	SMC	SMC	MC	66	5150	5986	7168	9234	13017	17320
5302	Bhedvad	SMC	SMC	MC	50	909	1056	1265	1630	2848	3790
5401	Bhestan	SMC	SMC	MC	80	1255	1459	1747	2250	3678	4894
5402	Bhestan	SMC	SMC	МС	77	753	875	1048	1350	2475	3293
5403	Bhestan	SMC	SMC	MC	132	10041	11670	13975	18003	24744	32922
5404	Bhestan	SMC	SMC	MC	51	6276	7294	8734	11252	15047	20020
5405	Bhestan	SMC	SMC	MC	59	1255	1459	1747	2250	3678	4894
5406	Bhestan	SMC	SMC	MC	138	3514	4085	4891	6301	9095	12101
5407	Bhestan	SMC	SMC	МС	253	2008	2334	2795	3601	5484	7297
5501	Pandesara	SMC	SMC	МС	125	29578	34378	41167	53032	70919	94359
5502	Pandesara	SMC	SMC	MC	161	3286	3820	4574	5892	8549	11374
5601	Udhana	SMC	SMC	MC	198	7268	8447	10115	13031	18095	24076
5602	Udhana	SMC	SMC	MC	73	7268	8447	10115	13031	17426	23185
5603	Udhana	SMC	SMC	MC	114	29072	33789	40462	52123	69703	92742
5604	Udhana	SMC	SMC	MC	129	15574	18101	21676	27923	37341	49683
5605	Udhana	SMC	SMC	MC	66	18689	21721	26011	33508	44809	59620
5606	Udhana	SMC	SMC	МС	104	25957	30168	36126	46539	62235	82805

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
5701	Bamroli (Part)	SMC	SMC	MC	144	43226	50239	60161	77501	71796	95526
5702	Bamroli (Part)	SMC	SMC	МС	59	10806	12560	15040	19375	25910	34474
5801	Majura	SMC	SMC	MC	121	1221	1419	1699	2189	3597	4785
5802	Majura	SMC	SMC	MC	26	4884	5677	6798	8757	11710	15581
5901	Bhatar	SMC	SMC	MC	137	8919	10366	12413	15990	22052	29341
5902	Bhatar	SMC	SMC	MC	117	10900	12669	15171	19544	26804	35664
6001	Althan	SMC	SMC	MC	94	7855	9129	10932	14083	19502	25947
6002	Althan	SMC	SMC	MC	66	4937	5738	6872	8852	12507	16640
6003	Althan	SMC	SMC	МС	56	5610	6521	7809	10059	13452	17898
6004	Althan	SMC	SMC	МС	74	4040	4695	5622	7243	10354	13777
6101	Umara	SMC	SMC	MC	84	6307	7330	8777	11307	15790	21009
6102	Umara	SMC	SMC	MC	141	8409	9773	11703	15076	20830	27715
6103	Umara	SMC	SMC	MC	71	3153	3665	4389	5654	8229	10949
6104	Umara	SMC	SMC	МС	28	3153	3665	4389	5654	7560	10059
6201	Piplod	SMC	SMC	MC	72	2189	2544	3047	3925	5917	7873
6202	Piplod	SMC	SMC	MC	48	1564	1817	2176	2803	4418	5878
6203	Piplod	SMC	SMC	MC	84	2502	2908	3482	4485	6667	8871
6301	Jahangirabad	SMC	SMC	MC	221	2148	2497	2990	3852	5820	7744
6302	Jahangirabad	SMC	SMC	MC	73	3223	3746	4485	5778	8396	11171
6303	Jahangirabad	SMC	SMC	MC	90	4297	4994	5980	7704	10971	14597
6304	Jahangirabad	SMC	SMC	MC	61	1074	1249	1495	1926	3245	4317
6401	Jahangirpura	SMC	SMC	MC	240	886	1030	1233	1589	2793	3717

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
6501	Pisad	SMC	SMC	MC	85	1487	1728	2070	2666	4234	5634
6601	Vadod	SMC	SMC	MC	56	72	84	100	129	842	1120
6701	Pal	SMC	SMC	MC	341	2175	2528	3027	3899	5883	7828
6702	Pal	SMC	SMC	MC	111	7249	8426	10090	12998	18051	24017
6703	Pal	SMC	SMC	MC	125	5075	5898	7063	9098	12836	17079
6801	Palanpor	SMC	SMC	MC	149	4852	5640	6754	8700	12303	16370
6802	Palanpor	SMC	SMC	MC	45	3882	4512	5403	6960	9977	13274
6803	Palanpor	SMC	SMC	MC	123	970	1128	1351	1740	2996	3986
6901	Variyav	SMC	SMC	MC	1452	432	502	601	774	1705	2268
6902	Variyav	SMC	SMC	MC	95	1814	2109	2525	3253	5019	6678
6903	Variyav	SMC	SMC	MC	245	173	201	240	310	1083	1441
6904	Variyav	SMC	SMC	MC	96	1901	2209	2645	3408	5226	6953
6905	Variyav	SMC	SMC	MC	109	432	502	601	774	1705	2268
6906	Variyav	SMC	SMC	MC	88	432	502	601	774	1705	2268
6907	Variyav	SMC	SMC	MC	80	3024	3514	4208	5421	7919	10536
6908	Variyav	SMC	SMC	MC	20	432	502	601	774	1705	2268
7001	Chhapara Bhatha	SMC	SMC	MC	104	11777	13688	16391	21115	28237	37569
7002	Chhapara Bhatha	SMC	SMC	MC	77	6870	7984	9561	12317	17140	22806
7003	Chhapara Bhatha	SMC	SMC	MC	18	981	1141	1366	1760	3022	4021
7101	Kosad	SMC	SMC	MC	405	10312	11985	14352	18488	25393	33786
7102	Kosad	SMC	SMC	MC	280	1719	1997	2392	3081	4790	6373
7103	Kosad	SMC	SMC	МС	98	13749	15980	19136	24651	32965	43861

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
7104	Kosad	SMC	SMC	MC	165	6874	7990	9568	12325	17151	22820
7105	Kosad	SMC	SMC	MC	40	1719	1997	2392	3081	4790	6373
7201	Amroli	SMC	SMC	MC	30	12544	14579	17459	22491	21362	28422
7301	Utran	SMC	SMC	MC	213	7971	9264	11093	14291	19780	26317
7302	Utran	SMC	SMC	MC	28	886	1029	1233	1588	2792	3715
7401	Motavarachha	SMC	SMC	MC	521	3404	3957	4738	6104	8831	11750
7402	Motavarachha	SMC	SMC	MC	159	6241	7254	8686	11190	15633	20800
7403	Motavarachha	SMC	SMC	MC	91	2270	2638	3159	4069	6110	8130
7501	Sarthana	SMC	SMC	MC	149	2255	2621	3139	4044	6076	8085
7502	Sarthana	SMC	SMC	MC	116	4510	5242	6278	8087	11484	15279
7503	Sarthana	SMC	SMC	MC	55	2255	2621	3139	4044	6076	8085
7601	Simada	SMC	SMC	MC	125	452	525	629	810	1752	2331
7602	Simada	SMC	SMC	MC	68	3161	3674	4400	5668	8248	10975
7603	Simada	SMC	SMC	MC	40	3613	4199	5028	6477	8662	11525
7604	Simada	SMC	SMC	MC	57	1806	2099	2514	3239	5000	6653
7701	Puna	SMC	SMC	MC	70	10395	12081	14467	18637	24923	33160
7702	Puna	SMC	SMC	MC	168	5197	6041	7234	9319	13130	17470
7703	Puna	SMC	SMC	MC	35	6497	7551	9042	11648	15577	20725
7704	Puna	SMC	SMC	MC	54	10395	12081	14467	18637	24923	33160
7705	Puna	SMC	SMC	MC	83	7796	9061	10850	13978	18692	24870
7706	Puna	SMC	SMC	MC	78	12993	15102	18084	23296	31154	41451
7707	Puna	SMC	SMC	МС	71	10395	12081	14467	18637	24923	33160

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
7708	Puna	SMC	SMC	MC	45	3898	4531	5425	6989	9346	12435
7709	Puna	SMC	SMC	MC	47	6497	7551	9042	11648	15577	20725
7710	Puna	SMC	SMC	MC	50	7796	9061	10850	13978	18692	24870
7711	Puna	SMC	SMC	MC	26	3898	4531	5425	6989	9346	12435
7712	Puna	SMC	SMC	MC	24	5197	6041	7234	9319	12461	16580
7713	Puna	SMC	SMC	MC	48	38980	45305	54252	69889	93461	124352
7801	Magob (Part)	SMC	SMC	MC	38	1448	1683	2016	2597	4142	5511
7802	Magob (Part)	SMC	SMC	MC	48	1086	1263	1512	1948	3274	4356
7803	Magob (Part)	SMC	SMC	МС	21	362	421	504	649	1537	2045
7804	Magob (Part)	SMC	SMC	МС	28	2173	2525	3024	3895	5878	7821
7805	Magob (Part)	SMC	SMC	MC	23	579	673	806	1039	2058	2738
7806	Magob (Part)	SMC	SMC	MC	22	1593	1852	2217	2857	4489	5973
7901	Parvat	SMC	SMC	MC	60	10285	11954	14315	18441	24660	32811
7902	Parvat	SMC	SMC	МС	108	3857	4483	5368	6915	9917	13194
7903	Parvat	SMC	SMC	MC	18	2571	2989	3579	4610	6165	8203
7904	Parvat	SMC	SMC	MC	46	9000	10460	12525	16136	21578	28710
8001	Godadara	SMC	SMC	MC	156	21493	24981	29914	38536	51533	68566
8002	Godadara	SMC	SMC	MC	29	4776	5551	6648	8564	11452	15237
8003	Godadara	SMC	SMC	MC	68	9553	11103	13295	17127	22904	30474
8004	Godadara	SMC	SMC	MC	68	11941	13878	16619	21409	28630	38092
8101	Dindoli (Part)	SMC	SMC	MC	134	2882	3349	4011	5166	7578	10083
8102	Dindoli (Part)	SMC	SMC	МС	214	2882	3349	4011	5166	7578	10083

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
8103	Dindoli (Part)	SMC	SMC	MC	40	5763	6698	8021	10333	13818	18385
8104	Dindoli (Part)	SMC	SMC	MC	80	8645	10047	12032	15499	20727	27578
8105	Dindoli (Part)	SMC	SMC	MC	63	8645	10047	12032	15499	20727	27578
8201	Unn	SMC	SMC	MC	195	15134	17589	21063	27134	36954	49168
8202	Unn	SMC	SMC	MC	93	9585	11140	13340	17185	22981	30576
8203	Unn	SMC	SMC	MC	73	504	586	702	904	1879	2499
8301	Sonari	SMC	SMC	MC	138	2402	2792	3343	4307	6428	8553
8401	Gabheni	SMC	SMC	MC	1749	2628	3055	3658	4712	6302	8384
8402	Gabheni	SMC	SMC	MC	58	6833	7942	9511	12252	16384	21799
8403	Gabheni	SMC	SMC	MC	246	1051	1222	1463	1885	3190	4244
8501	Budiya	SMC	SMC	MC	149	95	111	133	171	898	1194
8502	Budiya	SMC	SMC	MC	84	95	111	133	171	898	1194
8503	Budiya	SMC	SMC	MC	270	763	887	1062	1368	2499	3324
8601	Jiyav	SMC	SMC	MC	225	0	90	108	139	186	247
8602	Jiyav	SMC	SMC	MC	235	515	598	716	923	1903	2532
8603	Jiyav	SMC	SMC	MC	165	1544	1795	2149	2769	4372	5817
8701	Vadod(Part)	SMC	SMC	MC	208	4207	4889	5855	7542	10086	13420
8702	Vadod(Part)	SMC	SMC	MC	57	7011	8149	9758	12571	16811	22367
8703	Vadod(Part)	SMC	SMC	MC	104	7011	8149	9758	12571	16811	22367
8704	Vadod(Part)	SMC	SMC	MC	60	9816	11408	13662	17599	23535	31313
8801	Bamroli (Part)	SMC	SMC	MC	144	22726	26414	31630	40746	54489	72499
8802	Bamroli (Part)	SMC	SMC	МС	114	0	0	75	97	129	172

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
8803	Bamroli (Part)	SMC	SMC	MC	118	6993	8127	9732	12537	17435	23197
8804	Bamroli (Part)	SMC	SMC	MC	39	3496	4064	4866	6269	9052	12044
8805	Bamroli (Part)	SMC	SMC	MC	121	1748	2032	2433	3134	4860	6467
8901	Bhimrad	SMC	SMC	MC	213	1193	1387	1660	2139	3529	4696
9001	Bharthana – Vesu	SMC	SMC	MC	124	1495	1738	2081	2681	4254	5660
9002	Bharthana – Vesu	SMC	SMC	MC	85	641	745	892	1149	2205	2934
9101	Sarsana	SMC	SMC	MC	277	398	463	554	714	1623	2160
9201	Khajod	SMC	SMC	MC	1368	678	788	944	1216	2295	3053
9301	Abhava	SMC	SMC	MC	2137	1287	1496	1791	2308	3755	4996
9401	Vesu	SMC	SMC	MC	86	2538	2950	3533	4551	6755	8987
9402	Vesu	SMC	SMC	MC	128	1523	1770	2120	2731	4320	5748
9403	Vesu	SMC	SMC	MC	209	1523	1770	2120	2731	4320	5748
9404	Vesu	SMC	SMC	MC	148	3554	4130	4946	6371	9189	12226
9405	Vesu	SMC	SMC	MC	385	1015	1180	1413	1820	3103	4129
9501	Rundh	SMC	SMC	MC	105	1093	1270	1521	1960	3290	4377
9502	Rundh	SMC	SMC	MC	86	729	847	1014	1307	2416	3215
9601	Magdalla	SMC	SMC	MC	66	1164	1353	1620	2087	3460	4604
9602	Magdalla	SMC	SMC	MC	39	466	541	648	835	1785	2376
9603	Magdalla	SMC	SMC	МС	149	698	812	972	1252	2344	3118
9701	Gaviyar	SMC	SMC	MC	130	150	174	208	269	359	478
9702	Gaviyar	SMC	SMC	MC	277	1348	1567	1876	2417	3901	5191
9801	Vanta	SMC	SMC	MC	83	56	66	79	101	135	180

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
9802	Vanta	SMC	SMC	МС	33	19	22	26	34	45	60
9803	Vanta	SMC	SMC	МС	36	19	22	26	34	45	60
9901	Dumas	SMC	SMC	МС	1324	2892	3361	4025	5185	7603	10116
10001	Sultanabad	SMC	SMC	МС	568	1459	1696	2031	2616	4167	5545
10101	Bhimpor	SMC	SMC	МС	825	2695	3132	3751	4832	7131	9487
11001	Sarol	SUDA	Olpad	Village	188	172	200	259	346	519	691
11002	Balkas	SUDA	Olpad	Village	515	447	519	673	899	1349	1795
11003	Talad	SUDA	Olpad	Village	167	246	286	370	495	743	988
11004	Vadod	SUDA	Olpad	Village	384	186	216	280	374	562	747
11005	Kosam	SUDA	Olpad	Village	419	747	867	1125	1502	2255	3001
11006	Sherdi (suda)	SUDA	Olpad	Village	180	695	807	1046	1397	2098	2792
11007	Kanad	SUDA	Olpad	Village	417	224	260	337	450	676	900
11008	Jothan	SUDA	Olpad	Village	351	330	383	497	663	996	1326
11009	Saroli (Olpad)	SUDA	Olpad	Village	388	1006	1168	1515	2022	3037	4041
11010	Sonsak	SUDA	Olpad	Village	303	507	589	763	1019	1531	2036
11011	Ambheta	SUDA	Olpad	Village	714	920	1068	1385	1849	2777	3695
11012	Ariyana	SUDA	Olpad	Village	296	711	825	1070	1429	2146	2856
11013	Kunkni	SUDA	Olpad	Village	239	321	373	483	645	969	1289
11014	Chichi	SUDA	Chorasi	Village	184	0	62	80	107	161	215
11015	Vanakala	SUDA	Chorasi	Village	351	86	100	129	173	260	345
11016	Vihel	SUDA	Chorasi	Village	127	0	50	65	87	130	173
11017	Okha	SUDA	Chorasi	Village	309	25	29	38	263	395	526

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11018	Segwachhama	SUDA	Olpad	Village	510	557	647	839	1120	1682	2237
11019	Malgama	SUDA	Chorasi	Village	288	411	477	619	826	1241	1651
11020	Bhesan	SUDA	Chorasi	Village	583	990	1149	1490	1990	2989	3977
11021	Asarma	SUDA	Chorasi	Village	211	0	85	110	147	221	294
11022	Ichchhapor	SUDA	Chorasi	Muncipality	478	2647	3073	3985	5534	9512	12656
11023	Ichchhapor	SUDA	Chorasi	Census Town	507	2648	3074	3987	5536	9515	12660
11024	Bhatha	SUDA	Chorasi	Out Growth	833	2369	2750	3567	4762	7152	9516
11025	Bhatpor	SUDA	Chorasi	Out Growth	754	1520	1765	2288	3055	4589	6105
11026	Kavas	SUDA	Chorasi	Out Growth	725	3212	3729	4836	6457	9697	12902
11027	Segwasyadla	SUDA	Olpad	Village	303	419	486	631	842	1265	1683
11028	Vaswari	SUDA	Olpad	Village	404	398	462	599	800	1202	1599
11029	Gothan	SUDA	Olpad	Village	718	1357	1575	2043	2728	4097	5451
11030	Bharthana Kosad	SUDA	Chorasi	Census Town	439	2078	2412	3128	4177	6273	8347
11031	Abrama	SUDA	Kamrej	Village	978	1330	1544	2002	2887	5536	7366
11032	Kholvad	SUDA	Kamrej	Village	781	5682	6597	8554	11422	17154	22823
11033	Bhada	SUDA	Kamrej	Village	380	657	763	989	1321	1983	2639
11034	Valak	SUDA	Kamrej	Village	258	790	917	1189	1801	3906	5197
11035	Laskana	SUDA	Kamrej	Village	394	7569	8787	11395	12415	11379	15140
11036	Navagam	SUDA	Kamrej	Village	388	3745	4348	5638	7528	11306	15043
11037	Vav	SUDA	Kamrej	Village	1343	2707	3143	4075	5442	8172	10873

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11038	Pasodara	SUDA	Kamrej	Village	347	393	456	592	1003	2707	3602
11039	Khadsad	SUDA	Kamrej	Village	294	557	647	839	1333	3202	4261
11040	Kathodara	SUDA	Kamrej	Village	549	1121	1301	1688	2253	3384	4503
11041	Kosamadi	SUDA	Kamrej	Village	419	528	613	795	1061	1594	2121
11042	Valthan	SUDA	Kamrej	Village	247	534	620	804	1073	1612	2145
11043	Ladvi	SUDA	Kamrej	Village	408	487	565	733	979	1470	1956
11044	Oviyan	SUDA	Kamrej	Village	377	293	340	441	589	885	1177
11045	Kosmada	SUDA	Kamrej	Village	753	852	989	1283	1926	4093	5446
11046	Saniya Hemad	SUDA	Chorasi	Village	347	1960	2275	2951	3940	5917	7873
11047	Saroli (Choryasi)	SUDA	Chorasi	Village	208	1440	1672	2168	2895	4347	5784
11048	Kumbharia	SUDA	Chorasi	Village	290	2456	2851	3698	4937	7414	9865
11049	Vedchha	SUDA	Chorasi	Village	263	283	329	426	782	2375	3160
11050	Chhedchha	SUDA	Kamrej	Village	188	164	190	247	543	2016	2682
11051	Sabargam	SUDA	Chorasi	Village	72	85	99	128	384	1777	2365
11052	Antroli	SUDA	Palsana	Village	496	749	870	1128	1506	2261	3009
11053	Vareli	SUDA	Palsana	Village	291	3382	3926	5092	6798	10210	13585
11054	Haripura	SUDA	Palsana	Village	144	605	702	911	1216	1826	2430
11055	Umbhel	SUDA	Kamrej	Village	708	2395	2781	3606	4814	7230	9620
11056	Kadodara	SUDA	Palsana	Census Town	353	10486	12174	15786	21078	31656	42119
11057	Kadodara	SUDA	Palsana	Census Town	84	2262	2626	3406	4548	6830	9087

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11058	Vankaneda	SUDA	Palsana	Village	266	1255	1323	1715	2290	3439	4576
11059	Vankaneda	SUDA	Palsana	Village	28	88	102	133	177	267	355
11060	Chalthan	SUDA	Palsana	Census Town	31	522	606	786	1050	1576	2097
11061	Chalthan	SUDA	Palsana	Census Town	337	8131	9440	12241	16345	24547	32660
11062	Karala	SUDA	Palsana	Village	145	696	808	1048	1399	2101	2796
11063	Niyol	SUDA	Palsana	Village	559	768	892	1156	1757	3839	5108
11064	Devadh	SUDA	Chorasi	Village	384	414	981	1272	1698	2345	3121
11065	Dakhkhanvada	SUDA	Chorasi	Village	148	129	150	194	259	358	477
11066	sedhav	SUDA	Palsana	Village	142	317	368	477	850	2478	3297
11067	Deladva	SUDA	Chorasi	Village	652	580	673	873	1379	3272	4353
11068	Mohni	SUDA	Chorasi	Village	458	633	735	953	1485	3432	4566
11069	Kharbhasi	SUDA	Palsana	Village	278	366	425	551	736	1105	1470
11070	Talodara	SUDA	Palsana	Village	174	216	251	325	434	652	868
11071	Karan	SUDA	Palsana	Village	263	482	560	726	969	1455	1936
11072	Tantizaghda	SUDA	Palsana	Village	230	274	318	413	551	827	1101
11073	Erthan	SUDA	Palsana	Village	430	743	482	625	835	1253	1668
11074	Timbarva(s)	SUDA	Chorasi	Village	357	310	360	467	623	936	1245
11075	Goja	SUDA	Chorasi	Village	204	173	201	260	348	522	695
11076	Khambhasla	SUDA	Chorasi	Village	167	188	218	283	591	2088	2779
11077	Saniya Kanade	SUDA	Chorasi	Village	286	790	917	1189	1801	3906	5197

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11078	Karadva	SUDA	Chorasi	Village	238	493	572	742	991	1488	1980
11079	Eklera	SUDA	Chorasi	Village	213	322	374	485	647	2173	2891
11080	Kharvasa	SUDA	Chorasi	Village	661	561	651	845	1341	3215	4277
11081	Bonand	SUDA	Chorasi	Village	520	627	728	944	1260	1893	2518
11082	Vadadala	SUDA	Palsana	Village	326	541	628	814	1088	1633	2173
11083	Ravla Alias Vaktana	SUDA	Chorasi	Village	413	519	603	781	1043	1567	2085
11084	Vanz	SUDA	Chorasi	Village	407	1125	1306	1693	2474	4916	6541
11085	Bhanodra	SUDA	Chorasi	Village	297	439	510	661	1095	2846	3787
11086	Pardi Kanade	SUDA	Chorasi	Census Town	142	4242	4925	6386	6927	4656	6195
11087	Sachin,INA	SUDA	Chorasi	INA	653	1495	1081	1402	1388	1261	1678
11088	Sachin	SUDA	Chorasi	Census Town	275	14171	16452	21335	28486	42781	56921
11089	Umber	SUDA	Chorasi	Village	844	604	701	909	1214	1823	2426
11090	Pali	SUDA	Chorasi	Village	182	669	777	1007	1558	3541	4711
11091	Kansad	SUDA	Chorasi	Muncipality	709	11355	13183	17095	22826	34280	45610
11092	Lajpor	SUDA	Chorasi	Village	730	2912	3381	4384	5854	8791	11697
11093	Vanz	SUDA	Chorasi	Village	362	77	90	116	368	1754	2334
11094	Bhatia	SUDA	Chorasi	Village	497	504	585	759	1013	1522	2024
11095	Lingad	SUDA	Palsana	Village	389	821	953	1236	1650	2479	3298
11096	Taraj	SUDA	Palsana	Village	362	785	911	1182	1578	2370	3153
11097	Samrod	SUDA	Chorasi	Village	210	427	496	643	858	1289	1715

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11098	Kachholi	SUDA	Chorasi	Village	460	949	1102	1429	1908	2865	3812
11099	Kapletha	SUDA	Chorasi	Village	310	1480	1718	2228	2975	4468	5945
11100	Popda	SUDA	Chorasi	Village	271	490	569	738	985	1479	1968
11101	Talangpor	SUDA	Chorasi	Out Growth	193	7373	8533	11065	14774	22188	29522
11102	Hajira	SUDA	Chorasi	Village	2292	12137	14591	18921	25263	30791	40968
11103	Sunvali	SUDA	Chorasi	Village	1434	2003	2325	3016	4026	6047	8046
11104	Mora	SUDA	Chorasi	Village	2218	10151	11785	15282	20105	24504	32603
11105	Limla (CT)	SUDA	Chorasi	Village	598	1255	1457	1889	2523	3789	5041
11106	Rajgari	SUDA	Chorasi	Village	409	642	745	967	1291	1938	2579
11107	Bhatlai	SUDA	Chorasi	Village	233	2357	2736	3548	4738	7116	9467
11108	Damka	SUDA	Chorasi	Village	1486	2273	2639	3422	4569	6862	9130
11109	Vansva	SUDA	Chorasi	Village	516	918	1066	1382	1845	2771	3687
11110	Barbodhan	SUDA	Olpad	Village	1397	1607	1866	2419	3230	4851	6455
11111	Sithana	SUDA	Olpad	Village	156	121	140	182	243	296	394
11112	Dihen	SUDA	Olpad	Village	1270	1398	1623	2105	2810	4220	5615
11113	Tena	SUDA	Olpad	Village	728	765	888	1152	1538	2309	3073
11114	Pinjrat	Outside	Olpad	Village	3306	2609	3029	3928	5245	7876	10480
11115	Bhandut	Outside	Olpad	Village	e 584 689		800	1037	1385	2080	2768
11116	Selut	Outside	Olpad	Village	403	525	610	790	1055	1585	2109
11117	Narthan	Outside	Olpad	Village	575	621	721	935	1248	1875	2494
11118	Veluk	Outside	Olpad Village 479 617		716	929	1240	1863	2478		
11119	Kasala Khurd	Outside	Olpad	Village	148	411	477	619	680	829	1103

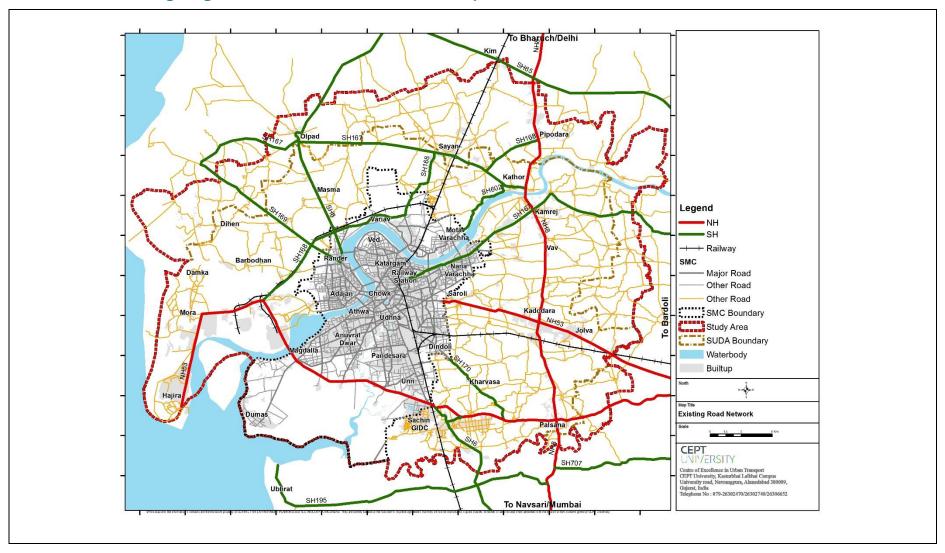
TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11120	Kachhol	Outside	Olpad	Village	281	183	212	276	368	552	735
11121	Kasla Bujrang	Outside	Olpad	Village	181	216	251	325	434	652	868
11122	Orma	Outside	Olpad	Village	651	424	492	638	852	1280	1703
11123	Masma	SUDA	Olpad	Village	993	1426	1656	2147	2867	4305	5728
11124	Jafrabad	Outside	Olpad	Village	226	280	325	422	563	686	913
11125	Asnabad	SUDA	Olpad	Village	211	343	398	516	689	1035	1378
11126	Olpad	Outside	Olpad	Village	1628	6616	7681	9960	13512	21494	28598
11127	Isanpor	SUDA	Olpad	Village	343	562	652	846	1130	1697	2257
11128	Karamla	Karamla SUDA Olpad Village 571 343		398	516	689	1035	1378			
11129	Atodra	Outside	Olpad	Village	693	627	728	944	1260	1893	2518
11130	Andhi	dhi Outside Olpad Village 462 295		342	444	593	891	1185			
11131	Gola	Outside	Olpad	Village	415	401	466	604	806	1211	1611
11132	Morthan	Outside	Olpad	Village	588	546	634	822	1098	1648	2193
11133	Achharan	Outside	Olpad	Village	418	569	661	857	1364	1673	2227
11134	Sandhiyer	SUDA	Olpad	Village	1359	1355	1573	2040	2724	4091	5443
11135	Paria	SUDA	Olpad	Village	912	1218	1414	1834	2448	3677	4892
11136	Madhar	Outside	Olpad	Village	292	214	248	322	430	646	860
11137	Khalipor	Outside	Olpad	Village	169	201	233	303	404	607	807
11138	Sithan	Outside	Olpad	Village	303 604		701	909	1214	1823	2426
11139	Kanthraj	Outside	Olpad	Village 256 377		377	438	568	758	1138	1514
11140	Obhla	Outside	Olpad	Village	384	213	247	321	428	643	856
11141	Bharundi	Outside	Olpad	Village	547	605	702	911	1216	1826	2430

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11142	Siwan	Outside	Olpad	Village	562	870	1010	1310	1749	2626	3495
11143	Delad	SUDA	Olpad	Village	283	1644	1909	2475	3305	4963	6604
11144	Sayan (CT)	Outside	Olpad	Village	690	6325	7343	9522	12714	19095	25406
11145	Umra	SUDA	Olpad	Village	417	1110	1289	1671	2231	3351	4459
11146	Kathor	SUDA	Kamrej	Village	1092	4972	5772	7485	9995	15010	19971
11147	Velanja	SUDA	Kamrej	Village	612	1174	1363	1767	2360	3544	4716
11148	Shekhpur	Outside	Kamrej	Village	553	651	756	980	1309	1965	2615
11149	Kareli	Outside	Olpad	Village	786	533	619	802	1071	1609	2141
11150	Syadla	Outside	Olpad	Village	508	753	874	1134	1514	2273	3025
11151	Kudsad	Outside	Olpad	Village	1702	4411	5121	6641	8867	13316	17718
11152	Ghaludi	Outside	Kamrej	Village	389	401	466	604	806	1211	1611
11153	Antroli	Outside	Kamrej	Village	406	490	569	738	985	1479	1968
11154	Tharoli	Outside	Kamrej	Village	290	63	73	95	127	190	253
11155	Kanyasi	Outside	Olpad	Village	420	720	836	1084	1447	2174	2892
11156	Pipodara	Outside	Mangrol	Village	822	3305	3837	4976	6644	9978	13275
11157	Navi Paradi	Outside	Kamrej	Village	764	2049	2379	3085	4119	6186	8230
11158	Dhoran Paradi	Outside	Kamrej	Village	181	579	672	872	1164	1748	2326
11159	Choryasi	SUDA	Kamrej	Village 219 398		398	462	599	800	1202	1599
11160	Amboli	SUDA Kamrej Village 342 2382		2382	2765	3586	4788	7191	9568		
11161	Bhairav	SUDA	Kamrej	Village	360	467	542	703	939	1410	1876
11162	Dhoran Paradi	Outside	Kamrej	Village	658 145		168	218	291	438	582
11163	Akhakhol	Outside	Kamrej	Village	293	185	215	279	372	559	743

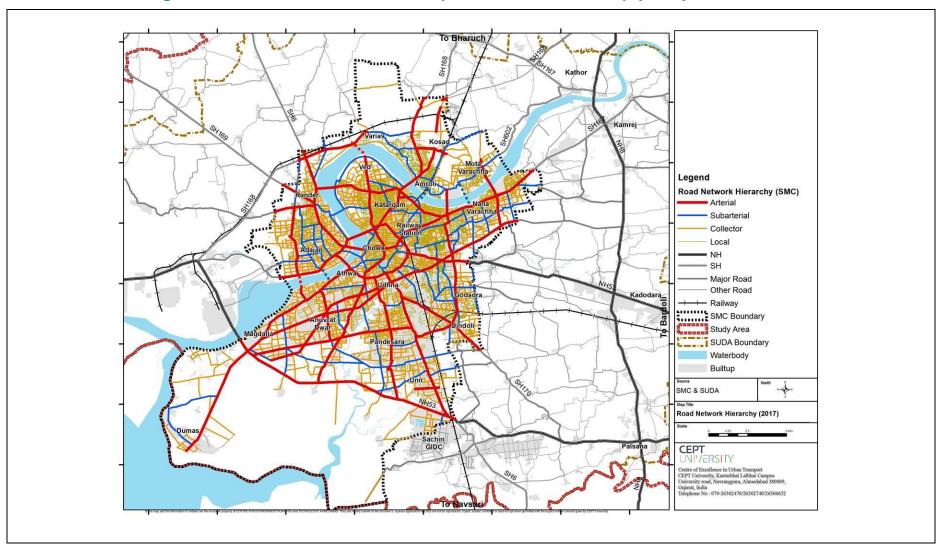
TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11164	Karjan	Outside	Kamrej	Village	1210	1240	1440	1867	2493	3743	4981
11165	Ghala	Outside	Kamrej	Village	2141	1824	2118	2746	3667	5507	7327
11166	Dhatva	Outside	Kamrej	Village	371	549	637	827	1104	1657	2205
11167	Jior	Outside	Kamrej	Village	182	97	113	146	195	293	390
11168	Dungra	SUDA	Kamrej	Village	690	1437	1668	2163	2889	4338	5772
11169	Kholeshwar	SUDA	Kamrej	Village	435	664	771	1000	1335	2005	2667
11170	Kamrej	SUDA	Kamrej	Village	1151	6128	7114	9226	12531	20021	26638
11171	Delod	SUDA	Kamrej	Village	241	793	921	1194	1594	2394	3185
11172	Nansad	SUDA	Kamrej	Village	227	755	877	1137	1518	2279	3033
11173	Koli Bharthana	SUDA	Kamrej	Village	654	972	1128	1463	1954	2934	3904
11174	Netrang	Outside	Kamrej	Village	360	611	709	920	1228	1845	2454
11175	Jat Bharthana	Outside	Kamrej	Village	131	321	373	483	645	969	1289
11176	Dharutha	Outside	Kamrej	Village	202	245	284	369	492	740	984
11177	Jokha	SUDA	Kamrej	Village	651	994	1154	1496	1998	3001	3993
11178	Simadi	SUDA	Kamrej	Village	306	434	504	653	872	1310	1743
11179	Morthana	SUDA	Kamrej	Village	654	598	694	900	1202	1805	2402
11180	Segva	Outside	Kamrej	Village	655	508	590	765	1021	1534	2041
11181	Asta	Outside	Kamrej	Village	373 706		820	1063	1419	2131	2836
11182	Vansdarundhi	Outside	Kamrej	Village	116	288	334	434	579	869	1157
11183	Pali	Outside	Kamrej	Village	413	669	777	1007	1345	2020	2687
11184	Alura	Outside	Kamrej	Village	256 337		391	507	677	1017	1354
11185	Valan	Outside	Kamrej	Village	352	521	605	784	1047	1573	2093

TAZ Number	Name	Boundary	Taluka	Census Level	Area (Ha)	2011	2016	2021	2026	2036	2046
11186	Mankna	SUDA	Kamrej	Village	358	632	734	951	1270	1908	2539
11187	Parab	Outside	Kamrej	Village	506	834	968	1256	1676	2518	3350
11188	Jolva	SUDA	Palsana	Village	624	955	1109	1438	1920	2883	3836
11189	Haldharu	Outside	Kamrej	Village	697	1307	1517	1968	2627	3946	5250
11190	Dastan	SUDA	Palsana	Village	719	1049	1218	1579	2109	3167	4214
11191	Bagumara	SUDA	Palsana	Village	944	1757	2040	2645	3532	5304	7057
11192	Tantithaiya	SUDA	Palsana	Village	403	1965	2281	2958	3950	4814	6406
11193	Sanki	SUDA	Palsana	Village	600	519	603	781	1043	1567	2085
11194	4 Baleshvar SUDA		Palsana	Village	723	3063	3556	4611	6157	9247	12303
11195	Isroli	SUDA	Palsana	Village	64	473	549	712	951	1428	1900
11196	Bhutpor	Outside	Palsana	Village	603	249	289	375	501	752	1000
11197	Tundi	Outside	Palsana	Village	804	1209	1404	1820	2430	3650	4856
11198	Ghaluda	Outside	Palsana	Village	163	234	272	352	470	706	940
11199	Kanav	Outside	Palsana	Village	497	810	940	1219	1628	2445	3254
11200	Palsana	SUDA	Palsana	Village	711	5846	6787	8801	11752	17649	23482
11201	Makhinga	Outside	Palsana	Village	442	465	540	700	935	1404	1868
11202	Intalva	SUDA	Palsana	Village	285	652	757	982	1311	1968	2619
Total	Total					2078093	2414912	2924554	3787550	5158876	6864000

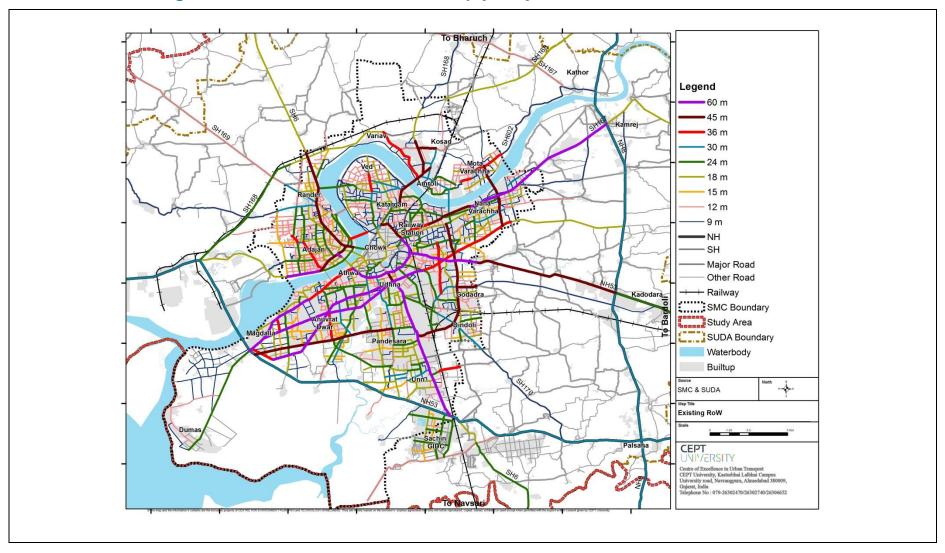
Annexure 8: Existing Regional Road Network within Study Area



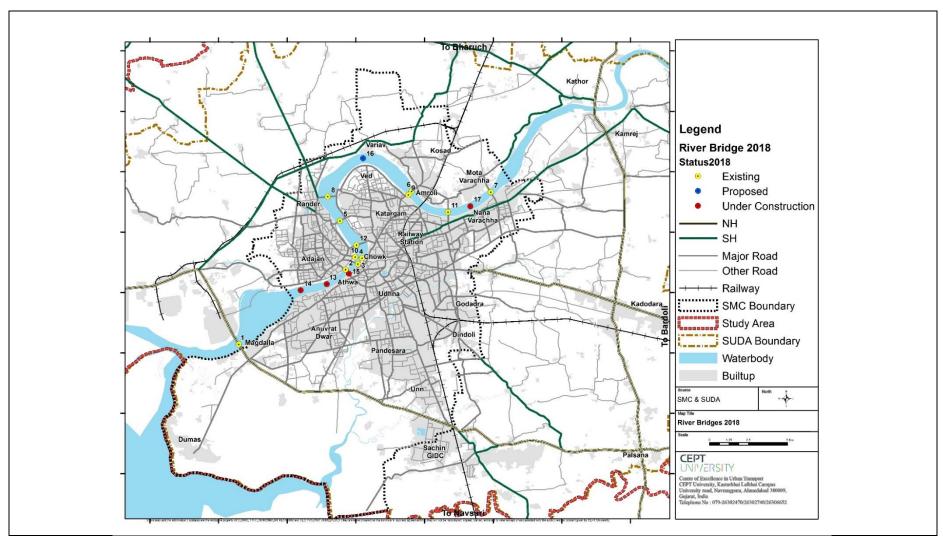
Annexure 9: Existing Refined Road Network Hierarchy within SMC Boundary (2017)



Annexure 10: Existing Road Widths within SMC Boundary (2017)

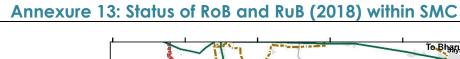


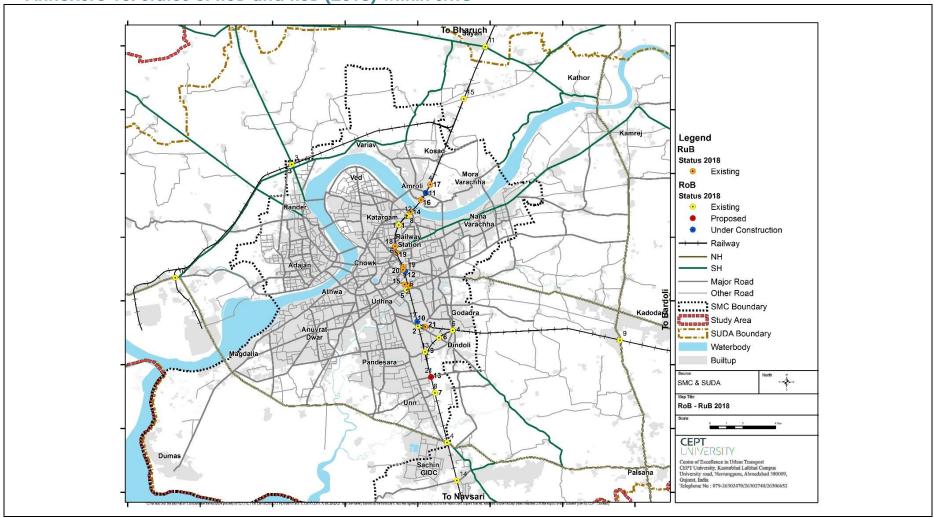
Annexure 11: Status of River Bridges (2018) within SMC



Annexure 12: Details of River Bridges in Year 2007 and 2018 (SMC)

Code	Name	Status in year 2007	Status in 2018
1	Magdalla Bridge	Existing	Existing
2	Sardar Vallabhbhai Patel Bridge	Existing	Existing
3	Swami Vivekanand Bridge	Existing	Existing
4	Nehru Bridge	Existing	Existing
5	Singanpore Weir-cum-Causeway	Existing	Existing
6	Amroli Bridge	Existing	Existing
7	Savjibhai Korat bridge	Existing	Existing
8	Dabholi - Jahangirpura Bridge	Under Construction	Existing
9	Amroli New High Level Bridge	Under Construction	Existing
10	Hope Bridge	Proposed	Existing
11	Utran - Kapodara Bridge	Proposed	Existing
12	Dhastipura-Jilani complex (Shri Chandra Sekhar Azad bridge)	Proposed	Existing
13	Pandit Dindayal Upadhyay Cable Stay Bridge, Athwa-Adajan	Proposed	Under Construction
14	Pal - Umra Bridge	Proposed	Under Construction
15	Sardar Vallabhbhai Patel Bridge	-	Under Construction
16	Varachha Water Works to Utran power house	Proposed	Under Construction
17	Ved-Variyav	Proposed	Proposed

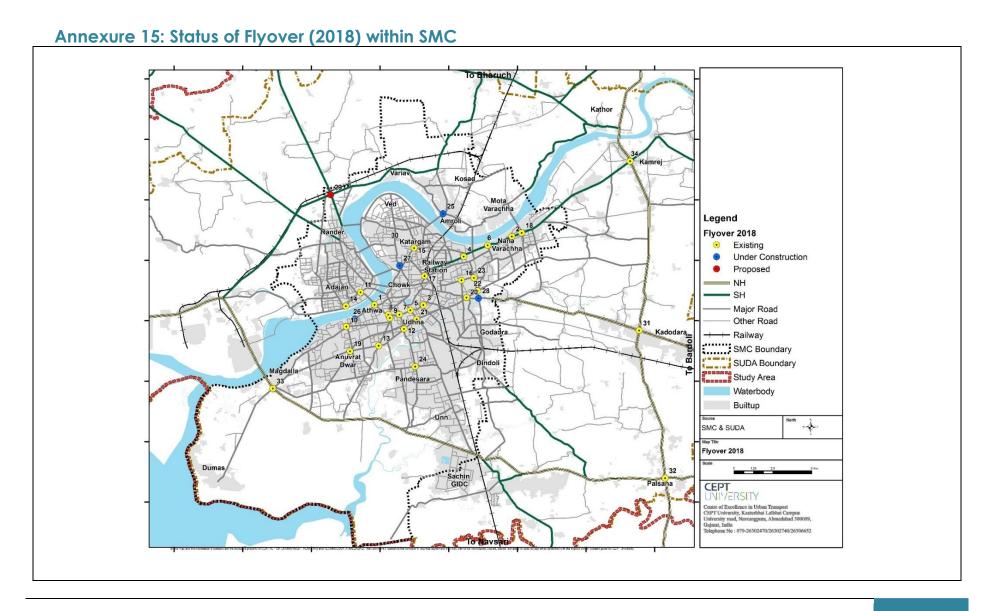




Annexure 14: Details of RoB and RuB in Year 2007 and 2018(SMC)

Code	Туре	Name	Status in year 2007	Status in year 2018						
Rail Ove	Rail Over Bridges (RoB)									
1	RoB	Sumul Dairy, RC 146	Existing	Existing						
2	RoB	Dindoli Railway Quarter no 436	Existing	Existing						
3	RoB	Jahangirpura RoB on Olpad Road	Existing	Existing (Proposed to be redeveloped)						
4	RoB	Sachin RoB	Existing	Existing						
5	RoB	Maharana Pratap	Proposed	Existing						
6	RoB	Anjana farmRailway Galanala no 440-A	Proposed	Existing						
7	RoB	Dindoli Jakatnaka	-	Existing						
8	RoB	Mumbai Surat nr Bhestan railway	-	Existing						
9	RoB	ROB Near Kadodara on NH8	-	Existing						
10	RoB	ONGC Circle ROB on NH53	-	Existing						
11	RoB	ROB Near Sayan on SH168	-	Existing						
12	RoB	Varachha Katargam Uttkal nagar	-	Existing						
13	RoB	Udhana - Bhestan ROB nr. Pramukh Park	Propose <mark>d</mark>	Existing						
14	RoB	Sachin Railway crossing	-	Existing						
15	RoB	RoB Near Gothan	-	Existing						
16	RoB	Construction of Railway Over Bridge at Udhana Yard on Bhusaval line Nr.Saibaba mandir,Limbayat area	-	Existing						
17	RoB	Limbayat-Udhana nr. railway garanala no 437	-	Under Construction						
18	RoB	Amroli Utran ROB Manisha Garnala	-	Under Construction						
19	RoB	RoB Ringroad Sahara Darwaja fly over bridge to Karanimata Chowk	-	Under Construction						

20	RoB	Construction of Rly Over Bridge on 45.00 mt. wide canal road near Sidhdharth Nagar, Bhestan, Surat	-	Proposed
Rail Und	ler Bridges	s (RuB)		
1	RuB	Nr.Railway Garnala no 451 Ashwinikumar	Existing	Existing
2	RuB	Nr. Railway Garnala no 441 Anjana	Existing	Existing
3	RuB	Amroli - Utran Link Road RuB (S)	Existing	Existing
4	RuB	Amroli - Utran Link Road RuB (N)	Existing	Existing
5	RuB	Suryapur Gate	Existing	Existing
6	RuB	Lambe Hanuman	Existing	Existing
7	RuB	Sahara Gate	Existing	Existing



Annexure 16: Details of Flyovers in Year 2007 and 2018 (SMC)

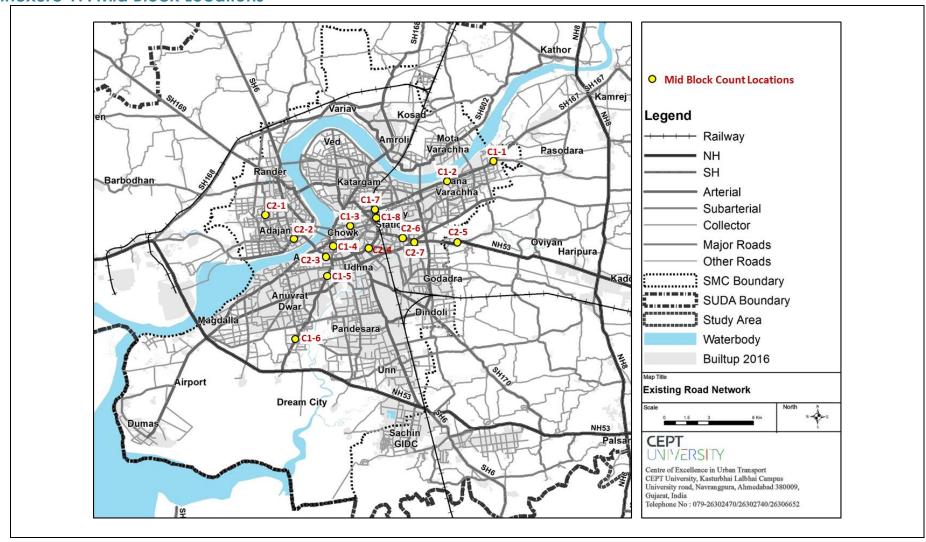
Code	Name	Status in year 2007	Status in year 2018
1	Athwa Gate	Existing	Existing
2	Nana Varachha Gam Juntion	Existing	Existing
3	Dr. Baba Saheb Ambedker flyover bridge	Existing	Existing
4	Shrinathji bridge	Existing	Existing
5	Udhana Bridge	Existing	Existing
6	Kapodara Fire station Junction	Existing	Existing
7	Kadiwala Junction Flyover	Existing	Existing
8	Majura gate Junction	Existing	Existing
9	Aaykar bhavan	Existing	Existing
10	Shahid Veer Bhagat singh flyover, Parle point Jun.	-	Existing
11	On Gujarat Gas Circle junction	-	Existing
12	Shri Balgangadhar Tilak flyover, Sosyo Circle Junc.	-	Existing
13	Shri Prithviraj Chauhan Flyover, Evershine circle	-	Existing
14	Star Bazaar junction	-	Existing
15	Shri Ramkrishna Paramhans flyover, Katargam	-	Existing
16	Shri Maharshi Arvind Ghosh Flyover	-	Existing
17	Shri Madanlal Dhingra Flyover	-	Existing
18	On Savji Korat Jun. 2*3 level flyover bridge, Surat - kamrej Road	-	Existing
19	Anuvratdhwara Jun., Udhana - Magdalla Road	-	Existing
20	Aaimata Junction	-	Existing
21	Kharwar nagar junction	-	Existing
22	Vishwakarma junction	-	Existing

Code	Name	Status in year 2007	Status in year 2018
23	Sitaram junction	-	Existing
24	Nr. Pandesara Piyush Point Circle	-	Existing
25	Amroli char rasta, Mansarovar Circle	-	Under Construction
26	New Court Building	-	Under Construction
27	Ved Darwaja Junction for Jilani Bridge	-	Under Construction
28	T.P.64 Surat-Bardoli road Puna Junction near Rin	-	Under Construction
29	Widening of existing Saroli Bridge on Surat-Olpad road	-	Proposed

SUMMARY OF EXISTING BRIDGES, FLYOVER AND ROB/RUB (2018) WITHIN SMC

Status	River bridges	Flyover	RuB	RoB	Total
Existing	12	28	7	15	62
Under Construction	4	4	0	3	11
Proposed	1	1	0	1	3

Annexure 17: Mid Block Locations



Annexure 18: Classified Volume Counts on Midblock Location (2016)

Locati	Lauretten Names	Discolina			No. of	Vehicles				PCUs
on No.	Location Name	Direction	2Wh	3Wh	4Wh	Bus	BRT	Others	Total	Total
C1-1	Sarthana Nature Park	Towards Kamrej	40133	6754	11519	1058	76	1549	61089	56513
CII	Sarthana Nature Fark	From Kamrej	49388	8265	13673	886	80	2172	74464	67351
64.2	Shree Swami Atmanand Saraswati	Towards Sarthana Nature Park	117427	13071	19144	916	104	1739	152401	129062
C1-2	Institute of Technology	From Sarthana Nature Park	132631	14975	17673	850	80	1815	168024	141554
C1-3	Mahidhanura Dalica Station	Towards Surat Railway Station	26370	7264	962	331	0	138	35065	30924
C1-3	Mahidhapura Police Station	From Surat Railway Station	31575	9771	2948	346	0	373	45013	40453
61.4	Machine d Khari Daad	Towards Majura Gate	18684	4469	3015	41	0	355	26564	23498
C1-4	Machhiwad Khari Road	From Majura Gate	13763	4278	1922	43	0	244	20250	18770
C1 F	Central Bank of India - Bhatar Road	Towards Bhatar Road	18407	7085	2405	102	0	201	28200	25699
C1-5	Central Bank of India - Bhatar Road	From Bhatar Road	20304	8313	3324	61	0	225	32227	29409
C1 6	Asshirtuad Englava	Towards Citilite, Parle Point	11053	2269	5506	55	0	368	19251	17556
C1-6	Aashirwad Enclave	From Citilite, Parle Point	10845	2145	5266	55	0	341	18652	16936
61.7	Manual Danas I I adamaga	Towards Varaccha	69647	12225	9632	462	0	1173	93139	80833
C1-7	Khand Bazar Underpass	From Varaccha	48210	11661	6592	267	0	682	67412	59287
64.0	Lamba Hannara Hadanaa	To Delhi Gate	36403	9599	6179	613	3	837	53634	48470
C1-8	Lambe Hanuman Underpass	From Delhi Gate	13111	9712	990	367	0	318	24498	24277
C2 1	Vidhua Kuni Cankul	Towards Rajpoint, Pal	8616	3690	1665	153	0	153	14277	13464
C2-1	Vidhya Kunj Sankul	From Rajpoint, Pal	8860	3472	1632	183	0	195	14342	13325
C2-2	Adajan Gaam Circle	Towards Hazira Road	28801	6121	11437	311	89	617	47376	42856

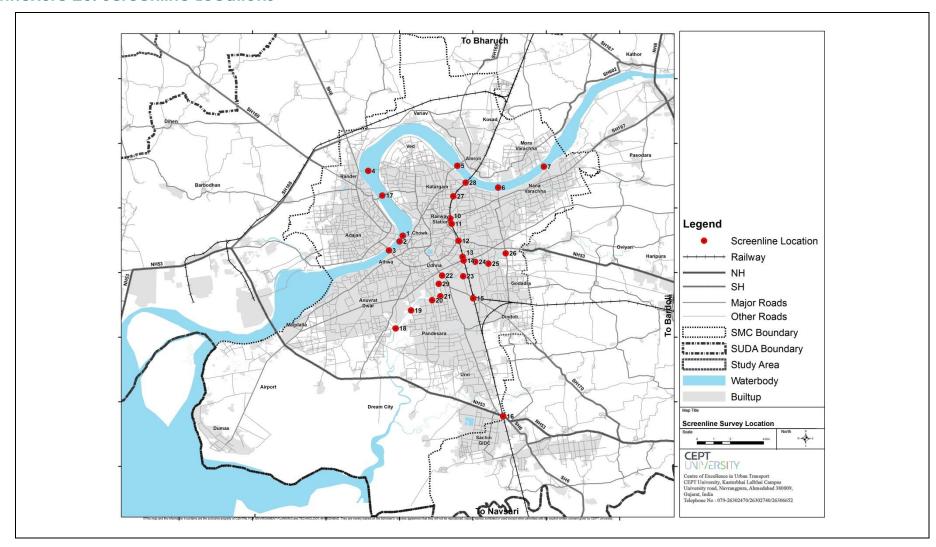
Locati					No. of	Vehicles				PCUs
on No.	Location Name	Direction	2Wh	3Wh	4Wh	Bus	BRT	Others	Total	Total
		From Hazira Road	26262	6530	13880	359	88	606	47725	43759
63.3	Maiura Cata	Towards Majura Gate	77152	12953	15558	453	0	1416	107532	93545
C2-3	Majura Gate	From Majura Gate	86336	16855	20525	490	0	2156	126362	111121
C2-4	Maan Damusia	Towards Udhna Darwaja	66262	25715	21855	704	0	2619	117155	111436
C2-4	Maan Darwaja	From Udhna Darwaja	72927	28429	29443	700	0	3433	134932	130190
C2 F	Magab	Towards Sahara Darwaja	26337	6861	9278	791	0	4921	48188	52918
C2-5	Magob	From Sahara Darwaja	24722	7022	10572	665	0	5256	48237	53020
		Towards Kamela Dharwaja	25616	12750	1491	6	0	1897	41760	45686
C2-6	Anjana Railway Crossing	From Kamela Dharwaja	24505	11667	1549	0	0	1970	39691	43646
	Surat Municipal Corporation	Towards Kharwar nagar	41438	3683	9101	209	70	3199	57700	54063
C2-7	Sankalith Ward Office - Limbayat Zone	From Kharwar nagar	42795	3216	9403	231	49	3292	58986	54736

Annexure 19: Comparison of Traffic Volumes of 2004 and 2016

			Total '	Vehicles	Tota	al PCU		o/ cl
Code No.	Survey Location	Type of Location	2004	2016	2004	2016	28% 46% 51% 47% 187% 22% 40% 65%	% Change in PCU
			River I	Bridges (No 1-4)			
1	Nehru Bridge	Bridge	69415	89157	49802	79623	28%	60%
2	Vivekanand Bridge	Bridge	54429	79312	33361	65697	46%	97%
3	Sardar Bridge	Bridge	139532	210694	58090	183235	51%	215%
4	Amroli Bridge	Bridge	89011	130940	48013	118267	47%	146%
			Railway	Bridges (No 5-2	11)			
5	Rander-Singanpore Causeway	Bridge	17383	49827	9829	40877	187%	316%
6	Surya Gate Underpass	RuB	133350	162281	97488	140120	22%	44%
7	Lambey Hanuman Underpass	RuB	56095	78703	42514	72741	40%	71%
8	Anjana Limbayat Road/Anjana farm	RoB	54913	90716	36804	89332	65%	143%
9	Limbayat Dindoli Underpasses	RuB	45055	70489	18448	62761	56%	240%
10	Ashvini Kumar ROB(Alkapuri)	RoB	49137	131846	32221	107941	168%	235%

Carla Na	6	Town of Laureign	Total '	Vehicles	Tota	al PCU	ov Charras in Valsialas	o/ Character DCIA
Code No.	Survey Location	Type of Location	2004	2016	2004	2016	% Change in Vehicles	% Change in PCU
11	Fulpada Underpass	RuB	28618	90809	16240	75856	217%	367%
			Khadi B	ridges (No 12-1	.5)			
12	Sarthana Nature Park	Mid-Block	43642	135553	46262	123863	211%	168%
13	Central Bank of India - Bhatpara Road	Mid-Block	35194	60427	23624	55108	72%	133%
14	Majura Gate	Mid-Block	110088	233894	71856	204666	112%	185%
15	Maan Darwaja	Mid-Block	46437	252087	31109	241625	443%	677%
	Total		972299	1866735	615661	1661713	92%	170%

Annexure 20: Screenline Locations



Annexure 21: Traffic Volume on Screen Line (16 Hours)

Location	Laurelian Name	Discotion			No. o	f Vehicles				PCUs
No.	Location Name	Direction	2Wh	3Wh	4Wh	Bus	BRT	Others	Total	Total
Screen 1	Rander Bridge	Towards Rander General	34865	13274	2443	119	0	858	51559	45321
3creen 1	Rander Bridge	Form Rander General	24954	11357	1759	131	0	661	38862	34811
6 2		Towards Makkaipool	31515	3837	3928	43	0	962	40285	32900
Screen 2	Low Level Bridge	From Makkaipool to Bapunagar	31290	4263	4109	31	0	1267	40960	33640
Saucan 2	Candan Drides	Towards Athwagate	70988	9454	20935	535	2	1952	10386 6	88801
Screen 3	Sardar Bridge	Athwagate to Gujarat Gas Circle	69406	13989	22392	626	1	2269	10868 3	95186
Sereen 4	Dabholi Bridge	Towards Jahangirpura	8326	703	2199	122	44	346	11740	10169
Screen 4	Dabiloli Bridge	Jahangirpura to Dabholi	10218	752	2156	108	50	415	13699	11670
Sereen F	AMROLI BRIDGE	Towards Bridge General	42629	16159	4326	96	70	12540	75820	62895
Screen 5	AIVINOLI BRIDGE	From Bridge General	44410	16631	4453	106	54	10621	76275	64100
Screen 6	Kanadra Htran Dridge	Towards Varachha Road	71458	5594	4675	41	0	1625	83393	66434
Screen 6	Kapodra Utran Bridge	From Varaccha Road	62872	5229	4641	64	0	1298	74104	59345
Saucan 7	Cavii Karat Drida	Towards varaccha	39811	3387	7513	263	0	1165	52139	43815
Screen 7	Savji Korat Bridge	Varaccha to Lajamni Restaurant	46567	4061	7927	272	0	1229	60056	50203
Screen 10		From Varaccha	48210	12368	6592	267	0	2501	69938	60043

Location	Laurelian Nama	Diversities			No. o	f Vehicles				PCUs
No.	Location Name	Direction	2Wh	3Wh	4Wh	Bus	BRT	Others	Total	Total
	Under Ground Railway Bridge at Ayurvedic Collage	Towards Varaccha	69647	13326	9632	462	0	3230	96297	81705
Screen 11	Under Ground Railway Bridge	From Delhi Gate	13111	9850	990	367	0	1277	25595	24715
Screen 11	at L.H. Road	To Delhi Gate	36403	10131	6179	613	3	2002	55331	48978
Screen 12	Under Ground Railway Bridge	Towards Sahara Darwaja	39268	25264	7114	460	0	4542	76648	75117
Screen 12	at Sahara Darwaja	From Sahara Darwaja	51847	26082	7653	687	28	5074	91371	86260
Screen 13	Mithi Khadi Bridge Railway	Towards Raghukul MKT	25616	17446	1491	6	0	6291	50850	47494
Screen 13	Under Pass	From Raghukul MKT	24505	16320	1549	0	0	5703	48077	45173
Screen 14	Anjana Bridge Railway Flyover	Towards Raghukul MKT	41438	5761	9101	209	70	3694	60273	54275
Screen 14	Alijalia biluge kaliway Flyovei	From Raghukul MKT	42795	5264	9403	231	49	4077	61819	55072
Screen 15	Udhna Dindoli Bridge	Towards Dindoli	23669	6936	2253	54	0	1290	34202	30275
Screen 15	Odilila Dilidoli Bridge	From Dindoli	26171	7072	2545	67	0	1466	37321	32891
Screen	Sachin Railway Bridge	Towards Palsana	1588	298	3346	7	1	1663	6903	10173
16A	(Highway)	From Palsana	1707	248	0	15	2	1601	3573	6849
Screen	Cookin Doilugu Drides	Towards Navsari	14077	4443	6118	231	0	3678	28547	29164
16B	Sachin Railway Bridge	From Navsari	14098	4509	5931	168	91	4136	28933	29647
Screen 17	Cauzway Bridge	Towards Singapur	18499	1711	2946	1	0	648	23805	19370

Location	Location Name	Divertion			No. o	f Vehicles				PCUs
No.	Location Name	Direction	2Wh	3Wh	4Wh	Bus	BRT	Others	Total	Total
		From Singapur	21108	1891	3331	0	0	669	26999	21909
Saura 10	Vin Danid Bandaran Bridan	Towards VIP Road	14689	4852	0	58	48	1850	21497	21222
Screen 18	Vip Road - Pandesara Bridge	From VIP Road	15369	4956	3425	52	59	1949	25810	22518
Correct 10	Dhatan Danasii Dridea	Towards Bamroli	9047	3678	1390	7	0	6482	20604	15328
Screen 19	Bhatar-Bamroli Bridge	From Bamroli	10217	3511	1399	11	0	6607	21745	16086
C 20	U.M. Road - Bamroli Road	Towards Piyush Point	27926	12431	3367	62	3	10517	54306	45073
Screen 20	Bridge	From Piyush Point	33165	12525	4326	68	2	11894	61980	50434
S 21	Dr. Hedgewar Road-Udhna	Towards Bamroli Road	11281	1525	951	15	0	3022	16794	12850
Screen 21	Main Road Bridge	From Bamroli Road	11711	1649	1082	16	0	3099	17557	13584
C 22	Kahrwar Nagar -Satyanager	Towards Udhna Darwaja	61853	22133	9669	339	133	6455	10058 2	91374
Screen 22	Bridge	From Udhna Darwaja	68277	21034	9230	322	158	6447	10546 8	93640
Carrage 22	OO Foot Court Dood Dridge	Towards Udhna	14604	6607	935	10	0	5028	27184	20163
Screen 23	80 Feet Canal Road Bridge	From Udhna	15876	7209	1128	17	0	4922	29152	44323
Conocia 34	Aniono Mithi Whadi Daida	Towards Raghukul MKT	16015	14594	371	14	0	6478	37472	33690
Screen 24	Anjana Mithi Khadi Bridge	From Raghukul MKT	15241	16391	383	7	0	7040	39062	35540
Screen 25	Dumbhal Road Khadi Bridge	Towards Surat	22296	7112	0	32	0	6799	36239	30524

Location	Location Name	Divertion			No. o	f Vehicles				PCUs
No.	Location Name	Direction	2Wh	3Wh	4Wh	Bus	BRT	Others	Total	Total
		From Surat	24877	7586	1151	23	0	7522	41159	33290
Caraon 26	Downst Dative Khadi Dridge	Towards North	33418	8105	3543	66	0	2754	47886	40862
Screen 26	Parvat Patiya Khadi Bridge	Towards South	32419	7379	3516	57	0	2955	46326	39750
Saraan 27	Calc Daily and Elyanon	Towards A.K. Road	54804	4779	4665	219	0	1715	66182	53912
Screen 27	Srk Railway Flyover	From A.K. Road	56148	4814	4698	153	0	1893	67706	54859
Coroon 30	Ashwani Kumar Railway	Towards A.K. Road	36751	5075	2414	124	1	3742	48107	38740
Screen 28	Flyover	From A.K.Road	37009	5831	2409	57	0	4082	49388	39819
Screen 29	Udhna Zone Khadi Bridge	Towards Udhna Zone Office	14905	3246	2859	14	0	2281	23305	19802

Annexure 22: Calibration of Private Traffic Mode

Screen Line location No.	Group Interaction	Model Traffic Volume (M) (Peak hour)	Observed Traffic Volume (O) (Peak hour)	GEH Value
1	2-1	3117	2629	9
1	1-2	3291	3060	4
2	1-2	2080	2356	6
2	2-1	2032	2311	6
3	1-2	6070	6366	4
3	2-1	6078	6337	3
4	2-1	1147	946	6
4	1-2	1100	855	8
5	3-1	4764	4418	5
5	1-3	4694	4570	2
6	4-3	3205	3571	6
6	3-4	3163	3550	7
7	4-3	2786	3041	5
7	3-4	2766	2653	2
10	1-4	5486	6143	9
10	4-1	3942	4506	9
11	1-4	1976	1845	3
11	4-1	2692	3683	18
12	4-1	7047	6486	7
12	1-4	6848	6279	7
13	4-1	3426	3472	1
13	1-4	3315	3317	0
14	1-4	4539	4152	6
14	4-1	4524	4097	7
15	6-5	2616	2288	7
15	5-6	2613	2482	3
16	5-6	3185	2715	9

Screen Line location No.	Group Interaction	Model Traffic Volume (M) (Peak hour)	Observed Traffic Volume (O) (Peak hour)	GEH Value
16	6-5	3013	2958	1
17	2-1	1306	1457	4
17	1-2	1207	1649	12
18	1-6	1654	1653	0
18	6-1	1530	1557	1
19	6-1	1025	1062	1
19	1-6	1025	1006	1
20	6-1	3831	3500	5
20	1-6	3780	3138	11
21	6-1	894	890	0
21	1-6	844	943	3
22	6-1	6918	6845	1
22	1-6	7020	6980	0
23	6-1	1595	1850	6
23	1-6	1593	1697	3
24	5-4	2901	2452	9
24	4-5	2881	2502	7
25	5-4	1859	2136	6
25	4-5	1817	2324	11
26	5-4	3221	3045	3
26	4-5	3449	2963	9
27	4-1	2693	2307	8
27	1-4	2340	2270	1
28	4-1	3469	2919	10
28	1-4	3153	2846	6
29	1-6	1116	1379	7
29	6-1	1227	1410	5

Annexure 23: Calibration of Private Travel Time

Corridor No.	Corridor Name	Distance (km)	Model Travel Time Min. (M)	Avg. Travel Time (Min) Observed (O)	Difference ((M-O)/O)	GEH
1	Y Junction - Anuwrat Dwar	4.11	7	6	1.13	0.3
2	Anuwrat Dwar,Athwa - Sosyo Circle, Udhna	2.79	8	8	1.01	0.0
3	Anuwrat Dwar,Athwa - Udhna Circle	4.56	11	12	0.93	0.3
4	Gujarat Gas Circle, Adajan Gam - Althan Canal BRTS,Althan	6.83	15	18	0.85	0.7
5	Bhatha Gam - New Rander Road	5.91	14	13	1.04	0.2
6	Rander Road - Railway Station	12.24	19	24	0.82	0.9
7	Magdalla - Athwa Gate	8.98	12	17	0.68	1.4
8	Rander Road - Kamela Darwaja	4.77	15	18	0.83	0.7
9	Nanpura - Kosad	9.87	27	28	0.96	0.2
10	Khand Bazar, Varacha - Nana Varachha	9.56	21	27	0.77	1.3
11	Navapara - Uttran	8.29	21	18	1.15	0.6
12	Kamela Darwaja - Saroli Gam	5.83	17	19	0.88	0.5
13	Amaazia Amusement - Millenium Park,Dindoli	6.25	11	13	0.83	0.6
14	Khatodara Industrial - Millenium Park, Dindoli	6.9	23	20	1.12	0.5
15	Gopi Talav - Sachin Railway Station	12.46	26	31	0.84	0.9
16	Daksheshwar Mahadev - Vesu	7.8	16	15	1.05	0.2

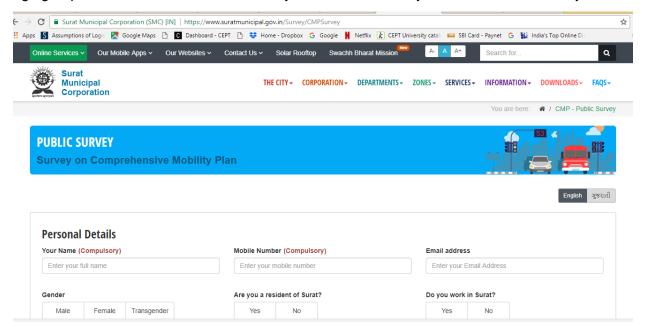
Annexure 24: Stakeholder Consultation

Two rounds of stakeholder consultations were carried out as a part of the CMP. The first one was in the form of an online survey initiated through the SMC website and social media in June 2017. The second round was in the form of a city workshop on 22nd January, 2018. Apart from this, a series of meetings and presentations were also made to SMC and SUDA.

24.1. Online Survey Results

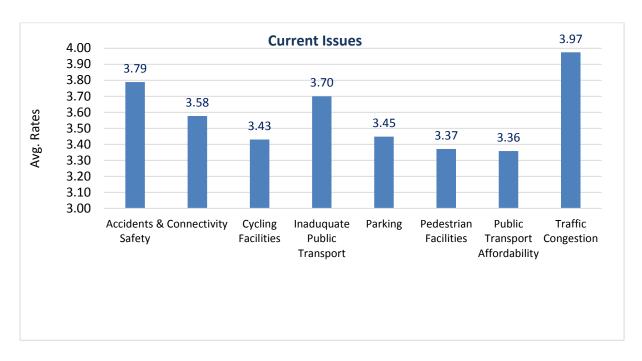
An online survey questionnaire was designed to elicit response from Surat's residents on the most pressing transport issues they faced and their expectations from the CMP. Along with this, respondents were also asked to provide a vision that would convey their expectations. The survey was rolled out through the SMC website in the month of June 2017. The last date for submission for the survey form was 30th June 2017, which was later extended till August end.

A total of 388 responses were received of which 85% were male respondents. In terms of the age group distribution, 57% were 16 to 25 years, 37% 26 to 45 years and 6 % above 45 years.



SNAPSHOT OF THE SURVEY QUESTIONNAIRE ON SMC WEBSITE

As per the responses received, traffic congestion, accident and safety along with inadequate public transport emerged as the most important issues faced by city residents.



ISSUES IDENTIFIED BY STAKEHOLDERS

In terms of the priority areas for Surat CMP 2046, safety, efficient mobility and seamless connectivity were outlined as the key expectation areas.



EXPECTATIONS OF STAKEHOLDERS FROM THE CMP

24.2. City Level Consultation

A stakeholder consultation workshop for the draft CMP Surat, 2046 was organized by SMC on 22 January 2018 at the Science Center Auditorium, City Light, Surat. The main aim of this workshop was to deliberate and discuss responses to the CMP. Apart from the presentation of the draft CMP, exhibition posters on the proposals was also displayed outside the auditorium.

The welcome address was given by Honorable Mayor Smt. Asmitaben Shiroya who introduced the purpose of the gathering. She said that due to rapid increase in the number of vehicles, traffic pollution and accidents have increased at an alarming rate. Therefore, a CMP has been prepared for SMC and SUDA for the next 30 years, to serve a population of 1.25 Cr. She highlighted that more than 100 underpasses and over 45 flyovers have been planned in the city and the total project cost is estimated to be around 37,000 crores.

The keynote address was given by the Commissioner, Surat Municipal Corporation Sri M. Thennarasan (IAS). He said that although Surat city has already started investing in public transportation for improving the mobility of the city, more needs to be done. He further added that aspects like NMT, parking, traffic signals would be integrated into the CMP. The city bus system of Surat has been awarded as the best transport system in India. He highlighted the importance of E-buses, recommended their implementation with the help of the central government.

Mr. Nagrajan, Deputy Commissioner, SMC said that feedback from the stakeholders is important for the planning and implementation of CMP. The major objectives of the CMP are to increase modal shift from four wheelers to buses and reduce travel time.





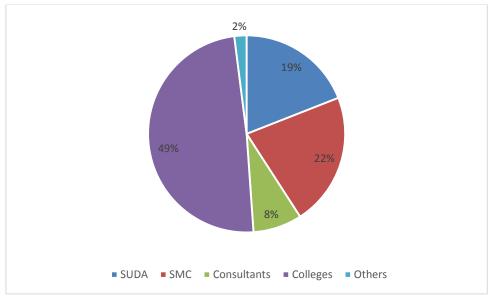


A presentation of the Draft CMP was given by Prof. Shivanand Swamy, Executive Director, Center of Excellence in Urban transport, CEPT University. After describing in brief the current situation of Surat, Professor Swamy gave a detailed description of the proposals suggested as part of the Draft CMP. He highlighted some of the major challenges for mobility of Surat.

To address the transport challenges, the CMP proposals were presented. The participants were asked to put forward their suggestions in the feedback form provided.

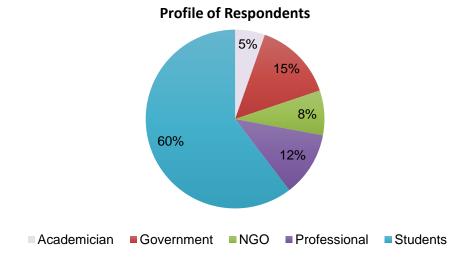
The stakeholder consultation workshop was attended by 248 participants, including various experts from the transport planning field. These included academicians from reputed universities and colleges, consultants and officials from various government organizations. The following figure shows the composition of the people who attended the workshop:





ORGANIZATION OF EMPLOYMENT BREAKUP OF PARTICIPANTS

Of the 248 participants, 111 responded to the feedback form circulated. The profile of respondents was as under:



Participants were asked to rate the priority areas for CMP 2046. The results were evaluated on a scale of 0-5 with 5 being the highest priority, 1 at lowest priority and 0 for 'Don't know'.

In response to the first question regarding priority areas for the CMP 2046, reducing congestion and air pollution along with managing parking areas emerged as the key priority areas along with focus on public transport systems, safety and walkability.

After evaluation of the feedback, the following were the highest and lowest priority areas:-

Highest Priority Area

- Reduce air pollution
- Reduce congestion
- Manage parking

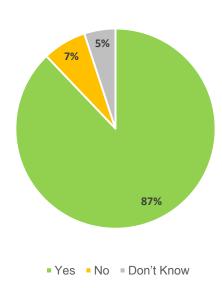
Lowest Priority area

- Improve cycling infrastructure
- Manage and improve intermediate public transport (auto rickshaw)
- Manage freight vehicles

	Sr. No.	Parameters	Ratings
	1	Reduce Air Pollution	4.38
	2	Reduce Congestion	4.30
1	3	Manage Parking	4.30
	4	Improve Public Transport Accessibility	4.29
	5	Improve walkability	4.27
	6	Improve transport Safety	4.17
	7	Improve Public Transport Quality	4.17
2 –	8	Reduce Travel Time	3.99
\smile	9	Extend Public transport Infrastructure	3.99
	10	Reduce GHG Emissions	3,87
	11	Improve Mobility Options for Citizens	3.83
(3)	12	Improve cycling infrastructure	3.78
	13	Manage and Improve Intermediate Public Transport (Auto Rickshaw)	3.75
	14	Manage Freight Vehicles	3.63

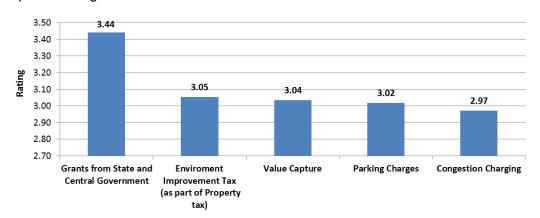
PRIORITY AREAS FOR CMP 2046

Participants were asked to suggest if separate funds should be created for financing different transport initiatives. A majority (87%) of the participants felt the need to have a separate transport fund, whereas 7% of the participants were against any such intervention and 5% were not sure if there should be any such provision.



Urban Transport Fund for Surat

Additionally, participants were also asked to rate the different proposed financing schemes for the CMP. The results were evaluated on a scale of 0-4 with 4 being 'Very important', 1 being 'unimportant' and 0 being 'Don't know'. After evaluation of the feedback, it was seen that grants from state and central departments were considered the most important form of finance mechanism followed by environment improvement tax (as part of Property Tax) and Value capture through TOD.



The key Vision statements suggested for the Draft Surat CMP were as follows:-

- 1. Surat as a safe, environment friendly and peaceful city
- 2. Multi-national city with best class public transport network
- 3. Safe Road and Save Environment for Surat
- 4. A city with efficient transport and land infrastructure that gives healthy Environment
- 5. Compact, Sustainable, livable and environmentally responsive global city

- 6. Surat as a safe walkable city for healthy and improved quality life for future
- 7. A transportation system where all the needs are fulfilled including para transit facilities which prompt the user to avail public transport
- 8. Integrated, people centric green mobility system generating Equitable Values
- 9. Focus on mass oriented development to reduce number of private vehicles
- 10. Create a transparent, sustainable and efficient system to satisfy the present as well as future need in terms of services and infrastructure facilities
- 11. Focus on public facility, vehicle parking, public walkway, air pollution, noise pollution, traffic solution
- 12. A safe, Sustainable transportation network for Surat by Surat
- 13. Integrated transport structure towards overall peace of mind
- 14. 15 min city, easy accessibility from any point of Surat city with smart transportation system
- 15. Moving towards high standard transport with low urban footprints and best level of service.
- 16. The vision is to create walkable, green eco-friendly city having good public transport system with last mile connectivity.

The key comments received for the Draft CMP were as follows:-

- Additional focus should be given to increase number of buses in Surat as per Model by CRRI (New Delhi)
- It is suggested to give emphasis to the NMT facilities of Surat city by providing separate bicycle lane and walking streets
- The goals of the study should be elaborated in detail
- More details of the implementation strategies could be provided
- More emphasis could be given to PT/ NMT rather than flyovers and road infrastructure
- Nominal parking charge for car parking could be introduced
- Development of satellite towns could be proposed to create multiple acivity nodes and for distribution of traffic.
- Proposal to encourage solar based transport could be added.
- Design differently abled-friendly streets
- Parking charges may be categorized as per halt time of the vehicles
- It is suggested to additionally consider connectivity to the two diamond markets (Mini bazar or Motibazar in Mahidharpura) in the CMP proposals
- Provide BRTS connectivity to the various Diamond factories.
- Relocate Textile Park in vicinity of existing and upcoming Market near Vareli, Dumbhal
- More attention should be given to manage road side parking

24.3. Meetings with Stakeholders

Stakeholder Consultation: 1 Minutes of Meeting

Date: 20/03/2018	Place: SUDA Bhavan
Meeting arranged by: CEPT	Meeting Chaired by: P.K Dutta
Agenda: Discussion regarding the future phasing in CMP	

Following points were discussed:

Sr.	Component	Discussion	Recommendation / Instructions from Sitilink and CEPT
а	High Speed Rail Alignment and Station Location	High speed rail station location will be near to Antroli Village. SUDA has received the affected plot under the high-speed rail.	Needs to take affected plot shapefile and High speed rail location from SUDA Bhavan
b	Corridor from Simada Naka to NH and BRT extension	 SUDA is planning to develop 3 lane road for this corridor as another entry for Surat city which can help to reduce the congestion on Kamrej road. At present BRTS Corridor is till Simada it could be possible to extend till national highway. This BRTS Corridor should be considered under phase1 of development. 	As suggested the extension of BRT corridor on this corridor till NH can be considered in the proposal.
С	DFC Corridor	Total 14 RUB/ROB is under the DFC corridor which need to be develop in future for ease in transportation. DFC team need to be informed regarding RUB/ROB.	Proposal regarding the RuB/RoB under the DFC corridor would be coordinated with DFC team and will update the proposal based on the suggestion/comment received.
d	Phasing	 There are few area which was developed previously in 2004 needs to be included in Phase 1, since at that time TP scheme were not available. Icchhapore area has constrain due to High tense line, Gas line etc need to be considered. Development in SUDA area will be based on T.P.Scheme only. 	 As suggested, will consider in the proposed area phasing based on potential development. CEPT and Sitilink will do joint site visit of all depot.

Stakeholder Consultation: 2

Minutes of Meeting

Date:20/03/2018	Place: Traffic Cell
Meeting arranged by: CEPT	Meeting Chaired by: Debashish Basak (Executive Engineer)
Agenda: Discussion regarding the future phasing in CMP	

Following points were discussed:

Sr.	Component	Discussion	Recommendation / Instructions from Sitilink and CEPT
а	Future Development Phasing	 Discussion on Road Network phasing Few pockets of phase 2 and phase 3 is surrounded by Phase 1; therefore it should be considered in Phase 1 for development. 	As suggested, the changes would be incorporated in the phasing of area planning and road network development.

Stakeholder Consultation: 3

Minutes of Meeting

Date:21/04/2018	Place: Traffic Cell
Meeting arranged by: CEPT	Meeting Chaired by: Debashish Basak (Executive Engineer)
Agenda: Discussion regarding the future phasing in CMP	

Following points were discussed:

Sr.	Component	Discussion	Recommendation / Instructions from Sitilink and CEPT
a	Future Development Phasing	 Traffic cell has developed detailed road network map for Surat city for all local and T.P. Roads which need to be validate and considered remaining roads into CMP road network Check BRTS future phasing legend and make it in a continuation with previous BRTS phasing legends. Consider Althan depot in phase 1. Traffic cell has identified total 11 depots for future development which need to be consider under phase1 SVNIT has identified 25 major junctions for Re-design need to be considered in Phase 1 Traffic cell has identified zone wise junction need to be considered in future phase wise development 	 CEPT has to check and validate the road network with traffic cell detailed road network to considered remaining T.P roads into CMP. CEPT has to take list of Depot identified by traffic cell and list of major junctions. CEPT has to consider junction identified by SVNIT and Traffic cell for future phasing.

Stakeholder Consultation: 5

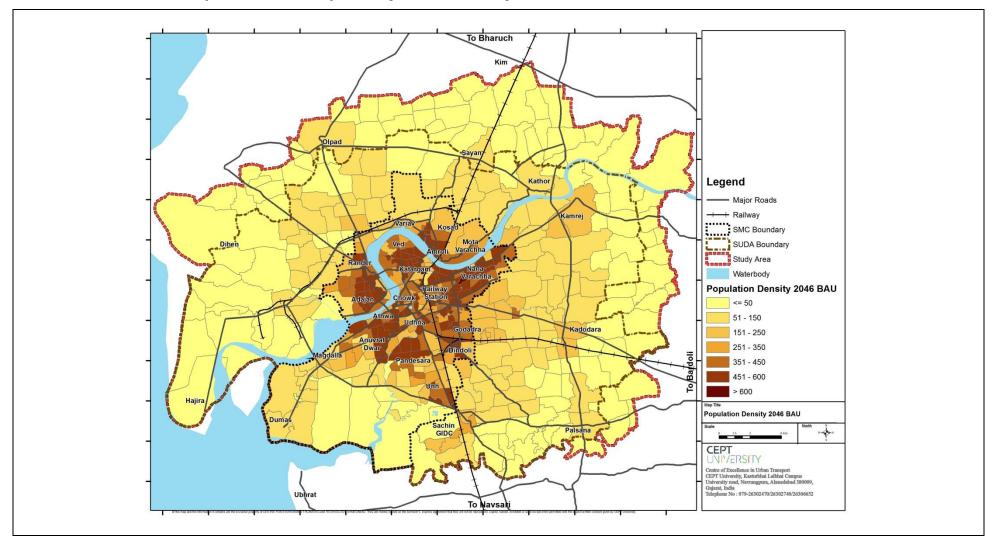
Response to Letter

Date:16/05/2018	Received from: Traffic Cell, SMC
Agenda: Draft report submitted "Comprehensive Mobility Plan (CMP) -2046 for Surat city"	

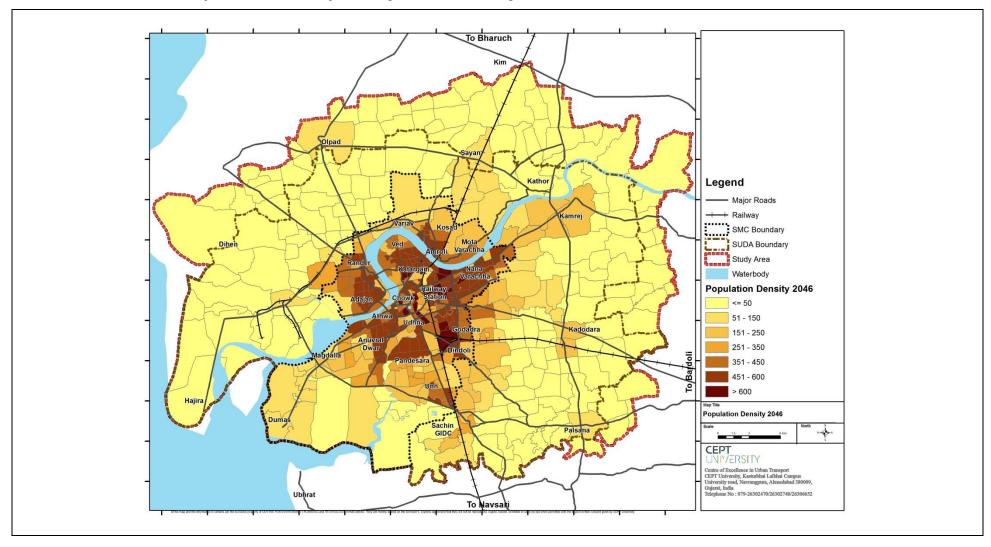
Following points highlighted:

Sr.	Recommendation / Instructions from SMC	Responses from CEPT
а	The existing & proposed road network need to be re-checked and rectified with the on-site condition and shall be rectified if required. The same can be done through the existing GIS map if required.	Existing & proposed road network has been updated in final report based on road inventory survey and proposed TP scheme roads (>=24m) has been incorporated in the proposal.
b	Proposal of phasing of road network, bridges, intersections etc. shall be made judiciously based on development potentials of Surat city.	As suggested, phasing of the road infrastructure development has been done based on the potential development of Surat.
С	There is a proposal of Public Bicycle Sharing (PBS) in SMC, you need to look into this matter and included if necessary.	Proposal of PBS in central area has been incorporated in the final report as received form Central Zone office SMC
d	There are other potential sites for Bus depot/ terminals and few of them were suggested to you in the meeting. You need to reconsider after taking into account the suggestions made during the meeting.	The suggested potential depot location has been incorporated in final report.
е	It is advisable to take the comments of Surat Urban Development Authority (SUDA) also for further inputs.	The inputs/ suggestion given by Surat Urban Development Authority (SUDA) has been incorporated.
f	It is request that all the chapters shall be followed with an appraisal note.	The appraisal checklist has been prepared for all the chapters with respect to the format defined in annexure 10 of Revised CMP toolkit document, 2014.
g	Since, the CMP is required to be approved by appropriate authority. The executive summary shall be very script and simple to understand.	Yes, for the approval of the CMP by the respective authority; Executive summary has been prepared.
h	You are requested to make a separate presentation and executive summary in Gujarati also.	As suggested, the generic presentation and Executive summary both has been prepared in Gujarati

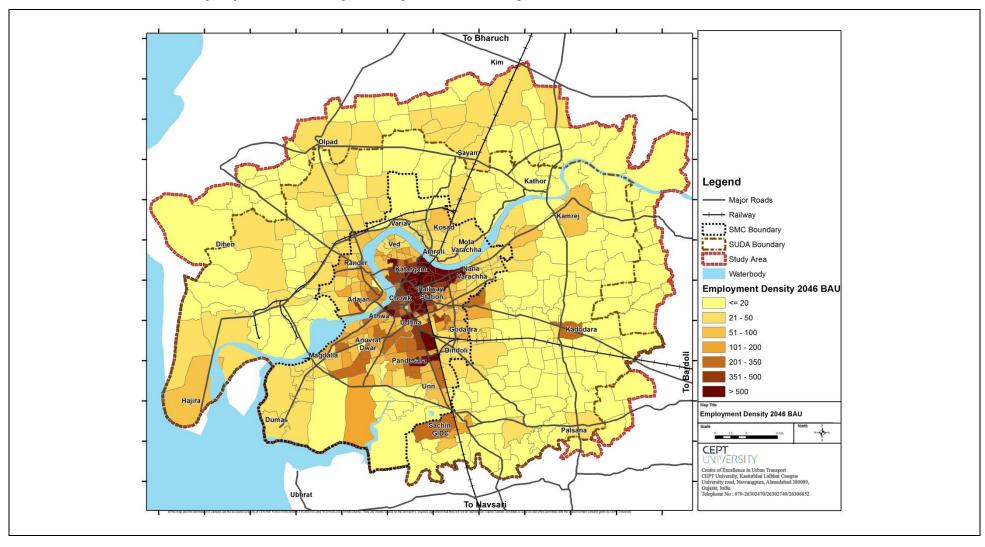
Annexure 25: Future Population Density 2046 (BAU scneario)



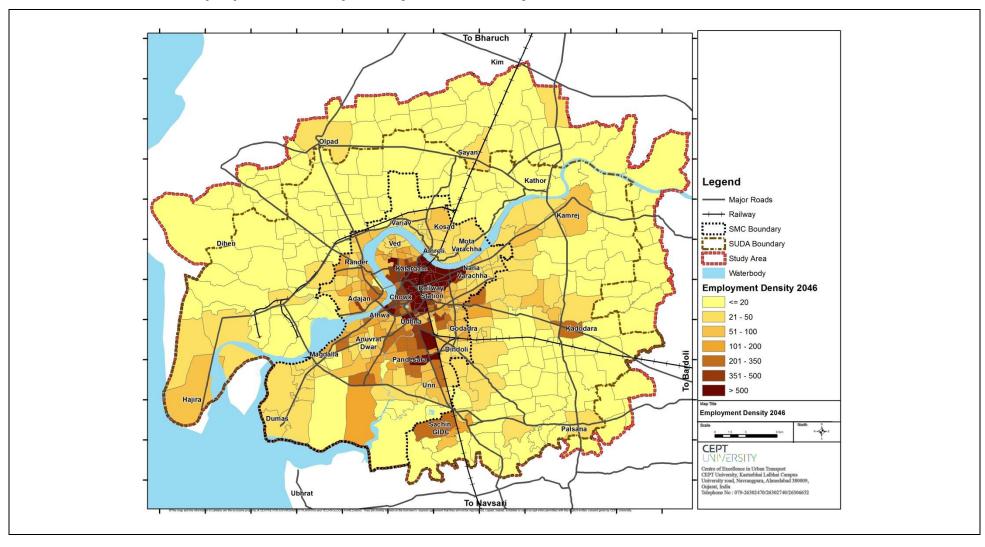
Annexure 26: Future Population Density 2046 (CMP scneario)



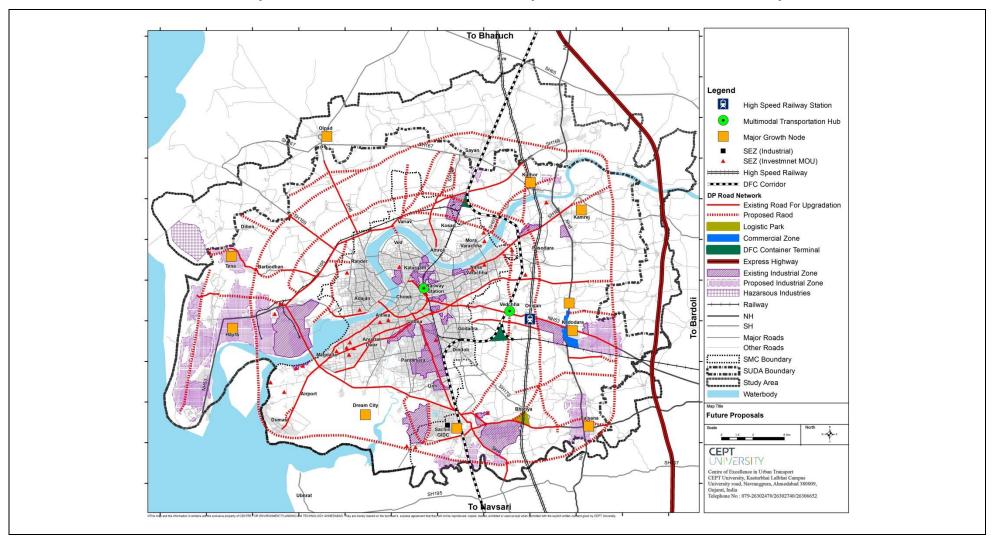
Annexure 27: Future Employment Density 2046 (BAU scneario)



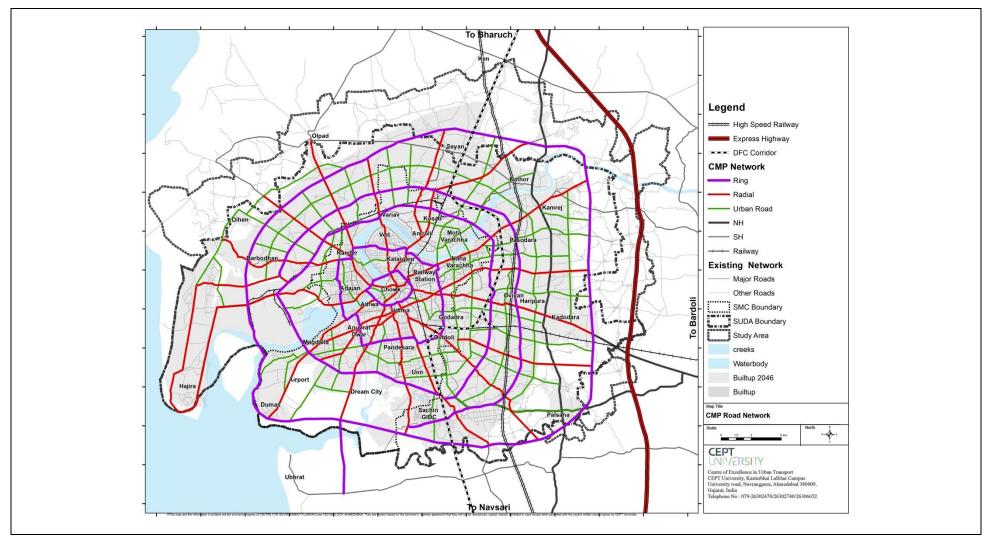
Annexure 28: Future Employment Density 2046 (CMP scneario)



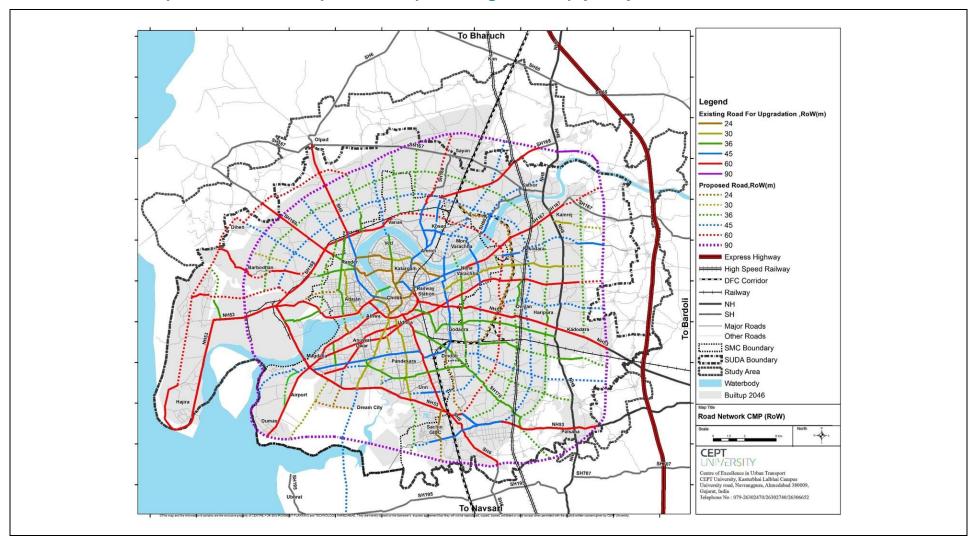
Annexure 29: Revised Development Plan 2035 – Future Development and Road Network Proposal



Annexure 30: Comprehensive Mobility Plan – Proposed Road Network (2046)

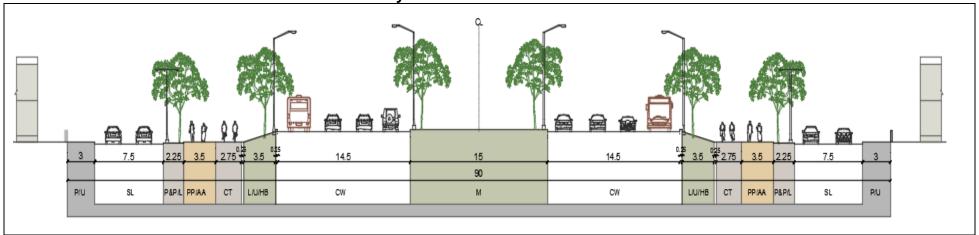


Annexure 31: Comprehensive Mobility Plan – Proposed Right of Way (2046)

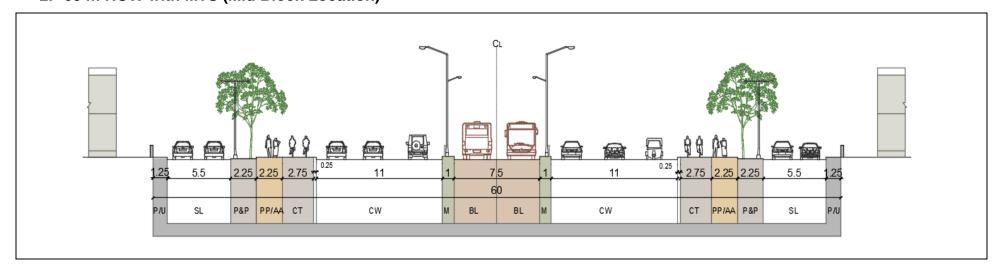


Annexure 32: Proposed Cross Sections for CMP

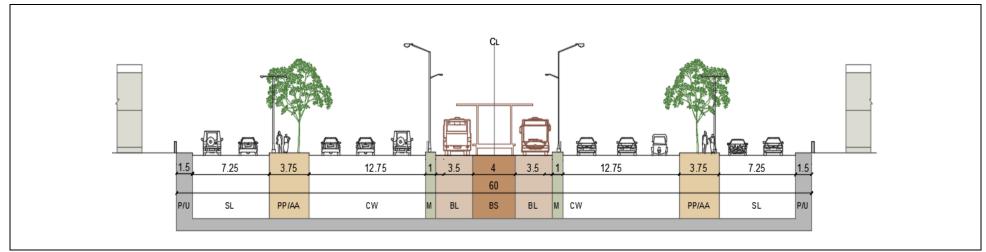
1. 90m ROW with Service lane and Transit Ready Streets



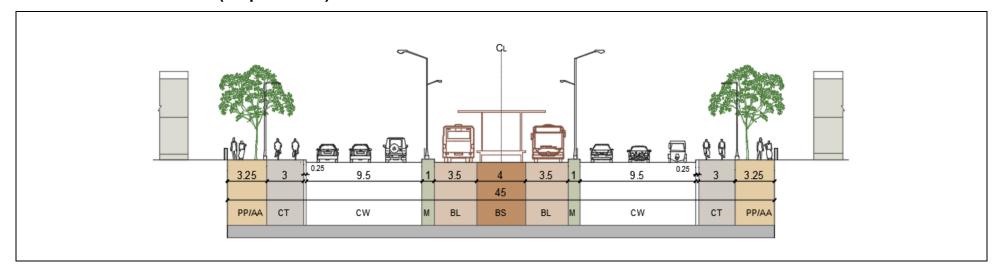
2. 60 m ROW with MTS (Mid Block Location)



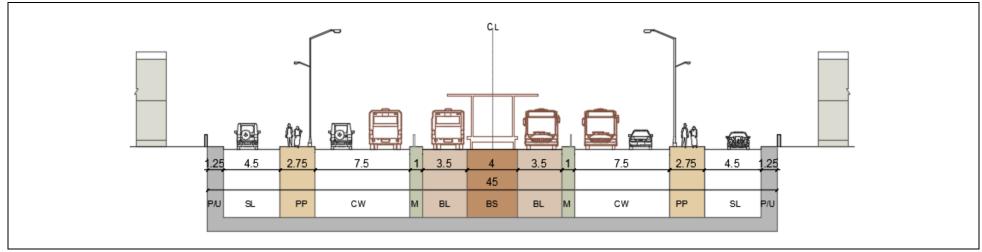
3. 60m ROW with MTS (Stop Location) Industrial Area



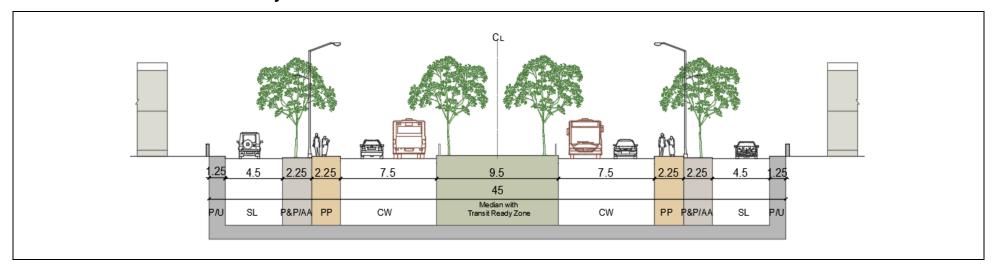
4. 45m ROW with MTS (Stop location)



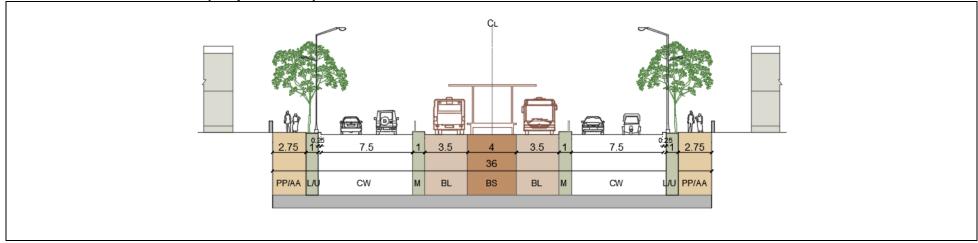
5. 45m RoW with MTS (Stop location) & Service lane



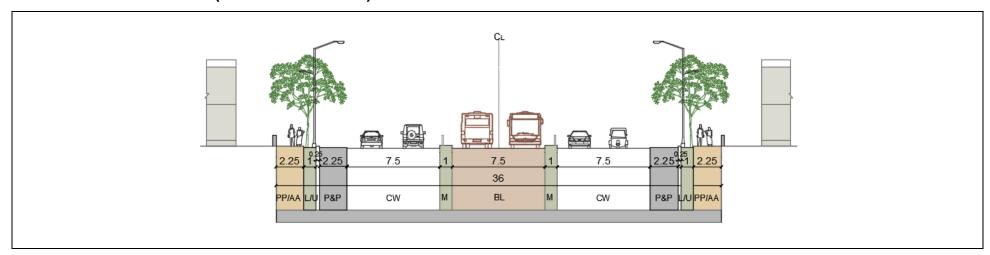
6. 45m ROW with Transit Ready Zone & Service lane



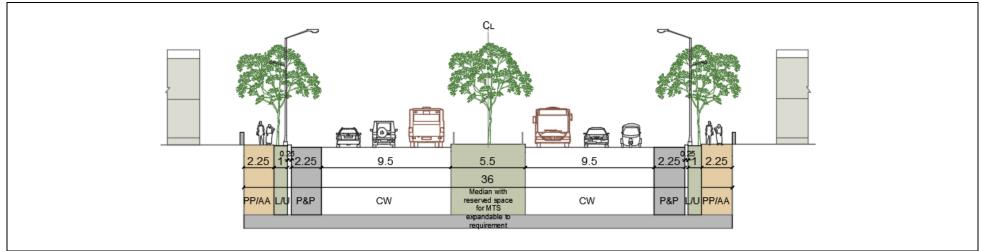
7. 36m RoW with MTS (Stop location)



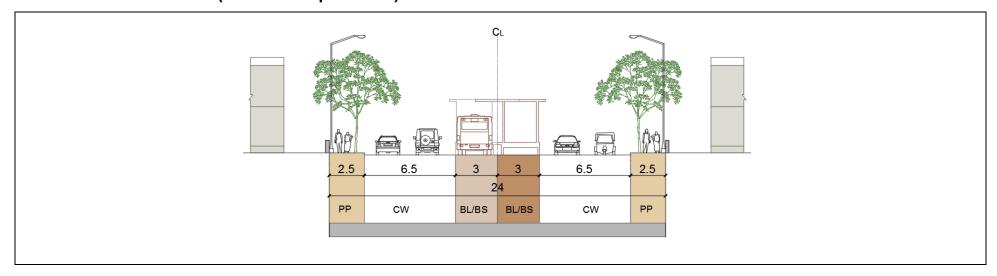
8. 36m ROW with MTS (Mid Block Location)



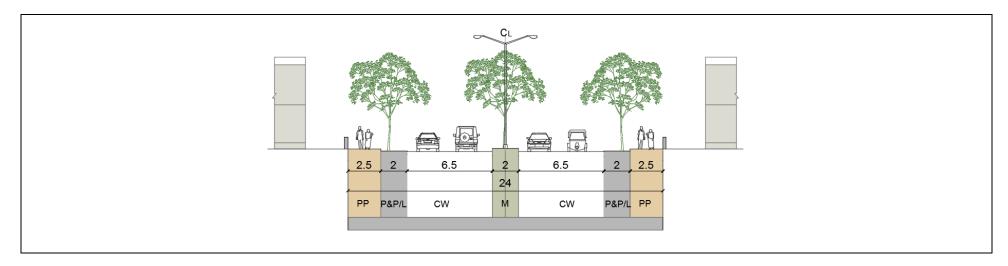
9. 36m RoW with Transit Ready Zone



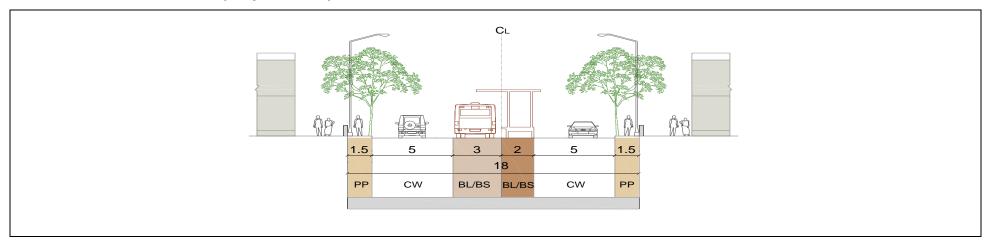
10.24m ROW with MTS (BRT lite- Stop location)



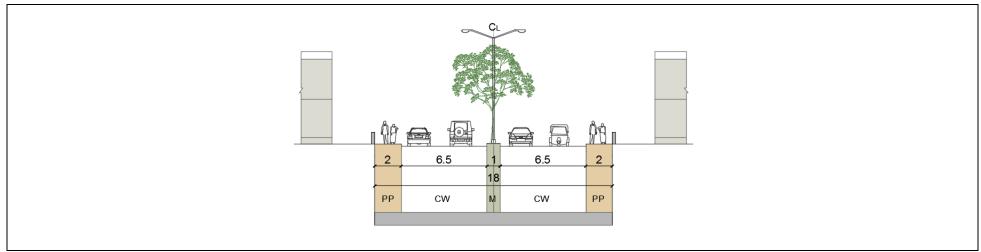
11.24m ROW with MTS (Midblock location)



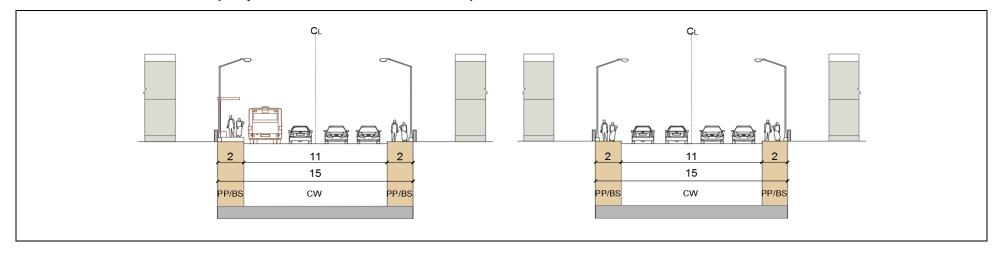
12.18 m ROW with CBS (Stop location)

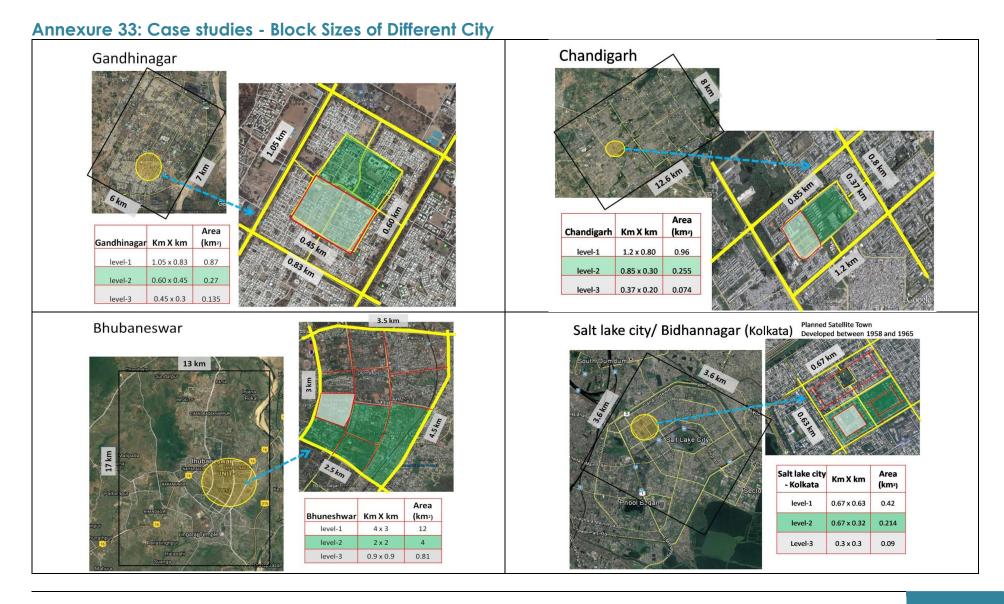


13.18m ROW with CBS (Mid Block Location)



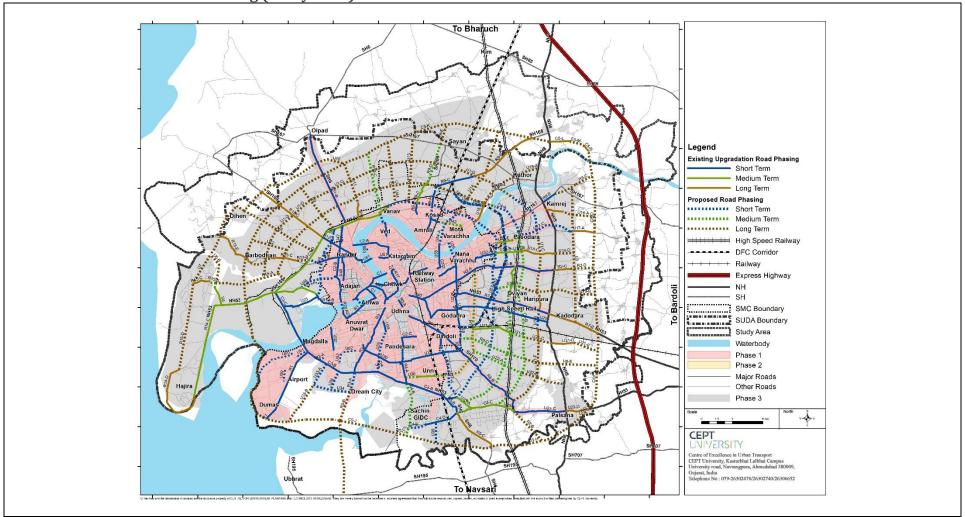
14.15m RoW with CBS (Stop Loction/Mid Block Location)



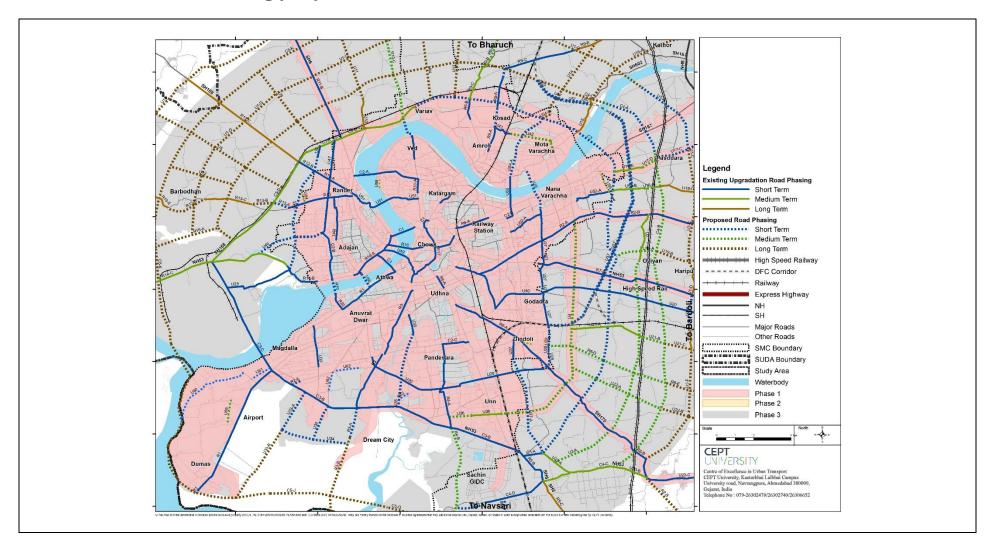


Annexure 34: CMP Road Network Phasing (2046)

34.1. Road Network Phasing (Study Area)



34.2. Road Network Phasing (SMC)



Annexure 35: Details of Road Network Phasing And Costing

35.1. SMC

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
Surat M	unicipal Corporat	tion (SMC) (A+B+C)			227	28385	
Α.	Existing - Upgrad	ation			140	783	
1	C1	Katargam Darwaja - Athwa Gate (Inner Ring Road)	Ring Road	60	1.7	15	Short Term
2	C2-B	Palanpur Canal Road - Pal RTO (Middle Ring Road)	Ring Road	36	4.6	13	Short Term
3	C2-C	Patrakar Colony-Daksheshwar BRT(MiddleRingRoad)	Ring Road	45	1.3	12	Short Term
4	C2-D	Valinath Society Road	Ring Road	45	0.8	7	Short Term
5	C2-A	Dabholi - Jahangirpura	Ring Road	21	1.0	4	Short Term
6	C3-B	Sachin GIDC - ONGC Colony	Ring Road	60	13.9	89	Short Term
7	C3-E	Variyav-Vankal(Outer Ring Road)	Ring Road	60	5.0	54	Medium Term
	Cost of Ring Roa	ds upgradation			28	195	
8	R1	Athwa - Dumas Road	Radial Road	60	10.8	56	Short Term
9	R2-A	Anjana Canal-Parvat Patia-Simada-Valthan(Canal Co*	Radial Road	60	6.2	74	Short Term
10	R3	Majura Gate - Sarsana	Radial Road	30	6.9	30	Short Term
11	R4-A	Daksheshwar BRT - Piyush Point-Vadod -Jiav	Radial Road	30	4.9	12	Short Term
12	R5-A	Udhna Darwaja-Kharwarnagar	Radial Road	60	0.7	8	Short Term
13	R6-A	Udhna Teen Rasta- Vrukshmani Society	Radial Road	36	5.7	41	Short Term
14	R6-B	Vrukshmani Society - Bhatia	Radial Road	36	8.3	60	Short Term
15	R8-A	R8-A Ayurvedic college - Hira baug Circle			1.7	15	Short Term
16	R9-A	Katargam BRT - Kosad Gothan Road	Radial Road	45	3.3	20	Short Term
17	R9-B	Kosad Depot-Sayan Road	Radial Road	45	1.1	10	Short Term
18	R9-C	Sayan Road - Canal Crossing	Radial Road	60	2.1	22	Medium Term

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
19	R10-A	Vadinath Chowk - Moti Ved Dargah	Radial Road	36	1.9	14	Short Term
20	R12-A	Subhash Garden-Vankala	Radial Road	36	2.2	6	Short Term
21	R13	Mora Bhagal-South Gujarat Medical College	Radial Road	36	2.4	14	Short Term
22	R14-A	Adajan Patia-star Bazar	dajan Patia-star Bazar Radial Road 60 1.6 20 S			Short Term	
23	R16	Nehru Bridge - Surya Gate	Radial Road	21	2.4	10	Short Term
24	R17	Ved Darwaja - Majura Gate	Radial Road	21	3.9	16	Short Term
25	R19	Godhani Circle-Katargam BRTS	Radial Road	24	0.4	2	Short Term
26	R20	SVNIT to Umra	Radial Road	21	0.9	4	Short Term
	Cost of Radial Ro	oads upgradation			67.5	434.1	
27	U27	Balaji Chowk - Saroli Godadara	Urban Road	36	5.9	17	Short Term
28	U29	Vrukshlaxmi Society - Vadod Gam	Urban Road	36	5.2	17	Short Term
29	U30	Vadod Gam - Bamroli - Shyam Mandir BRTS	Urban Road	36	4.2	12	Short Term
30	U32	Vesu Main Road	Urban Road	36	2.2	6	Short Term
31	U35	Vinayaknagar - Gandhi kutir Road	Urban Road	30	1	2	Short Term
32	U36	Unn Ind.Estate BRT - Reshma Nagar	Urban Road	45	1.4	13	Medium Term
33	U37	Dindoli-Radhika Homes	Urban Road	24	1	2	Short Term
34	U40	Kamela Darwaja-Nilgiri Circle-Godadara Naher	Urban Road	36	6.2	23	Short Term
35	U43	Kosad Gothan Road - Kosad Rail. Crossing	Urban Road	45	1	9	Short Term
36	U47	Palanpur Canal Road - Vivekanand College	Urban Road	36	3.1	9	Short Term
37	U48	LP Savani-Ugat	Urban Road	36	2.4	17	Short Term
38	U49	Makkai pul Adajan - Vallab Chowk	Urban Road	21	0.9	4	Short Term
39	U51	Subhash Garden-Rander-Causeway-Akhand Anand Colle*	Urban Road	24	2.3	4	Short Term
40	U52-A	Anjani Soc.(Puna)-Kargil Chowk-Yogi chowk-Kansad	Urban Road	30	3.87	9	Short Term
41	U52-B	Kansad-Sumada	Urban Road	30	1.71	4	Medium Term

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing	
42	U53	Variyav Jakatnaka-Kanaj Road	Urban Road	36	1.7	5	Long Term	
	Cost of Urban Ro	oads upgradation			44.1	154		
В.	Proposed Road li	nks			87	753		
43	C4-E	Sachin-Talangpor road	Ring Road	45	1.6	13	Short Term	
44	C5-J	CK Pithawala - Kansad-Outer ring Road(120m)	Ring Road	90	16.9	274	Long Term	
	Cost of Ring Roa	ds proposed						
45	R2-A	Agarwal Vidhya Vihar School - SH bypass	, , , , , , , , , , , , , , , , , , , ,					
46	R3-A	Khajod Road		45	1.6	13	Short Term	
47	R3-B	Khajod Road - Dream City		45	3.3	27	Long Term	
48	R4-B	Jiav-Umber Road		36	5.3	34	Medium Term	
49	R9-A	Kosad Road	Radial Road	45	1.6	9	Short Term	
	Cost of Radial Ro	pads proposed			12.2	87.2		
50	U26	Balaji Chowk-Varachha Khadi-Utran Power House		36	0.7	4.61	Short Term	
51	U27	Balaji Chowk - Saroli Godadara	Urban Road	36	0.5	3.18	Short Term	
52	U28	Saroli Gadadara - Vrukshlaxmi Society	Urban Road	36	2.4	15.27	Short Term	
53	U33-A	Abhva Road		30	2.32	12.55	Short Term	
54	U33-B	Abhva Road - Bhimpore		30	4.32	23.31	Long Term	
55	U34	Abhava Road	Urban Road	24	5.4	23.12	Short Term	
56	U35	Gandhi Kutir-Bamroli-Dundi Gam	Urban Road	30	4.1	22.16	Short Term	
57	U36	Reshma Nagar - Jiav	Urban Road	45	1.2	11.57	Medium Term	
58	U42	Kosad Rail. Crossing - Kosad Road	Urban Road	45	2.6	23.66	Medium Term	
59	U44	Variyav-Sandhiyer	Urban Road	36	5.9	38.55	Long Term	
60	U45	Vankala-Bheshan Road	Urban Road	36	6.5	41.84	Short Term	
61	U46	Palanpur - Ichchhapor Canal Road	Urban Road	24	3.5	14.98	Short Term	

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
62	U54-A	Utran Bridge - Barthana		45	3.7	30.01	Short Term
63	U54-B	Barthana Road		45	0.44	3.57	Long Term
64	U55	Vishal Nagar	Urban Road	30	1.2	14.0	Short Term
65	U56	Dindoli Lake	Urban Road	30	0.5	3.1	Short Term
66	U64	Bhesan Gam	Urban Road	30	0.8	4.6	Short Term
67	U58	Riverfront Road	Urban Road	30	0.5	2.8	Short Term
68	U59	Vanta	Urban Road	36	1.3	9.5	Short Term
69	U60	Dock Beach Road	Urban Road	45	4.5	40.3	Short Term
70	U61	Magdalla Canal Road	Urban Road	45	1.1	9.9	Short Term
71	U62	Sarsana Gam	Urban Road	45	2.3	21.1	Short Term
72	U63	Dundi	Urban Road	45	0.6	5.0	Short Term
	Cost of Urban Ro	oads proposed			56.3	379	
73	River Bridges			-	1 (no.)	84	1 Short Term
74	Flyover			-	1 (no.)	113.4	1 Short Term
75	RoB/RuB			-	10 (no.)	831.6	4 Short Term & 6 Medium Term
C.	Cost of Bridges				12 (no.)	1029	

35.2. SUDA

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
Surat U	rban Developmer	nt Authority (SUDA) (A+B+C)			596	16727	
Α.	Existing - Upgrad	ation			168	1060	
1	C3-A	Sachi GIDC-Raj Abhishek City Homes	Ring Road	60	1	4.60	Short Term
2	C3-B	Vankala ONGC Juncton(Outer Ring Road)	Ring Road	60	0.87	4.19	Short Term
3	C3-C	Magdalla shipyad - ONGC Circle	Ring Road	60	5.68	27.25	Short Term
4	C3-D	ONGC Juncton - Vivekanand College(Outer Ring Road)	Ring Road	60	8.78	42.16	Medium Term
5	C4-C	Sachin - Toll Plaza	Ring Road	45	3.68	13.26	Medium Term
6	C4-D	Sachin - Talangpor Lake	Ring Road	45	3.15	11.35	Short Term
7	C5-L	Pardi Road	Ring Road	90	1.78	12.87	Long Term
8	C5-N	Pardi Road	Ring Road	90	0.55	4.02	Long Term
	Cost of Ring Roa	ds upgradation			25.49	120	
9	R2-B	Anjana Canal-Valthan	Radial Road	60	6.93	83.25	Short Term
10	R2-C	Valthan Road	Radial Road	60	1.46	7.02	Long Term
11	R5-B	Sachin GIDC-Pardi Kande	Radial Road	60	1.81	8.70	Short Term
12	R5-C	Pardi Kande - Lajpor	Radial Road	60	4.75	22.85	Long Term
13	R7-A	Saroli - Haripura	Radial Road	60	8.76	105.13	Short Term
14	R7-B	Haripura - Jolva	Radial Road	60	4.86	23.36	Long Term
15	R8-B	Kamrej Char Rasta-Kamrej Gam Road	Radial Road	60	1.3	6.39	Short Term
16	R9-C	Gothan - Umara	Radial Road	60	3.7	17.77	Short Term
17	R9-E	Umara - Navipardi	Radial Road	60	6.53	31.38	Long Term
18	R11-B	Jahangirpura-Olpad	Radial Road	60	10.5	125.42	Short Term
19	R12-B	Vankala Road	Radial Road	60	0.9	4.36	Short Term

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
20	R12-C	Vankala Road - Veluk	Radial Road	60	7.09	34.05	Long Term
21	R13-A0	South Gujarat Medical College-Bhesan	Radial Road	36	0.83	6.02	Short Term
22	R13-C	Segvachhama Road - Borbardhan	Radial Road	60	2.33	11.23	Long Term
23	R13-E	Borbardhan Lake - Tena	Radial Road	60	4.25	20.43	Long Term
24	R14-B	Pal RTO - Bhatha Gam	Radial Road	60	1.88	22.61	Short Term
25	R14-C	Bhatha Gam - Hazira	Radial Road	60	19.04	162.66	Medium Term
26	R14-D	Hazira Ring	Radial Road	60	7.61	36.53	Long Term
27	R15-C	Bhatlay Road	Radial Road	60	1.6	7.47	Long Term
	Cost of Radial Ro	oads upgradation			96.13	737	
28	U1-D	Vareli - Haripura	Urban Road	36	1.37	3.97	Long Term
29	U1-E	Vankaneda Road - Kharbhasi	Urban Road	36	1.25	3.61	Long Term
30	U2	Sabargam-Kosamada Road	Urban Road	36	2.7	7.85	Long Term
31	U6	Mora-Damka Road	Urban Road	36	1.8	13.02	Medium Term
32	U9	Vankala-Bheshan Road	Urban Road	36	0.5	1.36	Short Term
33	U15	Abrama road	Urban Road	45	2	7.31	Long Term
34	U16	Kamrej Char Rasta-Nansad	Urban Road	30	1.4	3.28	Long Term
35	U17-A	Vav - Jokha	Urban Road	45	1.98	7.16	Long Term
36	U17-B	Vav Road	Urban Road	45	0.31	1.12	Short Term
37	U17-E	Pasodara, Vav Road	Urban Road	45	1.44	12.97	Medium Term
38	U18-B	Gadhpur Township - Kathodara	Urban Road	30	0.40	0.95	Medium Term
39	U18-C	Kathodara - Kosmadi	Urban Road	30	3.17	7.61	Long Term
40	U20	Saroli Godadara Naher-Vedchha-Chalthan	Urban Road	36	8.5	24.37	Short Term
41	U21-A	Deldava - Mohini Gam	Urban Road	36	3.74	10.78	Medium Term
42	U21-D	Deldava-Chalthan	Urban Road	36	2.06	5.96	Long Term

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
43	U23-A	Raj Abhishek City Homes - Toll Plaza Road	Urban Road	45	1.69	6.10	Medium Term
44	U23-B	Toll Plaza - Bhatiya	Urban Road	60	1.81	8.70	Medium Term
45	U23-C	Bhatiya - Palsana	Urban Road	60	4.78	57.38	Short Term
46	U23-D	Palsana Road	Urban Road	60	2.09	10.03	Long Term
47	U25	Bhatha-Bhatpor Road	Urban Road	36	3.5	10.01	Short Term
	Cost of Urban Ro	oads upgradation			46.49	204	
В.	Proposed Road li	nks			428	3959	
48	C3	Variyav- RajAbhishekCityHomes(Outer Ring Road)	Ring Road	60	25.8	278	short Term
49	C4-A	Bhada Gam - Pasodara (Outer Ring Road)	Ring Road	45	3.4	28	short Term
50	C4-B	Pasodara - Vaktana Road (Outer Ring Road)	Ring Road	45	18	145	Medium Term
51	C4-C	Malgama - Bhada Gam (Outer Ring Road)	Ring Road	45	24.15	187	Long Term
52	C5-K	C.K Pithawala College - NEW Pardi	Ring Road	90	42	663	Long Term
53	C5-M	NEW Pardi - Dungra	Ring Road	90	1	24	Long Term
54	C5-O	Karjan - Palsana - Umber Lake	Ring Road	90	34	557	Long Term
	Cost of Ring Roa	ds proposed			148	1883	
55	R2-D	Valthan Road - Mankna	Radial Road	60	2.1	23	Long Term
56	R2-B	Bhatiya-Kalakachha	Radial Road	36	3.9	25	Long Term
57	R6-D	Deldava - Mohini Gam	Radial Road	45	6.3	51	Long Term
58	R6-E	Mohini Gam - Tundi	Radial Road	45	6.7	54	Long Term
59	R8-C	Kamrej Gam Road - Derod	Radial Road	60	3.9	42	Long Term
60	R9-D	Vaswari - Sayan	Radial Road	60	3.8	51	Medium Term
61	R9-E	Sayan - Siwan	Radial Road	60	2.0	22	Long Term
62	R10-C	Variyav-Sherdi-Karmala Road	Radial Road	45	5.9	59	Medium Term
63	R13-A	Bhesan - bhesan hazira Road	Radial Road	36	0.8	5	short Term

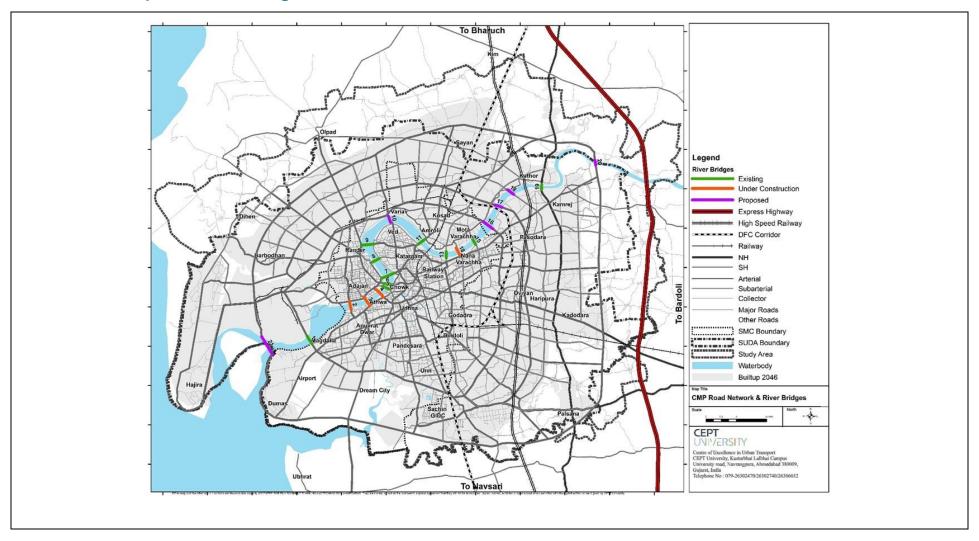
Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
64	R13-B	Bhesan hazira Road - Segvachhama Road	Radial Road	60	1.1	12	Long Term
65	R13-D	Borbardhan - Borbardhan Lake	Radial Road	60	2.1	23	Long Term
66	R15-A	Malgama-Damka	Radial Road	60	6.9	75	Long Term
67	R15-B	Damka Road	Radial Road	60	0.6	7	Medium Term
68	R15-D	Hajira-Sunvali-Tena-Dihen-Sarol-Ishanpur	Radial Road	60	8.5	92	Long Term
	Cost of Radial Ro	oads proposed			55	540	
69	U1-A	Vav - Bhada Gam	Urban Road	36	4.39	28	short Term
70	U1-B	Haripura - Vankaneda	Urban Road	36	1.82	12	short Term
71	U1-C	Vav - Vareli	Urban Road	36	6.56	43	Long Term
72	U1-F	Kharbhasi - Vaktana	Urban Road	36	6.71	43	Long Term
73	U1-G	Bhada Gam - Borbardhan	Urban Road	36	29	181	Long Term
74	U2-A	Sabargam - Vanz	Urban Road	36	12.7	82	Medium Term
75	U3	Tantithhaiya - Valthan - Derod	Urban Road	36	13.2	86	Long Term
76	U4	Unn to Simada Canal	Urban Road	45	12.8	127	Medium Term
77	U6-A	Damka Road	Urban Road	36	0.47	3	Medium Term
78	U6-B	Damka - Vansva	Urban Road	36	3.07	20	Long Term
79	U7	Hajira-Sunvali-Tena-Dihen-Sarol-Ishanpur	Urban Road	60	9.5	102	Long Term
80	U8	Okha - Dihen	Urban Road	45	7.6	61	Long Term
81	U9	Vihel - Balkash	Urban Road	45	5.1	41	Long Term
82	U10	Hajira-Sunvali-Tena-Dihen-Sarol-Ishanpur	Urban Road	60	11	118	Long Term
83	U11	Kanad - Ishanpur	Urban Road	36	4.1	26	Long Term
84	U12	Segvachhama	Urban Road	30	3.3	18	Long Term
85	U13	Variyav-Sithan	Urban Road	36	6.1	40	Long Term
86	U14	Mota Varachha - Shekpur	Urban Road	45	8.6	70	Long Term

Sr. No.	Road Segments		Road Category	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
87	U15-A	Abrama - Kathor	Urban Road	45	6.2	51	Long Term
88	U16-A	Nansad - Koli Bharthana	Urban Road	30	3	16	Long Term
89	U17-C	Pasodara Gam - Vav Gam	m Urban Road 45 5.0				short Term
90	U17-D	Pasodara, Vav Road	Urban Road	45	0.77	8	Medium Term
91	U18-A	Gadhpur Township	Urban Road	30	0.3	2	Medium Term
92	U18-D	Anjani Soc.(Puna)-Kargil Chowk-Yogi chowk-Sumada *	Urban Road	30	1.67	9	Long Term
93	U19-A	Chhedchha - Oviyan	Urban Road	45	2.04	17	Medium Term
94	U19-B	Oviyan - Parab	Urban Road	45	7.1	58	Long Term
95	U21-B	Mohini Gam - Khabhashi	Urban Road	36	1.15	7	Medium Term
96	U21-C	Khabhashi - Chalthan	Urban Road	36	2.55	17	Long Term
97	U21-E	Deldava-Bagumara	Urban Road	36	2.33	15	Long Term
98	U22-A	Saniya Kande - Timabrava	Urban Road	36	4.93	32	Medium Term
99	U22-B	Timabrava - Vadadala	Urban Road	36	4.03	26	Long Term
100	U37-A	Radhika Homes to Raj Abhishek City Homes	Urban Road	24	5.4	23	short Term
101	U39	Sachin GIDC - Kansad	Urban Road	24	2	9	short Term
102	U57	Along DFC Corridor	Urban Road	18	30.3	98	short Term
	Cost of Urban Ro	pads proposed			224.8	1536	
63	River Bridges			-	5 (no.)	546	1 Medium Term & 4 Long Term
							12 Short Term, 8
64	RoB/RuB			-	25no.)	2344	Medium Term &
				22/		5 Long Term	
C.	Cost of Bridges				30(no.)	2890	

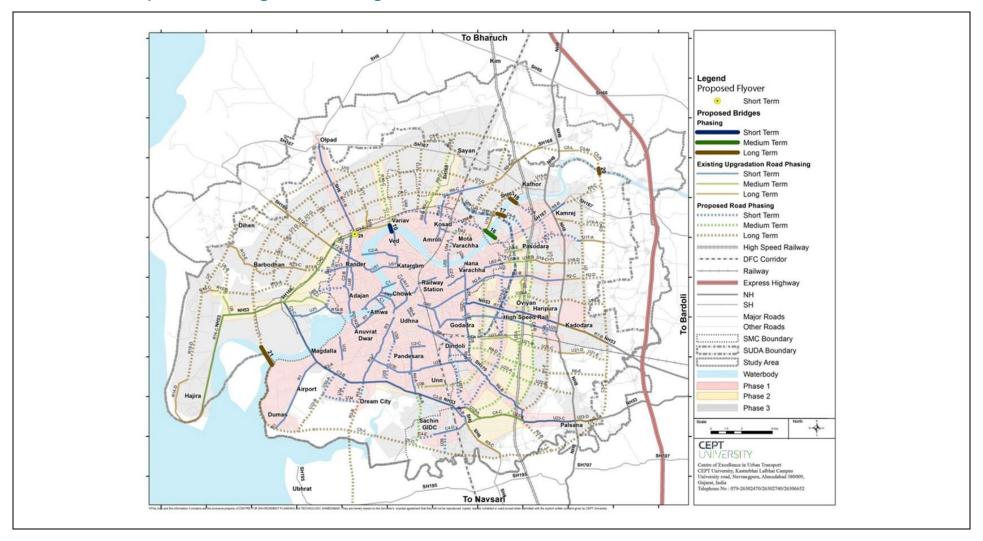
35.3. Outside SUDA

Sr. No.	Road Segments	Road Category	Existing RoW	Proposed RoW	Length (km)	Cost (Rs in crore)	Phasing
3. Outside S	SUDA (A+B)				11	293.4	
A. Pro	posed Road links			11	180		
1	C5-F	Ring Road	1	90	3.9	63.4	Long Term
2	C5-G	Ring Road	1	90	2.5	40.4	Long Term
3	C5-H	Ring Road	-	90	4.7	76	Long Term
			Cost of Ring	Roads proposed	11	180	
4	RoB/RuB		-	-	1 (no.)	113.4	1 Long Term
B. Cos	st of Bridges				1 (no.)	113.4	

Annexure 36: Proposed River Bridges in CMP Road Network



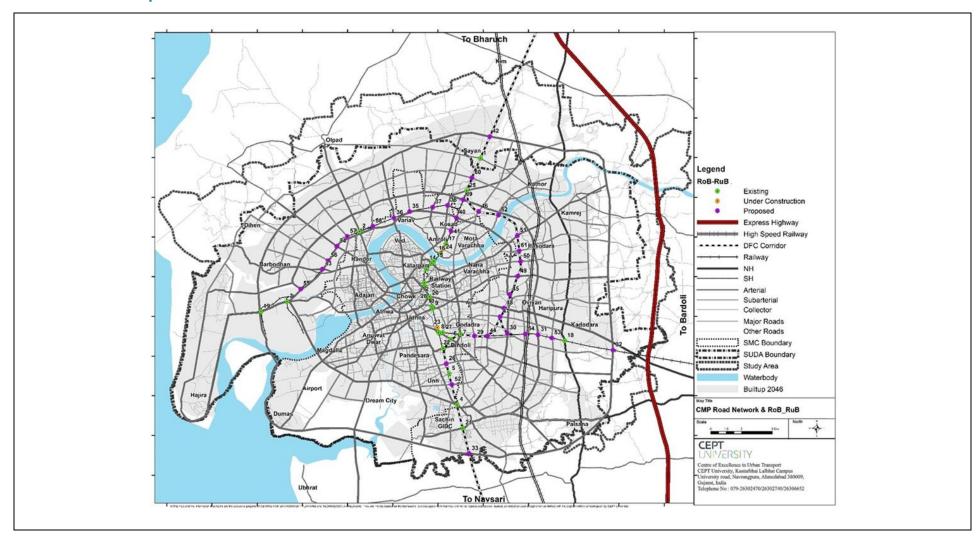
Annexure 37: Proposed Phasing of River Bridges in CMP Road Network



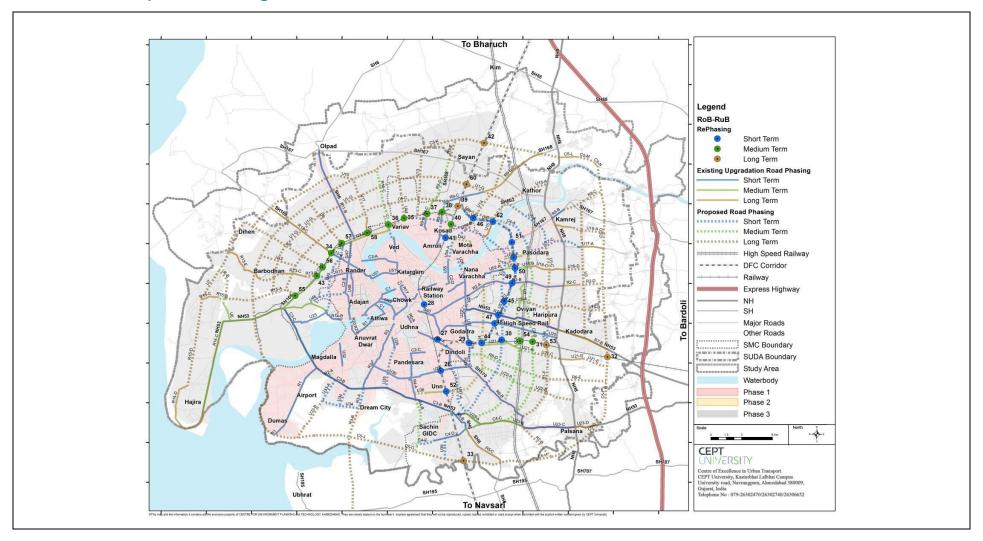
Annexure 38: List of Proposed River Bridges and Flyovers in CMP Road Network with Phasing and Costing

Sr. No.	Label ID	Туре	Boundary	Name	LANES	Final cost in crore	Phasing
1	10	River Bridges	SMC	Ved-Variyav	4	84	Short Term
2	16	River Bridges	SUDA	Bridge Near Sarthana	6	126	Medium Term
3	20	River Bridges	SUDA	Bridge Near Kholeshwar	6	126	Long Term
4	21	River Bridges	SUDA	Bridge near Dumas	6	126	Long Term
5	17	River Bridges	SUDA	Bridge Near Valak	4	84	Long Term
6	18	River Bridges	SUDA	Bridge Near abrama-Bhada	4	84	Long Term
7	29	Flyover	SMC	Widening of existing Saroli Bridge on Surat- Olpad road	6	113.4	Short Term

Annexure 39: Proposed RuB and RoB in CMP Road Network



Annexure 40: Proposed Phasing of RUB and ROB in CMP Road Network

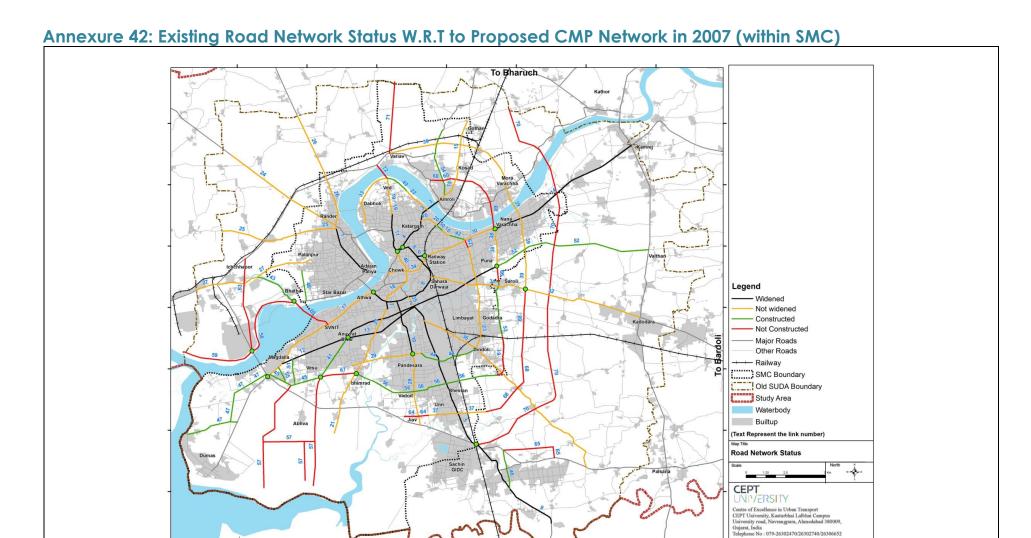


Annexure 41: List of Proposed RUB and ROB in CMP Road Network with Phasing and Costing

Sr. No.	Label ID	Туре	Boundary	Name	LANES	Final cost (Rs in crore)	Phasing
1	34	RoB/RuB	SMC	Construction of Railway Over Bridge Ringroad Sahara Darwaja fly over bridge to Karanimata Chowk	6	113.4	Short Term
2	27	RoB/RuB	SMC	RoB on Sayan Road nr Vaswari	6	113.4	Medium Term
3	26	RoB/RuB	SMC	RoB nr Kosad	4	75.6	Short Term
4	31	RoB/RuB	SMC	RoB nr Tirupati Nagar,Bhestan	4	75.6	Short Term
5	46	RoB/RuB	SMC	RoB near Variyav	4	75.6	Medium Term
6	37	RoB/RuB	SMC	RoB nr Gothan	4	75.6	Medium Term
7	35	RoB/RuB	SMC	Construction of Rly Over Bridge on 45.00 mt. wide canal road near Sidhdharth Nagar, Bhestan, Surat	4	75.6	Short Term
8	43	RoB/RuB	SMC	RoB near Variyav(East)	4	75.6	Medium Term
9	40	RoB/RuB	SMC	Bridge nr Variyav Jakatnaka	4	75.6	Medium Term
10	57	RoB/RuB	SMC	Bridge nr Variyav	4	75.6	Medium Term
11	60	RoB/RuB	SUDA	RoB Nr Kansad	6	113.4	Long Term
12	30	RoB/RuB	SUDA	RoB nr Gangadhara on Ring C5	6	113.4	Long Term

Sr. No.	Label ID	Туре	Boundary	Name	LANES	Final cost (Rs in crore)	Phasing
13	53	RoB/RuB	SUDA	RoB nr Bharthana	6	113.4	Medium Term
14	46	RoB/RuB	SUDA	RoB nr Bhesan	6	113.4	Medium Term
15	28	RoB/RuB	SUDA	RoB on SH 169 near Vanakala	6	113.4	Medium Term
16	32	RoB/RuB	SUDA	RoB nr Niyol on Ring C3	6	113.4	Short Term
17	52	RoB/RuB	SUDA	RuB nr Laskana on DFC Corridor	6	113.4	Short Term
18	44	RoB/RuB	SUDA	RuB nr Kosmada on DFC Corridor	6	113.4	Short Term
19	33	RoB/RuB	SUDA	RuB nr Chedchha on DFC Corridor	6	113.4	Short Term
20	45	RoB/RuB	SUDA	RuB nr Kumbariya on DFC Corridor	6	113.4	Short Term
21	41	RoB/RuB	SUDA	RoB nr Malgama	6	113.4	Medium Term
22	29	RoB/RuB	SUDA	Bridge Nr Vanakala	6	113.4	Medium Term
23	42	RoB/RuB	SUDA	RuB nr Gothan	4	75.6	Long Term
24	47	RoB/RuB	SUDA	RoB nr Devadh on Ring C2	4	75.6	Short Term
25	47	RoB/RuB	SUDA	RoB on Ring C4	4	75.6	Medium Term
26	56	RoB/RuB	SUDA	RuB nr Abrama on DFC Corridor	4	75.6	Short Term

Sr. No.	Label ID	Туре	Boundary	Name	LANES	Final cost (Rs in crore)	Phasing
27	38	RoB/RuB	SUDA	Bridge Nr Bhestan(North)	4	75.6	Medium Term
28	36	RoB/RuB	SUDA	RuB nr Pasodara on DFC Corridor	4	75.6	Short Term
29	61	RoB/RuB	SUDA	RuB nr Abrama on DFC Corridor	4	75.6	Short Term
30	55	RoB/RuB	SUDA	RoB nr Godadara	4	75.6	Short Term
31	54	RoB/RuB	SUDA	RoB nr Niyol	4	75.6	Medium Term
32	39	RoB/RuB	SUDA	RoB nr Vankadeda	4	75.6	Long Term
33	48	RoB/RuB	SUDA	RuB nr Vedchha on DFC Corridor	4	75.6	Short Term
34	58	RoB/RuB	SUDA	RuB nr Umra	4	75.6	Long Term
35	49	RoB/RuB	SUDA	RuB nr Khadsad on DFC Corridor	4	75.6	Short Term
36	51	RoB/RuB	Study Area	RuB nr Sayan on Ring C5	6	113.4	Long Term



Annexure 43: List of Existing Road Network Status w.r.t to Proposed CMP Network in 2007 (within SMC)

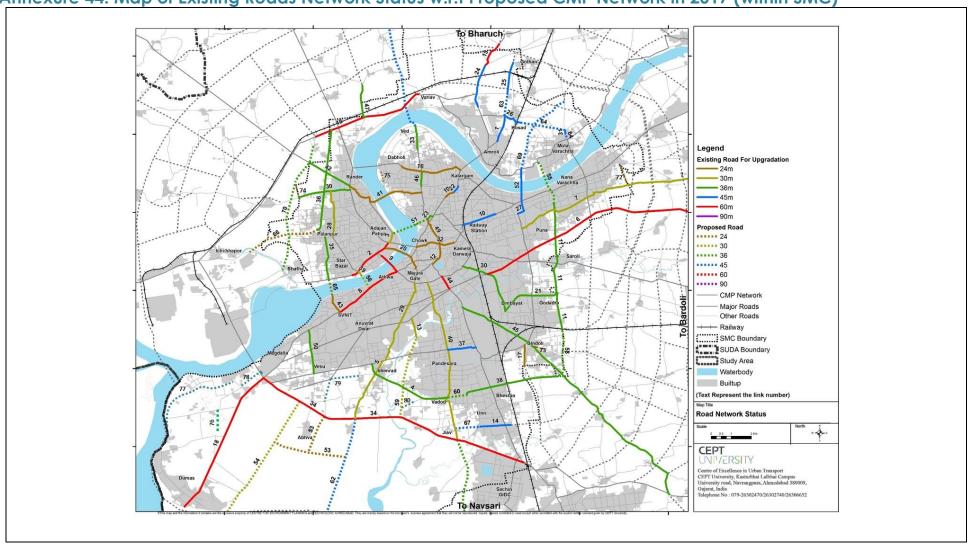
Link No	Status	Road name	Length (KM)	RoW status in 2007	Proposed RoW in 2007	RoW status in 2017
1	Widened	Adajan Patia to mora Bhagal	3.32	30-45	45-60	45
2	Widened	Canal road	10.14	18-40	60	60
3	Widened	Gajera to amroli	1.24	27-30	30-45	45
4	Widened	Katargam darawaja to gajera	3.08	27-30	30-45	30-45
5	Widened	Kharwarnagar to sachin GIDC	9.38	30-50	60	60
6	Widened	Lal Darwaja-Ayurvedic College road	0.47	18-22	45-60	45
7	Widened	Majura Gate to incometax	0.46	27-30	30-45	36
8	Widened	Ring Road	7.09	24-45	30-60	45-60
9	Widened	Sachin GIDC to lajpor	7.29	30-50	60	60
10	Widened	Sub jail to pandesara	3.54	27-30	30-45	36
11	Widened	Ved darwaja to dabholi char rasta	2.44	20-30	30-45	36
12	Widened	Y junction to anuvrat dwar	4.14	45-60	60	60
13	Widened	Anuvrat dwar to kharwarnagar	4.59	30-45	60	60
14	Widened	Kapodara to Kamrej	9.65	35-45-60	60	60
15	Not Widened	Amroli-kosad-gothan	5.64	30-50	45-60	30-50
16	Not Widened	Ashwinikumar circle-Atalji Nagar	0.52	20	30-45-60	24
17	Not Widened	Athwa Gate to Magdalla	8.31	45-60	60	45-60
18	Not Widened	Bhagl to Majura gate	2.52	10-12	18-24	15
19	Not Widened	Dabholi char rasta to nani ved	2.28	20	30-35	24

Link No	Status	Road name	Length (KM)	RoW status in 2007	Proposed RoW in 2007	RoW status in 2017
20	Not Widened	Gajera circle-patel nagar	1.07	20	30-45-60	24
21	Not Widened	Incometax to sarsana	8.66	12-18	45-60	24
22	Not Widened	Jagiriwadi-Amroli bridge	1.72	30	45-60	30
23	Not Widened	Lambe Hanuman road-Dindoli	6.51	10-20-30-45	30-35-60	30-45
24	Not Widened	Mora bhagal to Ariyana	7.60	18	45-60	18
25	Not Widened	Mora Bhagal to Babodhan	6.96	18	45	18
26	Not Widened	Mora Bhagal to Olpad	7.58	18	45	18
27	Not Widened	Palanpur Canal - Ichchhapor	7.24	12	45-60	12
28	Not Widened	Pandesara to jiav	4.57	10-12	30-45	12
29	Not Widened	Pandesara-Altan	4.19	10-20-30-45	30-35-60	45
30	Not Widened	Railway Station to Kapodara	4.60	36	60	36
31	Not Widened	Sahara Darwaja Saroli	5.77	45	60	60
32	Not Widened	Saroli Kadodara	7.10	35-45	60	45
33	Not Widened	Singanpor-Dabholi-motived road along river	3.63	30	45-60	30
34	Not Widened	station to chowk	2.70	14-18	18-24	18
35	Not Widened	Udhna darwaja to kharwar nagar	0.69	40-45	60	45
36	Not Widened	Udhna teen rasta to bhatia	14.04	10-18-22	30-45	24
37	Not Widened	Un to jiav	3.38	24	45-60	24
38	Not Widened	Varachha Water Works to Puna Canal	2.42	30	45-60	30
39	Not Widened	Variyav to Saroli	15.10	24	45-60	24

Link No	Status	Road name	Length (KM)	RoW status in 2007	Proposed RoW in 2007	RoW status in 2017
40	Not Widened	Ved darwaja to bhagal	1.41	18	30	18
41	Constructed	Anuvrat Dwar-Dream House(Vesu)	2.91	not Exist	60	60
42	Constructed	Ataljinagar-Hirabag	0.94	not Exist	30	30
43	Constructed	Bhatha-Ichchhapor	2.80	not Exist	45-60	18
44	Constructed	Dindoli-Pandesara	3.55	not Exist	45	45
45	Constructed	Dream House vesu-Magdalla	3.24	not Exist	45-60	45-60
46	Constructed	Lajpor Jail-Vrudavan society-NH8	2.50	not Exist	60	24
47	Constructed	Magdalla-Gaviyer-Dumas	7.14	not Exist	60	12
48	Constructed	Monarch(Palanpur)-Bhulka Vihar School	1.91	not Exist	45-60	15
49	Constructed	Moti ved-jagiriwadi	1.42	not Exist	45-60	12
50	Constructed	Patel nagar-Ashwinikumar circle	0.48	not Exist	30	30
51	Constructed	Prime Shoppers - Star Galaxy	1.60	not Exist	45-60	18
52	Constructed	Puna gam-Valthan Road	9.46	not Exist	60	18
53	Constructed	Saroli to Godadara	3.61	not Exist	45-60	12
54	Constructed	Sayan road	4.30	not Exist	45-60	45
55	Constructed	Suda EWS Rundh - Mile stone 7 Heaven	1.03	not Exist	45-60	12
56	Constructed	Vrukhmani society - bhestan- ganeshnagar- Sai residency bhimrad	8.92	not Exist	45-60	30
57	Not Constructed	Abhva Road	19.59	Not Constructed	45-60	-
58	Not Constructed	Bhatha-Bhatpor	5.17	Not Constructed	45-60	-

Link No	Status	Road name	Length (KM)	RoW status in 2007	Proposed RoW in 2007	RoW status in 2017
59	Not Constructed	Bhatpor-ONGC Plant	4.30	Not Constructed	45-60	-
60	Not Constructed	Chhapra Batha to varachha Water works	5.96	Not Constructed	45-60	-
61	Not Constructed	Godadara to vruksmani society	2.54	Not Constructed	45-60	-
62	Not Constructed	Hirabaug-Lambe Hanuman Road	0.50	Not Constructed	45-60	-
63	Not Constructed	Ichchhapor-bhatpor-ONGC Bridge	5.85	Not Constructed	45-60	-
64	Not Constructed	Jiav	1.42	Not Constructed	45-60	-
65	Not Constructed	NH-8-Vanz	3.64	Not Constructed	60	-
66	Not Constructed	Puna Canal to Saroli	1.00	Not Constructed	45-60	-
67	Not Constructed	Sai residency bhimrad-Dream house Vesu	2.10	Not Constructed	45-60	-
68	Not Constructed	Saroli to Un	8.97	Not Constructed	45-60	-
69	Not Constructed	SVNIT-Bhatha	2.55	Not Constructed	45-60	-
70	Not Constructed	Umra to Sachin GIDC	25.04	Not Constructed	45-60	-
71	Not Constructed	Variav Road	4.52	Not Constructed	30-45	-
72	Not Constructed	Ved-Variyav Bridge	1.04	Not Constructed	30-45	-

Annexure 44: Map of Existing Roads Network Status w.r.t Proposed CMP Network in 2017 (within SMC)



Annexure 45: Details of Existing Roads Network Status w.r.t to Proposed CMP Network in 2017 (within SMC)

Link Number	Status of Road network	Road Name	Existing (2017) RoW	Proposed (2046) RoW	Length (km)
1	Existing	Abhishek Township-Kosad Talav	30	45	1.33
2	Existing	Adajan Patia-star Bazar	45	60	2.38
3	Existing	Adajan Patiya-Jilani Bridge	24	30	0.53
4	Existing	Althan - Bamroli - Vadod	24	36	4.22
5	Existing	Althan Sarsana	12	30	3.19
6	Existing	Anjana Canal-Parvat Patia-Simada-Valthan(Canal Corridor)	18	60	14.56
7	Existing	Anjani Soc.(Puna)-Kargil Chowk-Yogi chowk-Sumada Gam-Kathodara	12	30	11.19
8	Existing	Athwa Gate to SVNIT	36	60	3.37
9	Existing	Athwa Gate-Gujarat Gas Circle	18	60	1.06
10	Existing	Ayurvedic College-Baroda Pristage	36	45	1.61
11	Existing	Balaji chowk - Saroli-godadara	24	36	5.74
12	Existing	Bhagal - Gopi Talav	15	24	1.12
13	Existing	Bhatar-bamroli road	24	30	0.99
14	Existing	Bhestan-Unn Road	18	45	1.43
15	Existing	Canal Crossing- Vasvari	18	60	1.27
16	Existing	Dabholi-Gajera School	15	24	2.91
17	Existing	Dindoli-Radhika Homes	12	24	1.03

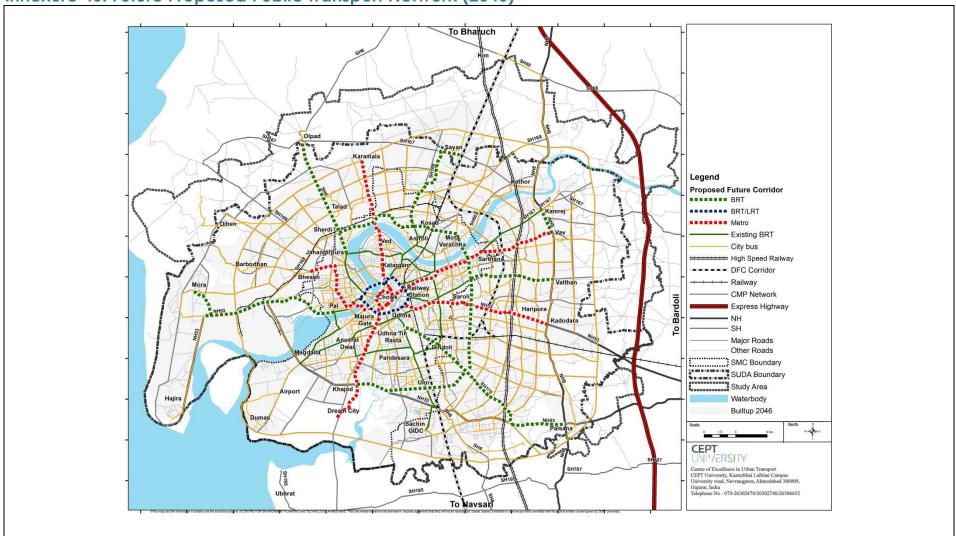
Link Number	Status of Road network	Road Name	Existing (2017) RoW	Proposed (2046) RoW	Length (km)
18	Existing	Dumas Road	24	60	7.48
19	Existing	Godhani Circle-Katargam BRTS	18	24	0.42
20	Existing	Kadarsha ni nal-Makkai pul	15	24	1.95
21	Existing	Kamela Darwaja-Nilgiri Circle-Godadara Naher	24	36	6.16
22	Existing	Katargam BRTS-Gajera	24	45	0.40
23	Existing	Katargam Darwaja	30	36	0.32
24	Existing	Kosad Depot-Canal Crossing	18	45	2.19
25	Existing	Kosad Gothan Road	9	45	1.58
26	Existing	Kosad Talav-Kosad Railway Crossing	9	45	0.97
27	Existing	Lambe Hanuman Road-Kapodra-Utran power house	24	45	0.33
28	Existing	LP Savani-Ugat	24	30	2.36
29	Existing	Majura Gate to Althan	18	30	4.19
30	Existing	Mora Bhagal-South Gujarat Medical College	30	36	2.43
31	Existing	Mota Varachha Road	9	45	0.16
32	Existing	Moti Talkies-Chowk	15	24	1.83
33	Existing	Nani ved-Moti ved Dargah	18	36	1.18
34	Existing	ONGC Colony-Sachin GIDC	24	60	13.17
35	Existing	Pal RTO-Panalpur canal Raod	24	36	2.12

Link Number	Status of Road network	Road Name	Existing (2017) RoW	Proposed (2046) RoW	Length (km)
36	Existing	Palanpur Canal Road	12	36	5.01
37	Existing	Piyush Point - Daksheswar	24	45	1.32
38	Existing	Shyam villa Dindoli-Ganesh nagar Pandesara	24	36	4.33
39	Existing	Star bazar-Cable Bridge Road	12	30	0.14
40	Existing	Sub Jail - Piyush Point-Vadod -Jiav	12	30	8.42
41	Existing	Subhash Garden-Rander-Causeway-Akhand Anand College	12	24	4.00
42	Existing	Subhash Garden-Vankala	30	36	2.20
43	Existing	SVNIT to Umra	15	24	0.88
44	Existing	Udhna Darwaja-Kharwarnagar	45	60	0.69
45	Existing	Udhna Teen Rasta- Dindoli - Batia	24	36	14.04
46	Existing	Vadinath Chowk-Dabholi Char Rasta	30	36	0.73
47	Existing	Variyav Jakatnaka-Kanaj Road	12	36	1.65
48	Existing	Variyav-Vankal(Outer Ring Road)	18	60	5.34
49	Existing	Ved Darwaja-Bhagal	15	24	1.41
50	Existing	Vesu Main Road	24	36	2.18
51	Existing	Paliya Groung Road	9	36	0.14
52	Existing	Raj Abhishek City Homes-Toll Plaza	24	45	2.07
53	Proposed	Abhava Road	-	24	5.35

Link Number	Status of Road network	Road Name	Existing (2017) RoW	Proposed (2046) RoW	Length (km)
54	Proposed	Abhva-Bhimpor Road	-	30	6.64
55	Proposed	Balaji Chowk-Varachha Khadi-Utran Power House	-	36	2.27
56	Proposed	Cable Bridge	-	30	0.84
57	Proposed	Dhastipura-Jilani Bridge	-	36	1.67
58	Proposed	Gadadara - Dindoli	-	36	2.36
59	Proposed	Gandhi Kutir-Bamroli-Dundi Gam	-	30	4.10
60	Proposed	Ganesh Nagar Road	-	36	0.89
61	Proposed	Jiav-Umber Road	-	36	5.25
62	Proposed	Khajod-Dream city Road	-	45	4.88
63	Proposed	Kosad Road	-	45	1.09
64	Proposed	Mota Varachha - Kosad Road	-	45	2.39
65	Proposed	Pal-Umra Bridge	-	24	0.86
66	Proposed	Palanpur - Ichchhapor Canal Road	-	24	3.47
67	Proposed	Sonari Road	-	45	1.17
68	Proposed	Talangpor Bypass	-	45	1.61
69	Proposed	Utran Bridge - Mota Varachha Road	-	45	4.15
70	Proposed	Vankala-Bheshan Road	-	36	6.46
71	Proposed	Variyav-Sherdi-Karmala Road	-	45	7.17

Link Number	Status of Road network	Road Name	Existing (2017) RoW	Proposed (2046) RoW	Length (km)
72	Proposed	Vishal Nagar	-	30	1.2
73	Proposed	Dindoli Lake	-	30	0.5
74	Proposed	Bhesan Gam	-	30	0.8
75	Proposed	Riverfront Road	-	30	0.5
76	Proposed	Vanta	-	36	1.3
77	Proposed	Dock Beach Road	-	45	4.5
78	Proposed	Magdalla Canal Road	-	45	1.1
79	Proposed	Sarsana Gam	-	45	2.3
80	Proposed	Dundi	-	45	0.6



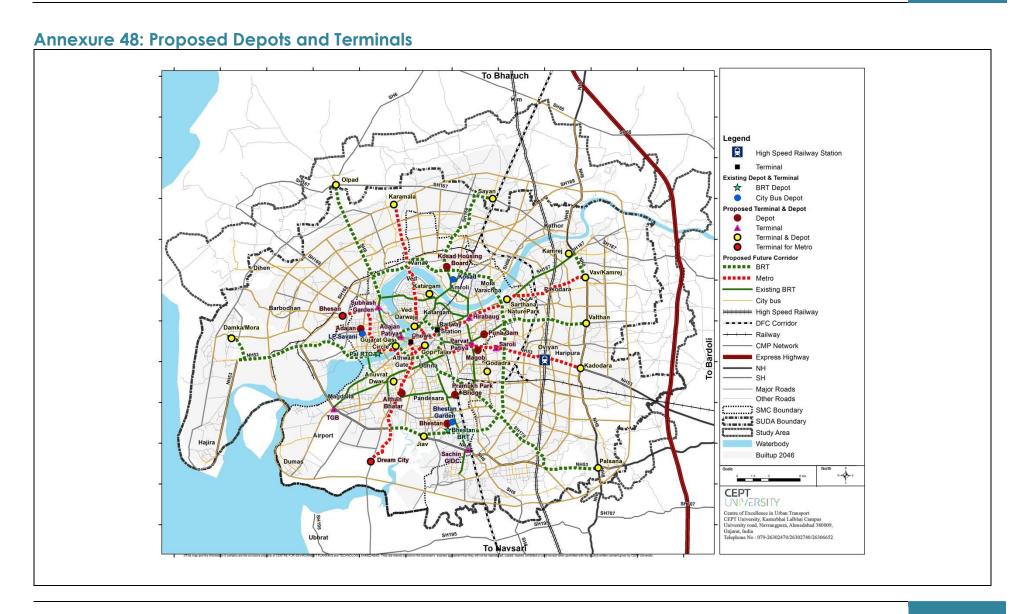


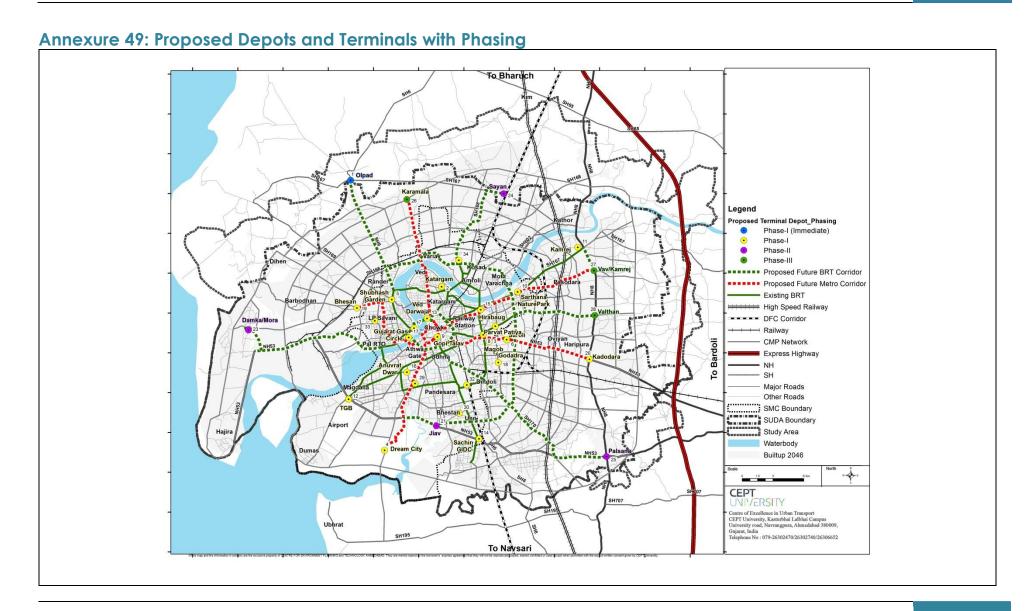
Annexure 47: Details of Public Transport Network Phasing and Costing

Sr. No.	Rapid Transit Corridor Name	Km	Elevated / Underground	Phasing	Unit cost (Rs in crore)	Total amount (Rs in crore)
A. Pı	roposed Future Metro corridor					
	Dream city – Kamrej/Vav (Sarsana- Exhibition Centre, Bhatar Char rasta and Sarsana, Majura Gate, Rly station and Sarthana)	31				8720
1	a. Dream city - Majuragate	11.5	Elevated	Phase- I	220	2530
	b. Majuragate- Kapodra	9.5	Underground	Phase- I	420	3990
	c. Kapodra -Sarthana	3.5	Elevated	Phase- I	220	770
	d. Sarthana - Kamrej/Vav	6.5	Elevated	Phase-II	220	1430
2	Bhesan - Kadodara (via Adajan, Majura gate, Kamela Darwaja, Saroli and Sabargam)	26			220	5720
	a. Bhesan - Saroli	17	Elevated	Phase- I	220	3740
	b. Soroli - Kadodara	9	Elevated	Phase-II	220	1980
	Majuragate - Karamala (via Ved)	16				3520
3	a. Majuragate - Ved	8	Elevated	Phase-II	220	1760
	b. Ved - Karmala	8	Elevated	Phase-III	220	1760
	Total	cost of prop	osed Metro corridors	(Rs in crore) for	73 km length	17960

Sr. No.	Rapid Transit Corridor Name	Km	Elevated / Underground	Phasing	Unit cost (Rs in crore)	Total amount (Rs in crore)			
B. Pr	roposed Future BRT corridor								
4	Jahangirpura to Olpad (via Talad)	11	At grade	Phase-III	20	220			
5	Udana teen rasta to Palsana (Dindoli)	19	At grade	Phase-III	20	380			
6	Punagam to Valthan (via Kosmada)	7	At grade	Phase-III	20	140			
7	Kosad to Sayan (via Gothan)	10	At grade	Phase-IV	20	200			
8	Pal to Hazira (via Icchapur)	15	At grade	Phase-IV	20	300			
9	Sherdi to Unn (half ring) (via Kapodara, Saroli, Devadh, Saniya Kande)	29	At grade	Phase-IV	20	580			
10	Unn to Khajod	6	At grade	Phase-IV	20	120			
11	Kamrej to Vav	2	At grade	Phase-IV	20	40			
12	Railway station loop (inner ring) - (BRT/LRT) (via Sahara Dharwaja,Udhana, Adajan, Katargam)	12	At grade	Phase-IV	150	1800			
	Total cost of proposed BRT corridors (Rs in crore) for 111 km length								

^{*}All cost are as per current cost, without taxes and land cost



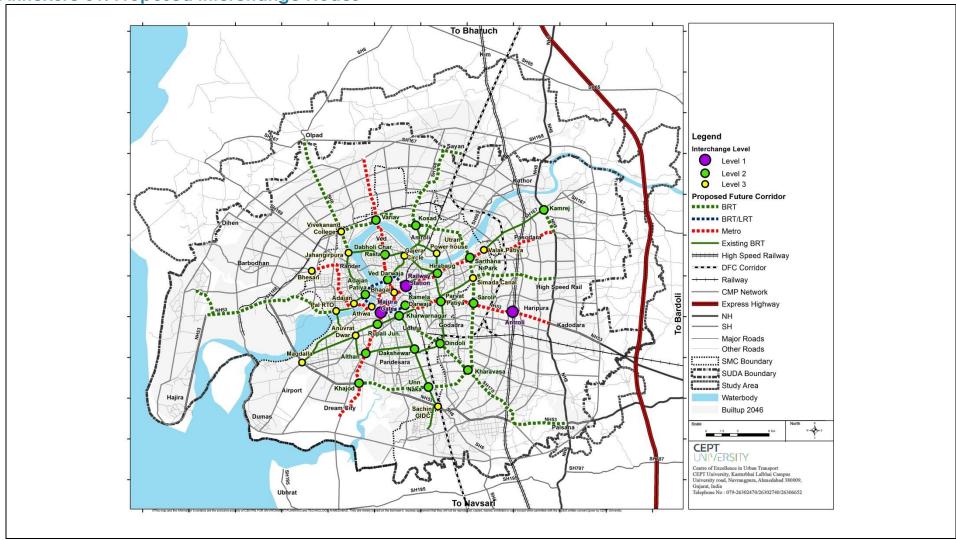


Annexure 50: List of Proposed Depots and Terminals with phasing

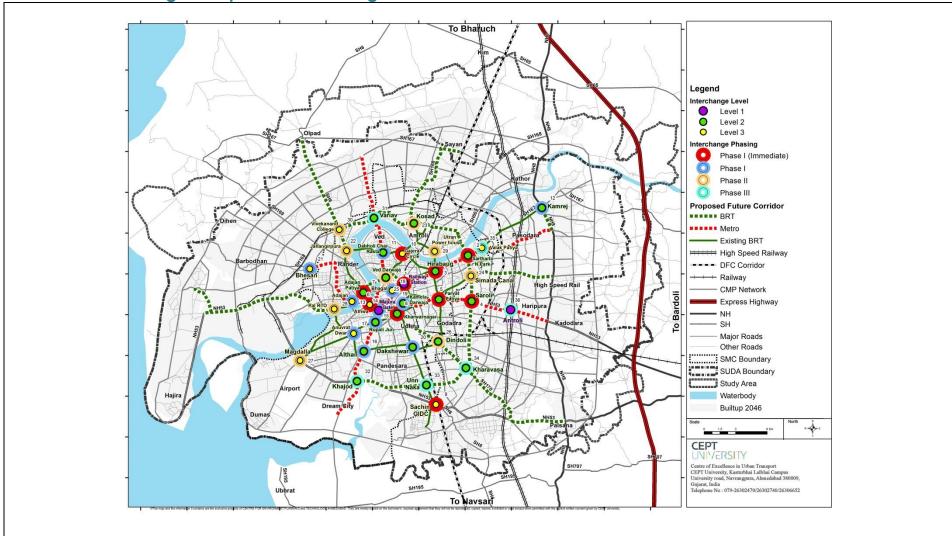
Sr. No.	Ref. Id	Type1	Name_1	Phasing
1	1	Terminal & Depot	Olpad	Phase-I (Immediate)
2	3	Depot	Magob	Phase-I
3	29	Depot	Althan Bhatar Depot	Phase-I
4	30	Depot	Bhestan Depot	Phase-I
5	31	Depot	Puna Gam Depot	Phase-I
6	32	Depot	Pramukh Park Bridge Under Parking Depot	Phase-I
7	33	Depot	Adajan Depot	Phase-I
8	34	Depot	Kosad Housing Board Depot	Phase-I
9	5	Terminal	Subhash Garden	Phase-I
10	6	Terminal	Saroli	Phase-I
11	7	Terminal	Adajan Patiya	Phase-I
12	8	Terminal	Parvat Patiya	Phase-I
13	12	Terminal	TGB	Phase-I
14	14	Terminal	Sachin GIDC	Phase-I
15	15	Terminal	Hirabaug	Phase-I
16	2	Terminal & Depot	Katargam	Phase-I
17	9	Terminal & Depot	Gopi Talav	Phase-I
18	10	Terminal & Depot	Sarthana Nature Park	Phase-I
19	11	Terminal & Depot	Kamrej	Phase-I
20	13	Terminal & Depot	Ved Darwaja	Phase-I
21	16	Terminal & Depot	Anuvrat Dwar	Phase-I

Sr. No.	Ref. Id	Type1	Name_1	Phasing
22	17	Terminal & Depot	Gujarat Gas Circle	Phase-I
23	18	Terminal & Depot	Godadara	Phase-I
24	20	Terminal & Depot	Kadodara	Phase-I
25	21	Terminal & Depot	Jiav	Phase-II
26	23	Terminal & Depot	Damka/Mora	Phase-II
27	24	Terminal & Depot	Sayan	Phase-II
28	25	Terminal & Depot	Palsana	Phase-II
29	26	Terminal & Depot	Karmala	Phase-III
30	27	Terminal & Depot	Vav	Phase-III
31	28	Terminal & Depot	Valthan	Phase-III
32	4	Terminal for Metro	Dream City	Phase-I
33	19	Terminal for Metro	Bhesan	Phase-I







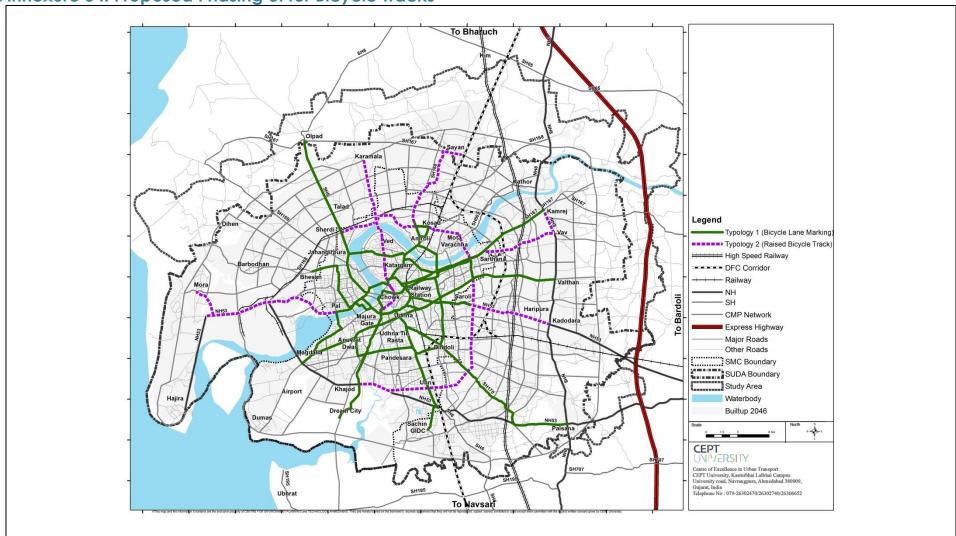


Annexure 53: List of Proposed Interchange Nodes with Phasing

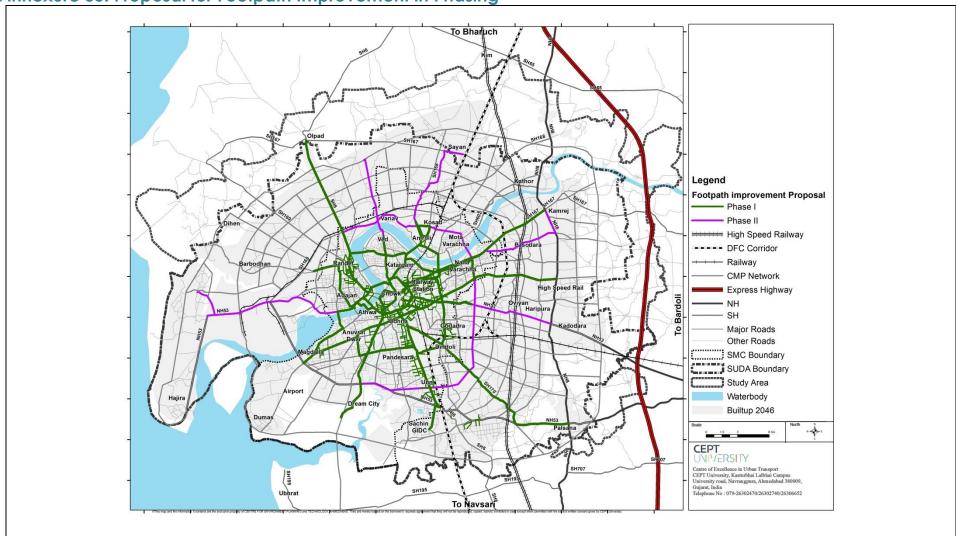
Ref. Id	ТУРЕ	Name	Level	Phasing
1	Rail + GSRTC + RTC + BRT+City bus	Railway Station	Level 1	Phase I (Immediate)
2	Metro + BRT + City bus	Sarthana Nature Park	Level 2	Phase I (Immediate)
3	Metro + BRT + City bus	Hirabaug	Level 2	Phase I (Immediate)
4	Metro + BRT + City bus	Saroli	Level 2	Phase I (Immediate)
5	Metro + BRT + City bus	Parvat Patiya	Level 2	Phase I (Immediate)
6	Metro + BRT + City bus	Athwa Gate	Level 3	Phase I (Immediate)
7	BRT + City bus + GSRTC	Adajan Patiya	Level 2	Phase I (Immediate)
8	BRT + BRT + City bus	Kharwar Nagar	Level 2	Phase I (Immediate)
9	BRT + City bus	Sachin GIDC	Level 3	Phase I (Immediate)
10	BRT + City bus	Gajera Circle	Level 3	Phase I (Immediate)
11	Metro + BRT + City bus	Dabholi Char Rasta	Level 2	Phase I
12	BRT + BRT + City bus + GSRTC	Kamrej	Level 2	Phase I
13	Metro + BRT + City bus	Adajan Gam	Level 3	Phase I
14	RTC + BRT + City bus	Majura Gate	Level 1	Phase I
15	Metro + BRT + City bus	Rupali Junction	Level 2	Phase I
16	Metro + BRT + City bus	Althan	Level 2	Phase I
17	BRT + City bus	Anuvarat Dwar	Level 3	Phase I
18	BRT + City bus	Bhagal	Level 3	Phase I

Ref. Id	ТҮРЕ	Name	Level	Phasing
19	Metro + BRT + City bus	Kamela Darwaja	Level 2	Phase I
20	BRT + BRT + City bus	Dakshewar	Level 2	Phase I
21	Metro + City Bus	Bhesan	Level 3	Phase I
22	BRT + BRT + City bus	Jahangirpura	Level 3	Phase II
23	BRT + BRT + City bus	Kosad	Level 2	Phase II
24	BRT + BRT + City bus	Simada Canal Junction	Level 3	Phase II
25	Metro + BRT + City bus	Ved Darwaja	Level 2	Phase II
26	BRT + BRT + City bus	Dindoli	Level 2	Phase II
27	BRT + City bus	Magdalla	Level 3	Phase II
28	BRT + BRT + City bus	Pal RTO	Level 3	Phase II
29	BRT + City bus	Utran Power House	Level 3	Phase II
30	BRT + City Bus	Vivekanand College	Level 3	Phase II
31	Metro + BRT + City bus	Variav	Level 2	Phase III
32	Metro + BRT + City bus	Khajod	Level 2	Phase III
33	BRT + BRT + City bus	Unn Naka	Level 2	Phase III
34	BRT + RTC + City bus	Kharavasa	Level 2	Phase III
35	Metro + BRT + City bus	Valak Patiya	Level 3	Phase III
36	High Speed Rail + RTC+City bus	Antroli	Level 1	Phase III









Annexure 56: Infrastructure Cost for TOD Zones

56.1. Cost of Infrastructure Improvements in the MRT LAP Zones

LAP ID	LAP Area(Ha)	Water Supply Cost/Ha (Lac)	Drainage Cost/Ha(Lac)	Storm Network Cost/Ha(Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Cost (Cr)	Total Cost (Cr)
1	36	1500000	1250000	450000	5	5	2	19	30
2	99	1500000	1250000	450000	15	12	4	8	40
3	78	1500000	1250000	450000	12	10	4	22	47
4	173	1500000	1250000	450000	26	22	8	45	101
5	231	1500000	1250000	450000	35	29	10	37	111
6	177	1500000	1250000	450000	27	22	8	41	97
7	264	1500000	1250000	450000	40	33	12	55	140
8	319	1500000	1250000	450000	48	40	14	109	211
9	152	1500000	1250000	450000	23	19	7	45	94
10	145	1500000	1250000	450000	22	18	7	37	84
11	172	1500000	1250000	450000	26	22	8	45	101
12	261	1500000	1250000	450000	39	33	12	55	139
13	245	1500000	1250000	450000	37	31	11	71	150
14	206	1500000	1250000	450000	31	26	9	15	81
15	190	1500000	1250000	450000	29	24	9	42	102
16	201	1500000	1250000	450000	30	25	9	29	94
17	61	1500000	1250000	450000	9	8	3	9	29
18	187	1500000	1250000	450000	28	23	8	33	93
19	141	1500000	1250000	450000	21	18	6	34	80
20	173	1500000	1250000	450000	26	22	8	48	103
21	157	1500000	1250000	450000	24	20	7	44	94
22	202	1500000	1250000	450000	30	25	9	51	115
23	125	1500000	1250000	450000	19	16	6	31	71
Total	3995				599	499	180	926	2204

56.2. Cost of Infrastructure improvements in the BRT LAP zones

LAP ID	LAP Area(Ha)	Water Supply Cost per Ha (Lac)	Drainage Cost per Ha(Lac)	Storm Network Cost per Ha (Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Amount (Cr)	Total Amount (Cr)
1	224	1500000	1250000	450000	34	28	10	73	145
2	331	1500000	1250000	450000	50	41	15	75	181
3	288	1500000	1250000	450000	43	36	13	94	187
4	183	1500000	1250000	450000	28	23	8	57	116
5	263	1500000	1250000	450000	39	33	12	88	173
6	153	1500000	1250000	450000	23	19	7	40	89
7	354	1500000	1250000	450000	53	44	16	82	195
8	335	1500000	1250000	450000	50	42	15	65	172
9	361	1500000	1250000	450000	54	45	16	109	224
10	97	1500000	1250000	450000	15	12	4	25	56
11	85	1500000	1250000	450000	13	11	4	30	57
12	149	1500000	1250000	450000	22	19	7	40	87
13	124	1500000	1250000	450000	19	16	6	31	70
14	224	1500000	1250000	450000	34	28	10	74	145
15	119	1500000	1250000	450000	18	15	5	28	66
16	132	1500000	1250000	450000	20	16	6	29	71
17	101	1500000	1250000	450000	15	13	5	29	62
18	139	1500000	1250000	450000	21	17	6	28	72
19	145	1500000	1250000	450000	22	18	7	30	77
20	110	1500000	1250000	450000	16	14	5	29	64

LAP ID	LAP Area(Ha)	Water Supply Cost per Ha (Lac)	Drainage Cost per Ha(Lac)	Storm Network Cost per Ha (Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Amount (Cr)	Total Amount (Cr)
21	274	1500000	1250000	450000	41	34	12	92	180
22	125	1500000	1250000	450000	19	16	6	29	69
23	110	1500000	1250000	450000	16	14	5	31	66
24	161	1500000	1250000	450000	24	20	7	40	91
25	227	1500000	1250000	450000	34	28	10	59	132
26	374	1500000	1250000	450000	56	47	17	91	211
27	219	1500000	1250000	450000	33	27	10	82	152
28	323	1500000	1250000	450000	48	40	15	71	174
29	195	1500000	1250000	450000	29	24	9	74	136
30	251	1500000	1250000	450000	38	31	11	57	137
31	266	1500000	1250000	450000	40	33	12	62	147
32	260	1500000	1250000	450000	39	33	12	16	99
33	159	1500000	1250000	450000	24	20	7	44	95
34	157	1500000	1250000	450000	24	20	7	19	69
35	161	1500000	1250000	450000	24	20	7	35	87
36	321	1500000	1250000	450000	48	40	14	61	163
37	228	1500000	1250000	450000	34	29	10	25	98
38	197	1500000	1250000	450000	30	25	9	49	112
39	272	1500000	1250000	450000	41	34	12	68	155
40	370	1500000	1250000	450000	56	46	17	80	199
41	151	1500000	1250000	450000	23	19	7	39	88

LAP ID	LAP Area(Ha)	Water Supply Cost per Ha (Lac)	Drainage Cost per Ha(Lac)	Storm Network Cost per Ha (Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Amount (Cr)	Total Amount (Cr)
42	232	1500000	1250000	450000	35	29	10	78	152
43	203	1500000	1250000	450000	30	25	9	58	123
44	160	1500000	1250000	450000	24	20	7	34	85
45	174	1500000	1250000	450000	26	22	8	41	97
46	183	1500000	1250000	450000	27	23	8	31	90
47	162	1500000	1250000	450000	24	20	7	46	98
48	197	1500000	1250000	450000	30	25	9	64	127
49	199	1500000	1250000	450000	30	25	9	61	124
50	234	1500000	1250000	450000	35	29	11	53	128
51	212	1500000	1250000	450000	32	27	10	51	119
52	171	1500000	1250000	450000	26	21	8	37	91
53	146	1500000	1250000	450000	22	18	7	34	80
54	178	1500000	1250000	450000	27	22	8	53	110
55	160	1500000	1250000	450000	24	20	7	27	78
56	146	1500000	1250000	450000	22	18	7	31	78
Total	11477				1722	1435	516	2878	6550

56.2. Cost of Infrastructure Improvements in the MRT & BRT Combined LAP Zones

LAP No	LAP Area(Ha)	Water Supply Cost per Ha (Lac)	Drainage Cost per Ha(Lac)	Storm Network Cost per Ha (Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Amount (Cr)	Total Amount (Cr)
1	331	1500000	1250000	450000	50	41	15	75	181
2	290	1500000	1250000	450000	43	36	13	95	187
3	152	1500000	1250000	450000	23	19	7	39	88
4	353	1500000	1250000	450000	53	44	16	83	196
5	246	1500000	1250000	450000	37	31	11	70	149
6	120	1500000	1250000	450000	18	15	5	29	67
7	132	1500000	1250000	450000	20	17	6	29	71
8	101	1500000	1250000	450000	15	13	5	30	62
9	127	1500000	1250000	450000	19	16	6	30	71
10	197	1500000	1250000	450000	30	25	9	49	112
11	373	1500000	1250000	450000	56	47	17	92	211
12	219	1500000	1250000	450000	33	27	10	82	152
13	324	1500000	1250000	450000	49	40	15	71	174
14	290	1500000	1250000	450000	43	36	13	71	164
15	251	1500000	1250000	450000	38	31	11	57	137
16	131	1500000	1250000	450000	20	16	6	53	95
17	100	1500000	1250000	450000	15	12	4	8	40
18	264	1500000	1250000	450000	40	33	12	55	139
19	206	1500000	1250000	450000	31	26	9	15	81

LAP No	LAP Area(Ha)	Water Supply Cost per Ha (Lac)	Drainage Cost per Ha(Lac)	Storm Network Cost per Ha (Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Amount (Cr)	Total Amount (Cr)
20	257	1500000	1250000	450000	39	32	12	83	165
21	37	1500000	1250000	450000	5	5	2	19	30
22	384	1500000	1250000	450000	58	48	17	121	244
23	331	1500000	1250000	450000	50	41	15	65	171
24	114	1500000	1250000	450000	17	14	5	30	67
25	75	1500000	1250000	450000	11	9	3	20	44
26	139	1500000	1250000	450000	21	17	6	28	73
27	234	1500000	1250000	450000	35	29	11	53	128
28	98	1500000	1250000	450000	15	12	4	26	57
29	304	1500000	1250000	450000	46	38	14	82	179
30	185	1500000	1250000	450000	28	23	8	48	108
31	286	1500000	1250000	450000	43	36	13	82	174
32	165	1500000	1250000	450000	25	21	7	55	108
33	205	1500000	1250000	450000	31	26	9	35	100
34	383	1500000	1250000	450000	57	48	17	128	251
35	167	1500000	1250000	450000	25	21	8	51	104
36	148	1500000	1250000	450000	22	18	7	27	74
37	203	1500000	1250000	450000	30	25	9	52	117
38	272	1500000	1250000	450000	41	34	12	68	155
39	370	1500000	1250000	450000	56	46	17	80	199
40	151	1500000	1250000	450000	23	19	7	39	88

LAP No	LAP Area(Ha)	Water Supply Cost per Ha (Lac)	Drainage Cost per Ha(Lac)	Storm Network Cost per Ha (Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Amount (Cr)	Total Amount (Cr)
41	232	1500000	1250000	450000	35	29	10	78	152
42	203	1500000	1250000	450000	30	25	9	58	123
43	201	1500000	1250000	450000	30	25	9	29	94
44	161	1500000	1250000	450000	24	20	7	40	91
45	198	1500000	1250000	450000	30	25	9	16	79
46	157	1500000	1250000	450000	24	20	7	44	94
47	157	1500000	1250000	450000	24	20	7	19	69
48	161	1500000	1250000	450000	24	20	7	35	87
49	321	1500000	1250000	450000	48	40	14	61	163
50	228	1500000	1250000	450000	34	29	10	25	98
51	191	1500000	1250000	450000	29	24	9	42	103
52	161	1500000	1250000	450000	24	20	7	34	85
53	174	1500000	1250000	450000	26	22	8	41	97
54	183	1500000	1250000	450000	27	23	8	31	90
55	61	1500000	1250000	450000	9	8	3	9	29
56	104	1500000	1250000	450000	16	13	5	18	52
57	125	1500000	1250000	450000	19	16	6	31	70
58	174	1500000	1250000	450000	26	22	8	48	103
59	158	1500000	1250000	450000	24	20	7	44	95
60	195	1500000	1250000	450000	29	24	9	49	112

LAP No	LAP Area(Ha)	Water Supply Cost per Ha (Lac)	Drainage Cost per Ha(Lac)	Storm Network Cost per Ha (Lac)	Water Supply Amount (Cr)	Drainage Network Amount (Cr)	Storm Network Amount (Cr)	Proposed Road Amount (Cr)	Total Amount (Cr)
61	110	1500000	1250000	450000	16	14	5	24	60
62	148	1500000	1250000	450000	22	18	7	39	86
63	183	1500000	1250000	450000	27	23	8	61	119
64	199	1500000	1250000	450000	30	25	9	61	124
65	98	1500000	1250000	450000	15	12	4	23	54
66	113	1500000	1250000	450000	17	14	5	23	59
67	213	1500000	1250000	450000	32	27	10	51	119
68	171	1500000	1250000	450000	26	21	8	37	91
69	146	1500000	1250000	450000	22	18	7	34	80
70	152	1500000	1250000	450000	23	19	7	38	87
71	161	1500000	1250000	450000	24	20	7	27	78
72	121	1500000	1250000	450000	18	15	5	23	61
Total	14074				2111	1759	633	3415	7919

Annexure 57: Revenue Generated by TOD Value Capture

57.1. Revenue Collected through MRT TOD Value Capture

LAP ID	Area with Chargeable FSI (sq.km)	Area under Chargeable FSI (sq.km)	Residential Revenue Amount (Cr.)	Commercial Revenue Amount (Cr.)	Total Revenue (Cr.)
1	0.75	0.25	164	41	204
2	2.14	0.70	467	116	584
3	1.45	0.48	318	79	397
4	3.35	1.10	733	182	915
5	4.61	1.52	1009	251	1260
6	3.17	1.05	694	173	866
7	5.14	1.70	1125	280	1405
8	5.93	1.96	1297	323	1620
9	2.72	0.90	596	148	744
10	2.59	0.86	567	141	708
11	3.24	1.07	709	177	886
12	5.07	1.67	1109	276	1384
13	4.54	1.50	992	247	1239
14	2.16	0.71	473	118	591
15	3.84	1.27	839	209	1048
16	4.06	1.34	889	221	1111
17	1.13	0.37	247	61	308
18	3.60	1.19	787	196	983
19	2.69	0.89	588	146	734
20	3.62	1.19	792	197	989
21	3.40	1.12	745	185	930
22	4.23	1.40	925	230	1155
23	2.60	0.86	569	141	710
Total	76.02	25.09	16632	4139	20772

57.2. Revenue Collected through BRT TOD Value Capture

LAP ID	Area with Chargeable FSI (sq.km)	Area under Chargeable FSI (sq.km)	Residential Revenue Amount (Cr.)	Commercial Revenue Amount (Cr.)	Total Revenue (Cr.)
1	4.79	1.58	1049	261	1310
2	7.24	2.39	1585	394	1979
3	6.43	2.12	1407	350	1758
4	3.99	1.32	874	217	1091
5	5.76	1.90	1260	314	1574
6	3.23	1.07	707	176	883
7	7.70	2.54	1685	419	2104
8	7.37	2.43	1613	402	2015
9	7.77	2.56	1700	423	2124
10	2.04	0.67	447	111	558
11	1.87	0.62	409	102	511
12	3.27	1.08	715	178	892
13	2.72	0.90	595	148	743
14	4.93	1.63	1079	268	1347
15	2.57	0.85	562	140	701
16	2.90	0.96	635	158	793
17	2.16	0.71	473	118	591
18	3.05	1.01	668	166	835
19	3.18	1.05	697	173	870
20	2.39	0.79	523	130	653
21	6.03	1.99	1320	329	1649
22	2.75	0.91	601	149	750
23	2.19	0.72	480	119	599
24	3.32	1.10	727	181	908
25	4.78	1.58	1045	260	1305
26	8.16	2.69	1785	444	2230

LAP ID	Area with Chargeable FSI (sq.km)	Area under Chargeable FSI (sq.km)	Residential Revenue Amount (Cr.)	Commercial Revenue Amount (Cr.)	Total Revenue (Cr.)
27	4.80	1.59	1051	262	1312
28	6.92	2.28	1514	377	1891
29	4.24	1.40	927	231	1158
30	5.49	1.81	1201	299	1500
31	5.78	1.91	1264	315	1579
32	5.65	1.86	1235	307	1543
33	3.22	1.06	704	175	880
34	3.41	1.12	746	186	931
35	3.25	1.07	711	177	888
36	6.39	2.11	1397	348	1745
37	5.01	1.65	1097	273	1370
38	4.11	1.35	898	224	1122
39	4.51	1.49	986	246	1232
40	7.63	2.52	1669	415	2085
41	3.28	1.08	718	179	896
42	5.02	1.66	1099	273	1372
43	4.35	1.43	951	237	1188
44	3.20	1.06	700	174	875
45	3.28	1.08	718	179	897
46	4.00	1.32	875	218	1092
47	3.44	1.13	752	187	939
48	4.21	1.39	922	229	1152
49	4.36	1.44	955	238	1192
50	5.09	1.68	1113	277	1390
51	4.61	1.52	1009	251	1261
52	3.77	1.24	824	205	1029
53	2.89	0.95	632	157	789

LAP ID	Area with Chargeable FSI (sq.km)	Area under Chargeable FSI (sq.km)	Residential Revenue Amount (Cr.)	Commercial Revenue Amount (Cr.)	Total Revenue (Cr.)
54	2.81	0.93	614	153	767
55	3.52	1.16	770	192	961
56	3.40	1.12	743	185	928
Total	244.24	80.60	53437	13299	66736

57.3. Revenue Collected through MRT and BRT TOD Value Capture

LAP ID	Area with Chargeable FSI (sq.km)	Area under Chargeable FSI (sq.km)	Residential Revenue Amount (Cr.)	Commercial Revenue Amount (Cr.)	Total Revenue (Cr.)
1	6.45	2.13	1410	351	1761
2	5.48	1.81	1199	298	1497
3	2.81	0.93	614	153	767
4	6.52	2.15	1426	355	1781
5	4.42	1.46	966	241	1207
6	2.21	0.73	484	121	605
7	2.56	0.84	559	139	699
8	1.85	0.61	404	101	505
9	2.37	0.78	518	129	647
10	3.90	1.29	853	212	1066
11	7.24	2.39	1583	394	1977
12	3.96	1.31	867	216	1082
13	6.27	2.07	1372	342	1714
14	6.03	1.99	1319	328	1647
15	5.17	1.71	1131	281	1412
16	2.51	0.83	549	137	685
17	2.14	0.70	467	116	584
18	5.13	1.69	1123	280	1403
19	2.16	0.71	473	118	591

	Area with Chargeable	Area under Chargeable FSI	Residential Revenue	Commercial Revenue	
LAP ID	FSI (sq.km)	(sq.km)	Amount (Cr.)	Amount (Cr.)	Total Revenue (Cr.)
20	4.67	1.54	1022	254	1277
21	0.75	0.25	164	41	204
22	7.11	2.35	1556	387	1943
23	6.69	2.21	1464	364	1829
24	2.05	0.68	448	112	560
25	1.36	0.45	298	74	372
26	2.65	0.88	580	144	725
27	4.28	1.41	936	233	1169
28	1.77	0.58	387	96	484
29	5.40	1.78	1181	294	1475
30	3.62	1.19	791	197	988
31	5.31	1.75	1161	289	1450
32	2.70	0.89	592	147	739
33	4.04	1.33	884	220	1104
34	7.05	2.32	1541	384	1925
35	3.09	1.02	676	168	844
36	2.84	0.94	622	155	777
37	3.72	1.23	814	203	1017
38	4.13	1.36	904	225	1129
39	7.26	2.40	1589	395	1984
40	3.06	1.01	670	167	837
41	4.64	1.53	1015	253	1267
42	4.07	1.34	891	222	1112
43	4.06	1.34	889	221	1111
44	3.31	1.09	725	180	906
45	3.54	1.17	773	192	966
46	3.01	3.01 0.99		164	823

	Area with Chargeable	Area under Chargeable FSI	Residential Revenue	Commercial Revenue	
LAP ID	FSI (sq.km)	(sq.km)	Amount (Cr.)	Amount (Cr.)	Total Revenue (Cr.)
47	3.17	1.05	694	173	867
48	3.25	1.07	710	177	887
49	5.77	1.91	1263	314	1578
50	4.49	1.48	983	245	1227
51	3.84	1.27	839	209	1048
52	3.12	1.03	683	170	853
53	3.06 1.01		669	166	835
54	3.75	1.24	820	204	1024
55	1.13	0.37	247	61	308
56	2.01	0.66	440	109	549
57	2.37	0.78	518 129		647
58	3.62	1.19	792	197	989
59	3.40	1.12	745	185	930
60	4.11	1.36	900	224	1124
61	2.31	0.76	504	126	630
62	2.93	0.97	640	159	800
63	3.63	1.20	795	198	992
64	4.03	1.33	881	219	1100
65	2.12	0.70	463	115	578
66	2.31	0.76	506	126	632
67	4.60	1.52	1006	250	1257
68	3.70	1.22	809	201	1010
69	2.77	0.91	605	151	756
70	2.23	0.74	487	121	609
71	3.29	1.09	720	179	899
72	2.36	0.78	517	129	646
Total	268.69	88.67	58788	14630	73418

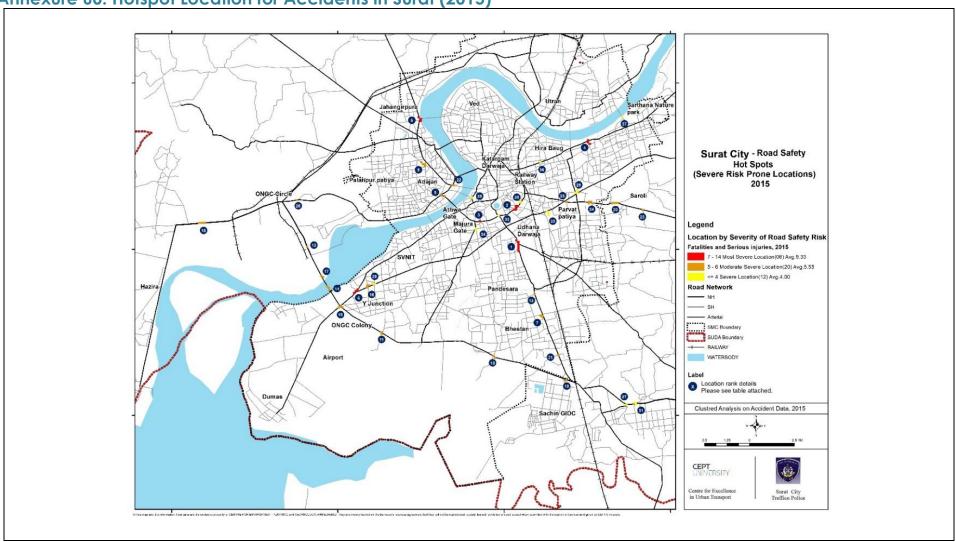
Annexure 58: Characteristics of Accident Prone Corridors, 2015

Sr.No	Corridors Name	Length (in km)	Road Type	RoW (Mt.)	Median (Y/N)	Fatalities	Serious injuries	Total Fatalities & Serious Injuries	Acci./Km
1	HMC Ring Road	8.8	Arterial	60	Υ	24	27	51	6
2	Kharwarnagar - Sachin GIDC Junction	9.4	Arterial	60	Υ	25	25	50	5
3	Tadwadi Circle - Vrudavan	1.7	Collector	45	Υ	5	4	9	5
4	Sahara Darwaja - Sabargam College	5.0	Arterial	45	Υ	6	19	25	5
5	Sahara Darwaja - Sabargam College	3.3	Arterial	12	Υ	5	9	14	4
6	Adajan - Jahangirpura	4.4	Arterial	45	Υ	3	12	15	3
7	Athwa Junction - Airport	4.9	Arterial	60	Υ	3	13	16	3
8	Railway Stn Valak Gam BRT	9.2	Arterial	60	Υ	8	21	29	3
9	DGVCL Urjan Sadan BRT - Magob gam BRT	3.3	Arterial	30	Υ	4	6	10	3
10	Y junction - Kharwarnagar	4.3	Arterial	60	Υ	5	8	13	3
11	ONGC Circle - Sachin GIDC Jun.	19.7	SH	90	Υ	24	34	58	3
12	Sachin GIDC Jun Toll Naka(Sachin - Palsana)	7.4	SH	12	Υ	7	14	21	3
13	Sita Nagar - Vishwakarma Junction	1.5	Sub arterial	24	N	2	2	4	3
14	Star Bazar Adajan - Morabhagal char rasta	5.4	Arterial	45	N	5	9	14	3
15	Kharwarnagar - Simada Naher	7.5	Arterial	36	Υ	7	12	19	3

Annexure 59: List of Accident Prone Junctions, 2015

Sr.No.	Junction	Fatalities	Serious Injuries	Fatalities and Serious Injuries
1	Kapodra Patiya Teen Rasta	0	7	7
2	Udhana Academy	1	6	7
3	Dabholi Bridge	4	3	7
4	Zota House	2	4	6
5	Abhva Cross Road	3	3	6
6	Udhana Teen Rasta	4	1	5
7	Mini Bazar	0	4	4
8	Makkai Pool	0	4	4
9	Udhana Darwaja	1	3	4
10	Bhestan Naher	3	1	4
11	Budiya Cross Road	1	3	4
12	Adajan Patiya Junction	0	4	4
13	Parvat Patiya Flyover	0	4	4
14	Gagera School Junction	1	2	3
15	Mora bhagal Junction	0	3	3

Annexure 60: Hotspot Location for Accidents in Surat (2015)

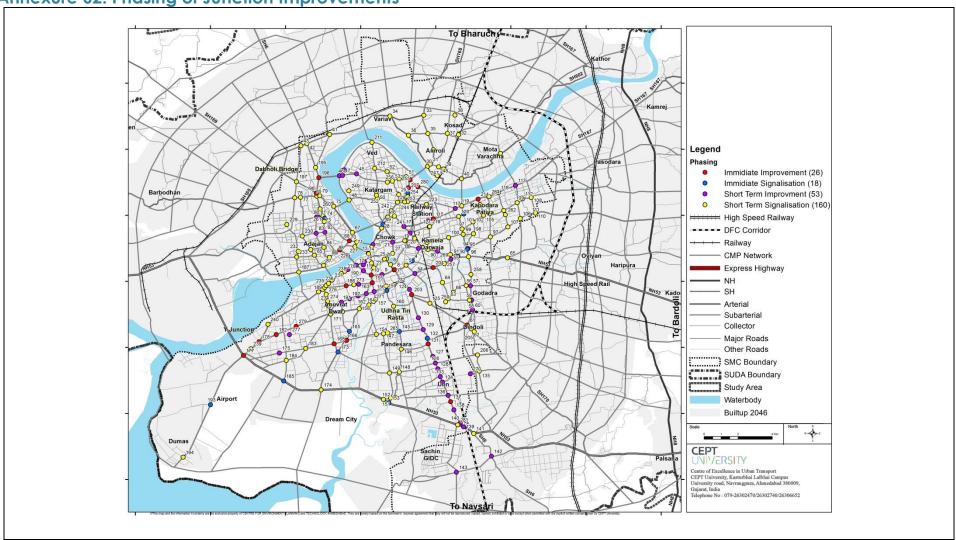


Annexure 61: List of Hotspot Locations for Accidents in Surat in, 2015

Sr. No.	Junctions	Fatalities	Serious Injuries	Total fatalities & Serious Injuries	Cumulative Percentage	Ranking
1	Udhana Tin Rasta	5	9	14	1.90	1
2	Kamela Darwaja	7	2	9	3.13	2
3	Majura Gate			4.35	3	
4	Kapodara Patiya Teen Rasta	0	9	9	5.58	4
5	Dabholi Bridge Junction	4	4	8	6.67	5
6	Y Junction	2	5	7	7.62	6
7	Bhestan Naher	5	1	6	8.44	7
8	Gujarat Gas Circle	5	1	6	9.25	8
9	Tadwadi Cross Road	4	2	6	10.07	9
10	Budiya Cross Road	3	3	6	10.88	10
11	Near Khajod Cross Road	3	3	6	11.70	11
12	By Pass Road 3	3	3	6	12.52	12
13	Zota House	2	4	6	13.33	13
14	By Pass Road 1	2	4	6	14.15	14
15	Mora Road	2	4	6	14.97	15
16	Maharana Pratap Junction	1	5	6	15.78	16
17	By Pass Road 2	0	6	6	16.60	17
18	Sachin GIDC	3	2	5	17.28	18
19	Magdalla Circle	3	2	5	17.96	19
20	Saniya Fanta	3	2	5	18.64	20
21	Unn char rasta	2	3	5	19.32	21
22	Adajan Patiya Junction	1	4	5	20.00	22
23	Kumbhariya	0	5	5	20.68	23
24	Vishwakarma Mandir Junction	0	5	5 5 21		24
25	Parvat Patiya	0	5	5	22.04	25
26	ONGC Char Rasta	0	5	5 22.72		26

Sr. No.	Junctions	Fatalities	Serious Injuries	Total fatalities & Serious Injuries	Cumulative Percentage	Ranking	
27	Sachin Palsana Teen Rasta	4	0	4	23.27	27	
28	Near S.D.Jain School	4	0	4	23.81	28	
29	Amazia Amuesment Park	3	1	4	24.35	29	
30	Near Sahar Darwaja	2	2	4	24.90	30	
31	Palsana Road	1	3	4	25.44	31	
32	Udhana Darwaja	1	3	4	25.99	32	
33	Samrat vidhyalay	1	3	4	26.53	33	
34	LB Fire Station	0	4	4	27.07	34	
35	Timliyawad Nanpura	0	4	4	27.62	35	
36	Mini Bazar	0	4	4	28.16	36	
37	SMVS Swaminaryan mandir Cross Road	0	4	4	28.71	37	
38	Laskana Gam Cross Road	0	4	4	29.25	38	
	Total accidents at Hotspot Locations	79	136	215			
	Total Accidents in 2015	291	444	735			





Annexure 63: Detail list of Junction Improvement/Signalisation Location

Sr. No.	Ref. ID	Phasing	Junction Name	Remark
1	7	Immediate Improvement	Udhana Darwaja	Critical Junctions
2	8	Immediate Improvement	Udhana Darwaja	Critical Junctions
3	10	Immediate Improvement	Majura Gate	Critical Junctions
4	61	Immediate Improvement	Dindoli Kharwasa Junction	
5	68	Immediate Improvement	Adajan Patiya	
6	115	Immediate Improvement	Maangadh Chowk	Critical Junctions
7	121	Immediate Improvement	Lambe Hanuman Road (Near CNG Pump)	
8	131	Immediate Improvement	Udhana Navsari Road, GIDC Junction	Critical Junctions
9	137	Immediate Improvement	Unn Patiya	Critical Junctions
10	155	Immediate Improvement	L.B Cinema	Critical Junctions
11	166	Immediate Improvement	Althan Canal Char Rasta	
12	168	Immediate Improvement	Shyam Mandir Char Rasta	
13	177	Immediate Improvement	ONGC Char Rasta (Under ROB)	Critical Junctions
14	178	Immediate Improvement	"Y" Junction	Critical Junctions
15	182	Immediate Improvement	VIP Char Rasta	Critical Junctions
16	186	Immediate Improvement	Union Park	
17	196	Immediate Improvement	Jahangirpura circle	Critical Junctions
18	198	Immediate Improvement	Subhash Garden Junction	
19	200	Immediate Improvement	Opposite Ratnamala Apartment (BRTS)	
20	203	Immediate Improvement	Udhana road no. 6 near W.D.S (Dindoli road)	Critical Junctions
21	204	Immediate Improvement	T.P 7, Anjana Underpass, Near Raghukul Market	Critical Junctions
22	207	Immediate Improvement	Gajera Circle Junction	
23	214	Immediate Improvement	T.P 16 (Kapodara) - Near Kapodara Police Station	Critical Junctions
24	226	Immediate Improvement	Sardar Bridge Gujarat Gas Circle	Critical Junctions

Sr. No.	Ref. ID	Phasing	Junction Name	Remark		
25	279	Immediate Improvement	Udhna Magdalla road Someshwar junction			
26	280	Immediate Improvement	Utkalnagar R.O.B (Katargam end)			
27	4	Immediate Signalised	Kamela Junction	Critical Junctions		
28	13	Immediate Signalised	Swami vivekanand Chowk	Critical Junctions		
29	49	Immediate Signalised	Hodi Bunglow			
30	74	Immediate Signalised	Palanpur Patiya (Sona Hotel)			
31	92	Immediate Signalised	Kheteshwar Circle	Critical Junctions		
32	94	Immediate Signalised	Vishwakarma Junction	Critical Junctions		
33	95	Immediate Signalised	Vishwakarma Junction	Critical Junctions		
34	101	Immediate Signalised	Rachna Circle			
35	132	Immediate Signalised	Pramukh Park (R.O.B)			
36	145	Immediate Signalised	Piyush Point			
37	153	Immediate Signalised	Pandesara CETP	Critical Junctions		
38	159	Immediate Signalised	Sosyo Circle			
39	165	Immediate Signalised	Althan Soham Residency Char Rasta			
40	173	Immediate Signalised	Bhimrat Petrol Pump			
41	185	Immediate Signalised	Abhva cross road	Critical Junctions		
42	193	Immediate Signalised	Surat Dumas road Kuvada road junction			
43	245	Immediate Signalised	Kansanagar Char Rasta Junction			
44	263	Immediate Signalised	Saraswati Vidhyalay			
45	1	Short Term Improvement	Delhi Gate			
46	3	Short Term Improvement	Sahara Darwaja			
47	9	Short Term Improvement	Kadiwala Junction			
48	11	Short Term Improvement	Mahavir Chowk			
49	12	Short Term Improvement	Athwa gate			

Sr. No.	Ref. ID	Phasing	Junction Name	Remark		
50	15	Short Term Improvement	Chowk Bazaar			
51	17	Short Term Improvement	Amisha Hotel			
52	21	Short Term Improvement	Bhagal Chowk			
53	24	Short Term Improvement	Chosathh Bhangani Chowk (Gandhi Smurti)			
54	44	Short Term Improvement	Sadanand Chowk (Dabholi Chowk)			
55	45	Short Term Improvement	Sadanand Chowk (Dabholi Chowk)			
56	46	Short Term Improvement	Sadanand Chowk (Dabholi Chowk)			
57	47	Short Term Improvement	Sadanand Chowk (Dabholi Chowk)			
58	54	Short Term Improvement	Bhathena Junction			
59	55	Short Term Improvement	Kabooter Circle			
60	57	Short Term Improvement	Maharana Pratap Junction			
61	58	Short Term Improvement	Maharana Pratap Junction			
62	60	Short Term Improvement	Dindoli Kharwasa Junction			
63	80	Short Term Improvement	Palanpur Jakatnaka			
64	81	Short Term Improvement	Palanpur Jakatnaka			
65	82	Short Term Improvement	Prime Arcade			
66	83	Short Term Improvement	Surbhi Dairy Circle			
67	113	Short Term Improvement	Savji Korat Junction			
68	116	Short Term Improvement	Maangadh Chowk			
69	117	Short Term Improvement	Hirabaug Junction			
70	122	Short Term Improvement	Kharwar Nagar			
71	123	Short Term Improvement	Kharwar Nagar			
72	124	Short Term Improvement	sarvottam Hotel			
73	126	Short Term Improvement	Bhestan Naher			
74	127	Short Term Improvement	Bhestan Naher			

Sr. No.	Ref. ID	Phasing	Junction Name	Remark		
75	128	Short Term Improvement	Bhestan Naher			
76	129	Short Term Improvement	Daksheshwar Junction			
77	130	Short Term Improvement	Daksheshwar Junction			
78	133	Short Term Improvement	Bhestan Char Rasta, Viral Hospital			
79	134	Short Term Improvement	Bhestan Char Rasta, Viral Hospital			
80	136	Short Term Improvement	Unn Naka			
81	138	Short Term Improvement	Unn Patiya			
82	139	Short Term Improvement	Sachin GIDC			
83	140	Short Term Improvement	Sachin GIDC			
84	142	Short Term Improvement	Sachin GIDC			
85	143	Short Term Improvement	Sachin GIDC			
86	156	Short Term Improvement	Prajapita Brahmakumari			
87	161	Short Term Improvement	Rupali Naher Junction			
88	162	Short Term Improvement	Rupali Naher Junction			
89	163	Short Term Improvement	Ram Chowk			
90	175	Short Term Improvement	Someshwar Enclave			
91	190	Short Term Improvement	Chowpati			
92	191	Short Term Improvement	Panas Gam "T" Point			
93	192	Short Term Improvement	Panas Gam "T" Point			
94	268	Short Term Improvement	Chosathh Bhangani Chowk (Gandhi Smurti)			
95	269	Short Term Improvement	APMC Junction (Sardar Market Circle)			
96	270	Short Term Improvement	Bhestan Aawas Char Rasta			
97	277	Short Term Improvement	Someshwar Enclave			
98	2	Short Term Signalisation	Golden Point			
99	5	Short Term Signalisation	Kamela Junction			

Sr. No.	Ref. ID	Phasing	Junction Name	Remark			
100	6	Short Term Signalisation	Udhana Darwaja				
101	14	Short Term Signalisation	Swami vivekanand Chowk				
102	16	Short Term Signalisation	Katargam Darwaja				
103	18	Short Term Signalisation	Swami Samarth Chowk				
104	19	Short Term Signalisation	Swami Samarth Chowk				
105	20	Short Term Signalisation	Swami Samarth Chowk				
106	22	Short Term Signalisation	Kevat Circle (Nanpura)				
107	23	Short Term Signalisation	Vijay Vallabh Chowk				
108	25	Short Term Signalisation	Sagrampura Police Choki				
109	26	Short Term Signalisation	Sagrampura Police Choki				
110	27	Short Term Signalisation	Maharana Pratap Chowk				
111	28	Short Term Signalisation	Mufni E Sukhat (Saiyyedpura Police Aamir Surati)				
112	29	Short Term Signalisation	Bala Ashram Char Rasta				
113	30	Short Term Signalisation	Amroli Police Choki				
114	31	Short Term Signalisation	Man Sarovar Circle				
115	32	Short Term Signalisation	Amroli Police Station				
116	33	Short Term Signalisation	Reliance Char Rasta				
117	34	Short Term Signalisation	Reliance Char Rasta				
118	35	Short Term Signalisation	Reliance Char Rasta				
119	36	Short Term Signalisation	Reliance Char Rasta				
120	37	Short Term Signalisation	Reliance Char Rasta				
121	38	Short Term Signalisation	Reliance Char Rasta				
122	39	Short Term Signalisation	Manisha Railway Underpass				
123	40	Short Term Signalisation	Mota Varaccha (Kapodara Bridge)				
124	41	Short Term Signalisation	Sadanand Chowk (Dabholi Chowk)				

Sr. No.	Ref. ID	Phasing	Junction Name	Remark			
125	42	Short Term Signalisation	Sadanand Chowk (Dabholi Chowk)				
126	43	Short Term Signalisation	Sadanand Chowk (Dabholi Chowk)				
127	48	Short Term Signalisation	Singanpore (D Mart)				
128	50	Short Term Signalisation	Akhand Anand Co.Op Bank (Katargam Main Road)				
129	51	Short Term Signalisation	Katargam Vahiwati Bhavan				
130	52	Short Term Signalisation	Hare Krishna Circle				
131	53	Short Term Signalisation	Hare Krishna Circle				
132	56	Short Term Signalisation	Maharana Pratap Junction				
133	59	Short Term Signalisation	Maharana Pratap Junction				
134	62	Short Term Signalisation	Dindoli Kharwasa Junction				
135	63	Short Term Signalisation	Nilgiri Circle				
136	64	Short Term Signalisation	Ganesh Bhakt Sahid Chowk				
137	65	Short Term Signalisation	Parvatgam Chowk				
138	66	Short Term Signalisation	Mahaprabhunagar Char Rasta				
139	67	Short Term Signalisation	Adajan Patiya				
140	70	Short Term Signalisation	Adajan Patiya				
141	71	Short Term Signalisation	Adajan Patiya				
142	73	Short Term Signalisation	Palanpur Patiya (Sona Hotel)				
143	75	Short Term Signalisation	Ramnagar Circle				
144	76	Short Term Signalisation	Morabhagal Junction				
145	77	Short Term Signalisation	Morabhagal Junction				
146	78	Short Term Signalisation	Morabhagal Junction				
147	79	Short Term Signalisation	Morabhagal Junction				
148	84	Short Term Signalisation	Adajan Gam				
149	85	Short Term Signalisation	Adajan Gam				

Sr. No.	Ref. ID	Phasing	Junction Name	Remark			
150	86	Short Term Signalisation	Adajan Gam				
151	87	Short Term Signalisation	Adajan Gam				
152	88	Short Term Signalisation	Bhulka Bhavan				
153	89	Short Term Signalisation	Karnimata Junction				
154	90	Short Term Signalisation	Karnimata Junction				
155	91	Short Term Signalisation	Kheteshwar Circle				
156	93	Short Term Signalisation	Vishwakarma Junction				
157	96	Short Term Signalisation	Vishwakarma Junction				
158	97	Short Term Signalisation	Sitanagar Chokdi				
159	98	Short Term Signalisation	Sitanagar Chokdi				
160	99	Short Term Signalisation	Sitanagar Chokdi				
161	100	Short Term Signalisation	Sitanagar Chokdi				
162	102	Short Term Signalisation	Rachna Circle				
163	103	Short Term Signalisation	LH Road (Mamta Park Junction)				
164	104	Short Term Signalisation	LH Road (Mamta Park Junction)				
165	105	Short Term Signalisation	LH Road (Mamta Park Junction)				
166	106	Short Term Signalisation	Yogi Chowk				
167	107	Short Term Signalisation	Yogi Chowk				
168	108	Short Term Signalisation	Bapa Sitaram Chokdi (Yogi Nagar BRTS Junction)				
169	109	Short Term Signalisation	Bapa Sitaram Chokdi (Yogi Nagar BRTS Junction)				
170	110	Short Term Signalisation	Bapa Sitaram Chokdi (Yogi Nagar BRTS Junction)				
171	111	Short Term Signalisation	Bapa Sitaram Chokdi (Yogi Nagar BRTS Junction)				
172	112	Short Term Signalisation	Bapa Sitaram Chokdi (Yogi Nagar BRTS Junction)				
173	114	Short Term Signalisation	Shree Swaminarayan Temple Circle (Mota Varaccha -Abhrama Chokdi)				
174	118	Short Term Signalisation	Nana Varccha (Varigruh)				

Sr. No.	Ref. ID	Phasing	Junction Name	Remark			
175	119	Short Term Signalisation	Kapodara Bridge Approch (Ram Mobile)				
176	120	Short Term Signalisation	LH Road (BRTS Junction)				
177	125	Short Term Signalisation	Udhana Jal Vitran Mathak				
178	135	Short Term Signalisation	Bhestan Aawas Char Rasta				
179	141	Short Term Signalisation	Sachin GIDC				
180	144	Short Term Signalisation	Unique Hospital				
181	146	Short Term Signalisation	Piyush Point				
182	147	Short Term Signalisation	Patrakar Colony				
183	148	Short Term Signalisation	Pandesara CETP				
184	149	Short Term Signalisation	Pandesara CETP				
185	150	Short Term Signalisation	Pandesara CETP				
186	151	Short Term Signalisation	Pandesara CETP				
187	152	Short Term Signalisation	Pandesara CETP				
188	154	Short Term Signalisation	Pandesra Kailash Nagar				
189	157	Short Term Signalisation	Nivjeevan Circle				
190	158	Short Term Signalisation	Bhatar Char Rasta				
191	160	Short Term Signalisation	Sosyo Circle				
192	164	Short Term Signalisation	Udhana Magdalla Road,Bharat Petrol Pump				
193	169	Short Term Signalisation	Breadliner Char Rasta				
194	171	Short Term Signalisation	Anuvrat dwar junction				
195	174	Short Term Signalisation	Bhimrat Petrol Pump				
196	183	Short Term Signalisation	VIP Road Canal Char Rasta				
197	184	Short Term Signalisation	Vesu canal main road				
198	187	Short Term Signalisation	Sargam Shopping Centre				
199	188	Short Term Signalisation	Jani Farshan				

Sr. No.	Ref. ID	Phasing	Junction Name	Remark			
200	189	Short Term Signalisation	Parle Point				
201	194	Short Term Signalisation	Dumas langar circle				
202	195	Short Term Signalisation	Iskcon circle				
203	197	Short Term Signalisation	Dandi canal road junction				
204	205	Short Term Signalisation	Dindoli gam road				
205	206	Short Term Signalisation	Dindoli Kharvasa road				
206	211	Short Term Signalisation	Karada road char rasta				
207	212	Short Term Signalisation	Pramukh chowk				
208	217	Short Term Signalisation	T.P 68 (Puna- Simdada) - Yogichowk Circle - Puna Simada				
209	218	Short Term Signalisation	T.P 34 (Magob) - Aaimata Circle				
210	219	Short Term Signalisation	T.P 3 (Karanj) - Matawadi Circle				
211	223	Short Term Signalisation	T.P 4 (Ashwanikumar Navagam) - Bhavani Gems Circle				
212	227	Short Term Signalisation	Adajan Swaminarayan circle				
213	229	Short Term Signalisation	Palanpur gam junction				
214	230	Short Term Signalisation	L.P Savani School Junction				
215	231	Short Term Signalisation	TGB Circle				
216	232	Short Term Signalisation	Pal gam circle				
217	233	Short Term Signalisation	Pal galaxy circle				
218	234	Short Term Signalisation	Sargam Shopping Centre				
219	235	Short Term Signalisation	Ambika Niketan - 1				
220	236	Short Term Signalisation	Ambika Niketan - 2				
221	237	Short Term Signalisation	Sutex Bank				
222	238	Short Term Signalisation	Police Ground				
223	239	Short Term Signalisation	Magdalla Gam				
224	240	Short Term Signalisation	Central Mall				

Sr. No.	Ref. ID	Phasing	Junction Name	Remark		
225	241	Short Term Signalisation	Gotalawadi Circle			
226	242	Short Term Signalisation	Peopels Char Rasta			
227	243	Short Term Signalisation	Mehta Petrol Pump			
228	244	Short Term Signalisation	Naginawadi			
229	246	Short Term Signalisation	Amroli Police Station			
230	247	Short Term Signalisation	Sattadhar Chokdi			
231	248	Short Term Signalisation	Utran Railway Underpass			
232	249	Short Term Signalisation	Singanpore (D Mart)			
233	250	Short Term Signalisation	Singanpore Char Rasta			
234	251	Short Term Signalisation	Katargam Police Station			
235	252	Short Term Signalisation	S.M.C School No. 178,179,183'184 (Viramnagar)			
236	253	Short Term Signalisation	Kiran Hospital			
237	254	Short Term Signalisation	Ashabhai Patel Chowk (Bal Ganesh)			
238	255	Short Term Signalisation	Rashi Circle			
239	256	Short Term Signalisation	Bapa Sitaram Chowk			
240	257	Short Term Signalisation	Samrat Vidhyalay Char Rasta			
241	258	Short Term Signalisation	Parvatgam Chowk			
242	259	Short Term Signalisation	Limbayat Ward Office Char Rasta			
243	260	Short Term Signalisation	Ramnagar Circle			
244	261	Short Term Signalisation	Tekrawala School			
245	262	Short Term Signalisation	Yogi Chowk			
246	264	Short Term Signalisation	Nana Varccha (Varigruh)			
247	265	Short Term Signalisation	Patrakar Colony			
248	266	Short Term Signalisation	Gandhi bagh			
249	267	Short Term Signalisation	Kadarshahni Nal			

Sr. No.	Ref. ID	Phasing	Junction Name	Remark			
250	271	Short Term Signalisation	Gandhi Kutir				
251	272	Short Term Signalisation	Chosathh Jogani Mata				
252	273	Short Term Signalisation	ant. Xavier's School				
253	274	Short Term Signalisation	Ashok Pan Centre, Citylight				
254	275	Short Term Signalisation	Bank of Baroda, Citylight				
255	276	Short Term Signalisation	Science Centre				
256	278	Short Term Signalisation	leela Seva Sadan				
257	281	Short Term Signalisation	Sachin GIDC on NH				

Annexure 64: Emission Calculations for Passenger Transport Vehicles

a) Input Data

Sr.	Year	198	00	200	24	201	16		20	26			20	46	
No.	Teal	190	00	200	J4	201	10	Do nothir	Do nothing (Base)		D	Do nothing (Base)		TOD	
1	Population	1767	177	3870	964	5929	821	8550	0000	8550	000	12500	0000	12500000	
2	Trip Rates	1.3	2	1.3	31	1.0	6	-		-		-		-	
	Motorised Trip														
3	Rate	0.0	6	0.	8	0.9	9	0.9	95	0.9	95	1		1	
		Mode	Trip	Mode	Trip	Mode	Trip	Mode	Trip	Mode	Trip	Mode	Trip	Mode	Trip
4	Modes	Share	length	Share	length	Share	length	Share	length	Share	length	Share	length	Share	length
	2w	60%	3.5	63%	5.8	62.00%	5.8	57.83%	6.73	57.47%	6.0	42.63%	6.73	35.00%	6.0
	3w	20%	3.8	25%	5.3	17.18%	6.1	5.72%	7.44	5.41%	6.8	8.53%	7.44	6.88%	6.8
	4w	3%	3.5	7%	9.7	12.56%	7.9	8.40%	10.62	7.20%	9.0	23.25%	10.60	17.50%	9.0
	Bus	17%	5.5	5%	12.4	1.88%	10.3	15.00%	11.84	17.00%	10.3	22.50%	11.84	37.50%	10.3
	Company Bus/ Pvt. Bus/ School-College Buses/ Rail/ Others	0%	5.5	1%	5.8	6.38%	8	13.05%	10.75	12.92%	10.0	3.10%	14.00	3.13%	12.0
	Total	100.00%	5.6	100.00%	5.6	100.00%	6.04	100.00%	9.48	100.00%	8.43	100.00%	10.12	100.00%	8.82

5	Vehicle Occupancy Ratio	2w	3w	4w	Bus (No)*	Company Bus/ Pvt. Bus/ School-College Buses/ Rail
		1.1	1.5	1.2	700	20

^{*} Assumption 700 passengers/bus/day

b) Calculations

Sr. No.	Year	1988	2004	2016	2026	5	2046	5
31. NO.	real	1900	2004	2016	Do nothing (Base)	TOD	Do nothing (Base)	TOD
1	Total Motorised Passenger Demand	1060306	3096771	5336839	8122500	8122500	12500000	12500000
2	Passenger Demand							
	2w	636184	1957327	3309073	4697079	4667838	5328125	4375000
	3w	212061	768950	917123	464363	439508	1065625	859375
	4w	30294	209714	670233	682615	585145	2906250	2187500
	PT	181767	139809	100138	1218375	1380825	2812500	4687500
	Company Bus/ Pvt. Bus/ School-College							
	Buses/ Rail/ Others	0	20971	340271	1059986	1049183	387500	390625
	Total	1060306	3096771.04	5336839	8122419	8122500	12500000	12500000
3	Total No. of Vehicles							
	2w	578349	1779388	3008248	4270072	4243489	4843750	3977273
	3w	141374	512633	611416	309576	293006	710417	572917
	4w	25245	174761	558528	568846	487621	2421875	1822917
	PT (No of Bus)	260	200	143	1654	1874	4018	4688
	Company Bus/ Pvt. Bus/ School-College							
	Buses/ Rail	0	1049	17014	52999	52459	19375	19531
	Total	745228	2468031	4195348	5203146	5078449	7999435	6397325
4	Vehicle Kilometer Travelled (VKT)							
	2w	2024221	10320452	17447838	28742439	25460936	32598438	23863636
	3w	537222	2716956	3729635	2301962	1992438	5285500	3895833
	4w	88359	1695185	4412369	6039401	4388587	25671875	16406250
	Bus*	51933	39945	28611	330702	374795	803571	937500
	Company Bus/ Pvt. Bus/ School-College Buses/ Rail/ Others	0	6082	136109	569813	526827	271250	234375
	Total	2701736	14778620	25754562	37984317	32743583	64630634	45337595

^{*}Assuming 200 km/bus/day

c) Mode share assumptions by vehicle category and fuel standards

No a da				Υ	ear 1988					
Mode	1986	1991	1996	India 2000	BS-II	BS-III	BS-IV	BS-VI	BS-VIII	Electric
2Wh (Petrol)	100%									
3Wh (petrol)	100%									
4Wh	100%									
Petrol (60%)	80	0%								
Diesel (40%)	20	0%								
CNG										
Electric										
Buses (Deisel & Electric)	100%									
Others	100%									
Mode				Υ	ear 2004					
ivioue	1986	1991	1996	India 2000	BS-II	BS-III	BS-IV	BS-VI	BS-VIII	Electric
2Wh (Petrol)			30%	55%	15%					
3Wh (Petrol)			25%	60%	15%					
4Wh				75%	25%					
Petrol (60%)				60%	15%					
Diesel (40%)				15%	10%					
CNG										
Electric										
Buses (Deisel & Electric)			20%	55%	25%					
Others			20%	55%	25%					

Mada				Ye	ear 2016					
Mode	1986	1991	1996	India 2000	BS-II	BS-III	BS-IV	BS-VI	BS-VIII	Electric
2Wh (Petrol)					10%	60%	30%			
3Wh (CNG)					10%	60%	30%			
4Wh					10%	50%	40%			
Petrol (60%)					8%	40%	20%			
Diesel (40%)					2%	10%	10%			
CNG							10%			
Electric										
Buses (Deisel & Electric)						20%	80%			
Others						20%	80%			
				Year 2026 Do	nothing (B	ase)/ TOD				
Mode	1986	1991	1996	India 2000	BS-II	BS-III	BS-IV	BS-VI	BS-VIII	Electric
2Wh (Petrol)							78%	20%		2%
3Wh (CNG)							50%	50%		
4Wh							65%	33%		2%
Petrol (90%)							55%	28%		
Diesel (10%)							10%	5%		
CNG										
Electric										2%
Buses (Deisel &								1000/		
Electric)								100%		
Others							40%	60%		

Mada				Year 2046 De	o nothing (B	ase)/ TOD				
Mode	1986	1991	1996	India 2000	BS-II	BS-III	BS-IV	BS-VI	BS-VIII	Electric
2Wh (Petrol)								60%	20%	20%
3Wh (CNG)								40%	30%	30%
4Wh								50%	30%	20%
Petrol								45%	25%	
Diesel								5%	5%	
CNG										
Electric										20%
Buses (Deisel &								20%	400/	400/
Electric)								20%	40%	40%
Others								20%	60%	20%

d) Emission factors

Year		198	86*			19	91*			19	96*			2	000*			BS II	(2003)	*		BS-III (2	:005)##	#		BS-IV (2	2010)#	#	:	BS-VI (2	2020)#	#	BS-	VII (20	30/4	0)***		tric - CC iHG***	
Modes	со	NO	P M	CO2	со	NO	PM	CO2	со	NOx	PM	CO2	со	NO	PM	CO2	со	NO	PM	CO2	со	NOx	PM	CO2	со	NOx	PM	CO2	со	NO	PM	CO2	со	NO		CO2	202	202	204
214/b		X .		77		A 2			1	NOX			1	X				X		COZ	 		1	-		1	+			Λ 0	1		0	Λ	M	27.9	10	1.4	13.
2Wh	6.5	0.	0.	22.	3.1	0.2	0.0	22.4	1.	0.3	0.0	23.2	1.	0.	0.0	24.9	0.	0.	0.0	45.6	1.4	0.11	0.0	43.	0.7	0.04	0.0	37.	0.5	0.0	0.0	32.	0.	0.	0.	27.9	18.	14.	
(Petrol)	U	03	23	8		3	1		58		15	5	65	27	35	/	72	15	13		62		85	8	63	6	39	8	04	3	25	5	33	02	02	4	/	8	3
3Wh	14.	0.	0.	54.	14.	0.0	0.3	54.5	3.		0.1		4.	0.	0.0	57.4	2.	0.	0.0		2.6	0.15	0.0	67.	0.6	0.04	0.0	58.	0.2	0.0	0.0	50.	0.	0.	0.	43.4	43.	34.	31.
(Petrol/	00	05	35	5	00	5	5	#	15	0.3	1	54.5	47	61	11	4	29	53	15	73.8	12	9	39	7	41	2	09	3	83	17	03	3	12	01	00	0	6	6	1
CNG)																									ļ ·-											Ŭ	L'	\coprod	
4Wh																																						1 .	ı
4Wh	9.8	1.	0.	97.	4.7	0.9	0.0	95.6	4.	0.75	0.0	106.	1.	0.	0.0	126.	0.	0.	0.0	172.		0.45	0.0	142		0.00	0.0	115	1.2	0.0	0.0	93.	1.	0.	0.	76.1			
Petrol	0	8	06	1	5	5	08	5	53	0.75	08	96	3	2	04	5	84	09	02	95	2.3	0.15	24	.2	1	0.08	09	.5	4	54	05	8	54	04	00	8		1 .	1
4Wh	7.3	2.	0.	147	7.3	2.7	0.8	147.	0.		0.1	129.	0.	0.	0.1	156.	0.	0.	0.0	148.	1.6	0.73	0.1	182	0.5	0.40	0.0	148	0.3	0.2	0.0	120	0.	0.	0.	97.7			
Diesel	0	77	84	.6	0	7	4	6#	87	0.45	45	09	72	84	9	76	06	28	15	76	41	4	21	.3	54	4	43	1	46	7	27	.3	22	18	02	2		1	ı
		· ·	<u> </u>			· ·		0	0.		0.0	149.	_	0.	0.0	143.	0.	0.	0.0	172.		•	0.0	142	J .	· ·	0.0	115	1.7	0.0	0.0		1	0.	0.	76.1			
4w CNG									85	0.53	0.0	36	0. 06	74	0.0	54	84	09	0.0	95	2.3	0.15	24	.2	1	0.08	0.0	113	97	43	0.0	131	54	0.	00	8		1	ı
4w									65		01	30	00	74	00	34	04	03	02	93			24	.2			03	.5	31	43	03		34	04	00	8	62.	49.	44.
																																					02.	49.	44.
Electric					4.2	4.4	2.0	047		455	4.2	020	_	_	4.0		_	_		600	0.0	467	0.5	602		10.0	0.2	400	2.0	6.7	0.4	207	_	\vdash	_	222	402	240	4
Buses	5.5	19	3	869	13.	11.	2.0	817.	4.	155.	1.2	920.	3.	6.	1.0	735.	3.	6.	0.3	602.	9.8	16.7	0.5	602	5.4	10.9	0.2	489	3.0	6.7	0.1	397	1.	4.	0.	322.	402		287
(Diesel)	0				06	24	13	52	48	25	13	77	97	77	75	51	92	53		01	02	88	04	.2	19	51	46	.2	56	37	34	.4	72	14	07	83	.6	.6	.1
Others																					9.8	16.7	0.5	602	5.4	10.9	0.2	489	3.0	6.7	0.1	397	1.	4.	0.	322.	402	319	287
Stricts																					02	88	04	.2	19	51	46	.2	56	37	34	.4	72	14	07	83	.6	.6	.1

^{*}Repot on "Emission Factor development for Indian Vehicles", ARAI Pune Report 2008

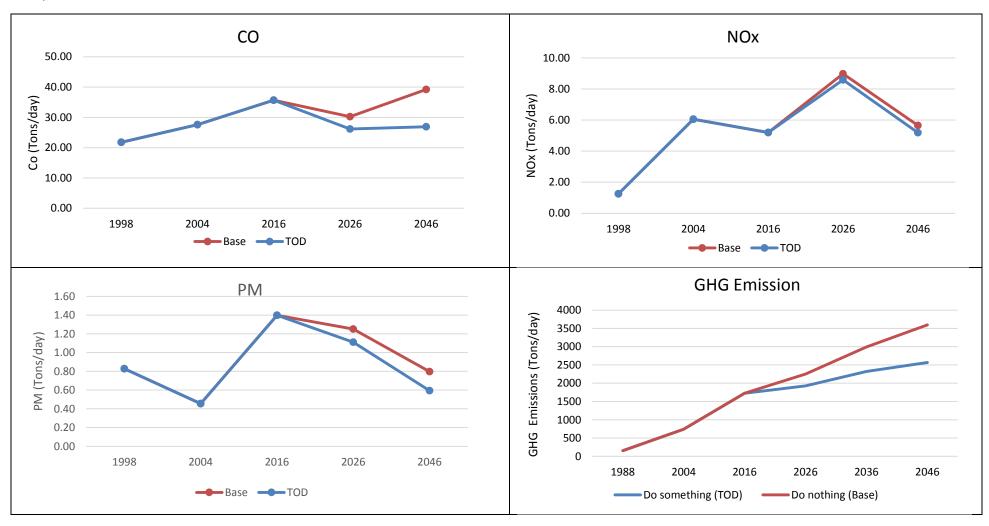
^{**} CPCB and Toolkit for Comprehensive Mobility Plan (CMP) Revised 2014.

^{***}BSVII emission factors are estimated for future year, considering the improvements in vehicle technology.

^{****} Estimated based on report "GHG inventory report for Electricity generation and consumption in India, 2009-10", cbalance Solution PVT. Ltd; "Back to the future: electric vehicles and oil demand", Spencer Dale and Thomas D Smith; International Journal of Engineering Research and Science & Technology, IJERST, Vol2, 2013.

[#] Pre 2001 Co2 emission form "Putting Urban Transport Sector on a Low Energy and Low Carbon Path – A Focus on the Passenger Transport Sector in Million Plus cities", Akshima Ghate and Sanjivi Sundar ##From BSIII, emission factors of 3wheeler is for CNG

e) Results



Surat -2046 Comprehensive Mobility Plan

Final
Volume 2
Annexure (Part 2)

SEPTEMBER 2018











Surat -2046 Comprehensive Mobility Plan

Final

Volume 2

Annexure – Part 2

SEPTEMBER 2018

Annexure:

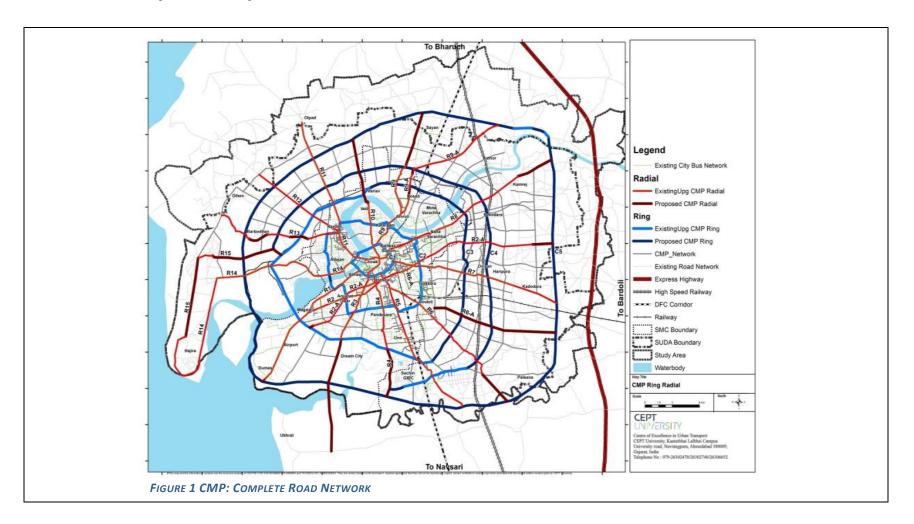
Existing Road Inventory for Proposed Road Upgradation in CMP Road Network

COMPREHENSIVE MOBILITY PLAN SURAT

Content

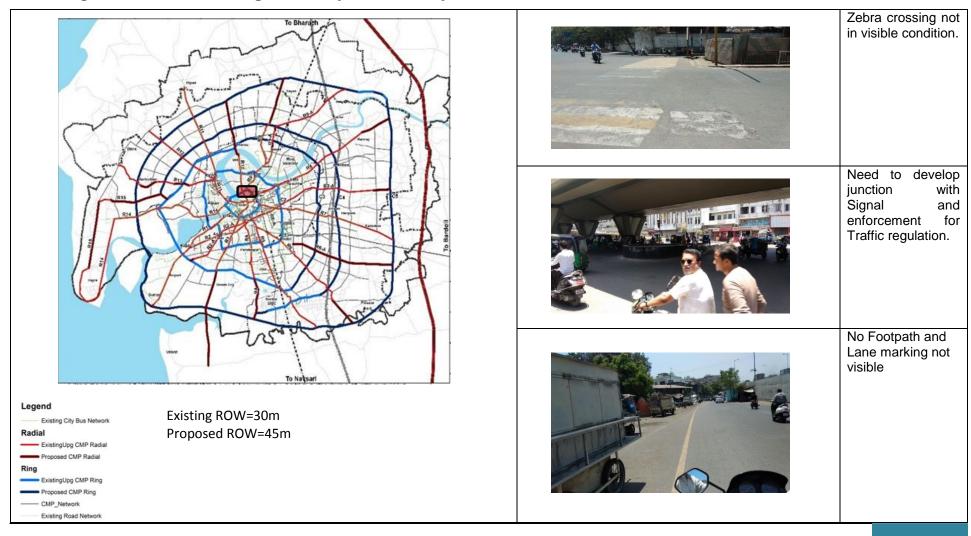
Annexure 1: Basemap for Survey Inventories	1
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Annexure 4: Summary of the Existing Road network	273

Annexure 1: Basemap for Survey Inventories



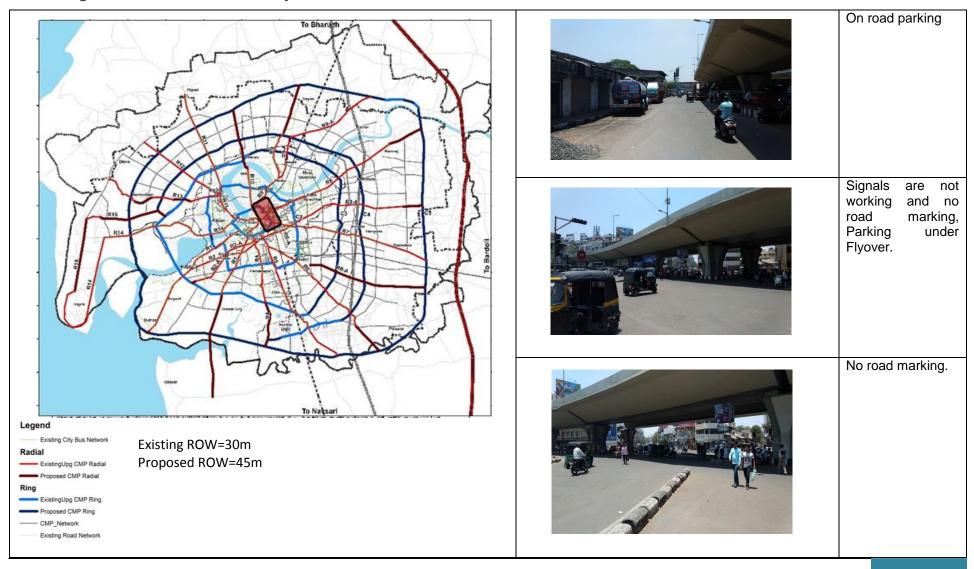
Annexure 2: Details of Survey Inventory for Proposed Upgration of Ring Roads

Ring C-1: Stretch from Katargram Darwaja to Lal Darwaja



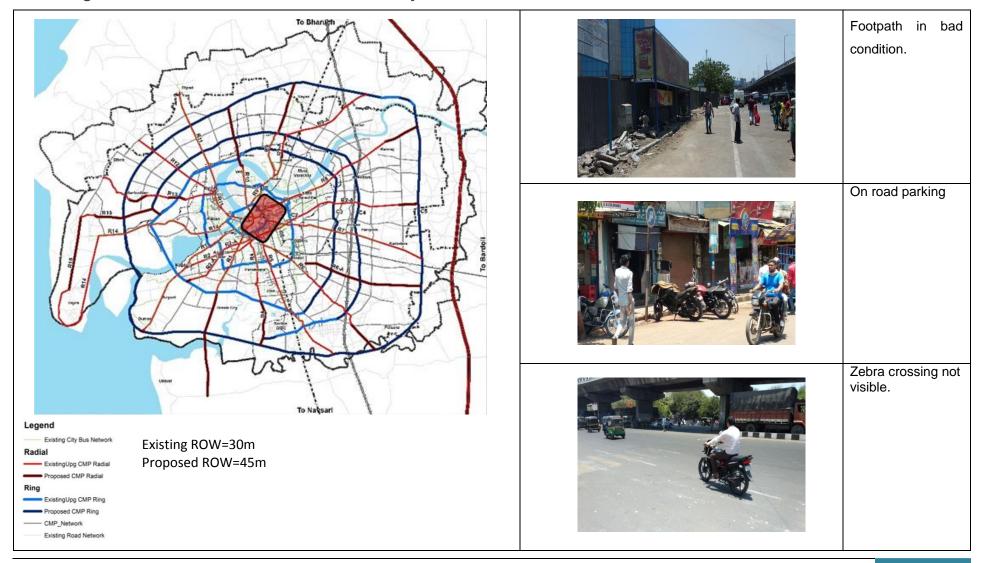
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	
2	Electrical Pole	Yes Provided	Yes Provided	Bridge Work In Progress.
3	Footpath	Not Provided	Not Provided	
4	Signs	Yes Provided	Yes Provided	Requirement of Speed Limit
5	Signals	Not Provided	Not Provided	
6	Road Markings	Yes Provided	Yes Provided	Partial lane marking need to marking where invisible
7	Pavement Condition	Good Condition	Good Condition	
8	Parking	Under Flyover	Under Flyover	
9	Bus Stop	Yes Provided	Yes Provided	City Bus Stop
10	Junctions	1.Manav Dharm Cl Existing Rotary, N	-	peed breaker near Jn.

1.2 Ring C-1: Stretch from Lal Darwaja to Delhi Gate



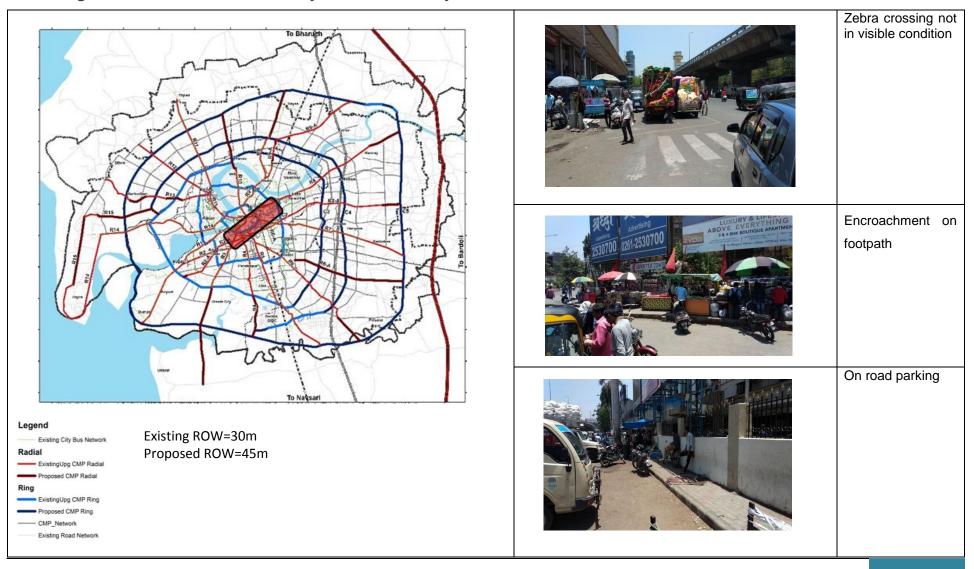
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Not Provided	Not Provided		
2	Electrical Pole	Yes Provided	Yes Provided		
3	Footpath	Not Provided	Not Provided		
4	Signs	Yes Provided	Yes Provided		
5	Signals	Yes Provided	Yes Provided	Not Follow	
6	Road Markings	Yes Provided	Yes Provided	Not Visible Condition	
7	Pavement Condition	Not good	Not Good	Flyover work in progress	
8	Parking	Not Provided	Not Provided		
9	Bus Stop	Yes Provided	Yes Provided	BRTS stop	
10	Drainage	Yes Provided	Yes Provided		

Ring C-1: Stretch from Delhi Gate to Sahara Darwaja



Corridor	Name: Delhi Gate To	Sahara Darwaja		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	Encroachment on Footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals	Not Provided	Not Provided	
6	Road Markings	Yes Provided	Yes Provided	Not Visible Condition
7	Pavement Condition	Good Condition	Good Condition	
8	Parking	Yes Provided	Yes Provided	SMC Parking , Loading Unloading under flyover
9	Bus Stop	Yes Provided	Yes Provided	City Bus Stop
10	Junctions	Need to provide er	nforcement to Regulat	e the traffic at Sahara darwaja

1.4 Ring C-1: Stretch from Sahara Darwaja to Kamela Darwaja



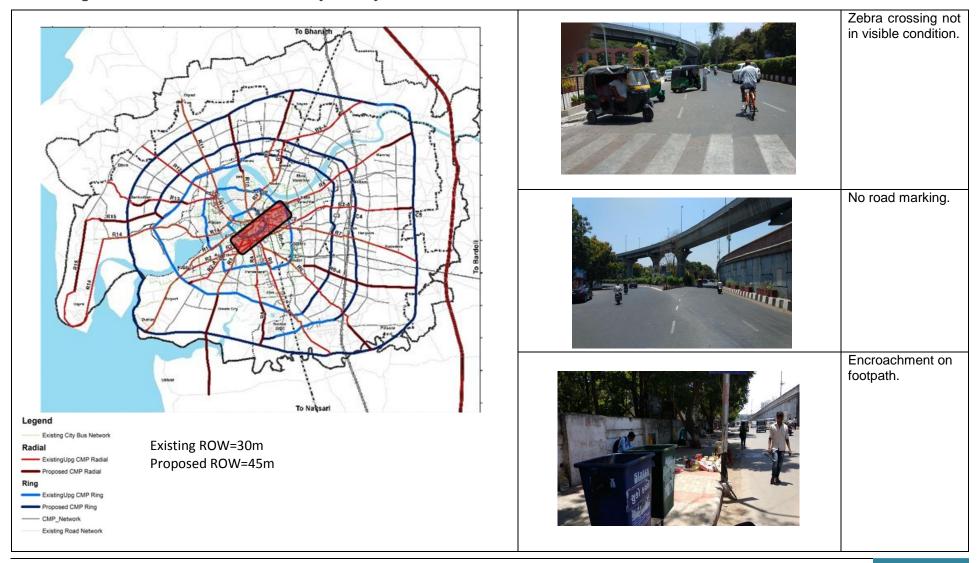
Corridor I	Name:- Sahara Darwaja	To Kamela Darwaja		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	NO	NO	Flyover
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	Encroachment on footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals	Not Provided	Not Provided	
6	Road Markings	Yes Provided	Yes Provided	Not Visible Condition
7	Pavement Condition	Average Condition	Average Condition	
8	Parking	Yes Provided	Yes Provided	SMC Parking and on Road Parking
9	Bus stop	Yes Provided	Yes Provided	City bus stop
10	Junctions	Man Darwaja Char R	asta – Need to provide signal	,

1.5 Ring C-1: Stretch from Kamela Darwaja to Udhana Darwaja



Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Not Provided	Not Provided	Narrow Footpath
4	Signs	Yes Provided	Yes Provided	·
5	Signals	Not Provided	Not Provided	Signals Are Not Working RHS Side
6	Road Markings	Yes Provided	Yes Provided	Not Visible Condition
7	Pavement	Average Condition	Average Condition	
	Condition			
8	Parking	Yes Provided	Yes Provided	SMC Parking And On Road Parking
9	Bus Stop	Yes Provided	Yes Provided	City Bus Stop

1.6 Ring C-1: Stretch from Udhana Darwaja to Majura Gate



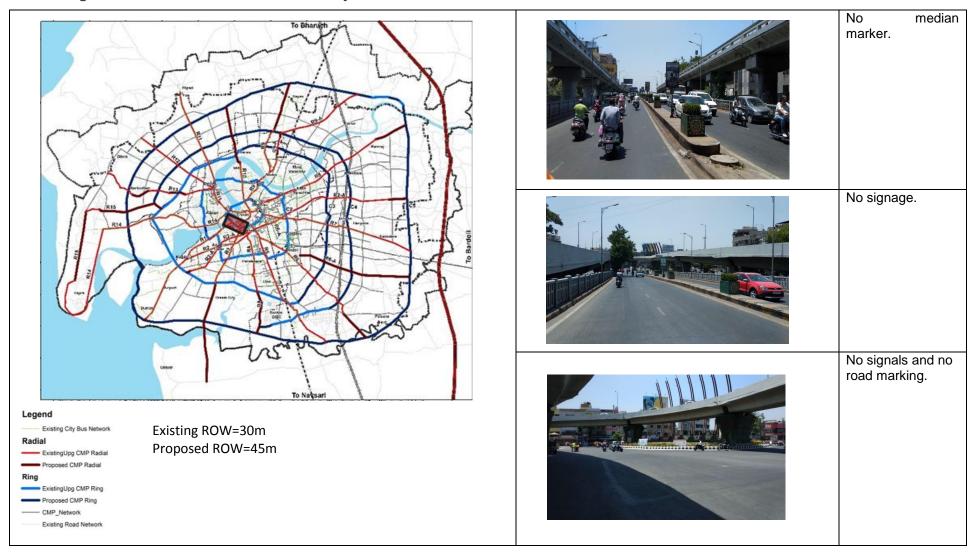
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	Encroachment of footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals	Yes Provided	Yes Provided	
6	Road Markings	Yes Provided	Yes Provided	Merging Marking Missing, not Visible
7	Pavement	Good Condition	Good Condition	
	Condition			
8	Parking	Yes Provided	Yes Provided	SMC Parking, On Road Parking, encroachment
9	Bus Stop	Yes Provided	Yes Provided	City Bus Stop
10	Junctions	Civil Char Rasta	<u> </u>	

1.7 Ring C-1: Stretch from Majura Gate to Athava Gate



Corridor Name:-Majura Gate To Athava Gate				
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	
4	Signs	Yes Provided	Yes Provided	
5	Signals	Yes Provided	Yes Provided	
6	Road Markings	Yes Provided	Yes Provided	
7	Pavement Condition	Good Condition	Good Condition	
8	Parking	Yes Provided	Yes Provided	SMC Parking
9	Bus Stop	Yes Provided	Yes Provided	City Bus Stop
10	Junctions			

1.8 Ring C-1: Stretch from Athava Gate to Gujarat Gas Circle



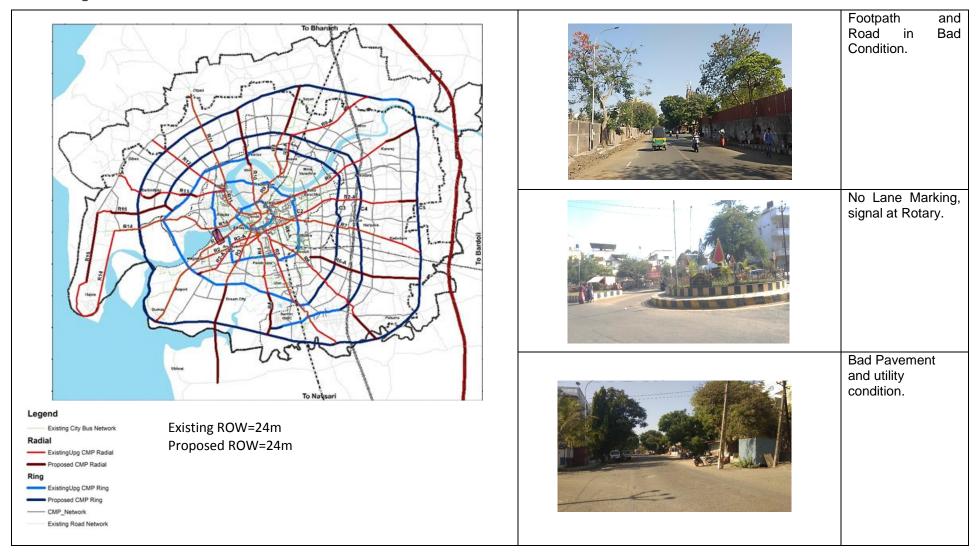
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided	NO median marker	
2	Electrical Pole	Yes Provided	Yes Provided		
3	Footpath	Not Provided	Not Provided	LHS Side Bridge Work In Progress	
4	Signs	Yes Provided	Yes Provided		
5	Signals	Yes Provided	Yes Provided		
6	Road Markings	Yes Provided	Yes Provided		
7	Pavement Condition	Yes Provided	Yes Provided	Widening Work Ongoing LHS Side	
8	Parking	Not Provided	Not Provided		
9	Bus Stop	Yes Provided	Yes Provided	Only Marker	
10	Junctions			·	

1.9 Ring C-1: Stretch from Gujarat Gas Circle to Katargam Darwaja



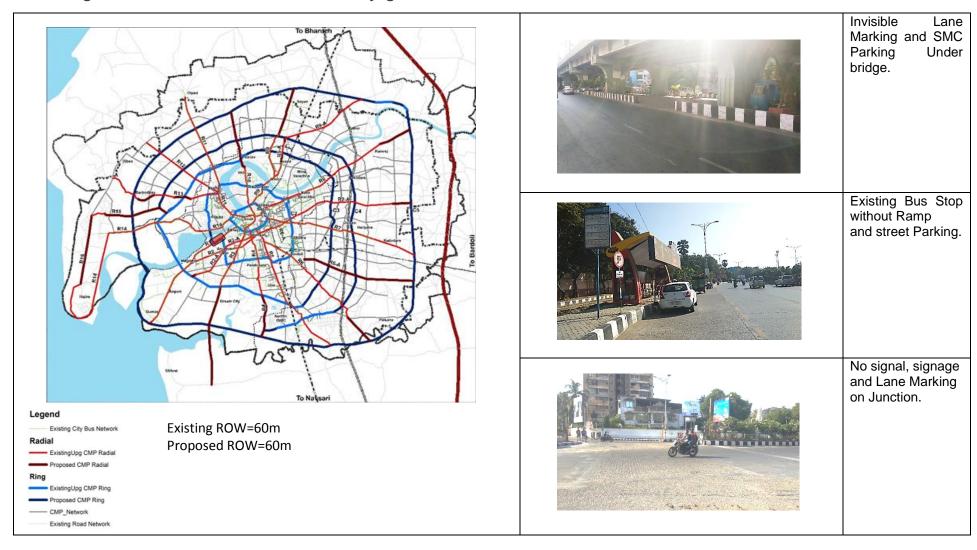
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	BRT Corridor
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	Encroachment of Footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals	Yes Provided	Yes Provided	Need To Encroachment To Follow
6	Road Markings	Yes Provided	Yes Provided	
7	Pavement Condition	Good Condition	Good Condition	Service Road Encroachment
8	Parking	Not Provided	Not Provided	
9	Bus Stop	Yes Provided	Yes Provided	Gujarat Gas Circle To Adajan Patiya BRTS Road
10	Junctions	Adajan Patiya – No	signal, Existing rotary	
		Makai pool -Needs	s to be signalised	

1.10 Ring C-2: Stretch from Umra Gam to SVNIT Junction



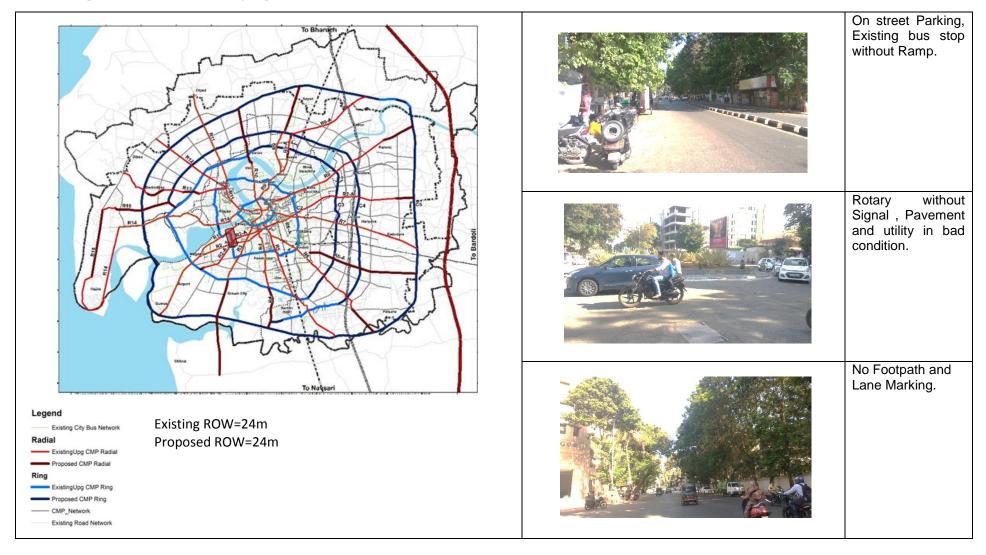
Sr.No.	Elements	LHS	RHS	Remarks
Umra C	Sam to SVNIT	Junction	'	
1	Median	No Provided	No Provided	Median to be Provided
2	Electrical Pole	Yes Provided	Yes Provided	Yes one side on Edge.
3	Footpath	Yes Provided	Yes Provided	Yes but on Some Portion Footpath is not Provided.
4	Signs	No Provided	Not Provided	Signage to be Provided.
5	Signals	No Provided	Not Provided	Only Provided at SVNIT Junction.
6	Road Markings	Yes Provided	Yes Provided	But not in Good Condition.
7	Pavement Condition	Bad	Bad	Road is not in Good Condition.
8	Parking slot	Not Provided	Not Provided	Street Parking.
9	Bus stop	Not Provided	Not Provided	No Bus Stop Available on Road.
10	Drain	Yes Provided	Yes Provided	But Catch pit and Drain are on the Road.
11	Junctions			
	Umra Gam Rotary	Yes Provided	Yes Provided	Yes Rotary Provided but no Footpath Road Marking, No Signage no Signal Provided on Junction.
	SVNIT Junction	Yes Provided	Yes Provided	Yes Rotary Provided but no Signal Provided on Junction.

1.11 Ring C-2: Stretch from SVNIT Junction to Citylight Junction



Sr.No.	Elements	LHS	RHS	Remarks					
SVNIT	VNIT Junction to Citylight Junction								
1	Median	Not Provided	Not Provided	Under Bridge on Road					
2	Electrical Pole	Yes Provided	Yes Provided	Both side on Bridge					
3	Footpath	Yes Provided	Yes Provided	Yes Provided.					
4	Signs	Yes Provided	Yes Provided	Mandatory and Directional Signage on Road.					
5	Signals	Not Provided	Not Provided	Not Provided on Junction too.					
6	Road Markings	Yes Provided	Yes Provided	Yes Provided.					
7	Pavement Condition	Good	Good						
8	Parking slot	Not Provided	Not Provided	Street Parking and Under Bridge SMC Parking.					
9	Bus stop	Yes Provided	Yes Provided	Existing Old City Bus Stop Available on Road and no bus stop Pole Available on bus Stop.					
10	Drain	Yes Provided	Yes Provided	But Catch pit and Drain are on road and on Footpath Some Portion.					
11	Junctions								
	SVNIT Junction	Yes Provided	Yes Provided	Yes Rotary Provided but no Signal and Lane Marking Provided on Junction.					

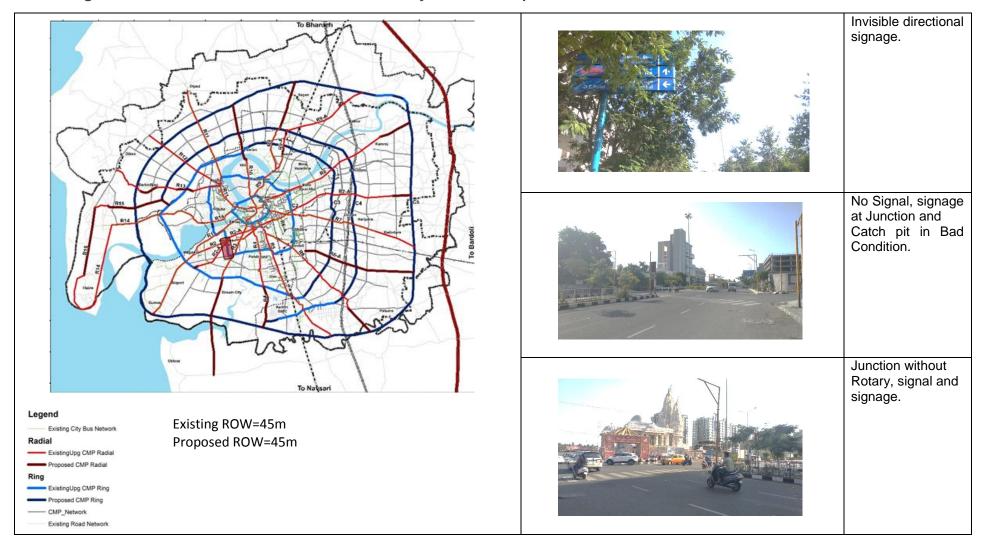
1.12 Ring C-2: Stretch from CityLight Junction to Anuwratdwar Junction



Sr.No.	Elements	LHS	RHS	Remarks
Parle P	│ Point Bridge to Cit	∣ ylight Medical S	tore	
1	Median	No Provided	No Provided	Only seperater Provided on Some Portion.
2	Electrical Pole Yes Provided		Yes Provided	One Side on Road.
3	Footpath	Yes Provided	Yes Provided	But not wide footpath provided.
4	Signs	Not Provided	Not Provided	Not Provided on Road.
5	Signals	Not Provided	Not Provided	Not Provided on Junction too.
6	Road Markings	Not Provided	Not Provided	Only Zebra Marking Provided on Road.
7	Pavement Condition	Average	Average	On Some Condition Bad Payment Condition.
8	Parking slot	Not Provided	Not Provided	Street Parking.
9	Bus stop	Not Provided	Not Provided	No Bus Stop or Pole on the Road.
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
	Junctions		·	
	City Light Junction	Yes Provided	Yes Provided	Yes Rotary Provided but no Signal, Siganage and Lane Marking Provided on Junction.
Cityligl	nt Medical Store to	o Anuwratdwar	Junction	
1	Median	Yes Provided	Yes Provided	Yes Provided.
2	Electrical Pole	Yes Provided	Yes Provided	Centre side on Median.
3	Footpath	Yes Provided	Yes Provided	Yes Provided but not in Good Condition.
4	Signs	Not Provided	Not Provided	Only Direction Signage Provided on Junction.
5	Signals	Not Provided	Not Provided	Only at Anuwratdwar Junction but not Follow by Traffic.
6	Road Markings	Yes Provided	Yes Provided	Only Zebra Marking and Sepreter Lane Marking Provided on Road.
7	Pavement Condition	Average	Average	On Some Condtion Bad Pavment Condition.
8	Parking slot	Not Provided	Not Provided	Street Parking.
9	Bus stop	Yes Provided	Yes Provided	Some Old Bus Stop and New Existing Bus stop on Road but no Poles on Bus stop.

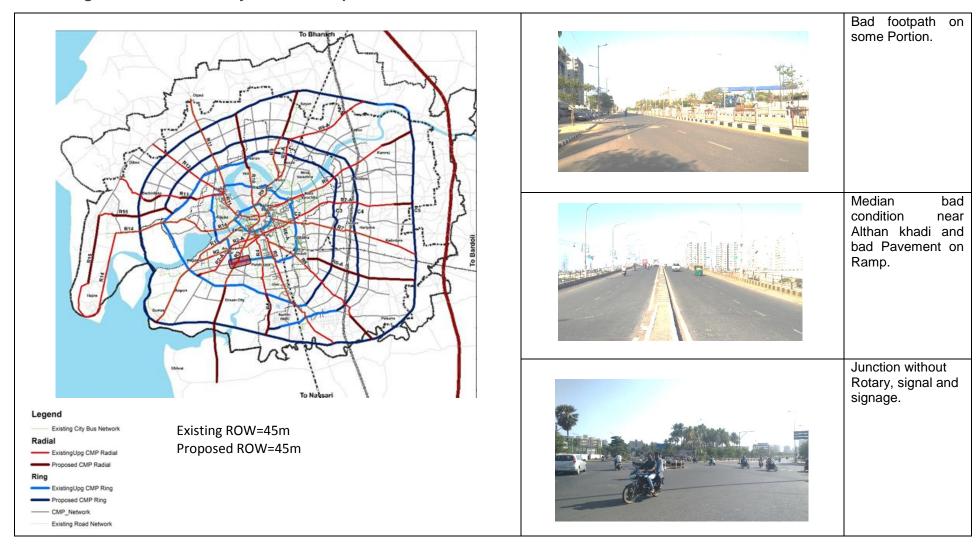
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Junctions			
	Anuwratdwar Junction	Yes Provided		No Rotary Provided on Junction.

1.13 Ring C-2: Stretch from Anuwratdwar Junction to Shyamdham Temple



Sr.No.	Elements	LHS	RHS	Remarks
Anuw	ratdwar Junction to Shyai	⊔ mdham Tei	mple	
1	Median	Not Provided	Not Provided	But on Some Portion BRTS Bus stop.
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.
3	Footpath	Yes Provided	Yes Provided	But on Some Portion not Provided.
4	Signs	Yes Provided	Yes Provided	But on Junction Pedestrian Crossing, Go slow Signage is not Provided.
5	Signals	Not Provided	Not Provided	Pole is Exist but no Signal Available.
6	Road Markings	Yes Provided	Yes Provided	
7	Pavement Condition	Good	Good	
8	Parking slot	Yes Provided	Yes Provided	Street Parking.
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS Bus stop.
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Junctions		·	
	Shyamdham Temple Junction	Yes Provided	Yes Provided	No Rotary Provided on road no Signal, no Mandatory signage on Junction.

1.14 Ring C-2: Stretch from Shyamdham Temple to Althan Khadi



Sr.No.	Elements	LHS	RHS	Remarks
Shyan	ndham Temple to	Althan Khad	di	
1	Median	Not Provided	Not Provided	But on Some Portion BRTS Bus stop.
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.
3	Footpath	Yes Provided	Yes Provided	But some Portion in Bad condition.
4	Signs	Yes Provided	Yes Provided	Only direction signage no Mandetory signage on Road.
5	Signals	Not Provided	Not Provided	Pole is Exist but no Signal Available.
6	Road Markings	Yes Provided	Yes Provided	Some Portion Invisible Marking
7	Pavement Condition	Good	Good	
8	Parking slot	Yes Provided	Yes Provided	Near Footpath but Some vehicle park on service road.
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS Bus stop.
10	Drain Junctions	Yes Provid	ed	Catch pit and Drain are on Road.
1	Althan Canal Circle	Yes Provided	Yes Provided	No Rotary Provided on road no Signal, no Mandatory signage on Junction.

1.15 Ring C-2: Stretch from Althan Khadi to Piyush Complex



Sr.No.	Elements	LHS	RHS	Remarks
Althar	Khadi to Piyus	h Point	I	
1	Median	Not Provided	Not Provided	Not Provided.
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.
3	Footpath	Yes Provided	Yes Provided	Yes Provided both side.
4	Signs	Yes Provided	Yes Provided	Only Directional and Uni direction signage on Road and some Mandatory signage on Road.
5	Signals	Not Provided	Not Provided	Not Provided.
6	Road Markings	Yes Provided	Yes Provided	Yes Provided.
7	Pavement Condition	Good	Good	Good Condition at Piyush point junction Paving in Bad Condition.
8	Parking slot	Yes Provided	Yes Provided	Yes but some Position Vehicle Park on Road.
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop on Road.
10	Drain	Yes Provided		Catch pit and Drain are on Road.
	Junctions			
1	Patrakar Colony	Yes Provided	Yes Provided	No Signage or Signal Available on Junction.

1.16 Ring C-2: Stretch from Piyush Complex to Daksheshwar Temple



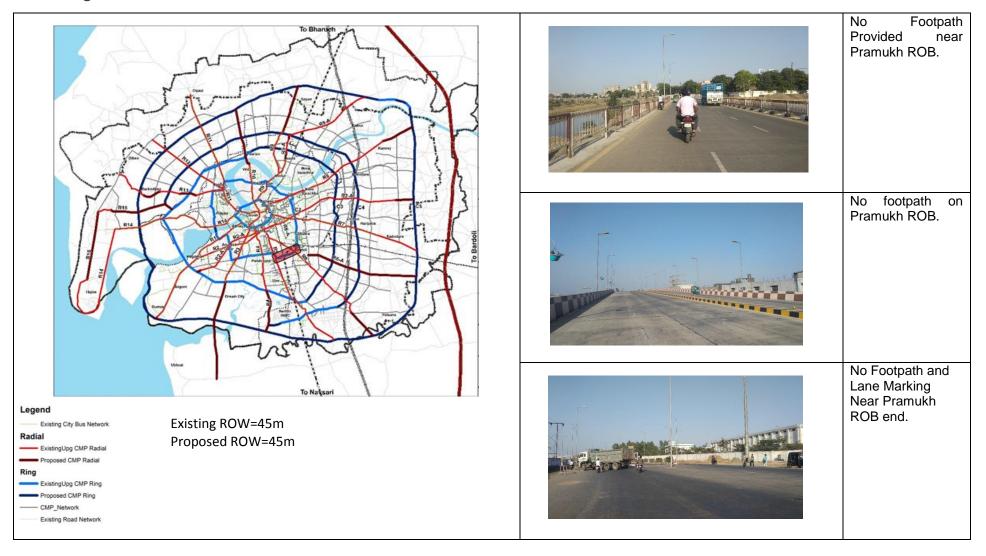
Sr.No.	Elements	LHS	RHS	Remark
1	Median	Not Provided	Not Provided	Not Provided.
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.
3	Footpath	Yes Provided	Yes Provided	Adequate footpath is require for missing portion
4	Signs	Yes Provided	Yes Provided	Only Directional and Uni direction signage on Road and some Mandatory signage on Road.
5	Signals	Yes Provided	Yes Provided	Not Working.
6	Road Markings	Not Provided	Not Provided	Road markings like lane separator, zebra crosing etc. are not in good condition
7	Pavement Condition	Average	Average	Piyush Complex junction Paving in Bad Condition.
8	Parking slot	Yes Provided	Yes Provided	Yes but some Position Vehicle Park on Road.
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop on Road.
10	Drain	rain Yes Provided		Catch pit and Drain are on Road.
11	Junctions			
	Piyush Point	Yes Provided	Yes Provided	No Rotary, signal and Signage are Provided on Junction.

1.17 Ring C-2: Stretch from Daksheshwar Temple to Pramukh Park



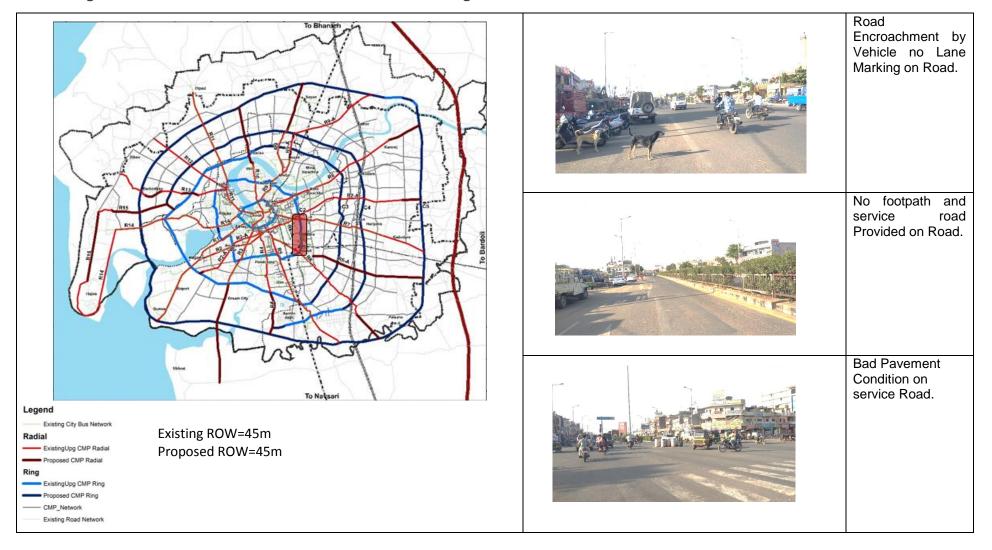
Sr.No.	Elements	LHS	RHS	Remarks	
Daksh	eshwar to Pram	ukh Park			
1	Median	Yes Provided	Yes Provided	Yes Provided.	
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.	
3	Footpath	Yes Provided	Yes Provided	Yes Provided.	
4	Signs	Yes Provided	Yes Provided	Only Directional and Uni direction signage on Road and some Mandatory signage on Road.	
5	Signals	Yes Provided	Yes Provided	But Traffic not follow by Signal	
6	Road Markings	Yes Provided	Yes Provided	But not in Good Condition.	
7	Pavement Condition	Average	Average	But on Some Condtion Pavment is in bad condition.	
8	Parking slot	Yes Provided	Yes Provided	Yes Provided both side but on some Portion vehicle park on Service road.	
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop on Road.	
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.	
	Junctions				
1	Daksheshwar Temple	Yes Provided	Yes Provided	No Rotary on Junction no signage and Pavement on Junction.	

1.18 Ring C-2: Stretch from Pramukh Park to Dindoli Kharwasha Junction



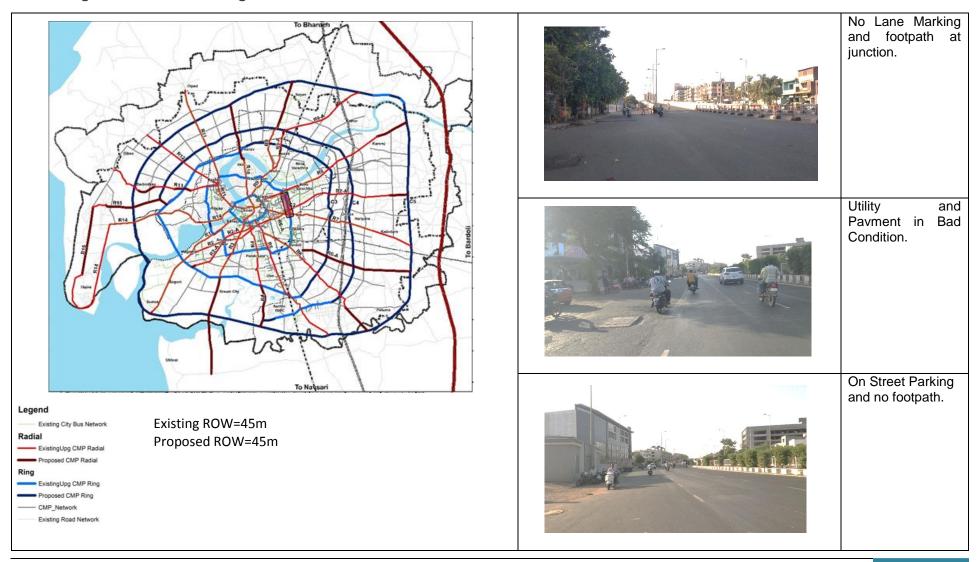
Sr.No	. Elements	LHS	RHS	Remarks
Prami	ukh Park ROB to Dindoli ion			
1	Median	Not Provided	Not Provided	
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.
3	Footpath	Not Provided	Not Provided	Not Provided.
4	Signs	Yes Provided	Yes Provided	Only Directional and Uni direction signage provided on Road.
5	Signals	Yes Provided	Yes Provided	But Traffic not follow by Signal
6	Road Markings	Yes Provided	Yes Provided	Yes Provided.
7	Pavement Condition	Good	Good	But Service road and footpath are not Constructed yet.
8	Parking slot	Not Provided	Not Provided	Not Provided on both side. Vehicle park on Carriage way.
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop on Road.
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Junctions			
	Dindoli Kharwasa Junction	Yes Provided	Yes Provided	No Rotary on Junction no signage, Signal and good Pavement on Junction.

1.19 Ring C-2: Stretch from Dindoli Kharwasha Junction to Magob Junction



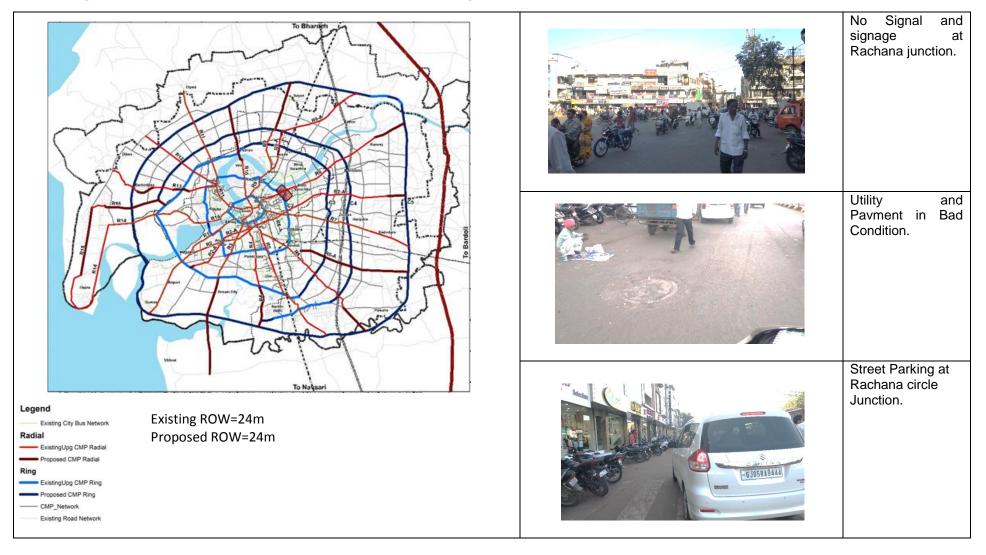
Sr.No.	Elements	LHS	RHS	Remarks			
Dindoli	Junction to Ma	gob Junct	ion				
1	Median	Yes Provided	Yes Provided	But Some Portion BRTS bus Stop on Median.			
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.			
3	Footpath	Not Provided	Not Provided	Not Provided on both side. On Godadara ROB footpath only Provided.			
4	Signs	Yes Provided	Yes Provided	Yes Provided.			
5	Signals	Yes Provided	Yes Provided	But Traffic not follow by Signal			
6	Road Markings	Yes Provided	Yes Provided	Yes Provided.			
7	Pavement Condition	Good	Good	But Service road and footpath are not Constructed yet.			
8	Parking slot	Not Provided	Not Provided	Not Provided on both side. Vehicle park on Carriage way.			
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop on Road.			
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.			
11	1 Junctions						
	Devadh Gam Char Rasta	Yes Provided	Yes Provided	Near junction no signage and no rotary provided on junction.			
	Magob Junction	Yes Provided	Yes Provided	Under Construction bridge near junction, no signal, no signage and no rotary provided on junction.			

1.20 Ring C-2: Stretch from Magob Junction LH Road BRTS Junction



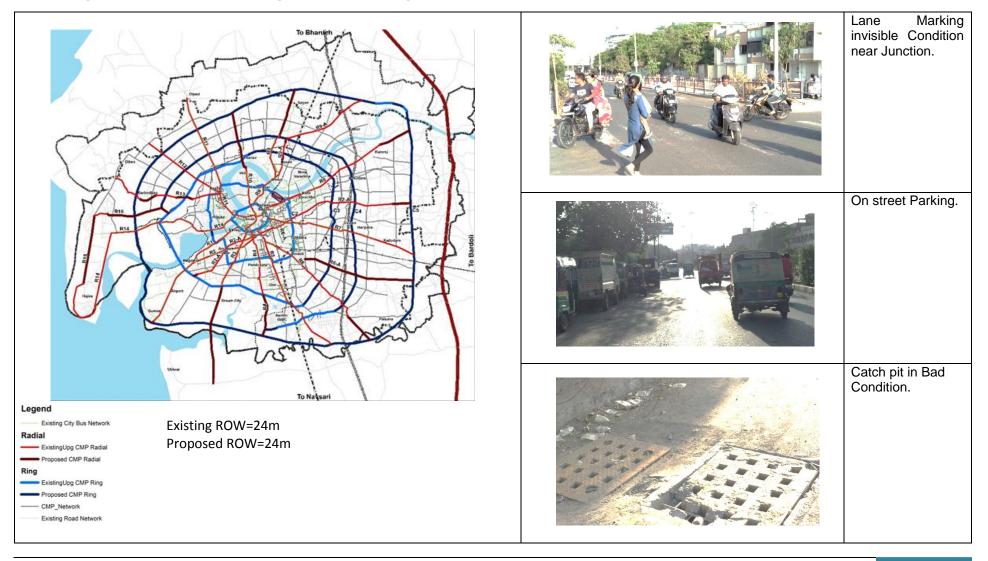
Sr.No.	Elements	LHS	RHS	Remarks			
Magok	Junction to LH	Road BRT	S				
1	Median	Not Provided	Not Provided	No Median but Bridge on the Road, and Existing Bus Stop on Road.			
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.			
3	Footpath	Not Provided	Not Provided	Enchrochment by Hawkers and Vehicle.			
4	Signs	Yes Provided	Yes Provided	Only Direction and Mandatory signage provided on some Portion.			
5	Signals	Yes Provided	Yes Provided	But Traffic not follow by Signal			
6	Road Markings	Not Provided	Not Provided	Signal to be Provided.			
7	Pavement Condition	Good	Good	But Service road and footpath are not Constructed yet.			
8	Parking slot	Not Provided	Not Provided	Only Provided under Bridge. On street Parking.			
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop on Road.			
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.			
	Junctions						
1	Sitanagar	Yes Provided	Yes Provided	Very Congested junction, no signal, no signage and not a good Pavment on junction.			
2	Anjana Boot Bhavani	Yes Provided	Yes Provided	Very Congested junction, no signal, no signage and not a good Pavment on junction.			
3	LH road Junction	Yes Provided	Yes Provided	Very Congested junction, no signal, no signage and not a good pavement on junction.			

1.21 Ring C-2: Stretch from LH Road BRTS Junction to Hirabaug Circle



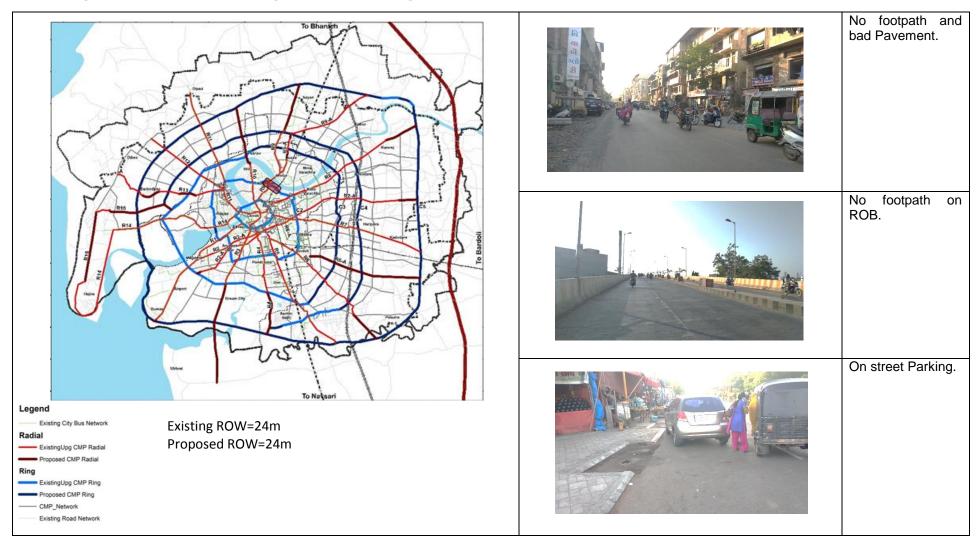
Sr.No.	Elements	LHS	RHS	Remarks		
LH Roa	LH Road BRTS to Hirabaug Circle					
1	Median	Not Provided	Not Provided	Only one way Road.		
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.		
3	Footpath	Yes Provided	Yes Provided	Enchrochment by Hawkers and Vehicle.		
4	Signs	Yes Provided	Yes Provided	Only Direction and Mandetory signage provided on some Portion.		
5	Signals	Not Provided	Not Provided	Only Provided at Major Road Junction.		
6	Road Markings	Not Provided	Not Provided	Not Proper Provided on Road.		
7	Pavement Condition	Average	Average	Average not good condition.		
8	Parking slot	Not Provided	Not Provided	Street Parking.		
9	Bus stop	Yes Provided	Yes Provided	No Bus stop Pole Avialable.		
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.		
	Junctions					
1	Rachana Circle	Yes Provided	Yes Provided	Very Conjusted junction, no signal, no signage and not a good pavment on junction.		
2	Kapodara Char Rasta	Yes Provided	Yes Provided	Rotary and Signal Provided but no Mandatory signage Provided on Junction.		

1.22 Ring C-2: Stretch from Hirabaug Circle to Utkalnagar ROB



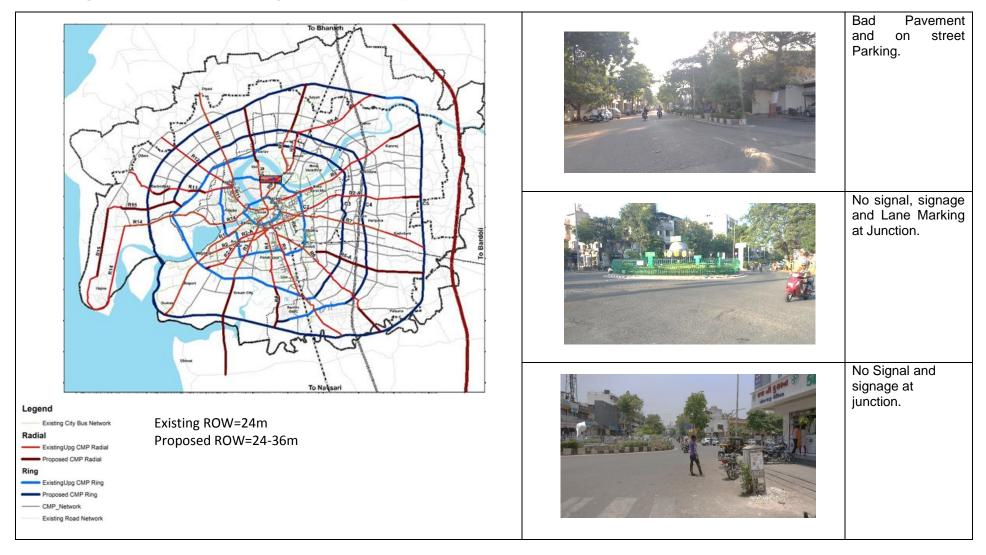
Sr.No.	Elements	LHS	RHS	Remarks
Hiraba	ug Circle to Utkalnaga	r ROB		
1	Median	Yes Provided	Yes Provided	Yes Provided with Landscape on Some Portion.
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.
3	Footpath	Yes Provided	Yes Provided	Yes Provided but on Some Portion not Provided.
4	Signs	Not Provided	Not Provided	Only Direction signage Provided.
5	Signals	Not Provided	Not Provided	Only Provided.
6	Road Markings	Not Provided	Not Provided	Some Portion Bad Lane Marking on Road.
7	Pavement Condition	Good	Good	
8	Parking slot	Yes Provided	Yes Provided	but on Some Portion Vehicle Park on Service Road.
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop Provided.
10	Drain	Yes Provided	Yes Provided	Provided on service road, and not in Good Condition.
11	Junctions			
	Utkalnagar ROB Start	Yes Provided	Yes Provided	No Rotary, no signal, no signage on junction.

1.23 Ring C-2: Stretch from Utkalnagar ROB to Utkalnagar Junction



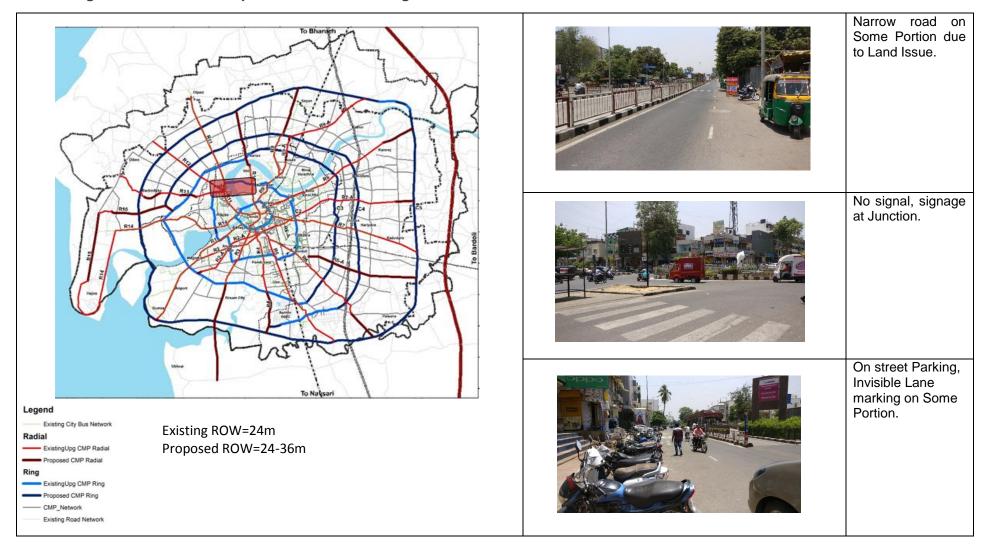
Sr.No.	Elements	LHS	RHS	Remarks
Utkalna	agar ROB Start to Utkalnag	ar Junction	I	
1	Median	Not Provided	Not Provided	No Median on Road.
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.
3	Footpath	Not Provided	Not Provided	Only Some Porsion Provided with footpath.
4	Signs	Not Provided	Not Provided	No Signage Provided on Road.
5	Signals	Not Provided	Not Provided	
6	Road Markings	Not Provided	Not Provided	Not Provided on Road.
7	Pavement Condition	Bad	Bad	Not Good Condition at Utkalnagar ROB End.
8	Parking slot	Not Provided	Not Provided	Not Provided, vehicle park on Road.
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop Provided.
10	Drain	Not Provided	Not Provided	No Utility Provided on Road.
11	Junctions			
	Utkalnagar ROB Junction	Yes Provided	Yes Provided	No Rotary, no signal, no signage on junction.

1.24 Ring C-2: Stretch from Utkalnagar Junction to Bapa Sitaram Chowk



Sr.No.	Elements	LHS	RHS	Remarks			
Utkalnag	Utkalnagar Junction to Bapa Sitaram Chowk						
1	Median	Yes Provided	Yes Provided	Yes with Landscape.			
2	Electrical Pole	Yes Provided	Yes Provided	Both side on road Edge.			
3	Footpath	Yes Provided	Yes Provided	Only Some Porsion Provided with footpath.			
4	Signs	Not Provided	Not Provided	No Signage Provided on Road.			
5	Signals	Not Provided		No Signal Provided on Road.			
6	Road Markings	Not Provided	Not Provided	Yes but Some Portion not Visible.			
7	Pavement Condition	Good	Good				
8	Parking slot	Not Provided	Not Provided	Vehicle park on Road.			
9	Bus stop	Yes Provided	Yes Provided	Existing BRTS stop Provided.			
10	Drain	Yes Provided	Yes Provided	On Mix Carriage way.			
	Junctions						
1	Rashi Circle	Yes Provided	Yes Provided	No Rotary, no signal, no signage on junction.			
2	Bapa Sitaramn Chowk	Yes Provided	Yes Provided	No Rotary, no signal, no signage on junction.			

1.25 Ring C-2: Stretch from Bapa Sitaram Chowk to Ugat Char Rasta



Bapa S	Bapa Sitaram to Ugat Char Rasta						
Sr.No.	Elements	LHS	RHS	Remarks			
1	Median	No	No	BRT corridor			
2	Electrical Pole	Yes Provided	Yes Provided				
3	Footpath	Yes Provided	Yes Provided	partial development of Pedestrian pathway			
4	Signs	Yes Provided	Yes Provided				
5	Signals	Not Provided	Not Provided				
6	Road Markings	Yes Provided	Yes Provided	Partial			
7	Pavement Condition	Good Condition	Good Condition	Mix carriage is narrow due to land problem			
8	Parking	Not Provided	Not Provided	need to be provided parking bay			
9	Drain	Yes Provided	Yes Provided				
10	Bus stop	Yes Provided	Yes Provided	BRT bus shelter			
11	Junctions						
1	Sahjanand chowk	Good condition, I	Good condition, Existing rotary, Needs road marking near Jn,signagae				
2	Hari krushna circle	Good condition, I	Existing rotary, Ne	eds road marking near Junction, signage			

1.26 Ring C-2: Stretch from Ugat Char Rasta to Pal RTO



CORRID	ORRIDOR NAME:-RTO Pal to Ugat Char Rasta						
Sr.No.	Elements	LHS	RHS	Remarks			
1	Median	Not Provided	Not Provided				
2	Electrical Pole	Yes	Yes				
		Provided	Provided				
3	Footpath	Not Provided	Not Provided				
4	Signs	Not Provided	Not Provided				
5	Signals	Not Provided	Not Provided				
6	Road Markings	Yes	Yes	Needs In Improve.			
		Provided	Provided				
7	Pavement Condition	Good	Good	RHS Side Work in Progress ,RDD Corridor			
		Condition	Condition				
8	Parking	Not Provided	Not Provided				
9	Bus stop	Not Provided	Not Provided				
10	Junctions	Yes	Yes	Linear Park in Center And Nishal Circle			
		Provided	Provided				

1.27 Ring C-03: Stretch from Hazira (ONGC) to Navsari NH





No footpath, No lane marking, Open earthen drain.



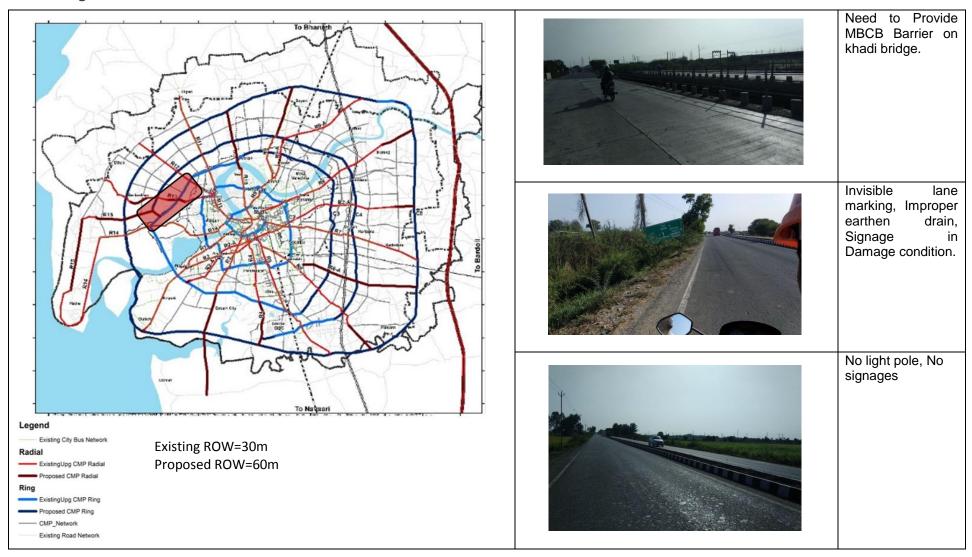
Median in bad condition, need to be repaired.



No light pole, No signages

Sr.No.	Elements	LHS	RHS	Remarks
Vankal	to Jahngirpura br	idge		
1	Median			Yes Provided but not in Good Condition. Upgradation required.
2	Electrical Pole	No Provided		Electric pole should be provided.
3	Footpath	No Provided	No Provided	Adequate footpath should be provided.
4	Signs	Not Provided	Not Provided	Adequate signages at certain locations should be provided.
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Not Provided	Not Provided	Road markings like lane separator, zebra crossing etc. are provided but not visible.
7	Pavement Condition	Average	Average	Upgradation required.
8	Parking slot	Not Provided	Not Provided	Adequate parking space should be provided.
9	Junctions			
	Jahangirpura Collage UnderPass	Not Provided	Not Provided	To be provided with Junction improvement
Jahngi	rpura bridge to Va	riyav		
1	Median	Not Provided		Adequate median should provided.
2	Electrical Pole	Not Provided	Yes Provided	Yes Provided at the Edge of the Road.
3	Footpath	Not Provided	Not Provided	Adequate footpath should be provided.
4	Signs	Yes Provided	Yes Provided	To be installed like 'GO SLOW" "Speed Limit" "NO PARKING "etc.
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided but not visible.
7	Pavement Condition	Good	Good	Fair Condition.
8	Parking slot	Not Provided	Not Provided	Adequate parking space should be provided.
9	Junctions			
	Variyav Char Rasta	-	-	to be improved with signal.

1.28 Ring C-03: Stretch from Vankala to ONGC



Vankala to	Vankala to ONGC circle						
Sr.No.	Elements	LHS	RHS	Remarks			
1	Median	Yes Provided	Yes Provided	Not Good Condition			
2	Electrical Pole	Not Provided	Not Provided				
3	Footpath	Not Provided	Not Provided				
4	Signs	Not Provided	Not Provided				
5	Signals	Not Provided	Not Provided				
6	Road Markings	Yes Provided	Yes Provided	Not Good Condition			
7	Pavement Condition	Good Condition	Good Condition	Average Condition			
8	Parking	Not Provided	Not Provided				
9	Bus stop	Not Provided	Not Provided				
10	Drainage	Not Provided	Not Provided				
11	Junctions	Ichhapore Khadi Ch	nar Rasta- Needs to pro	vide signal, Speed breaker,Signages			

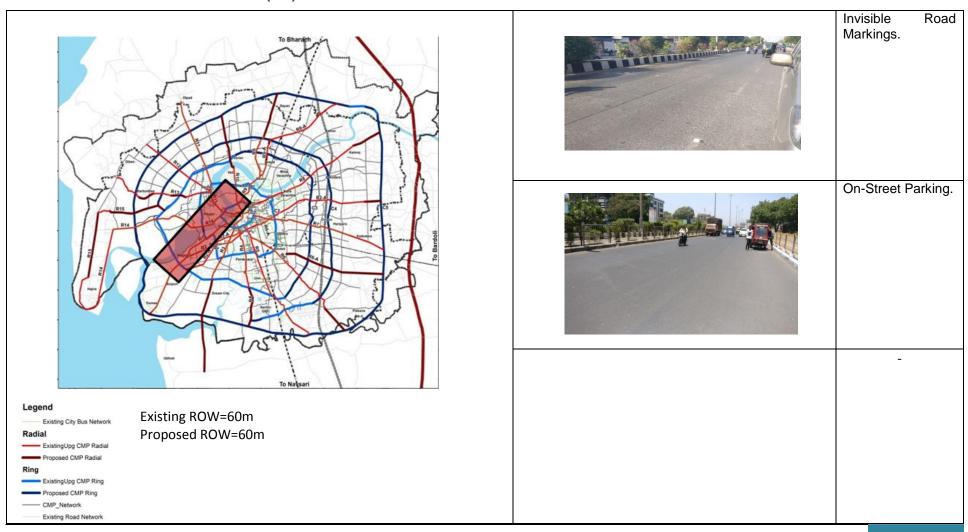
1.29 Ring C-3B & C3C: Stretch from Hazira to Navsari



C3B &	C3B & C3C - CORRIDOR NAME:- Hazira to Navsari [Outer Ring Road] (ROW= exist 24 M/proposed-60M)					
Sr.No.	Elements	LHS	RHS	Remarks		
Hazira	lazira to Navsari					
1	Median	Provided	Provided	MBCB provided		
2	Electrical Pole	Provided	Provided			
3	Footpath	Provided	Provided	-		
4	Signs	Provided	Provided	-		
5	Signals	Provided	Provided	-		
6	Road Markings	Provided	Provided	-		
7	Pavement Condition	Good	Good	-		
8	Parking slot	-	-	-		
9	Bus stop	-	-	-		
10	Drain	Partially Provided	Partially Provided	Need for additional		
11	Service Road	Provided	Provided	-		
12	Kerb	Provided	Provided	-		
13	Major Junctions	-	-	-		

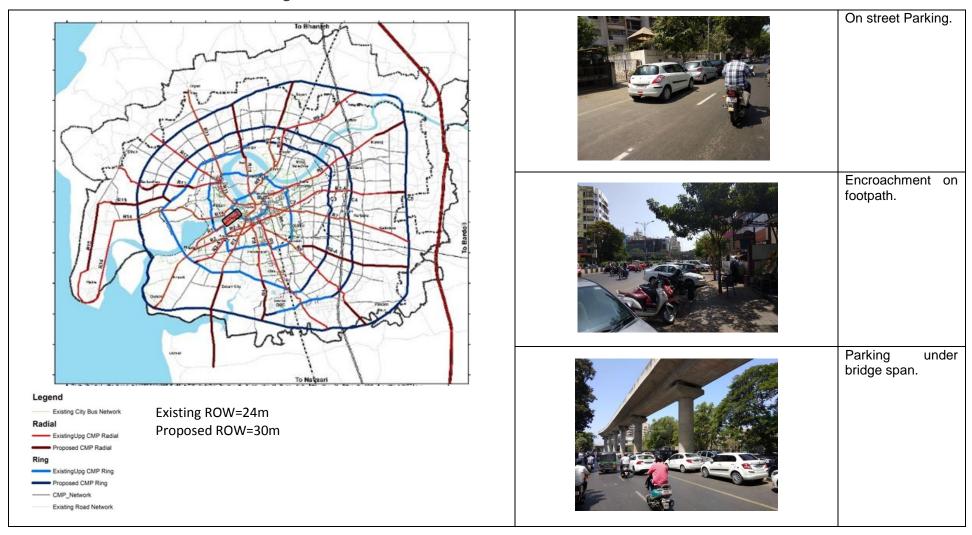
Annexure 3: Details of Survey Inventory for Proposed Upgration of Radial Roads

1.30 Radial R-1: Stretch from Surat (NH) to Dumas Road - BRT corridor



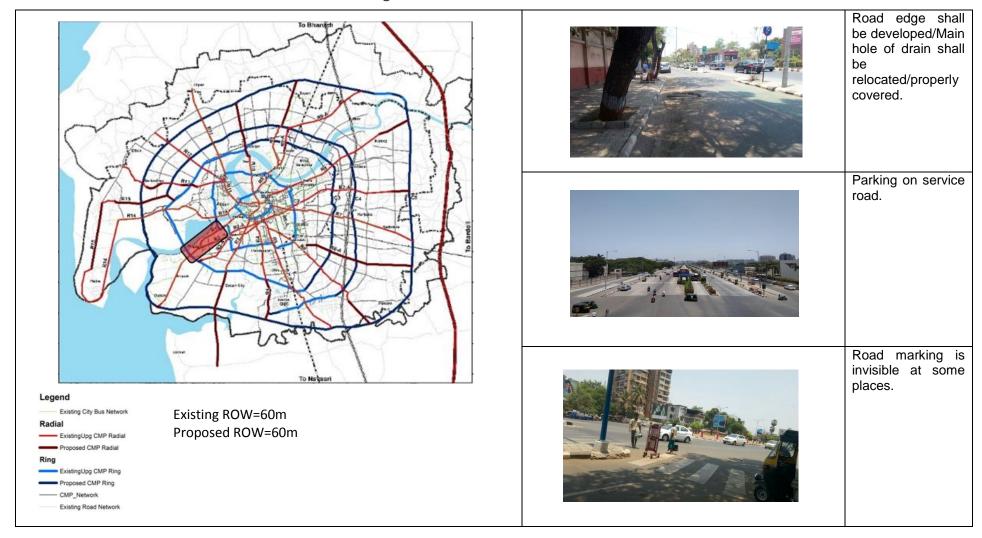
R1 - C0	R1 - CORRIDOR NAME:- Surat (NH) to Dumas Rd (ROW= exist 60 M/proposed-60M) -BRT corridor					
Sr.No.	T T	LHS	RHS	Remarks		
Surat (NH) to Dumas Rd	(BRT corridor)	·			
1	Median	Provided		-		
2	Electrical Pole	Provided		-		
3	Footpath	Provided	Provided	To be repair at some places; Encroachment to be removed		
4	Signs	Provided	Provided	-		
5	Signals	Provided	Provided	-		
6	Road Markings	Not visible	Not visible	to be repainted		
7	Pavement Condition	good	good	-		
8	Parking slot	Partially Provided	Partially Provided	At some places, it is provided		
9	Bus stop	-	-	-		
10	Drain	Provided	Provided	-		
11	Service Road	Provided	Provided	-		
12	Kerb	Provided	Provided	To be repair at some places		
13	Major Junctions	-	-	-		

1.31 Radial R-01: Stretch from Athwa gate to SVNIT



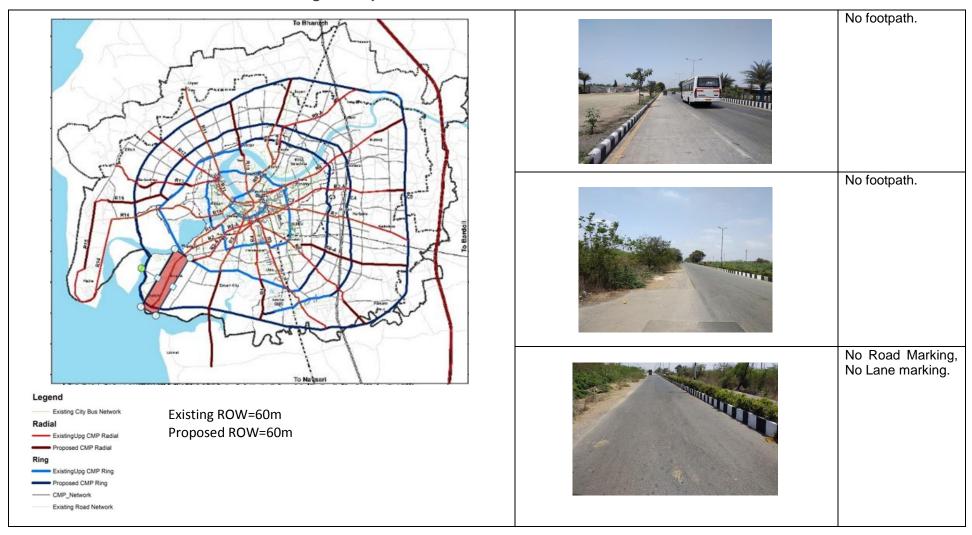
Athwa	Athwa gate to SVNIT					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	Good median is provided with landscape		
2	Electrical Pole	Center	Center	In good condition		
3	Footpath	Yes Provided	Not provided	Enchrochment & On street parking on Both side		
4	Signs	Yes Provided	Yes Provided			
5	Signals	Yes Provided	Yes Provided			
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crossing etc. are provided & needs to Be improvement		
7	Pavement Condition	Good	Good	Flexible Pavement		
8	Parking	Yes Provided	Yes Provided	On street Parking /providing parking option		
9	Bus stop	Old city bus stop	Old city bus stop			
10	Drain	Yes	Yes			
11	Junction	 chopati jn - Need to zebra marking Umara polish choki -Need to zebra marking City light road – Under flyover, No road marking SVNIT circle –existing rotary, 				

1.32 Radial R-01: Stretch from SVNIT to ONGC bridge



SVNIT	SVNIT to ONGC bridge						
Sr.No.	Elements	LHS	RHS	Remarks			
1	Median	Yes Provided	Yes Provided	Adequate median with landscape is provided.			
2	Electrical Pole	Yes Provided	Yes Provided	On edge.			
3	Footpath	Yes Provided	Yes Provided				
4	Signs	Yes Provided	Yes Provided				
5	Signals	Yes Provided	Yes Provided				
6	Road Markings	Yes Provided	Yes Provided	Road markings are invisible at some places.			
7	Pavement Condition	Fair Condition	Fair Condition				
8	Parking	Yes Provided	Yes Provided				
9	Bus stop	Yes Provided	Yes Provided	BRTS bus stop provided			
10	Junctions	Yes Provided	Yes Provided				
	1.SVNIT Circle	Developed					
	2.Y-junction -	Developed					

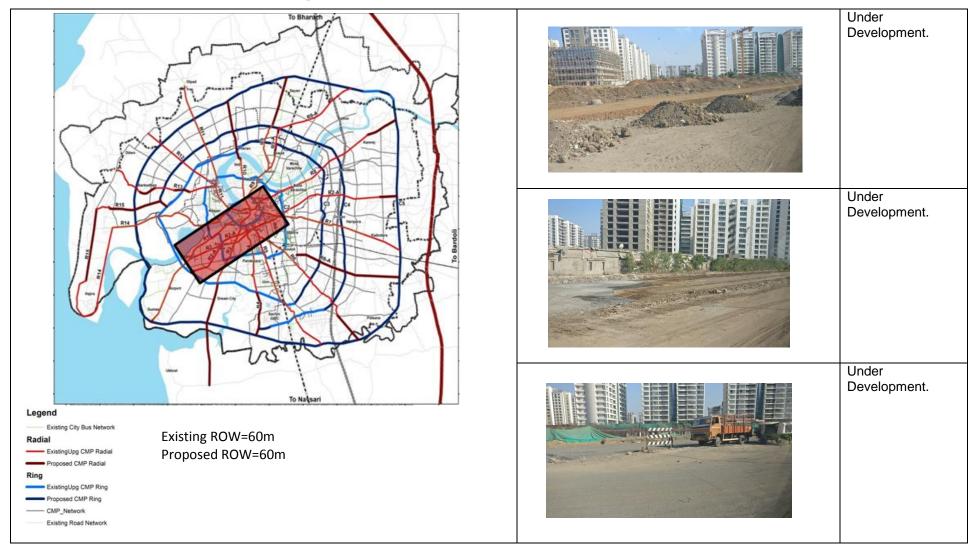
1.33 Radial R-01: Stretch from ONGC Bridge to Airport



ONGC I	Bridge to Airport (Ex	isting ROW-30mtr)		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Good median is provided with landscape
2	Electrical Pole	Center	Center	In good condition
3	Footpath	Not provided	Not provided	Adequate fotpath is require
4	Signs	Yes Provided	Yes Provided	Signage require in for Some location,
5	Signals	Not provided	Not provided	
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crossing etc. are provided but not in good condition.
7	Pavement Condition	Good	Good	CC pavement, No shoulder
8	Parking			On street Parking/providing parking option
9	Bus stop	New city bus stop	New city bus stop	No Ramp Provided, Encroachment near RHS bus stop
10	Drain	Yes	Yes	
11	Junction	1. ONGC Bridge – Ne	eds to provide Signals and	marking or Rotary
	Airport to Dumas Lu	ngar (existing Row -12	mtr)	
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not provided	Not provided	Require Adequate median with Landscape
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Not provided	Not provided	Development of Footpath
4	Signs	Not provided	Not provided	Signs require
5	Signals	Not provided	Not provided	
6	Road Markings	Not provided	Not provided	Road markings like lane separator, zebra crossing etc. are not provided
7	Pavement Condition	Not Good	Not Good	Needs to be resurface & widen the road

8	Parking				
9	Bus stop	yes	yes	Marker pole at some portion,	
10	Drain	Yes	Yes		
11	Junction	1.Airport Jun –Needs to provide signages and Signal or Rotary 2.Dumad lunger Jun –Developed with rotary			

1.34 Radial R-2: Stretch from Kharwarnagar to Anuwart to NH



Sr.No.	Elements	LHS	RHS	Remarks
Kharwa	arnagar to Anuv	ratdwar - (BRT	S corridor)	
1	Median	Provided		-
2	Electrical Pole	Provided		-
3	Footpath	Provided	Provided	-
4	Signs	Provided	Provided	-
5	Signals	Provided	Provided	-
6	Road Markings	Partially visible	Partially visible	to be repainted
7	Pavement Condition	good	good	-
8	Parking slot	Partially Provided	Partially Provided	-
9	Bus stop	-	-	-
10	Drain	Provided	Provided	Cleaning required for cross surface drain and underground both
11	Service Road	Provided	Provided	Enchroachment to be removed from some places
12	Kerb	Provided	Provided	To be repair at some places
13	Major Junctions	-	-	-
	Kharwarnagar	-	-	Developed under BRTS project - Need for pavement marking; Island to be develop; missing footpath observed at some places - to be constructed/repaired
	Anuwratdwar	-	-	Developing under RDD 16
Anuvra	itdwar to Jamna	ba Park		
ROAD	CONSTRUCTIO	N INPROGRSS	UNDER RDD 16	
Jamna	ba Park till NH			
1	Median	Not Provided		-
2	Electrical Pole	Partially Provided		-
3	Footpath	Not Provided	Not Provided	-
4	Signs	Not Provided	Not Provided	-
5	Signals	Not Provided	Not Provided	-
6	Road	Not visible	Not visible	to be repainted

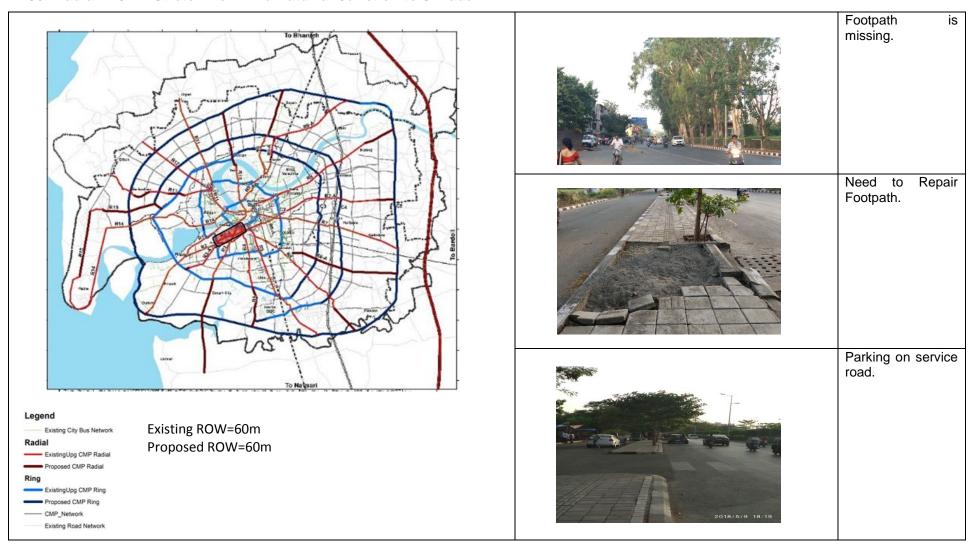
	Markings			
7	Pavement Condition	Fair	Fair	Need to be improved
8	Parking slot	Not Provided	Not Provided	-
9	Bus stop	-	-	-
10	Drain	Not visible	Not visible	drain required
11	Service Road	Not Provided	Not Provided	-
12	Kerb	Not Provided	Not Provided	-
13	Major	-	-	-
	Junctions			

1.35 Radial R-02: Stretch from Y-junction to Anuvratdwar



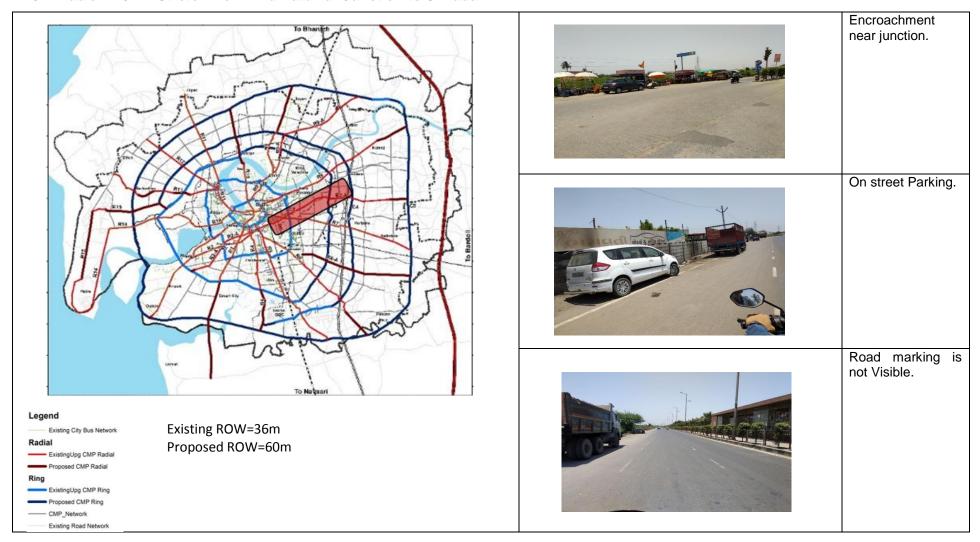
Y-Jn to Anuvratdwar Jn					
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Not Provided	Not Provided	BRTS corridor	
2	Electrical Pole	Yes Provided	Yes Provided		
3	Footpath	Yes Provided	Yes Provided		
4	Signs	Yes Provided	Yes Provided		
5	Signals	Yes Provided	Yes Provided	Needs to Provide signal on both end	
6	Road Markings	Yes Provided	Yes Provided	Partial	
7	Pavement Condition	Good Condition	Good Condition	6 lane PQC with service road	
8	Parking	Yes Provided	Yes Provided		
9	Bus stop	Yes Provided	Yes Provided	BRTS bus stop provided	
10	Junctions				
	Vesu Patiya	Signals are not follow	·		
	Anuvratdwar Jn	No signal , Needs to im	prove jun		
	Someswar Junction	Signals are not follow			

1.36 Radial R-02A: Stretch from Anuvratdwar Junction to Simada



Anuvra	Anuvratdwar Jn to Parvatpatiya JN					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Not Provided	Not Provided	Canal corridor		
2	Electrical Pole	Yes Provided	Yes Provided			
3	Footpath	Yes Provided	Yes Provided			
4	Signs	Yes Provided	Yes Provided	Need to provide traffic signaged like "speed limit", "Turn left or right", direction signages		
5	Signals	Yes Provided	Yes Provided			
6	Road Markings	Yes Provided	Yes Provided	Partial		
7	Pavement Condition	Good Condition	Good Condition	BRTS corridor		
8	Parking	Not Provided	Not Provided			
9	Bus stop	Yes Provided	Yes Provided	BRTS bus stop provided		
10	Drainage	Yes Provided	Yes Provided			
11	Junctions					
	Panas Crossing	Needs to Provide signal, ro	ad marking			
	Iswarfarm BRTS jun	Existing Rotary Needs to P		ng		
	Jamnanagar Brts Junction	Needs to Provide signal, ro	Needs to Provide signal, road marking			
	Rupali BRTS jn	Needs to Provide signal, road marking				
	Unique Hospital BRTS Jn	No rotary, NO signal				
	Kharwar nagar	Level difference at crossing				
	Bhatena Jun BRTS	No rotary, NO signal				

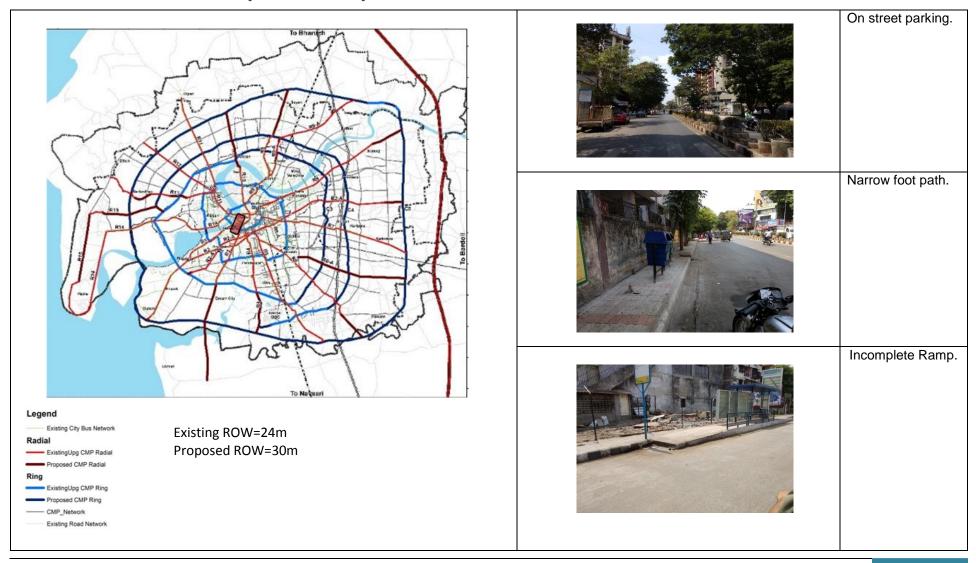
1.37 Radial R-02A: Stretch from Anuvratdwar Junction to Simada



Sr.No.	Elements	LHS	RHS	Remarks
Mithi K	hadi Road To Pa	rvat Patiya	<u>'</u>	
1	Median	NO		(Canal)
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	No Provided	No Provided	Provide footpath
4	Signs	Yes Provided	Yes Provided	Need to provide adequate signs like 'GO SLOW" "Speed Limit" "NO PARKING"etc at some places
5	Signals	Yes Provided	Yes Provided	Need to be signlise at junction
6	Road Markings	Not Provided	Not Provided	Zebra crossing and Pavement marking need to done
7	Pavement Condition	Average	Avreg	Need to be resurface for good riding quality
8	Parking slot	Not Provided	Not Provided	On road parking of Auto, Neccesary enforcement provide for Parking restiction
9	Bus stop	Yes Provided	Yes Provided	BRTS
10	Drain	Yes Provided	Yes Provided	
11	Junctions			
	(1)Mithi Khadi F	Road (2) Model Township (3) Parvat Patiya		
Parvat	Patiya To Simad	a BRTS		
1	Median	Not Provided		(Canal)
2	Electrical Pole	Yes Provided		
3	Footpath	No Provided	No Provided	Need to provide footpath, Service road under construction
4	Signs	Yes Provided	Yes Provided	Need to provide adequate signs like 'GO SLOW" "Speed Limit" "NO PARKING"etc at near junction
5	Signals	No Provided	No Provided	Need to be signlise at junction
6	Road Markings	Yes Provided	Yes Provided	Zebra crossing and Pavement marking need for Some missing places
7	Pavement Condition	Average	Avreg	Needs to be resurface and Service road improvement
8	Parking slot	Not Provided	Not Provided	To be provide parking slot near road
9	Bus stop	Yes Provided	Yes Provided	BRTS
10	Drain	Yes Provided	Yes Provided	
11	Junctions			

	Reshma Char			
	Resta			
Sima	da BRTS to the Hi	ghway	·	
1	Median	Canal		Need to provide Reflectore on Canal key
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	No Provided	No Provided	Need to provide footpath,
4	Signs	No Provided	No Provided	Need to provide adequate signs like 'GO SLOW" "Speed Limit" "NO PARKING"etc
				at near junction
5	Signals	No Provided	No Provided	Need to be signlise at junction
6	Road	Yes Provided	Yes Provided	Zebra crossing and Pavement marking need for Some missing places
	Markings			
7	Pavement	Good	Good	Needs to be resurface at some location
	Condition			
8	Parking slot	Not Provided	Not Provided	To be provide parking slot near road
9	Bus stop	No Provided	No Provided	BRTS
10	Drain	No Provided	No Provided	Need to provide
11	Junctions			

1.38 Radial R-3: Stretch from Majura Gate to Khajod Char Rasta



Majura	Gate to Bhatar Char F	Rasta		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape
2	Electrical Pole		Yes Provided	One Side
3	Footpath	Yes Provided	Yes Provided	1)Encroachment on footpath 2) not Adequate width of footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals	-	-	Not working at junction
6	Road Markings	Yes Provided(but invisible)	Yes Provided(but invisible)	Road markings like lane separator, zebra crosing etc. are provided but not in good condition.
7	Pavement Condition	Good	Good	
8	Parking			On street Parking
9	Bus stop	Existing New and Old City Stop	Existing New and Old City Stop	No Ramp Provided
Bhatar	Char Rasta to Soham		•	1
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape
2	Electrical Pole	Yes Provided	Yes Provided	Yes Provided at Centre
3	Footpath			No footpath Provided
4	Signs			No Directional signage/ Provide Directional signage at Junction
5	Signals			Not working at junction
6	Road Markings	Yes Provided(but invisible)	Yes Provided(but invisible)	Road markings like lane separator, zebra crosing etc. are provided but not visible.
7	Pavement Condition	Good	Good	
8	Parking			On street Parking
9	Bus stop	New City Bus Stop	New City Bus Stop	Ramp Not Provided at Bus Stop.
Soham	Circle to Althan Char		· · · · · ·	·
Sr.No.	Elements	LHS	RHS	Remarks

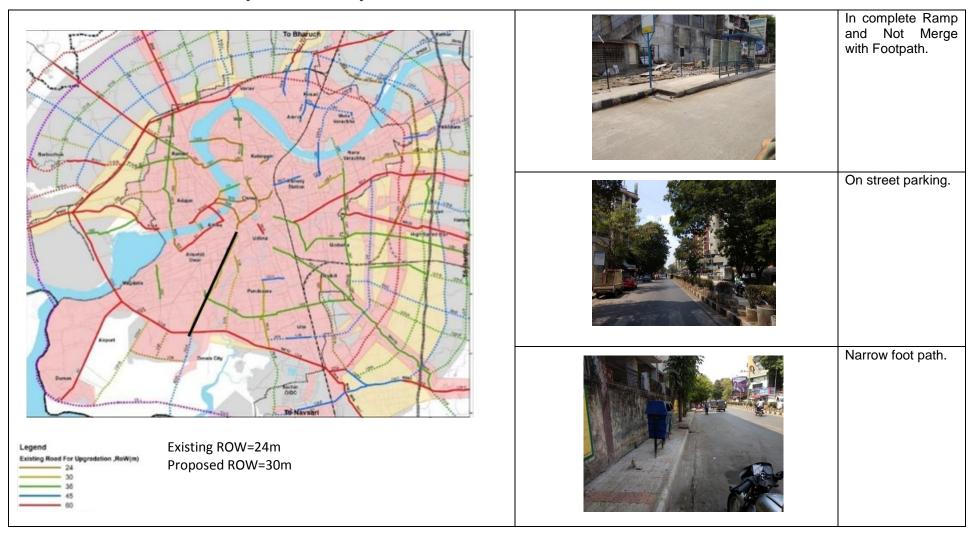
1	Median			Existing Dead Canal
2	Electrical Pole	Yes Provided	Yes Provided	Provided on road edge
3	Footpath			Construction of footpath
4	Signs	Yes Provided		Signage is not Provinding at Soham Circle
5	Signals	Yes Provided	Yes Provided	Not working at junction
6	Road Markings	Yes Provided(but invisible)	Yes Provided(but invisible)	Road markings like lane separator and Edge Line are not provided.
7	Pavement Condition	Good	Good	
8	Parking			On street Parking
9	Bus stop	New City Bus Stop		

1.39 Radial R-3: Stretch from Althan Char Rasta to Khajod Chokdi

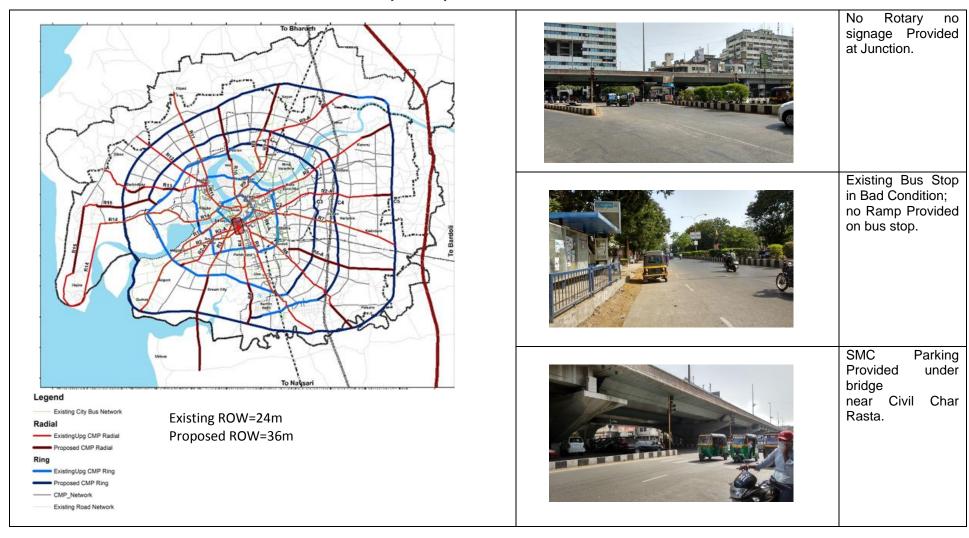


Althan	Althan Char Rasta to Khajod Chokdi (ROW=30 M)					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Not Provided	Not Provided	Need to be Provided		
2	Electrical Pole	Not provided	Yes Provided	on LHS Side to be provided		
3	Footpath	Not Provided	Not Provided	Need to be Provided		
4	Signs	Not Provided	Not Provided	Need to be Provided		
5	Signals	Not Provided	Not Provided	Need to be Provided		
6	Road Markings	Yes Provided(Some invisible)	Yes Provided(Some invisible)	Road markings like lane separator, zebra crosing etc. are provided but not in good condition.		
7	Pavement Condition	Good	God	-		
8	Parking	Not Provided	Not Provided	Need to be Provided		
9	Bus stop	New City Bus Stop	New City Bus Stop	Bus Stops are not in Good Condition and incomplete Construction		

1.40 Radial R-3: Stretch from Majura Gate to Khajod Chokdi

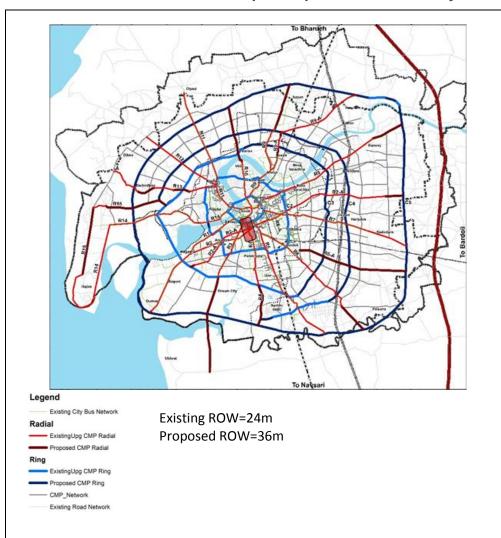


1.41 Radial R-4: Stretch from Civil Char Rasta to Unique Hospital Junction



Civil Cl	Civil Char Rasta to Unique Hospital					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	Yes Provided.		
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side		
3	Footpath	Yes Provided	Yes Provided	Yes but some Portion not Provided		
4	Signs	Yes Provided	Yes Provided	Directional signage provided only at junction		
5	Signals	Yes Provided	Yes Provided	Yes Provided near Junction.		
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crossing etc. are provided at some Portion.		
7	Pavement Condition	Good	Good	Good Condition		
8	Parking	Not Provided	Not Provided	On Street Parking		
9	Bus stop	Not Provided	Not Provided	Yes incomplete condition.		
10	Junctions					
	Civil Char Rasta	Yes Provided	Yes Provided	No Rotary, No Signage Provided on Junction.		

1.42 Radial R-4: Stretch from Unique Hospital Junction to Sosyo Circle





Rotary signage Provided at Junction.



Existing Bus Stop in Bad Condition; no Ramp Provided on bus stop.

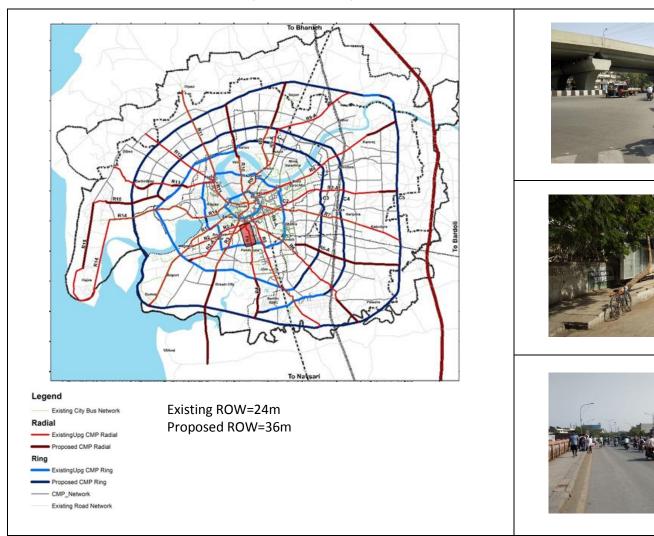


Invisible Lane Marking on some Portion.

Unique Hospital Junction to Sosyo Circle

Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Yes Provided
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side
3	Footpath	Yes Provided	Yes Provided	Yes but some Portion not Provided
4	Signs	Yes Provided	Yes Provided	Directional signage provided only at junction
5	Signals	Not Provided	Not Provided	Signals are not installed at Junction
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crossing etc. are provided at some Portion.
7	Pavement Condition	Good	Good	Good Condition
8	Parking	Not Provided	Not Provided	On Street Parking
9	Bus stop	Not Provided	Not Provided	Yes incomplete condition.
	Junctions			
10	Unique Hospital	Yes Provided	Yes Provided	No Rotary, no Footpath Marking, No Signage no Signal Provided on Junction.

1.43 Radial R-4: Stretch from Sosyo Circle to Piyush Point Junction





Rotary signage Provided at Junction.



Existing Bus Stop in Bad Condition; no Ramp Provided on bus stop.

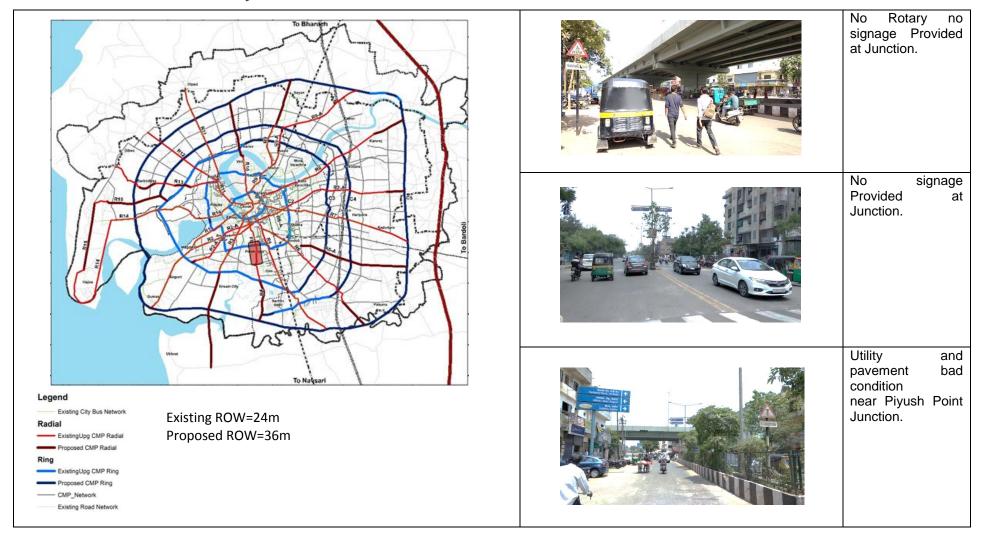


Bad footpath near Bamroli Khadi.

Sosyo Circle to Piyush Point Junction

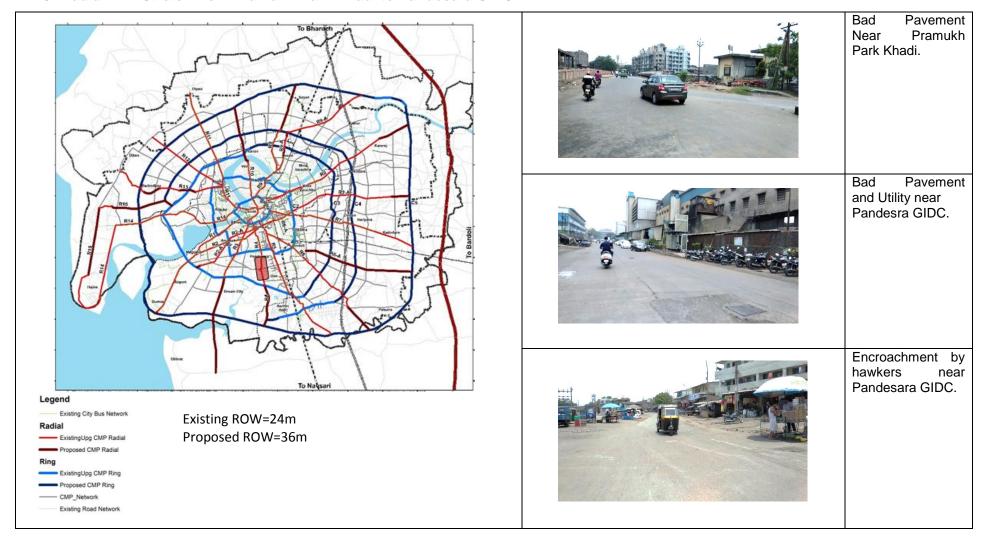
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Yes Provided.
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side
3	Footpath	Yes Provided	Yes Provided	Yes but some Portion not Provided
4	Signs	Yes Provided	Yes Provided	Directional signage provided only at junction
5	Signals	Not Provided	Not Provided	Signals are not installed at Junction
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided at some Portion.
7	Pavement Condition	Good	Good	Good Condition
8	Parking	Not Provided	Not Provided	On Street Parking
9	Bus stop	Not Provided	Not Provided	Yes incomplete condition.
10	Junctions			
	Sosyo Circle	Yes Provided	Yes Provided	No Rotary, no Footpath Marking, No Signage no Signal Provided on Junction.

1.44 Radial R-4: Stretch from Piyush Point to Pramukh Park Khadi



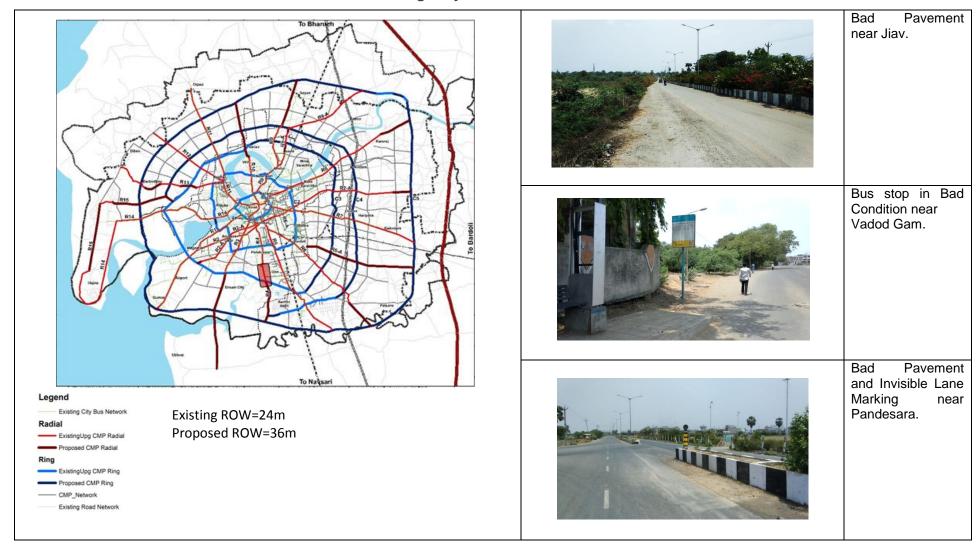
Piyush	Piyush Point to Pramukh Park Khadi						
Sr.No.	Elements	LHS	RHS	Remarks			
1	Median	Yes Provided	Yes Provided	No Median			
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side			
3	Footpath	Not Provided	Not Provided	No Footpath			
4	Signs	Yes Provided	Yes Provided	Yes Provided.			
5	Signals	Not Provided	Not Provided	Signals are not installed at Junction			
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided at some Portion.			
7	Pavement Condition	Good	Good	Good Condition			
8	Parking	Not Provided	Not Provided	On Street Parking			
9	Bus stop	Not Provided	Not Provided	No Bus Stops.			
10	Junctions						
	Piyush Point	Yes Provided	Yes Provided	No Rotary,no Footpath Marking, No Signage no Signal Provided on Junction.			

1.45 Radial R-4: Stretch from Pramukh Park Khadi to Pandesara GIDC



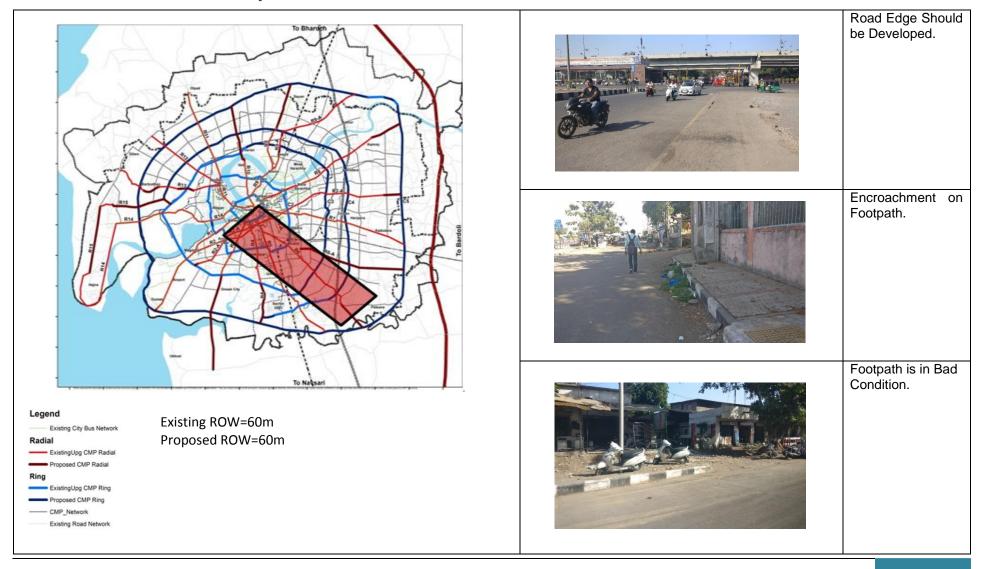
Pramul	Pramukh Park Khadi to Pandesara GIDC						
Sr.No.	Elements	LHS	RHS	Remarks			
1	Median	Not Provided	Not Provided	No Median			
2	Electrical Pole	Not Provided	Not Provided	No Electric Pole			
3	Footpath	Not Provided	Not Provided	No Footpath			
4	Signs	Not Provided	Not Provided	No Sign			
5	Signals	Not Provided	Not Provided	Signals are not installed at Junction			
6	Road Markings	Not Provided	Not Provided	Road markings like lane separator, zebra crosing etc. are not provided at some Portion.			
7	Pavement Condition	Average	Average	Single Lane			
8	Parking			On Street Parking			
9	Bus stop		New City Bus Stop	Encroachment at Bus Stop			
10	Junctions						
	Pramukh Park Khadi	Yes Provided	Yes Provided	No Rotary, no Footpath Marking, No Signage no Signal Provided on Junction.			

1.46 Radial R-4: Stretch from Pandesara GIDC to Jiav Highway



Pandes	sara GIDC to	Jiav Highway		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side
3	Footpath	Not Provided	Not Provided	Construction New Footpath
4	Signs	Not Provided	Not Provided	Provided Signage at Junction
5	Signals	Not Provided	Not Provided	Signals are not installed at Junction
6	Road Markings	Yes Provided(Some invisible)	Yes Provided(Some invisible)	Road markings like lane separator, zebra crossing etc. are provided at some Portion but not in good condition.
7	Pavement Condition	Good	Good	
8	Parking	Not Provided	Not Provided	No Parking
9	Bus stop	New City Bus Stop	New City Bus Stop	Bus Stops are not in Good Condition and incomplete Construction
10	Junctions			
	Jiav Highway	Yes Provided	Yes Provided	No Rotary, no Footpath Marking, No Signage no Signal Provided on Junction.

1.47 Radial R-5: Stretch from Adajan to Navasari - BRT corridor



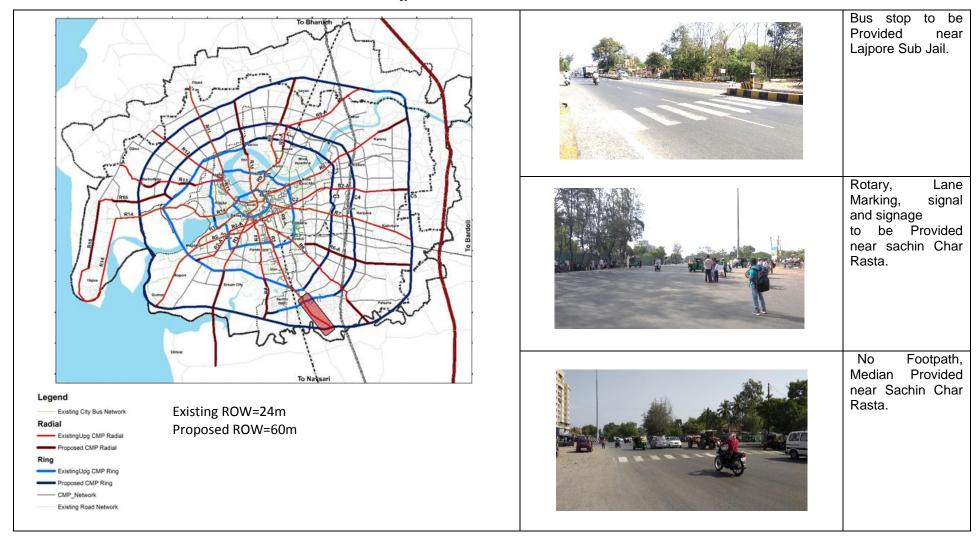
R5 - C0	DRRIDOR NAME:-	Adajan to Navasa	ri (ROW= exist 6	60 M/proposed-60M) -BRT corridor
Sr.No.	Elements	LHS	RHS	Remarks
Adajan	to Navsari (BRT	corridor)		
1	Median	Provided		-
2	Electrical Pole	Provided		-
3	Footpath	Provided	Provided	To be repair at some places; Enchroachment to be removed; In front of Birla Temple on LHS, due to disputed land Footpath is not constructed
4	Signs	Provided	Provided	-
5	Signals	Provided	Provided	-
6	Road Markings	Not visible	Not visible	to be repainted
7	Pavement Condition	Partially good	Partially good	Need to be improved
8	Parking slot	Partially Provided	Partially Provided	At some places, it is provided
9	Bus stop	-	-	-
10	Drain	Not visible	Not visible	drain required
11	Service Road	Not Provided	Not Provided	Enchroachment to be removed from some places
12	Kerb	Provided	Provided	To be repair at some places
13	Major Junctions	-	-	-

1.48 Radial R-5: Stretch from Sachin GIDC to Sachin Char Rasta



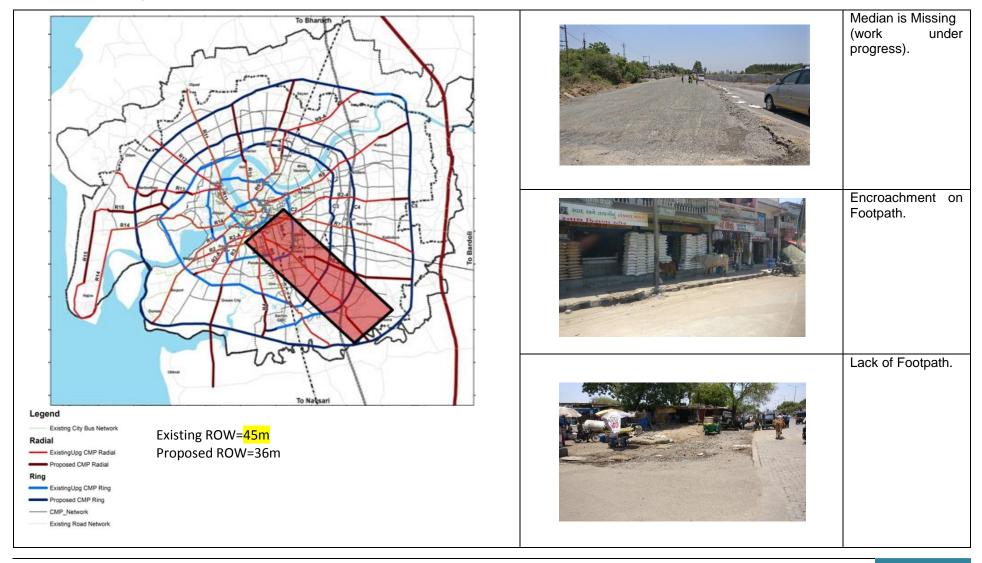
Sr.No.	Elements	LHS	RHS	Remarks	
Sachir	n GIDC Highway Rotar	y to Sachir	Char Ras	ta	
1	Median	Yes Provided	Yes Provided		
2	Electrical Pole	Not Provided	Not Provided	to be Provided.	
3	Footpath	Not Provided	No Provided	No footpath Provided.	
4	Signs	Yes Provided	Yes Provided	Direction signage Provided.	
5	Signals	Yes Provided	Yes Provided		
6	Road Markings	Yes Provided	Yes Provided	Separate lane Marking for Pedestrian and parking on road.	
7	Pavement Condition	Good	Good	Good Condition.	
8	Parking slot	Not Provided	Not Provided		
9	Bus stop	Not Provided	Not Provided		
10	Drain	Not Provided	Not Provided	No Utility on Road.	
11	Junctions				
	Sachin GIDC Highway Rotary	Yes Provided	Yes Provided	Yes Rotary Provided but no Footpath Marking, No Signage no Signal Provided on Junction.	

1.49 Radial R-5: Stretch from Sachin Char Rasta to Lajpore



Sr.No.	Elements	LHS	RHS	Remarks				
Sachin	achin Char Rasta to Kafletha							
1	Median	Yes Provided	Yes Provided					
2	Electrical Pole	Not Provided	Not Provided	to be Provided.				
3	Footpath	Not Provided	Not Provided	No footpath Provided.				
4	Signs	Yes Provided	Yes Provided	Direction signage Provided.				
5	Signals	Yes Provided	Yes Provided					
6	Road Markings	Yes Provided	Yes Provided	Separate lane Marking for Pedestrian and parking on road.				
7	Pavement Condition	Good	Good	Good Condition.				
8	Parking slot	Not Provided	Not Provided					
9	Bus stop	Not Provided	Not Provided					
10	Drain	Not Provided	Not Provided	No Utility on Road.				
11	Junctions							
	Sachin Char Rasta	Yes Provided	Yes Provided	No rotary, no signal and signage Provided on Junction.				

1.50 Radial R-6B, R-2B: Stretch from Udhana to Kalakachha



			•	· M/proposed-36M)
				stM/proposed-36M)
Sr.No.		LHS	RHS	Remarks
Kalaka	chha (Palsana) till	Dingoli		
I	Major Junctions Palsana			To be previded with lunction improvement with prepar circuling Directional
	Paisaria	-	-	To be provided with Junction improvement with proper signaling, Directional Signages, Island developmentOn street Rikshaw Parking problem on RHS to be solved
From \	/akatana gam till D	Dindoli - Construc	tion of 4 lane road	I work in progress
From [Dindoli (Madhuban	circle) - existing	4 lane road till Sa	i baba mandir & Upto ROB Bridge
1	Median	Not Provided	Not Provided	-
2	Electrical Pole	Not Provided	Not Provided	To be provided
3	Footpath	Not Provided	Not Provided	-
4	Signs	Partially Provided	Partially Provided	Adequate to be provided
5	Signals	Partially Provided	Partially Provided	Adequate to be provided
6	Road Markings	Partiall visible	Partiall visible	to be repainted
7	Pavement Condition	Fair	Fair	Need to be improved at some bad condition places
8	Parking slot	Not Provided	Not Provided	-
9	Bus stop	-	-	-
10	Drain	Not Provided	Not Provided	To be provided
11	Service Road	Not Provided	Not Provided	-
12	Kerb	-	-	-
13	Major Junctions			
	Saibaba Mandir	-	-	Need for - rotatary, Proper signaling free to visible for traffic, Footpath and Island with Pavement marking to be done; directional signages to be installed
After R	OB Bridge till Vru	kshmani society		
1	Median	Provided		To be repaired at some places
2	Electrical Pole	Provided		Need to check for working condition; additional Needed at some places

3	Footpath	Provided	Provided	Need to be widened; Disturbed at some places; Observed Encroachment & Parking at some places- to be remoed
4	Signs	Partially Provided	Partially Provided	Adequate to be provided
5	Signals	Not Provided	Not Provided	Not needed
6	Road Markings	Not visible	Not visible	to be repainted; Pedestrians crossing not given near ROB landing portion so people crosses the road in moving traffic
7	Pavement Condition	Partially good	Partially good	Need to be overlay OR Reconstruction
8	Parking slot	Not Provided	Not Provided	-
9	Bus stop	-	-	-
10	Drain	Not visible	Not visible	Need to provided/ need to clean
11	Service Road	Not Provided	Not Provided	-
12	Kerb	Not Provided	Not Provided	-
13	Major Junctions			
	Vrukshmani society	-	-	Need for - Proper signaling , Footpath to be developed, adequate Pavement marking
Narro	w Existing road @	350m after ROB f	lyover	, <u> </u>
1	Median	Not Provided		need to provided
2	Electrical Pole	Provided		Need to check for working condition
3	Footpath	Not Provided	Not Provided	need to provided
4	Signs	Not Provided	Not Provided	need to provided
5	Signals	Not Provided	Not Provided	need to provided
6	Road Markings	Not Provided	Not Provided	need to provided
7	Pavement Condition	Partially good	Partially good	Need to be overlay OR Reconstruction
8	Parking slot	-	-	need to provided
9	Bus stop	-	-	-
10	Drain	Not visible	Not visible	Need to provided/ need to clean if provided
11	Service Road	Not Provided	Not Provided	-

12	Kerb	Not Provided	Not Provided	-
13	Major Junctions	-	-	-
After	ROB flyover till Ud	hana Teen Rasta		
1	-			Missing at some places - need to provided
2	Electrical Pole	Provided		Need to check for working condition
3	Footpath	Partially provided; bad condition	Partially provided; bad condition	Missing at some places & need maintenance at some places; Observed Encroachment at most of the places, to be removed; Need to be provided/repair at most of the places
4	Signs	Inadequate	Inadequate	Need to provide adequate signs like 'GO SLOW" "Speed Limit" "NO PARKING"etc
5	Signals	Not visible	Not visible	To be provided as per requirement at each node
6	Road Markings	Not visible	Not visible	Zebra crossing and Pavement marking need to done
7	Pavement Condition	Partially good	Partially good	Need to be overlay OR Reconstruction
8	Parking	-	-	need to provided
9	Bus stop	-	-	
10	Drain	Not visible	Not visible	Need to provided/ need to clean if provided
11	Service Road	Not Provided	Not Provided	-
12	Kerb	Not Provided	Not Provided	-
13	Major Junctions	-	-	Developed under BRTS

Bad

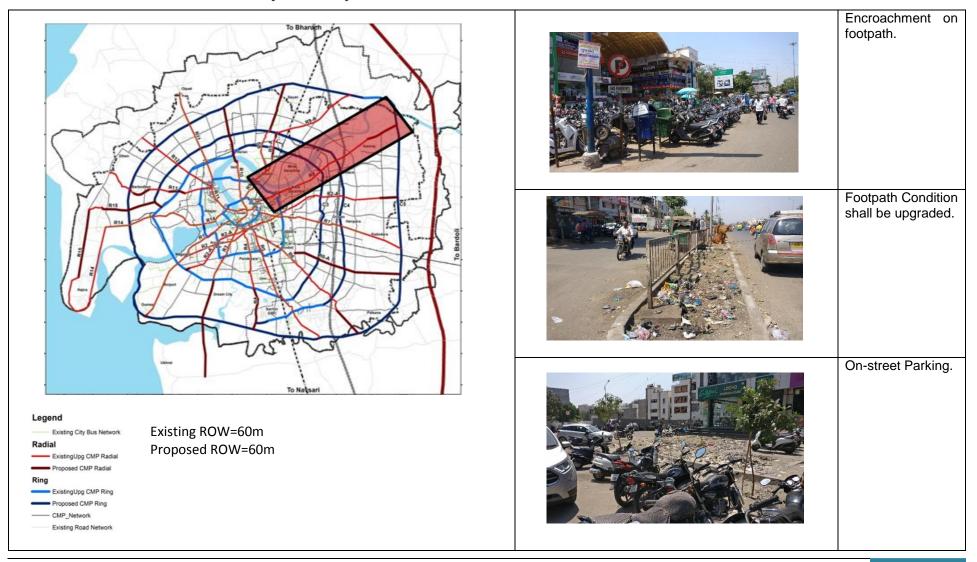
1.51 Radial R-7: Stretch from Sahara to Kadodara - BRT corridor



		Sahara to Kadod	ara (ROW= exist4	45M/proposed-60M) - BRT corridor
	Elements	LHS	RHS	Remarks
From S	ahara Darwaja till	6 lane road (BRT	corridor)	
1	Median	Provided		Median damage at some places obseved - to be repaired
2	Electrical Pole	Provided		Need to check for working condition during night time
BRIDGI	E UNDER CONSTI	RUCTION NEAR S	SIMAR BRT BUS S	ГОР
3	Footpath	Provided	Provided	Need to be widened; Disturbed at some places - to be construited with paver blocks;
				Observed Enchroachment & Parking at some places- to be remoed; MOST
				IMPORTANT - CLEANING IS REQUIRED FROM RoW to RoW throughout the
				<u>corridor</u>
4	Signs	Provided	Provided	-
5	Signals	Provided	Provided	Need to check for working condition
6	Road Markings	Provided	Provided	To be provided at some invisible stretches; Zebra marking to be repainted
7	Pavement Condition	Good	Good	-
8	Parking slot	Provided	Provided	-
9	Bus stop	-	-	
10	Drain	Provided	Provided	Cleaning is required for major route on both sides and for cross surface drain
11	Service Road	Provided	Provided	Edge development with wider footpath to be developed; At some local spots, damage pavement to be repaired; On SR road blocked due to FRUIT MARKET & Parking - need to be removed to ease traffic conjunction; At some places, SR road to be developed
12	Major Junctions			
	Sahara Darwaja	-	-	To be provided with Junction improvement with proper signaling; On street Rickshaw Parking problem on RHS to be solved
From 6	S lane road till Kad	lodara - 4 lane ro	ad	
1	Median	Provided		To be repaired at some places and median filling is required
2	Electrical Pole	Provided		Need to check for working condition; additional Needed at some places
3	Footpath	Not Provided	Not Provided	To be provided
4	Signs	Partially Provided	Partially Provided	To be provided
5	Signals	Partially	Partially	to be provided/Need to check for working condition

		Provided	Provided	
6	Road Markings	Partiall visible	Partiall visible	to be repainted
7	Pavement Condition	Fair/good	Fair/good	Observed in BAD condition at Kadodara junction -need to be improved
8	Parking slot	Not Provided	Not Provided	-
9	Bus stop	-	-	-
10	Drain	Provided	Provided	Invisible; need to clean
11	Service Road	Partially Provided	Partially Provided	To be developed properly
12	Kerb	Partially Provided	Partially Provided	To be constructed properly at missing places/ to be repaired at some places
13	Major Junctions			
	Kadodara			Need for - Proper signaling to ease traffic conduction, Footpath to be developed, Pavement marking to done; directional signages to be installed; Rotatory and island to be developed to ease the traffic direction
From	Kadodara till (NH 6	i) Jolva -4 lane roa	ıd	
1	Median	Provided		-
2	Electrical Pole	Not Provided		-
3	Footpath	Not Provided	Not Provided	-
4	Signs	Not Provided	Not Provided	-
5	Signals	Not Provided	Not Provided	-
6	Road Markings	Partiall visible	Partiall visible	to be repainted
7	Pavement Condition	Fair/good Fair/good		need to be improved
8	Parking slot	Not Provided	Not Provided	-
9	Bus stop	Not Provided	Not Provided	-
10	Drain	Not Provided	Not Provided	-
11	Service Road	Not Provided	Not Provided	-
12	Kerb	Not Provided	Not Provided	-
13	Major Junctions	-	-	-

1.52 Radial R-8: Stretch from Kamrej to Railway Station - BRT corridor



Sr.No.	Elements	LHS RHS		Remarks	
Kamre	j to Valak				
1	Median	Provided		Median damage at some places obseved - to be repaired	
2	Electrical Pole	Provided		Need to check for working condition during night time	
3	Footpath	Provided Provided		Disturbed at some places - to be constructed with paver blocks; Observed Encroachment at some places; MOST IMPORTANT - CLEANING IS REQUIRED FROM Row to Row throughout the corridor	
4	Signs	Provided	Provided	-	
5	Signals	Provided	Provided	Need to check for working condition	
6	Road Markings	Provided	Provided	To be provided at some invisible stretches; Zebra marking to be repainted	
7	Pavement Condition	Good	Good	-	
8	Parking slot	Provided	Provided	-	
9	Bus stop	-	-		
10	Drain	Provided	Provided	Cleaning is required for major route on both sides and for cross surface drain	
11	Service Road	Provided Provided		Edge development with wider footpath to be developed; At some local spots, damage pavement to be repaired; On street Juice centers & Parking to be removed to ease traffic conjunction;	
12	Major Junctions				
	Kamrej	Not Provided	Not Provided	To be provided with Junction improvement with Island and proper signaling to ease traffic conjunction, Pavement condition is fair and to be improved	
	Valak	Provided	Provided	-	
	Rly Station	Not Provided	Not Provided	Required Proper signaling to ease traffic conjunction, Footpath to be developed, Paid parking to be done	
Valak t	o Rly Station				
1	Median	Provided			
2	Electrical Pole	Provided		Need to check for working condition	
3	Footpath	Provided Provided		Encroachment & Parking to be removed at most of the places; Footpath to be provided/repair at most of the places; MOST IMPORTANT - CLEANING IS REQUIRED FROM Row to Row throughout the corridor; Near VARACHA HEALTH CENTRE BRT Bus stop -Footpath to be constructed on LHS and to be	

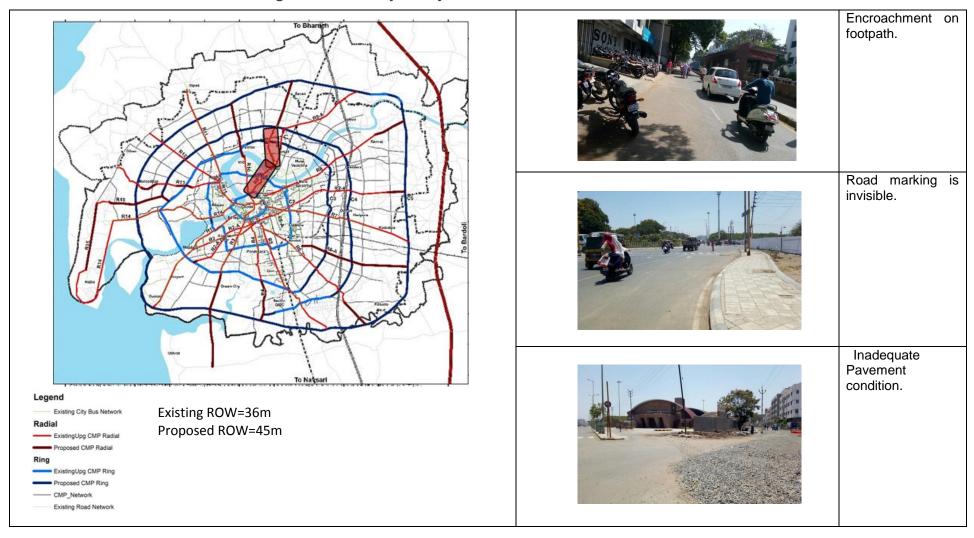
				repaired on RHS
4	Signs	Provided	Provided	-
5	Signals	Provided	Provided	Need to check for working condition
6	Road Markings	Provided	Provided	Near ROYAL Arcade - To be provided; To be provided at some invisible stretches; Zebra marking to be repainted
7	Pavement Condition	Good	Good	-
8	Parking slot	Not Provided	Not Provided	On street Parking to be PAID PARKING - Near VARACHA HEALTH CENTRE BRT Bus stop - Major parking problem
9	Bus stop	-	-	-
10	Drain	Provided	Provided	Cleaning is required for major route on both sides and for cross surface drain
11	Service Road	Provided	Provided	Edge development with wider footpath to be developed; At some local spots, damage pavement to be repaired; On street Juice centers & Parking to be removed to ease traffic conjunction;
12	Major Junctions			

1.53 Radial R-9A: Stretch from Kosad Gothan Road to Kosad Rail Crossing



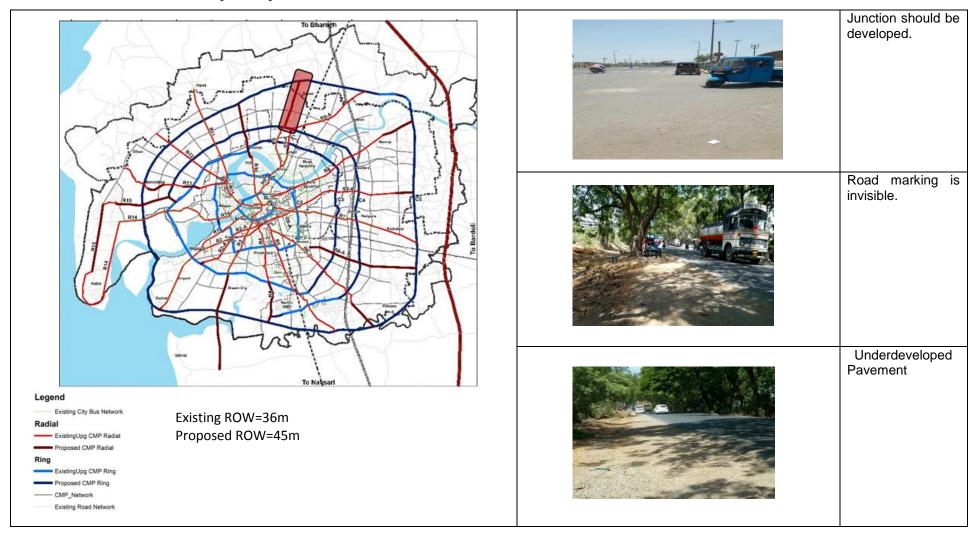
Sr. No.	Elements	LHS	RHS	Remarks	
1	Median	Not Provided	Not Provided	Adequate median should provided.	
2	Electrical Pole	Not Provided	Not Provided	Electrical pole to be provided.	
3	Footpath	Not Provided	Not Provided	footpath to be provided.	
4	Signs	Not Provided	Not Provided	Adequate signages at certain locations should be provided.	
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.	
6	Road Markings	Not Provided	Not Provided	Road markings like lane separator, zebra crossing etc. are provided but not visible.	
7	Pavement Condition	Average Condition	Average Condition	Minor cracks are found on the pavement surface and undeveloped pavement.	
8	Parking	Not Provided	Not Provided	Adequate parking space should be provided.	
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided	
10	Drain	Not Provided	Not Provided	No drain.	
11	Junctions	Yes Provided	Yes Provided		
	Sai chowk (char rasta)			No Signal and signs availble on Junction.	

1.54 Radial R-9A: Stretch from Katargam BRTS to Sayan-Hajira



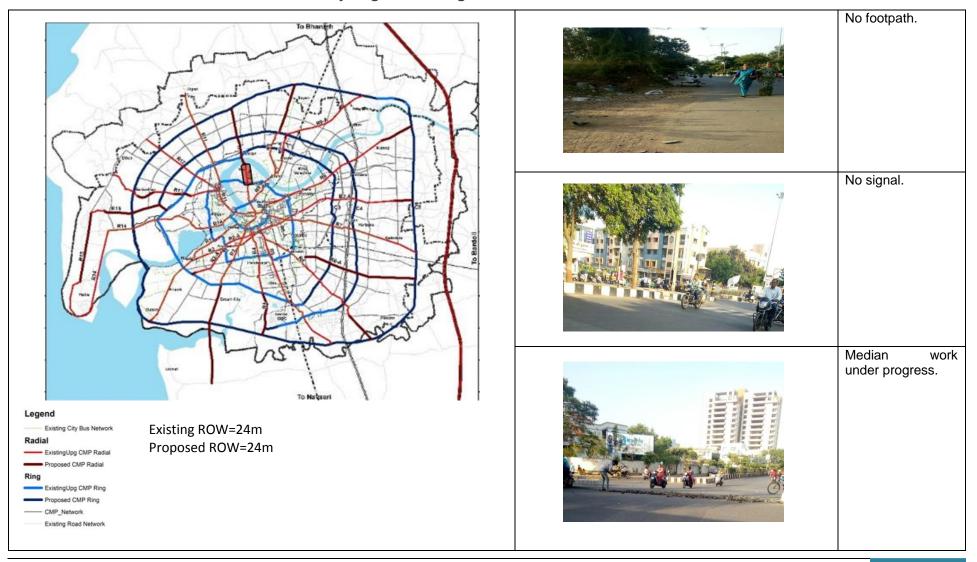
Sr.no.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape	
2	Electrical Pole	Yes Provided	Yes Provided		
3	Footpath	Not Provided	Not Provided	Adequate footpath should be provided.	
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.	
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.	
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided but not visible.	
7	Pavement Condition	Good Condition	Good Condition	Katargam to Amroli (Good Condition)	
8	Parking	Not Provided	Not Provided	Adequate parking space should be provided.	
9	Bus stop	Yes Provided	Yes Provided	BRTS bus stop provided	
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.	
11	Junctions	Yes Provided	Yes Provided		
	Gajera Junction -1			No Signal avilable on Junction.	
	Amroli Junction-2			Under Development Amroli char rasta	

1.55 Radial R-9A: Stretch Sayan-Hajira Main Road



Corrido	Corridor Name :- Sayan-Hajira main road						
Sr.No. Elements LHS RHS		RHS	Remarks				
1	Median	Not Provided	Not Provided	Adequate median should provided.			
2	Electrical Pole	Not Provided	Not Provided	Adequate light pole at certain location should provided.			
3	Footpath	Not Provided	Not Provided	Not Provided			
4	Signs	Not Provided	Not Provided	Adequate signages at certain locations should be provided.			
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.			
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided but not visible.			
7	Pavement Condition	Good Condition	Good Condition	Minor cracks are found on the pavement surface(road under development).			
8	Parking	Not Provided	Not Provided	Adequate parking space should be provided.			
9	Bus stop	Not Provided	Not Provided	No bus stop provided			
10	Drain	Not Provided	Not Provided	No drain			
11	Junctions	Not Provided	Not Provided				

1.56 Radial R-10: Stretch from Ved road to Majura gate via Bhagal Char Rasta



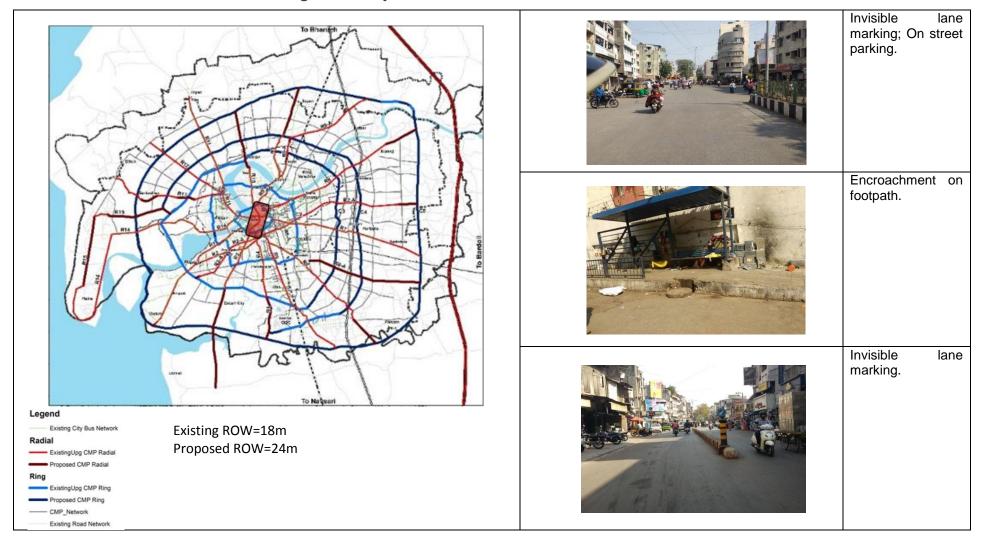
Sr.No.	No. Elements LHS RHS		RHS	Remarks			
1	Median	Not Provided	Not Provided	Adequate median should provided.			
2	Electrical Pole	Yes Provided	Yes Provided				
3	Footpath	Not Provided	Not Provided	Adequate footpath should be provided.			
4	Signs	Yes Provided	Yes Provided				
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.			
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided but not visible.			
7	Pavement Fair Condition Condition		Fair Condition				
8	Parking Not Provided		Not Provided	Adequate parking space should be provided.			
9	Bus stop Yes Provided		Yes Provided				
10	Junctions	Yes Provided	Yes Provided				
	Pramukh Chowk -1			Under Process Pramukh Chowk			
	Mani Baugh Char Rasta-2 Nani Ved-3						

1.57 Radial R-10: Stretch from Holi Bunglow to Gurukul Chawk



Holi bung	glow to Gurukul chawk					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	Not Good Condition		
2	Electrical Pole	Yes Provided	Yes Provided			
3	Footpath	Yes Provided	Yes Provided	Encroachment of Footpath. Footpath missing for some location		
4	Signs	Yes Provided	Yes Provided			
5	Signals	Yes Provided	Yes Provided	Signals Not Working		
6	Road Markings	Yes Provided	Yes Provided	Not Good Condition		
7	Pavement Condition	Good Condition	Good Condition	Work in Process And Average Condition		
8	Parking	No	No	On road parking		
9	Bus stop	Yes Provided	Yes Provided	City bus stop		
10	Drainage	No	No			
11	Junctions					
	Valinath Chowk	Rotary close by traffic police				
	Gurukul chauwk	Rotary close by traffic police				

1.58 Radial R-10: Stretch from Holi Bungalow to Majura Gate

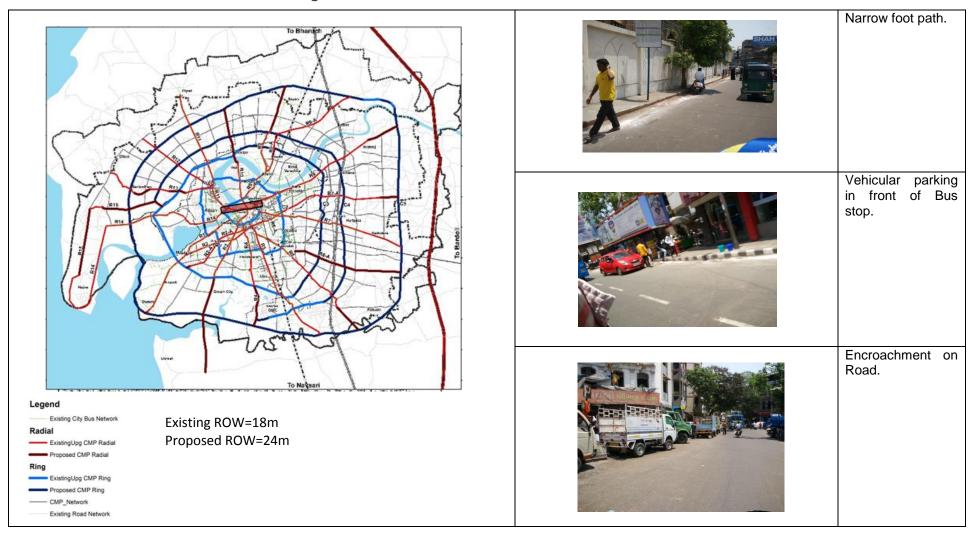


Holi bu	ngalow to Bhagal	char rasta		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape
2	Electrical Pole			Centre
3	Footpath	Not provided	Not provided	Adequate footpath is require
4	Signs	Not provided	Not provided	Signage require
5	Signals	-	-	Not working at junction
6	Road Markings	Yes Provided	Yes Provided Road markings like lane separator, zebra crosing etc. and not in good condition.	
7	Pavement Condition	average	average	
8	Parking			On street Parking/providing parking option
9	Bus stop	New city bus stop	New city bus stop	No Ramp Provided, Encroachment near RHS bus stop
Bhaga	l char rasta to Ma	jura gate		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes	Yes	But some portion no median
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	Width of Footpath to be widen, enforcement require for Encroachment on footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals			Not working at junction
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crossing etc. are provided but not in good condition.
7	Pavement Condition	Good	Good	
8	Parking			On street Parking, Parking restriction require and enforcement require for No parking

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9	Bus stop	yes	yes	Ramp Not Provided at Bus Stop, ,Marker pole at some portion, In this
				route the bus stop are encroachment by People as temporary home

1.59 Radial R-11: Stretch from Nehru Bridge to Delhi Gate



Nehru	Bridge To Chow	k		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape
2	Electrical Pole			Center
3	Footpath	Yes Provided	Yes Provided	
4	Signs	Yes Provided	Yes Provided	
5	Signals	-	-	Not working at junction
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided but not in good condition.
7	Pavement Condition	Good	Good	
8	Parking			On street Parking
9	Bus stop	New city bus stop	New city bus stop	No Ramp Provided, Encroachment near RHS bus stop
Chowk	To Bhagal Char			
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	no	no	
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	Width of Footpath to be widen, enforcement require for Encroachment on footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals			Not working at junction
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crossing etc. are provided but not in good condition.
7	Pavement Condition	Good	Good	

8	Parking			On street Parking, Parking restriction require and enforcement require for No parking		
9	Bus stop	yes	yes	Ramp Not Provided at Bus Stop, Some are old city bus stop, Marker pole at some portion		
Bhagal	Char Rasta To	Delhi Gate				
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median			No require because its one way road		
2	Electrical Pole	Yes Provided		Existing Dead Canal		
3	Footpath	Not provided	Not provided	One side		
4	Signs			Construction of footpath		
5	Signals	Yes Provided	Yes Provided	Signage require		
6	Road Markings	Not provided	Not provided			
7	Pavement Condition	Good	Good	Road markings like lane separator and Edge Line are not provided.		
8	Parking			road encroachment, Provide enforcement to no parking		
9	Bus stop	only SMC Marker	only SMC Marker	1 0		

1.60 Radial R-11: Stretch from Jahngirpura to Nehru bridge



Sr.No.	Elements	LHS		RHS	Remarks
1	Median	Yes Provided	Yes	Provided	BRT corridor
2	Electrical Pole	Yes Provided	Yes	Provided	
3	Footpath	Yes Provided	Yes	Provided	
4	Signs	Yes Provided	Yes	Provided	
5	Signals	Not Provided	Not	Provided	
6	Road Markings	Yes Provided	Yes	Provided	Needs In Improve, Not Good Condition
7	Pavement Condition	Good Condition	Goo	d Condition	
8	Parking	Yes Provided	Yes	Provided	on Road Parking And on Road Market
9	Bus stop	Yes Provided	Yes	Provided	BRTS Bus Station
10	Junctions				
	Iscon Circle	Need to Provide road marking ,existing rotary			
	Netaji subhaschandra garden	Needs to Provide signals,marking ,zebra crossing			
	Mora bhagal char rasta	Need to Provide road marking ,existing rotary			
	Ramnagar char rasta	No rotary,needs to be signalise,			
	Tadwadi circle No rotary,needs to be signalise,				
	Rander Teen rasta	Provide island for smooth traffic			
	Muktanagr teen rats	No rotary,needs to be signalise,			

1.61 Radial R-11: Stretch from Jahngirpura to Olpad



Jahang	irPura to ROB E	nd			
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided		
2	Electrical Pole	Yes Provided	Yes Provided	In center	
3	Footpath	Not Provided	Not Provided	there are enough space for development of Padestrian pathway	
4	Signs	Yes Provided	Yes Provided		
5	Signals	Not Provided	Not Provided		
6	Road Markings	Not Provided	Not Provided	Needs to road marking like Center line ,solid line	
7	Pavement Condition	Good Condition	Good Condition	Pavement condition very bad on ROB ,No signages,One side lightpole,Need to repaire MBCB.	
8	Parking	Not Provided	Not Provided	On road parking/need to provide provide parking bay	
9	Bus stop	Yes Provided	Yes Provided	City bus stop in good condition	
10	Drain	Yes Provided	Yes Provided		
ROB E	nd to Mansa cros	s road			
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided	Need to provide median marker, Some place kerb work in progress	
2	Electrical Pole	Not Provided	Not Provided		
3	Footpath	Not Provided	Not Provided		
4	Signs	Not Provided	Not Provided	Need to provide traffic signaged like "speed limit", "Turn left or right", direction signages	
5	Signals	Not	Not		

6 Road Markings Not Provided Provided Provided Provided Provided Provided Provided No paved shoulder, 4lane flexible Pavement Condition Not Not Not	
Provided Provided 7 Pavement Average Average No paved shoulder, 4lane flexible Pavement Condition	
Condition	
8 Parking Not Not	
Provided Provided	
9 Bus stop Yes Yes BRTS bus stop provided	
Provided Provided	
10 Drainage Not Not	
Provided Provided	
11 Junctions Yes Yes	
Provided Provided	
Kosad junction Main Road Kosad Char rasta .	
Mansa cross road to Olpad (Olpad town)	
Sr.No. Elements LHS RHS Remarks	
1 Median Yes Yes Partial, needs to provide median with reflectors	
Provided Provided	
2 Electrical Pole Yes Yes Partial, Center	
Provided Provided	
3 Footpath Not Not Needs to provide footpath	
Provided Provided	
4 Signs Not Not	
Provided Provided	
5 Signals Not Not	
Provided Provided	
6 Road Markings Not Not need to provide lane marking	
Provided Provided	
7 Pavement Average Average Need to resurface	
Condition	
8 Parking Not Not	
Provided Provided	
9 Bus stop Yes Yes city bus stop	

		Provided	Provided		
10	Drainage	Not	Not		
		Provided	Provided		
11	Junctions	Yes	Yes		
		Provided	Provided		
	Need to Provide rotary @ last stop of city bus for U-turn				

1.62 Radial R-12: Stretch from Veluk Town to Start of City Limit



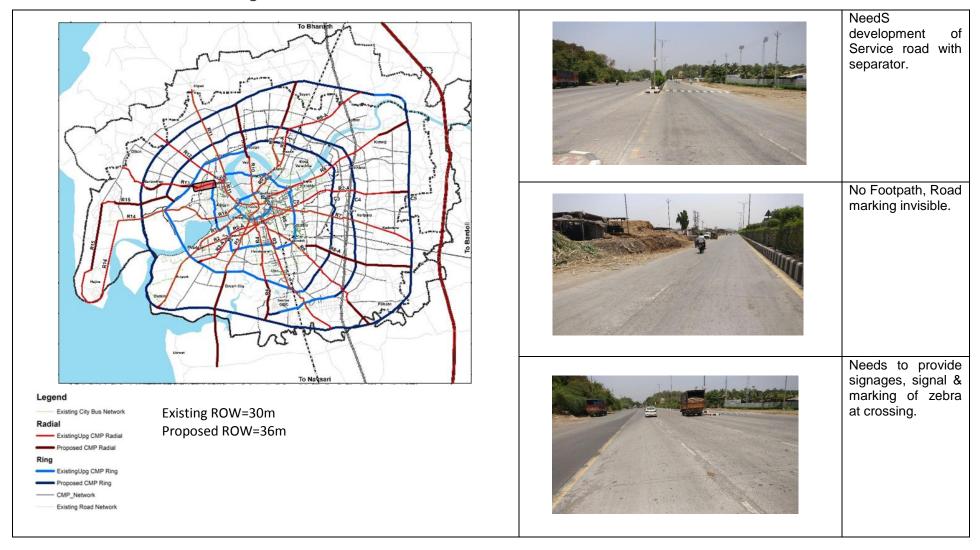
Veluk t	o Start of city limit			
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	
2	Electrical Pole	Not Provided	Not Provided	
3	Footpath	Not Provided	Not Provided	there are enough space for development of Padestrian pathway
4	Signs	Not Provided	Not Provided	
5	Signals	Not Provided	Not Provided	
6	Road Markings	Not Provided	Not Provided	Needs to road marking like Center line ,solid line
7	Pavement Condition	Average	Average	Two way road without median ,Pavement condition very bad ,
8	Parking	Not Provided	Not Provided	
9	Bus stop	Not Provided	Not Provided	
10	Junctions			
	Dihan aryana cross road	Need to wide the	road and provide signag	ges,

1.63 Radial R-12: Stretch from Surat city Limit to Jahngirpura



Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	in good condition
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Not Provided	Not Provided	Needs to develop footpath
4	Signs	Not Provided	Not Provided	
5	Signals	Not Provided	Not Provided	
6	Road Markings	Yes Provided	Yes Provided	Partial
7	Pavement Condition	Good	Good	6 lane PQC with service road, need to provide separator for Service road
8	Parking	Not Provided	Not Provided	
9	Bus stop	Yes Provided	Yes Provided	city bus stop
10	Junctions			
	Dandi char Rasta	Needs to provide sig	gnals, signages ,zebra mark	king

1.64 Radial R-13: Stretch from Ugat Char Rasta to Bhesan Treatment Plant



Ugat char rasta to Bhesan treatment plant

Sr.No.	Elements	LHS	RHS	Remarks		
1	Median Yes Provided Yes Provided		Yes Provided	With good arboriculture		
2	Electrical Pole	Yes Provided	Yes Provided	In center		
3	Footpath	Not Provided	Not Provided	there are enough space for development of Padestrian pathway		
4	Signs	Yes Provided	Yes Provided	Needs to provide signages at Junction		
5	Signals	Not Provided	Not Provided	Needs to Provide signal on both end		
6	Road Markings Yes Provided Yes Prov		Yes Provided	Partial		
7	Pavement Condition	Good Condition	Good Condition	6 lane PQC with service road, need to provide separator for Service road		
8	Parking	Not Provided		need to provide provide parking bay		
9	Bus stop	Yes Provided	Yes Provided	City bus stop in good condition		
10	Junctions					
	Ugat Char rasta	rasta No signal, no marking , needs signages				
	Bhesan Treatment plant	No signal, no marking , needs signages				

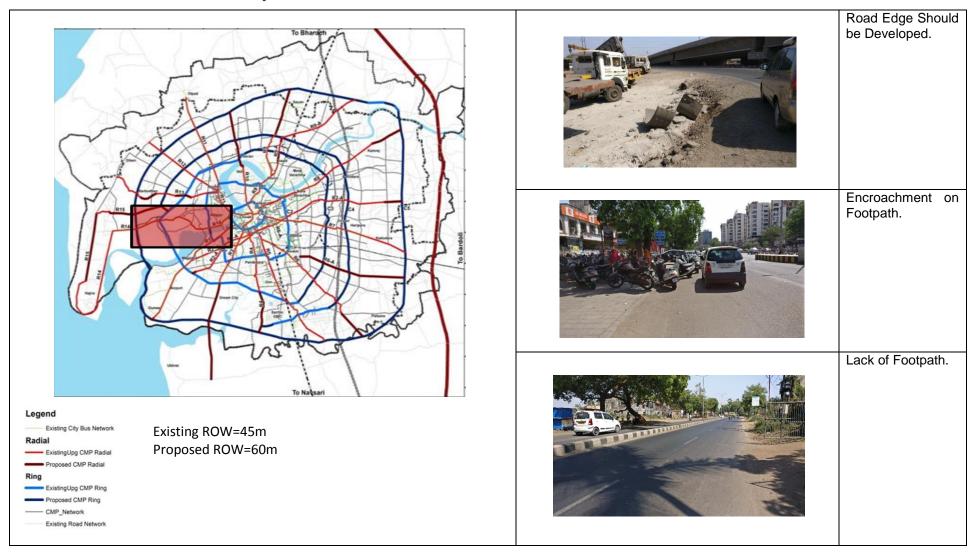
1.65 Radial R-13: Stretch from Bhesan Treatment to Barbodhan village



Bhesan treatment to Barbodhan village

Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	Need to provide median
2	Electrical Pole	Not Provided	Not Provided	
3	Footpath	Not Provided	Not Provided	
4	Signs	Not Provided	Not Provided	Need to provide traffic signaged like "speed limit", "Turn left or right", direction signages
5	Signals	Not Provided	Not Provided	
6	Road Markings	Yes Provided	Yes Provided	Partial
7	Pavement Condition	Average	Average	No paved shoulder, 2 lane flexible Pavement, need to widening
8	Parking	Not Provided	Not Provided	
9	Bus stop	Not Provided	Not Provided	BRTS bus stop provided
10	Drainage	Not Provided	Not Provided	Earthan drain
11	Junctions	Yes Provided	Yes Provided	
	Sayan highway	Needs to Provide signal,signage,road marking		

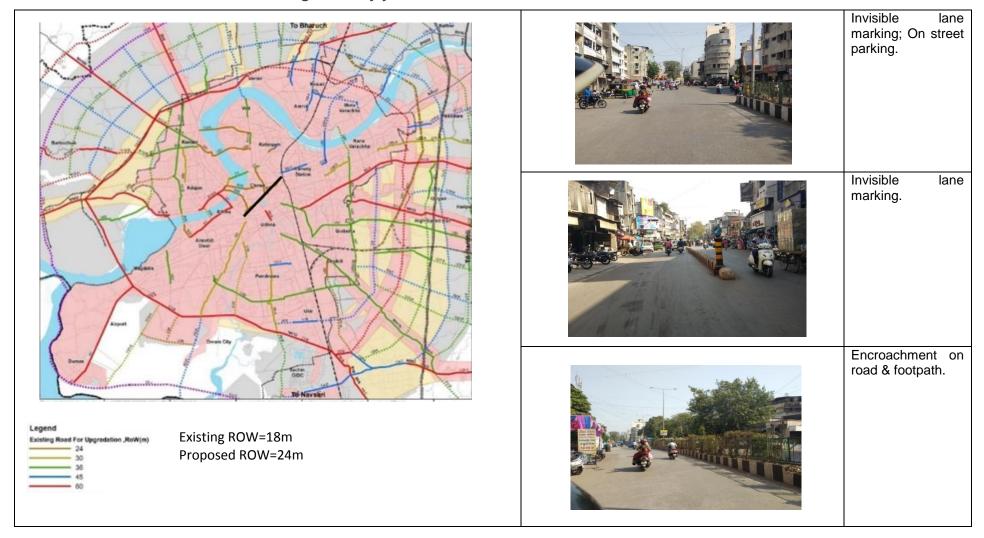
1.66 Radial R-14: Stretch from Adajan to Hazira



R14 - C	ORRIDOR NAME:	- Adajan to Hazira	a (ROW= exist 45	5 M/proposed-60M)
Sr.No.	Elements	LHS	RHS	Remarks
Adajan	to RTO pal (BRT	corridor)		
1	Median	Provided	Provided	-
2	Electrical Pole	Provided	Provided	-
3	Footpath	Provided	Provided	Enchroachment to be removed
4	Signs	Provided	Provided	-
5	Signals	Provided	Provided	-
6	Road Markings	Partially visible	Partiall visible	to be repainted
7	Pavement Condition	Good	Good	-
8	Parking slot	Provided	Provided	-
9	Bus stop	-	-	-
10	Drain	Provided	Provided	-
11	Service Road	Provided	Provided	-
12	Kerb	Provided	Provided	-
13	Major Junctions			
	Shanti Stambh	-	-	Island required
	RTO Pal	-	-	Developing under RDD 13 Corridor
RTO pa	al (BRT corridor) t	o Hazira - (3+3 la	ne road - NH53)	
1	Median	Provided		Single Kerb as separator is provided
2	Electrical Pole	Provided		Need to check for working condition; additional Needed at some places
3	Footpath	Not Provided	Not Provided	-
4	Signs	Partially Provided	Partially Provided	Adequate to be provided
5	Signals	Not Provided	Not Provided	-
6	Road Markings	Not visible	Not visible	to be repainted
7	Pavement Condition	Partially good	Partially good	Need to be improved

8	Parking slot	Not Provided	Not Provided	-
9	Bus stop	-	-	-
10	Drain	Not visible	Not visible	drain required; Only for 600m on RHS before Hazira circle- RCC drain is seen.
11	Service Road	Not Provided	Not Provided	-
12	Kerb	Provided	Provided	-
13	Major Junctions			
	Hazira	-	-	Need for - Proper signaling , Footpath and pavement marking required

1.67 Radial R-17: Stretch from Holi Bunglow to Vijay Vallabh Chowk

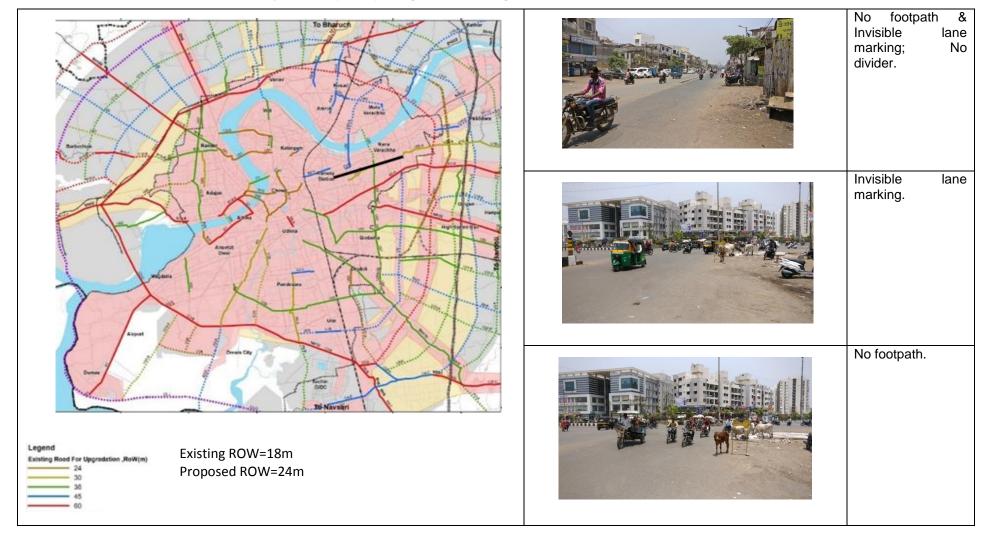


Holi bu	inglow to Bhagal o	char rasta		
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape
2	Electrical Pole			Center
3	Footpath	Not provided	Not provided	Adequate fotpath is require
4	Signs	Not provided	Not provided	Signage require
5	Signals	-	-	Not working at junction
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided but not in good condition.
7	Pavement Condition	average	average	
8	Parking			On street Parking/providing parking option
9	Bus stop New city bus stop		New city bus stop	No Ramp Provided, Enchrochment near RHS bus stop
Bhaga	ıl char rasta to Vija	ay vallabhacharya cho	owk	
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes	Yes	But some portion no median
2	Electrical Pole	Yes Provided	Yes Provided	
3	Footpath	Yes Provided	Yes Provided	Width of Footpath to be widen, enforcement require for Enchrochment on footpath
4	Signs	Yes Provided	Yes Provided	
5	Signals			Not working at junction
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crosing etc. are provided but not in good condition.
7	Pavement Condition	Good	Good	
8	Parking			On street Parking, Parking restiction require and emforcement require for No parking

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9	Bus stop	yes	yes	Ramp Not Provided at Bus Stop, ,Marker pole at some portion, In this
				route the bus stop are enchrochment by People as temporary home

1.68 Radial U-52A: Stretch from Anjani Soc.(Puna)-Kargil Chowk-Yogi Chowk-Kansad

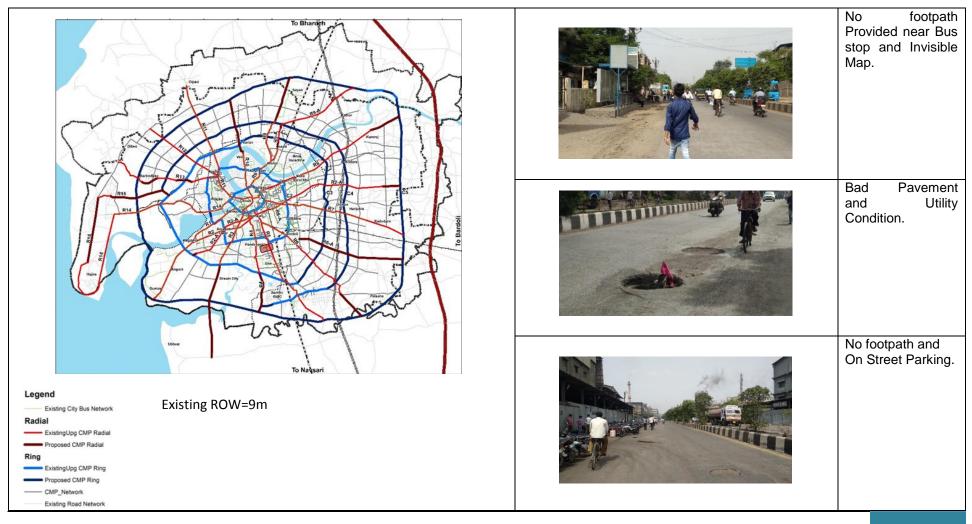


Sr.No.	Elements	LHS	RHS	Remarks
1	Median	-	1	Partially provided at some places
2	Electrical Pole	Partially provided		To be provided
3	Footpath	Partially provided	Partially provided	Missing at some places & need maintenance at some places; Observed Enchroachment at most of the places, to be removed; Need to be provided/repair at most of the places
4	Signs	Not Provided; Inadequate	Not Provided; Inadequate	To be installed like 'GO SLOW" "Speed Limit" "NO PARKING"etc.
5	Signals	Not Provided	Not Provided	To be provided
6	Road Markings	Not Provided	Not Provided	To be provided
7	Pavement Condition	Fair	Fair	Flexible; To be constructed with proper median and signages;
8	Parking	-	-	need to provided
9	Bus stop	-	-	
10	Drain	Not Seen	Not Seen	Need to provided/ need to clean if provided
10	Junctions			
	Kiran Chowk	-	-	Junction improvement needed with signal and parking system, Signages to be provided; Rotary to be construted
from Ka	rgil Chowk till Yo	gi chowk - Kansad	1	, , ,
Sr.No.	Elements LHS RHS		RHS	Remarks
1	Median	-	1	Partially provided at some places
2	Electrical Pole	Partially provided		To be provided
3	Footpath	Very Partially provided	Very Partially provided	Missing at some places & need maintenance at some places; Observed Enchroachment at most of the places, to be removed; Need to be provided/repair at most of the places
4	Signs	Not Provided; Inadequate	Not Provided; Inadequate	To be installed like 'GO SLOW" "Speed Limit" "NO PARKING"etc.
5	Signals	Not Provided	Not Provided	To be provided
6	Road Markings	Not Provided	Not Provided	To be provided
7	Pavement Condition	Fair	Fair	Flexible; To be constructed with proper median and signages;

8	Parking	-	-	need to provided
9	Bus stop	-	-	
10	Drain	Not Seen	Not Seen	Need to provided/ need to clean if provided
11	Junctions			
	Yogi Chowk	-	-	Junction improvement needed with Informatory Signs,Rotary to be constructed if possible
	Kansad Chowk	-	-	Informatory Signs needed

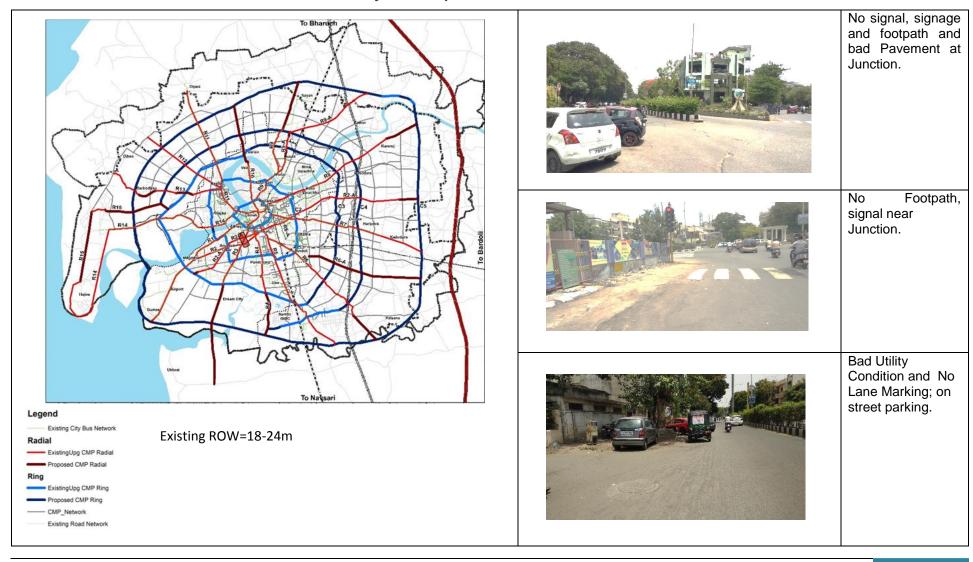
Annexure 4: Survey Inventory for Existing City Bus Networks

1.69 Corridor: Stretch from Batliboi Junction to Pandesara GIDC Junction



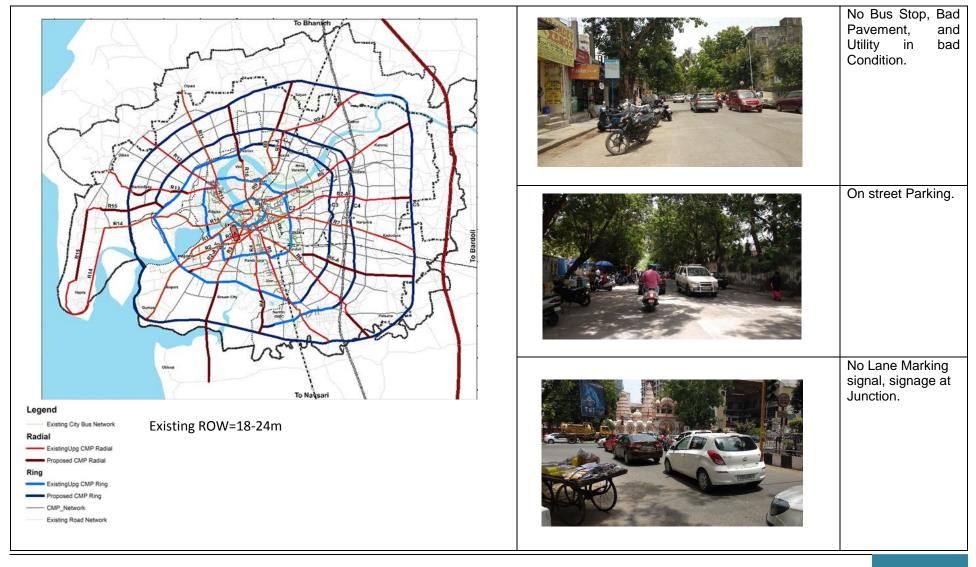
Batliboi Junction to Pandesara GIDC Junction					
Sr.No.	Elements	LHS	RHS	Remarks	
Batlibo	i Junction to Pa	ndesara GII	OC Junction	1	
1	Median	Yes Provided	Yes Provided		
2	Electrical Pole	Not Provided	Not Provided	to be Provided.	
3	Footpath	Not Provided	Not Provided	to be Provided.	
4	Signs	Not Provided	not Provided	only directional signage Provided near Batliboi Junction.	
5	Signals	Not Provided	Not Provided	Provided near Batliboi Junction.	
6	Road Markings	Not Provided	Not Provided	to be Provided.	
7	Pavement Condition	Average	Average	Some Portion are in Bad Condition.	
8	Parking slot	Not Provided	Not Provided	On street Parking.	
9	Bus stop	Yes Provided	Yes Provided	but in Bad condition and without Pole.	
10	Drain	Yes Provided	Yes Provided	in bad condition and open on road.	
	Junctions				
1	Batliboi Junction	Yes Provided	Yes Provided	No Rotary, Bad Pavement and Lane Marking, signal and signage not Provided at Junction.	

1.70 Corridor: Stretch from Bhatar Char Rasta Sanjivani Hospital to Ram chowk Junction



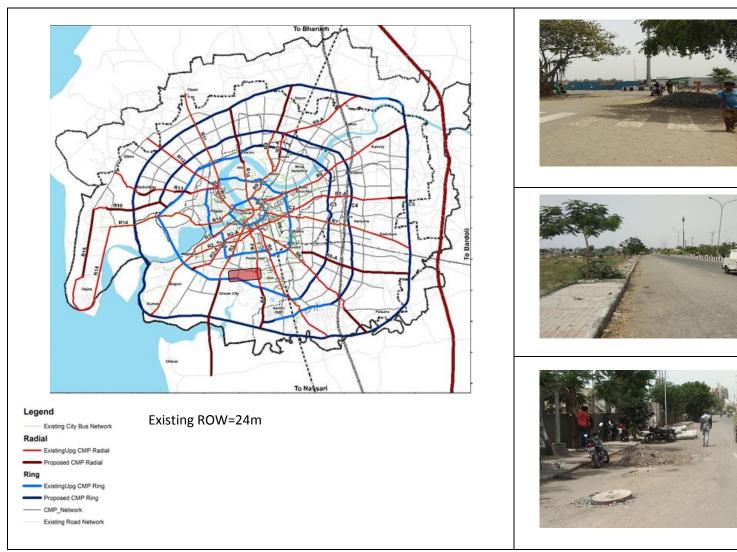
Sanjiva	Sanjivani Hospital to Ram chowk Jn					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided			
2	Electrical Pole	Yes Provided	Yes Provided	Centre side.		
3	Footpath	Yes Provided	Yes Provided	Some Portion under construction and in Bad Condition.		
4	Signs	Yes Provided	Yes Provided	only directional signage Provided in some Portion.		
5	Signals	Yes Provided	Yes Provided	near Junction.		
6	Road Markings	Not Provided	Not Provided	to be Provided.		
7	Pavement Condition	Average	Average	Some Portion in Bad Condition.		
8	Parking slot	Not Provided	Not Provided	On street Parking.		
9	Bus stop	Not Provided	Not Provided	to be Provided.		
10	Drain	Yes Provided	Yes Provided	in Bad Condition.		
	Junctions					
1	Sanjivani Hospital	Yes Provided	Yes Provided	Rotary Provided, Bad Pavement and Lane Marking, signal and signage not Provided at Junction.		

1.71 Corridor: Stretch from Ram Chowk Junction to Athwalines



Ram	Ram Chowk Jn to Athwalines					
1	Median	Not Provided	Not Provided	only sepreter Provided on some Portion.		
2	Electrical Pole	Yes Provided	Yes Provided	one sided.		
3	Footpath	Yes Provided	Yes Provided	Only some Portion in Bad Condition.		
4	Signs	Not Provided	not Provided	to be Provided.		
5	Signals	Yes Provided	Yes Provided	near Junction.		
6	Road Markings	Not Provided	Not Provided	to be Provided.		
7	Pavement Condition	Average	Average	Some Portion in Bad Condition.		
8	Parking slot	Not Provided	Not Provided	On street Parking.		
9	Bus stop	Not Provided	Not Provided	Only Bus stop pole Provided.		
10	Drain	Yes Provided	Yes Provided	in Bad Condition.		
	Junctions					
1	Ram Chowk	Yes Provided	Yes Provided	Rotary Provided, Bad Pavement and Lane Marking not Provided at Junction.		

1.72 Corridor: Stretch from Bhestan Char Rasta to Jiav Chokdi





No signal, signage and footpath and bad Pavement at Junction.



Bad condition of Footpath on some Portion.



Bad Utility Condition and on Street Parking.

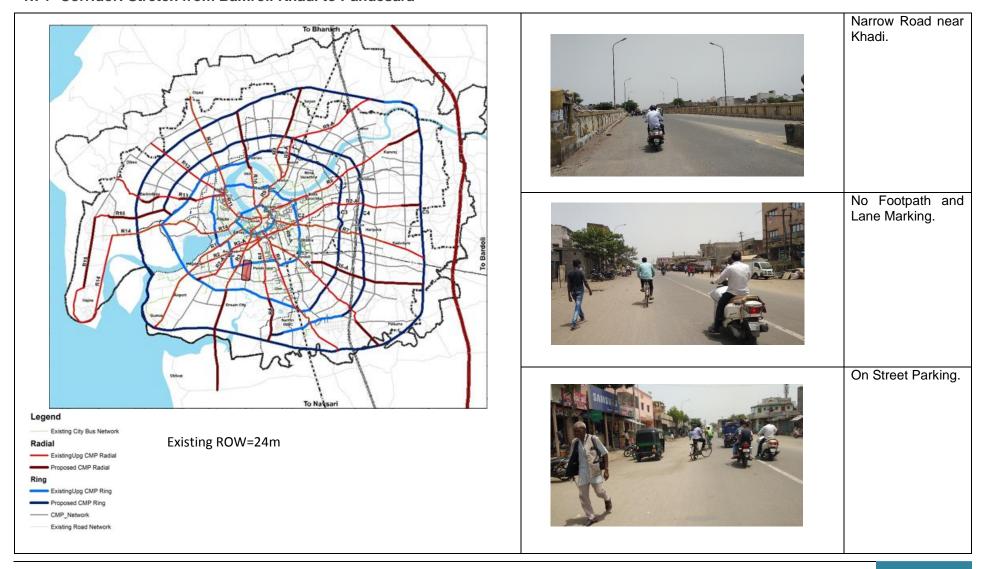
	Sr No Flements I HS PHS Remarks							
Sr.No.	Elements	LHS	RHS	Remarks				
Bhesta	n Char Rasta to Jiav	Chokdi						
1	Median	Yes Provided	Yes Provided					
2	Electrical Pole	Yes Provided	Yes Provided	Centre side.				
3	Footpath	Yes Provided	Yes Provided	Some Portion under construction and Bad Condition.				
4	Signs	Yes Provided	Yes Provided	only directional signage Provided in some Portion.				
5	Signals	Not Provided	Not Provided	to be Provided.				
6	Road Markings	Yes Provided	Yes Provided					
7	Pavement Condition	Average	Average	Some Portion in Bad Condition.				
8	Parking slot	Not Provided	Not Provided	On street Parking.				
9	Bus stop	Yes Provided	Yes Provided					
10	Drain	Yes Provided	Yes Provided	in Bad Condition.				
	Junctions							
1	Bhestan Char Rasta	Yes Provided	Yes Provided	Rotary Provided, Bad Pavement and Lane Marking not Provided at Junction.				

1.73 Corridor: Stretch from Budiya Chokdi to Bamroli Khadi



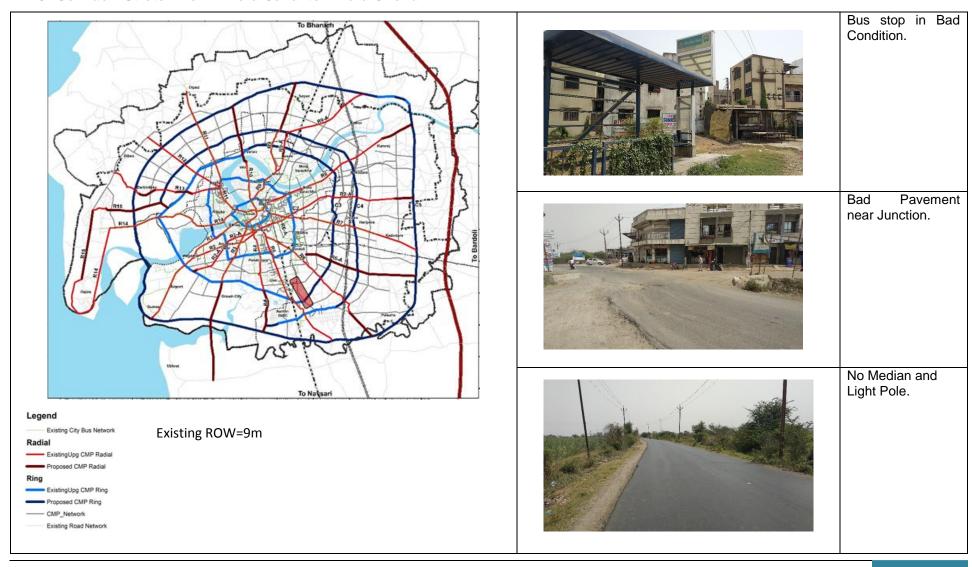
Budiya	Chokdi to Pandesa	ara						
Sr.No.	Elements	LHS	RHS	Remarks				
Budiya	Budiya Chokdi to Bamroli Khadi Median Yes Yes							
1	Median	Yes Provided	Yes Provided					
2	Electrical Pole	Yes Provided	Yes Provided	rovided				
3	Footpath	Not Provided	Not Provided	ovided				
4	Signs	Not Provided	Not Provided	to be Provided.				
5	Signals	Not Provided	Not to be Provided. Provided					
6	Road Markings	Yes Provided	Yes Provided	Only Zebra Marking Provided near Junction				
7	Pavement Condition	Average	Average	Some Portion under construction and Bad Condition.				
8	Parking slot	Not Provided	Not Provided	On street Parking.				
9	Bus stop	Not Provided	Not Provided	Only Bus stop Pole Provided.				
10	Drain	Yes Provided	Yes Provided	Not in Good Condition.				
	Junctions							
1	Budiya Chokdi Junction	Yes Provided	Yes Provided	No Rotary, Lane Marking, signal and signage Provided at Junction.				

1.74 Corridor: Stretch from Bamroli Khadi to Pandesara



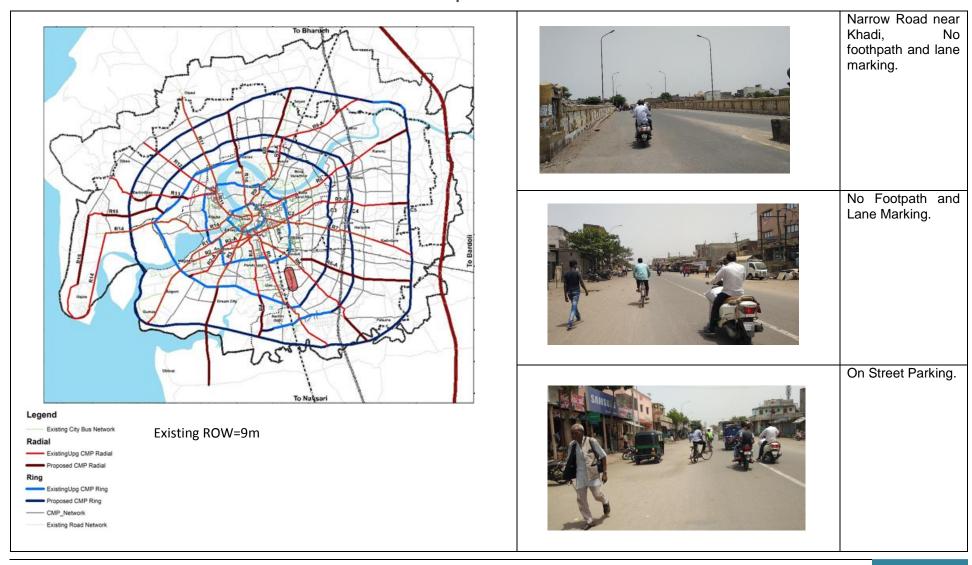
Bam	nroli Khadi to Pand	lesara			
1	Median	Not Provided	Not Provided	to be Provided.	
2	Electrical Pole	Yes Provided	Yes Provided	One sided.	
3	Footpath	Not Provided	Not Provided	to be Provided.	
4	Signs	Not Provided	Not Provided	to be Provided.	
5	Signals	Not Provided	Not Provided		
6	Road Markings	Yes Provided	Yes Provided	Invisible condition	
7	Pavement Condition	Average	Average		
8	Parking slot	Not Provided	Not Provided	On street Parking.	
9	Bus stop	Not Provided	Not Provided	to be Provided.	
10	Drain	Yes Provided	Yes Provided	Provided at edge of the road.	
	Junctions				
1	Pandesara	Yes Provided	Yes Provided	No Rotary, Lane Marking, signal and signage and Bad Pavement Junction.	

1.75 Corridor: Stretch from Eklera Canal to Eklera Chokdi



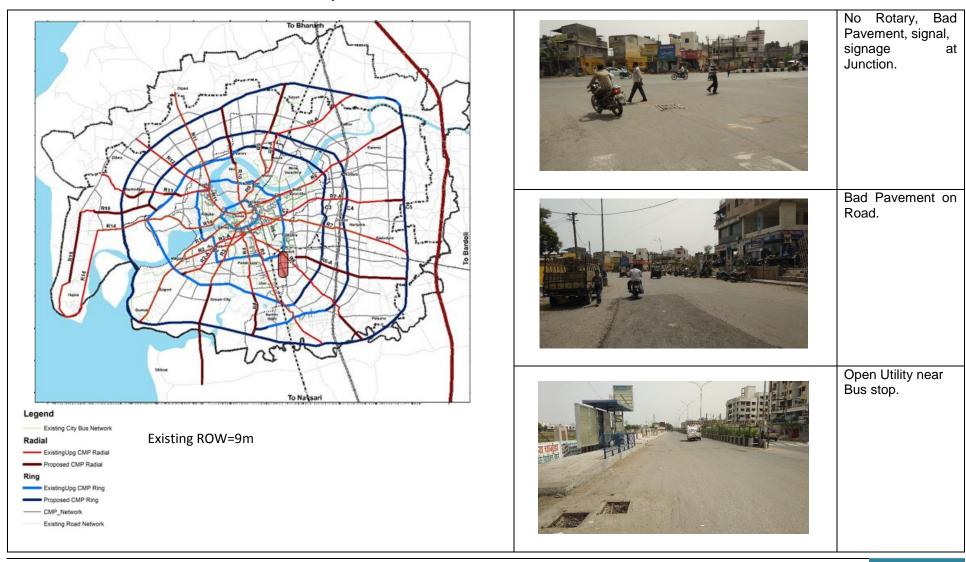
Ekle	era Canal to Dindoli Kar	wada Junctio	n			
Eklera Canal to Eklera Chokdi						
1	Median	Not Provided	Not Provided	to be Provided.		
2	Electrical Pole	Not Provided	Not Provided	to be Provided.		
3	Footpath	Not Provided	Not Provided	to be Provided.		
4	Signs	Not Provided	Not Provided	Only some Portion Provided.		
5	Signals	Not Provided	Not Provided	to be Provided.		
6	Road Markings	Not Provided	Not Provided	to be Provided.		
7	Pavement Condition	Average	Average	Road is not in Good Condition.		
8	Parking slot	Not Provided	Not Provided	On street Parking.		
9	Bus stop	Not Provided	Not Provided	to be Provided.		
10	Drain	Not Provided	Not Provided	to be Provided.		
	Junctions					
1	Eklera Canal	Not Provided	Not Provided			

1.76 Corridor: Stretch from Eklera Chokdi to Karwada Bus Stop



	Chokdi to Karwada Bus			Demonstra
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	to be Provided.
2	Electrical Pole	Not Provided	Not Provided	to be Provided.
3	Footpath	Not Provided	Not Provided	to be Provided.
4	Signs	Not Provided	Not Provided	to be Provided.
5	Signals	Not Provided	Not Provided	
6	Road Markings	Not Provided	Not Provided	to be Provided.
7	Pavement Condition	Bad	Bad	Road is not in Good Condition.
8	Parking slot	Not Provided	Not Provided	On street Parking.
9	Bus stop	Yes Provided	Yes Provided	Near Karwada bus stop, but stop is in Bad Condition.
10	Drain	Not Provided	Not Provided	to be Provided.
	Junctions			
1	Karwada bus stop Junction	Not Provided	Not Provided	

1.77 Corridor: Stretch from Karwada Bus stop Junction to Dindoli Karwada Junction



Karwad	da Bus stop Junction to	Dindoli Ka	rwada Junct	ion
Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	but some Portion not Provided.
2	Electrical Pole	Yes Provided	Yes Provided	Centre side.
3	Footpath	Yes Provided	Yes Provided	but some Portion not Provided.
4	Signs	Not Provided	Not Provided	to be Provided.
5	Signals	Not Provided	Not Provided	to be Provided.
6	Road Markings	Not Provided	Not Provided	to be Provided.
7	Pavement Condition	Average	Average	Some Portion in Bad condition.
8	Parking slot	Not Provided	not Provided	On street Parking.
9	Bus stop	Yes Provided	Yes Provided	Bus stop without Pole
10	Drain	Yes Provided	Yes Provided	Open Utility.
	Junctions			
1	Dindoli Karwada Junction	Yes Provided	Yes Provided	No Rotary,Lane Marking, signal,signage Provided at Junction.

1.78 Corridor: Stretch from Kinnary Junction to Bhathena Junction



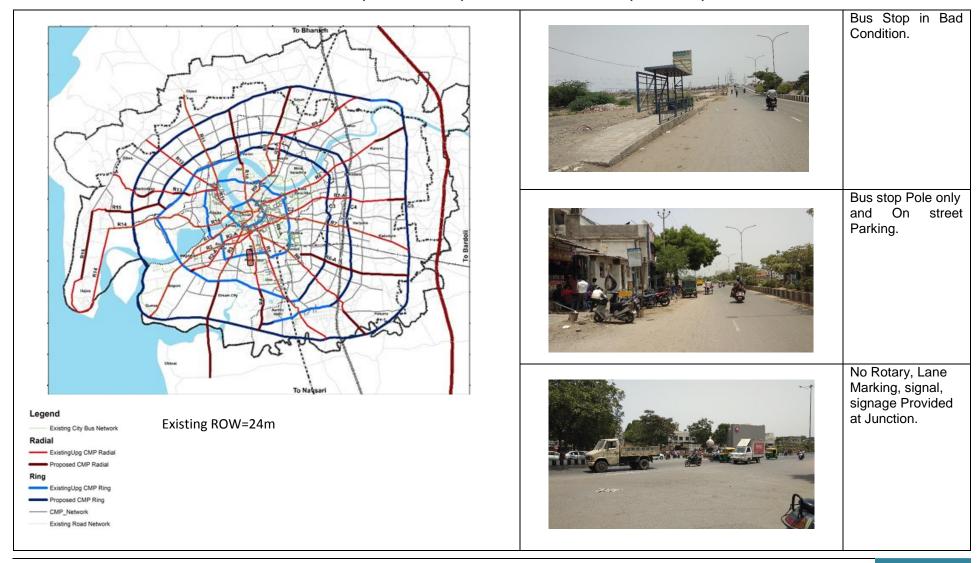
Kin	nary Junction to	Bhathena J	Junction		
1	Median	Yes Provided	Yes Provided		
2	Electrical Pole	Yes Provided	Yes Provided	Centre side.	
3	Footpath	Not Provided	Yes Provided	one side Provided(RHS side)	
4	Signs	Yes Provided	Yes Provided	only directional signage Provided near Kinnary Junction.	
5	Signals	Yes Provided	Yes Provided	Provided near Kinnary Junction.	
6	Road Markings	Not Provided	Not Provided	to be Provided.	
7	Pavement Condition	Bad	Average	Underconstruction LHS Road.	
8	Parking slot	Not Provided	Not Provided	On street Parking.	
9	Bus stop	Not Provided	Not Provided	Only bus stop pole Provided.	
10	Drain	Yes Provided	Yes Provided	Bad Condition on road near Junction.	
	Junctions				
1	Bhathena Junction	Yes Provided	Yes Provided	No Rotary, Bad Pavement and Lane Marking, signal and signage not Provided at Junction.	

1.79 Corridor: Stretch from Bhathena Junction to Udhyognagar



Bhathe	na Junction to U	dhyognaga	ar		
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided	After Khadi bridge only one way road Provided.	
2	Electrical Pole	Yes Provided	Yes Provided	vided	
3	Footpath	Not Provided	Not Provided		
4	Signs	Not Provided	not Provided		
5	Signals	Not Provided	Not Provided	to be Provided.	
6	Road Markings	Not Provided	Not Provided	to be Provided.	
7	Pavement Condition	Average	Average	e Some Portion are in Bad Condition.	
8	Parking slot	Not Provided	Not Provided	On street Parking.	
9	Bus stop	Not Provided	Not Provided	Only bus stop pole Provided.	
10	Drain	Yes Provided	Yes Provided	Bad condition on road.	
	Junctions				
1	Udhyognagar Junction	Not Provided	Not Provided		

1.80 Corridor: Stretch from Kailash Cross Road (Bamroli Road) to Link Road Junction (U-M Road)



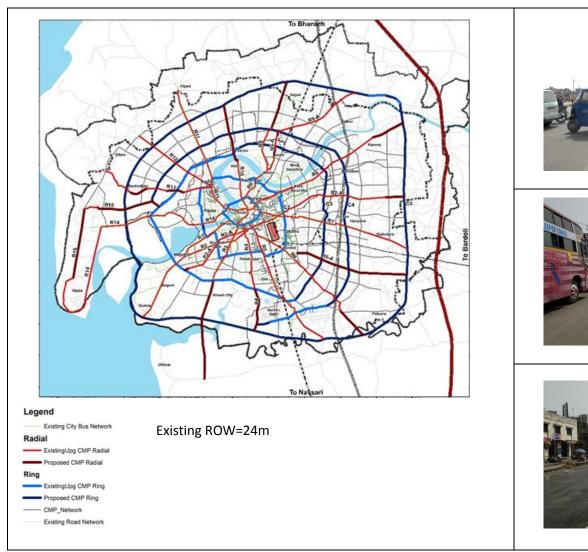
Sr.No.	Elements	LHS	RHS	Remarks
	n Cross Road (Bamroli R			
1	Median	Yes Provided	yes Provided	Udhana Magdalla to Bamroli Khadi single lane Provided.
2	Electrical Pole	Yes Provided	yes Provided	Centre side.
3	Footpath	Yes Provided	yes Provided	but some Portion to be Provided.
4	Signs	Not Provided	Not Provided	to be Provided.
5	Signals	Not Provided	Not Provided	to be Provided.
6	Road Markings	Not Provided	Not Provided	Lane Marking to be Provided.
7	Pavement Condition	Average	Average	Road is not in Good Condition.
8	Parking slot	Not Provided	Not Provided	On street Parking.
9	Bus stop	Yes Provided	yes Provided	but in Bad Condition without Ramp and some Portion only Pole Provided.
10	Drain	Yes Provided	yes Provided	On Road Provided
	Junctions			
1	Kailashnagar Char Rasta Junction	Yes Provided	Yes Provided	No Rotary, signage, signal, Road Marking and footpath Provided near Junction.
2	Link Road Junction	Yes Provided	Yes Provided	No Rotary, signage, signal, Road Marking and footpath Provided near Junction.

1.81 Corridor: Stretch from Nilgiri Circle Junction to Aaspas Char Rasta Junction



Sr.No.	Elements	LHS	RHS	Remarks	
Nilgiri	Circle Junction to	Aaspas C	har Rasta	Junction	
1	Median	Yes Provided	Yes Provided		
2	Electrical Pole	Yes Provided	Yes Provided	Centre side.	
3	Footpath	Yes Provided	Yes Provided	Encrochment by hawkers.	
4	Signs	Yes Provided	Yes Provided	only Mandetory signage Provided eg "Keep Left"	
5	Signals	Not Provided	Not Provided	to be Provided.	
6	Road Markings	Yes Provided	Yes Provided	Invisible Lane Marking	
7	Pavement Condition	Average	Average	Average road condition.	
8	Parking slot	Not Provided	Not Provided	On street Parking.	
9	Bus stop	Yes Provided	yes Provided	Bad Condition.	
10	Drain	Yes Provided	Yes Provided	Bad Condition on road.	
	Junctions				
1	Aas Pas Junction	Yes Provided	Yes Provided	No Rotary, Bad Pavement and Lane Marking, signal and signage not Provided at Junction.	

1.82 Corridor: Stretch from Niligiri Circle Junction to Maharana Pratap Chowk Junction





No Signal, signage and Lane Provided at Junction.



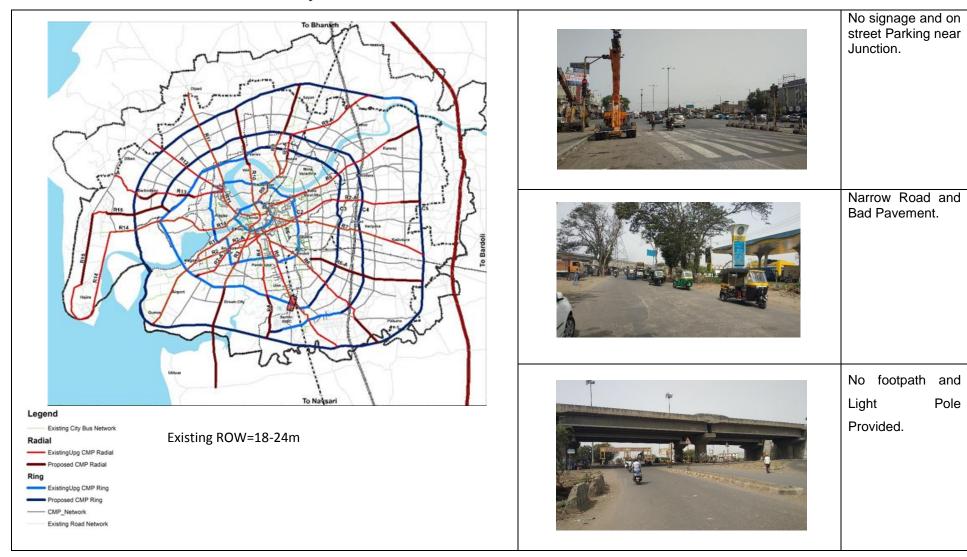
Narrow Road near Nilgiri Circle and on street Parking.



No street light arrangement.

Niligiri	Circle Junction to	Maharana	Pratap Ch	owk Junction
Sr.No.	.No. Elements LHS RHS		RHS	Remarks
Niligiri	Circle Junction to	Maharana	Pratap Ch	owk Junction
1	1 Median Not Provided		Not Provided	but Road and Median Underconstruction.
2	Electrical Pole	Yes Provided	Yes Provided	One sided.
3	Footpath	Yes Provided	Yes Provided	But in bad Condition and not Provided at some Portion.
4	Signs	Yes Provided	Yes Provided	Provided at some Portion.
5	Signals Yes Provided		Yes Provided	Near Junction Provided.
6	Road Markings Not Provided		Not Provided	to be Provided.
7	Pavement Good Condition		Good	Road is underconstruction process, and some Portion is in Bad condition.
8	Parking slot Not Provide		Not Provided	On street Parking.
9	Bus stop	Not Provided	Not Provided	to be Provided.
10	Drain Yes Provide		Yes Provided	Near Junction Provided.due to Road underconstruction utility is invisible condition.
	Junctions			
1	Nilgiri Circle Yes Yes Junction Provided Provide		Yes Provided	Rotary Provided, No Lane Marking, signal and signage Provided at Junction.
2	Maharana Pratap Junction	Yes Provided	Yes Provided	No Rotary,Lane Marking Provided at Junction.Encrochment by Rickshaw.

1.83 Corridor: Stretch from Sachin GIDC junction to Sachin GIDC Gate 1



Pole

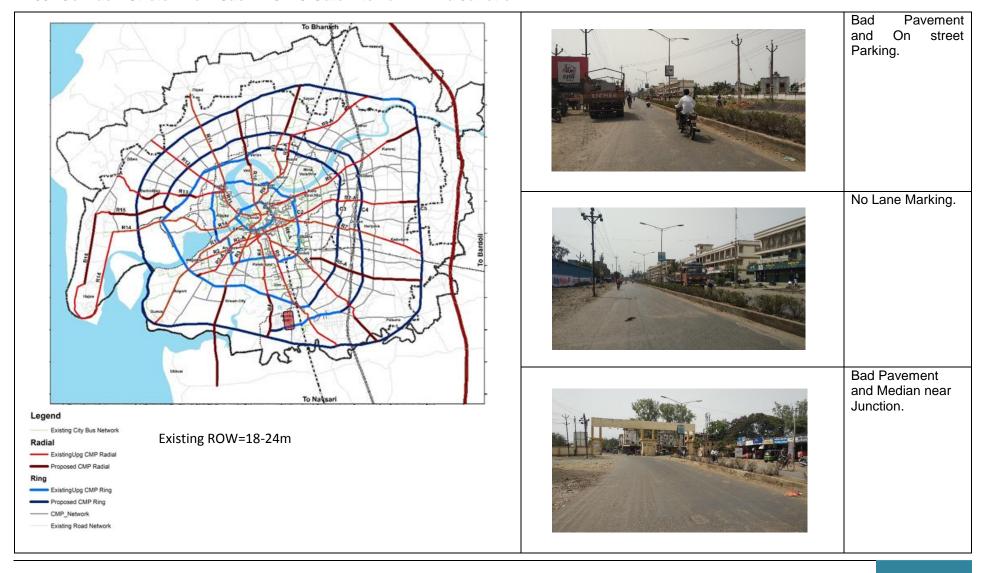
Sr.No.	Elements	LHS	RHS	Remarks
Sachin	GIDC junction to Sachin	GIDC Gate	1 Junction	
1	Median	Not Provided	Not Provided	Median to be Provided.
2	Electrical Pole	Not Provided	Not Provided	Electric Pole to be Provided.
3	Footpath	Not Provided	Not Provided	Footpath to be Provided.
4	Signs	Not Provided	Not Provided	to be Provided.
5	Signals	Not Provided	Not Provided	to be Provided.
6	Road Markings	Not Provided	Not Provided	Lane Marking to be Provided.
7	Pavement Condition	Bad	Bad	Road is not in Good Condition.
8	Parking slot	Not Provided	Not Provided	Street Parking.
9	Bus stop	Not Provided	Not Provided	to be Provided.
10	Drain	Not Provided	Not Provided	to be Provided.
	Junctions			
1	Sachin GIDC Junction	Yes Provided	Yes Provided	No Rotary, signage, signal, Road Marking and footpath Provided near Junction.
2	Sachin GIDC Gate No.1	Yes Provided	Yes Provided	No Rotary,signage, signal,Road Marking and footpath Provided near Junction.

1.84 Corridor: Stretch from Sachin GIDC Gate 1 to Laxmi Villa Junction



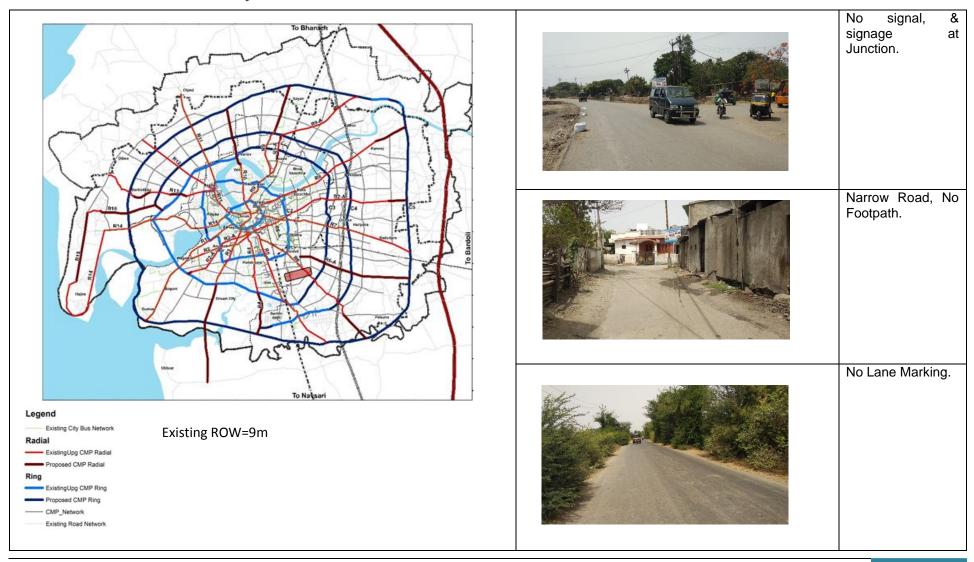
	GIDC Gate 1 to Laxmi \			Remarks
Sr.No.		LHS	RHS	
1	Median	Yes Provided	Yes Provided	but in Bad Condition.
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side.
3	Footpath	Not Provided	Not Provided	to be Provided.
4	Signs	Not Provided	Not Provided	to be Provided.
5	Signals	Not Provided	Not Provided	to be Provided.
6	Road Markings	Not Provided	Not Provided	only Zebra Marking provided on some Portion.
7	Pavement Condition	Average	Average	Near sachin GIDC gate 1 bad Road Condition.
8	Parking slot	Not Provided	Not Provided	On street Parking.
9	Bus stop	Not Provided	Not Provided	to be Provided.
10	Drain	Yes Provided	Yes Provided	But Catch pit and Drain are on the Road.
	Junctions			
1	Laxmi Villa Junction	Yes Provided	Yes Provided	No Rotary,signage, signal,Road Marking and footpath Provided near Junction.

1.85 Corridor: Stretch from Sachin GIDC Gate 1 to Laxmi Villa Junction



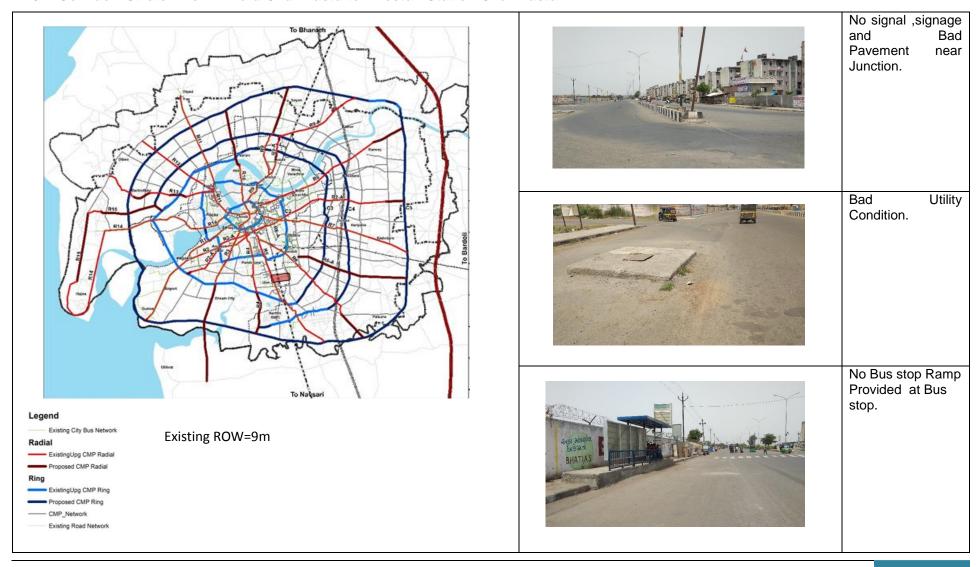
Laxmi '	Laxmi Villa Junction to Sachin Talangpore Junction				
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided	but in Bad Condition.	
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side.	
3	Footpath	Yes Provided	Yes Provided	to be Provided.	
4	Signs	Not Provided	Not Provided	to be Provided.	
5	Signals	Not Provided	not Provided	to be Provided.	
6	Road Markings	Not Provided	not Provided	to be Provided.	
7	Pavement Condition	Average	Average	some Portion in Bad Condition	
8	Parking slot	Not Provided	Not Provided	On street Parking.	
9	Bus stop	Not Provided	Not Provided	to be Provided.	
10	Drain	Not Provided	Not Provided	to be Provided.	
	Junctions				
1	Bhestan Station Char Rasta Junction	Yes Provided	Yes Provided	No Rotary, Road Marking and footpath Provided near Junction.	

1.86 Corridor: Stretch from Saniya Kande Junction to Eklera Char Rasta



Saniya	Saniya Kande Junction to Bhestan Station Char Rasta Junction					
Sr.No.	Elements	LHS	RHS	Remarks		
Saniya	Saniya Kande Junction to Eklera Char Rasta					
1	Median	Not Provided	Not Provided	Median to be Provided.		
2	Electrical Pole	Not Provided	Not Provided	Electric Pole to be Provided.		
3	Footpath	Not Provided	Not Provided	Footpath to be Provided.		
4	Signs	Not Provided	Not Provided	Signage to be Provided.		
5	Signals	Not Provided	Not Provided			
6	Road Markings	Not Provided	Not Provided	Lane Marking to be Provided.		
7	Pavement Condition	Bad	Bad	Road is not in Good Condition.		
8	Parking slot	Not Provided	Not Provided	Street Parking.		
9	Bus stop	Not Provided	Not Provided	No Bus Stop Avilable on Road.		
10	Drain	Not Provided	Not Provided	But Catch pit and Drain are on the Road.		
	Junctions					
1	Saniya Kande Junction	Not Provided	Not Provided	No signal, signage and Proper Pavement on Junction.		

1.87 Corridor: Stretch from Eklera Char Rasta to Bhestan Station Char Rasta



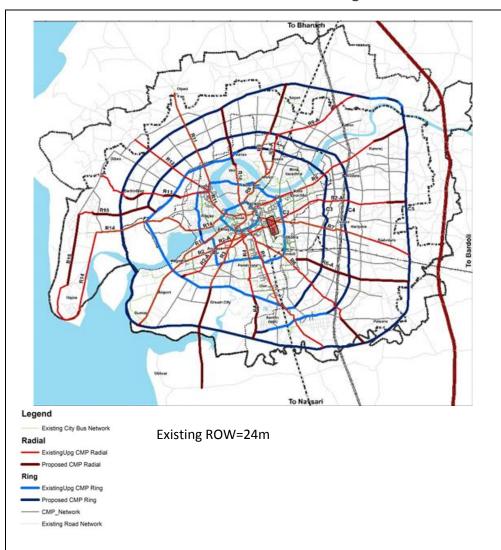
Ekle	Eklera Char Rasta to Bhestan Station Char Rasta					
1	Median	Yes Provided	Yes Provided			
2	Electrical Pole	Yes Provided	Yes Provided	Centre Side.		
3	Footpath	Yes Provided	Yes Provided	Yes but on Some Portion Footpath is not Provided.		
4	Signs	Yes Provided	Yes Provided	Signage to be Provided.		
5	Signals	Yes Provided	Yes Provided	Only Provided at Bhestan Station Char Rasta Junction.		
6	Road Markings	Yes Provided	Yes Provided	But not in Good Condition.		
7	Pavement Condition	Average	Average	Road is not in Good Condition.		
8	Parking slot	Not Provided	Not Provided	On street Parking.		
9	Bus stop	Yes Provided	Yes Provided	But not in Good Condition.		
10	Drain	Yes Provided	Yes Provided	But Catch pit and Drain are on the Road.		
	Junctions					
1	Bhestan Station Char Rasta Junction	Yes Provided	Yes Provided	No Rotary, Road Marking and footpath Provided near Junction.		

1.88 Corridor: Stretch from Sanjay Nagar Circle Junction Dumbhal to Dumbhal Khadi Bridge



Sanjay	Sanjay Nagar Circle Junction Dumbhal to Archana School Junction					
Sr.No.	Elements	LHS	RHS	Remarks		
Sanjay	Sanjay Nagar Circle Junction Dumbhal to Dumbhal Khadi Bridge					
1	Median	Not Provided	Not Provided	Under construction road so median to be Provide.		
2	Electrical Pole	Yes Provided	Yes Provided	One sided.		
3	Footpath	Not Provided	Not Provided	To be Provided.		
4	Signs	Not Provided	Not Provided	To be Provided.		
5	Signals	Not Provided	Not Provided	To be Provided.		
6	Road Markings	Not Provided	Not Provided	To be Provided.		
7	Pavement Condition	Good	Good	Road is under construction process, and some Portion is in Bad condition.		
8	Parking slot	Not Provided	Not Provided	On street Parking.		
9	Bus stop	Yes Provided	Yes Provided	But in bad Condition.		
10	Drain	Yes Provided	Yes Provided	Provided at some Portion.		
	Junctions					
1	Krishna Circle	Yes Provided	Yes Provided	Rotary Provided, No Lane Marking, signal and signage Provided and Bad Pavement at Junction.		

1.89 Corridor: Stretch from Dumbhal Khadi Bridge to Archana School Junction





No Bus stop Pole Provided.



Signal and signage Provided at Junction.



No Lane Marking, Pedestrains not using zebra crossing.

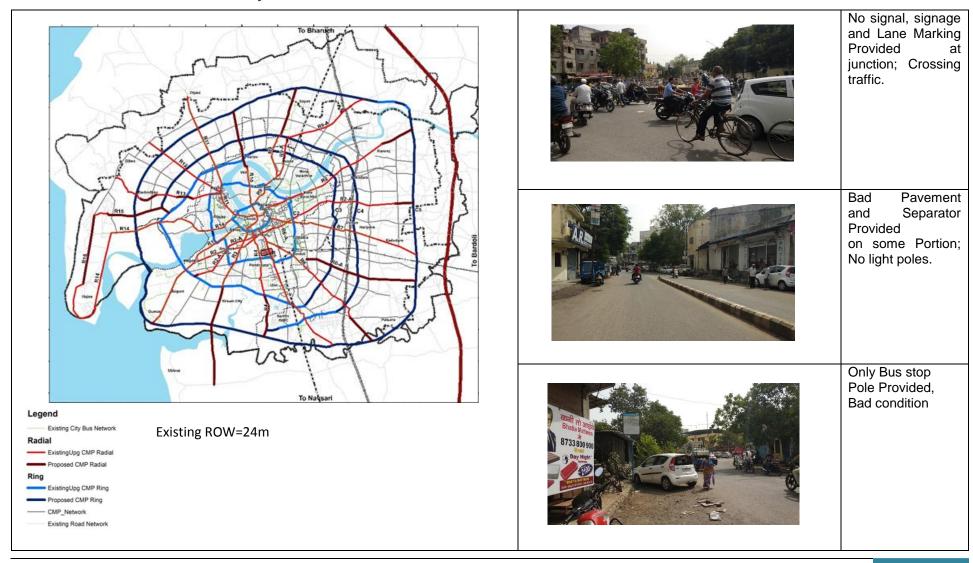
Dun	Dumbhal Khadi Bridge to Archana School Junction						
1	Median	Yes Provided	Yes Provided				
2	Electrical Pole	Pole Yes Yes Provided Provided		Centre side.			
3	Footpath	Yes Provided	Yes Provided	But in bad Condition and not Provided at some Portion.			
4	Signs	Yes Provided	Yes Provided	Provided at some Portion.			
5	Signals	Yes Provided	Yes Provided	Near Junction Provided.			
6	Road Markings	Yes Provided	Yes Provided	But Some Portion not Provided.			
7	Pavement Condition	Good	Good	Bad condition on some Portion.			
8	Parking slot	Not Provided	Not Provided	On street Parking.			
9	Bus stop	Yes Provided	Yes Provided				
10	Drain	Yes Provided	Yes Provided	Utility bad condition near Junction.			
	Junctions						
1	Model Town Junction	Yes Provided	Yes Provided	No Rotary Provided, No Lane Marking, signal and signage Provided at Junction.			
2	Aai Mata Junction	Yes Provided	Yes Provided	No Rotary,Lane Marking and Bad Pavement at junction.			
3	Archana School Junction	Yes Provided	Yes Provided	No Rotary,Lane Marking and Bad Pavement at junction.			

1.90 Corridor: Stretch from Sikon Circle Junction to Acharya Shree Tulshi Circle



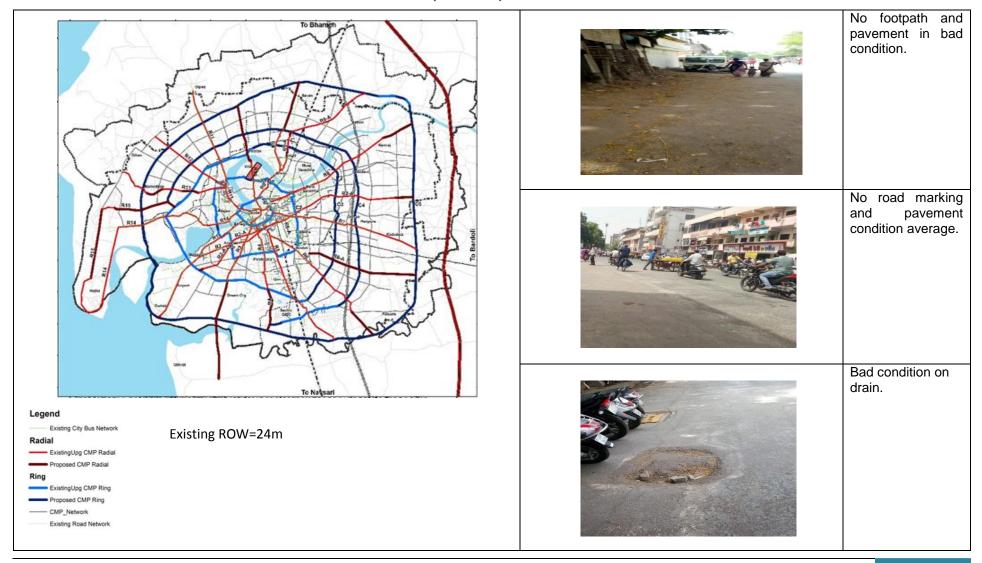
Sikon (Sikon Circle Junction to Gurudwara Junction Surat Navsari Road					
Sr.No.	Elements	LHS	RHS	Remarks		
Sikon (│ Circle Junction to	Acharya Sh	i nree Tulshi	i Circle		
1	Median	Yes Provided	Yes Provided			
2	Electrical Pole	Yes Provided	Yes Provided	Centre side.		
3	Footpath	Yes Provided	Yes Provided	But Some Portion not Provided.		
4	Signs	Not Provided	Not Provided	To be Provided.		
5	Signals	Not Provided	Not Provided	To be Provided.		
6	Road Markings	Not Provided	Not Provided	To be Provided.		
7	Pavement Condition	Good	Good	Near Junction Bad condition and on khadi bridge bad Pavement.		
8	Parking slot	Not Provided	Not Provided	On street Parking.		
9	Bus stop	Not Provided	Not Provided	To be Provided.		
10	Drain	Yes Provided	Yes Provided	On road Provided.		
	Junctions					
1	Sikon Circle	Yes Provided	Yes Provided	Rotary Provided, No Lane Marking, signal and signage Provided and Bad Pavement at Junction.		
2	Rayka Circle	Yes Provided	Yes Provided	Rotary Provided, No Lane Marking, signal and signage Provided and Bad Pavement at Junction.		

1.91 Corridor: Stretch from Acharya Shree Tulshi Circle to Gurudwara Junction



Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Not Provided	Not Provided	Only Sepreter Provided on some Portion.	
2	Electrical Pole	Yes Provided	Yes Provided	One sided.	
3	Footpath	Yes Provided	Yes Provided	But in bad Condition and not Provided at some Portion.	
4	Signs	Not Provided	Not Provided	To be Provided.	
5	Signals	Not Provided	Not Provided	To be Provided.	
6	Road Markings	Not Provided	Not Provided	To be Provided.	
7	Pavement Condition	Average	Average	Bad condition on some Portion.	
8	Parking slot	Not Provided	Not Provided	On street Parking.	
9	Bus stop	Not Provided	Not Provided	Only bus stop Pole Provided.	
10	Drain	Yes Provided	Yes Provided	On road Provided in Bad condition.	
	Junctions				
11	Gurudwara Junction	Not Provided	Not Provided	No Rotary Provided, No Lane Marking, signal and signage Provided at Junction.	

1.92 Corridor: Stretch from Lalita Circle to Godhani Circle (Asharam)



Sr.No	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Yes Provided	Yes Provided	But footpath average condition.
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Yes Provided	Yes Provided	Road markings like lane separator, zebra crossing etc. Are provided but not visible.
7	Pavement Condition	Average Condition	Average Condition	Minor cracks are found on the pavement surface
8	Parking	Not Provided	Not Provided	Adequate parking space should be provided.
9	Bus stop	Yes Provided	Yes Provided	City Bus Stop provided.
10	Drain	Yes Provided	Yes Provided	But not good condition.
11	Katargam Circle Junction-1	Yes Provided	Yes Provided	Junction not good condition.
12	Godhani Circle junction-2	Yes Provided	Yes Provided	But Average condition.

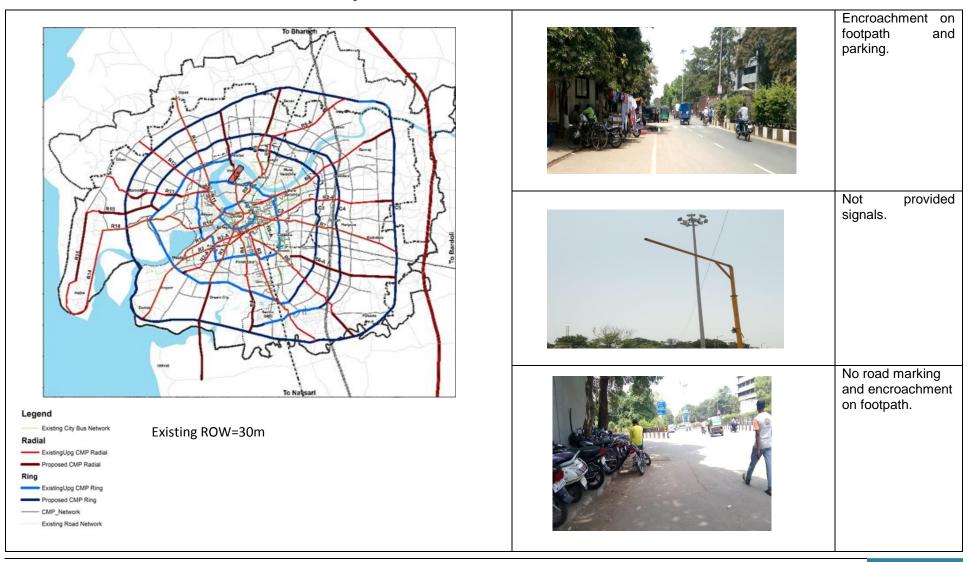
1.93 Corridor: Stretch from Godhani Circle to Bhavani Circle (A.K.Road)



Corridor Name:-Godhani Circle to Bhavani Circle (A.K.Road)

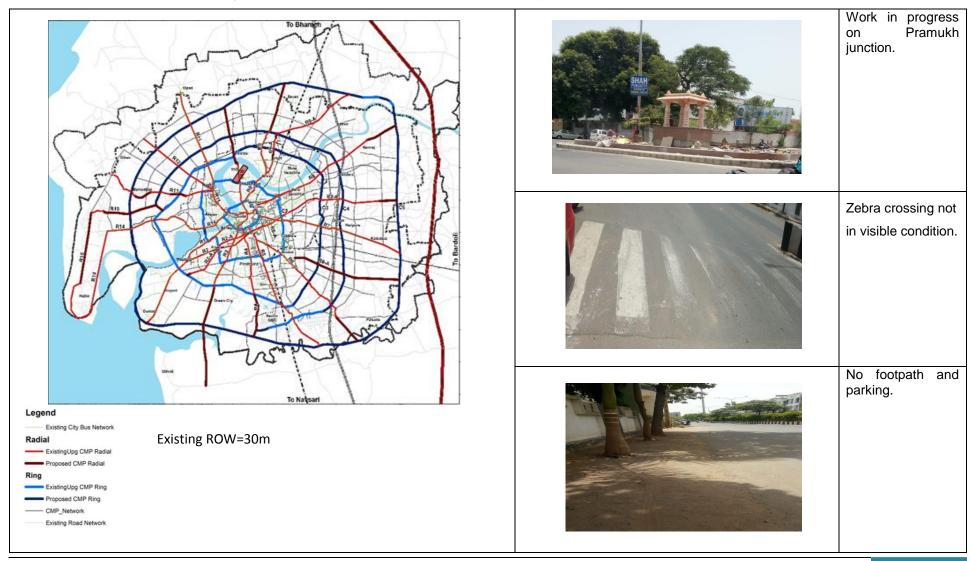
Sr.No	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Godhani circle to SRK circle bridge below SMC pay and park and this area not provided median.
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Yes Provided	Yes Provided	But not good condition and encroachment on footpath.
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Yes Provided	Yes Provided	Average condition road marking.
7	Pavement Condition	Average Condition	Average Condition	Minor cracks are found on the pavement surface
8	Parking	Not Provided	Not Provided	On road parking and SMC pay and park below bridge.
9	Bus stop	Not Provided	Not Provided	
10	Drain	Yes Provided	Yes Provided	But not good condition.
11	SRK Circle Junction	Yes Provided	Yes Provided	No signals provision on junction.

1.94 Corridor: Stretch from Bhavani Circle to Gajera School Char Rasta



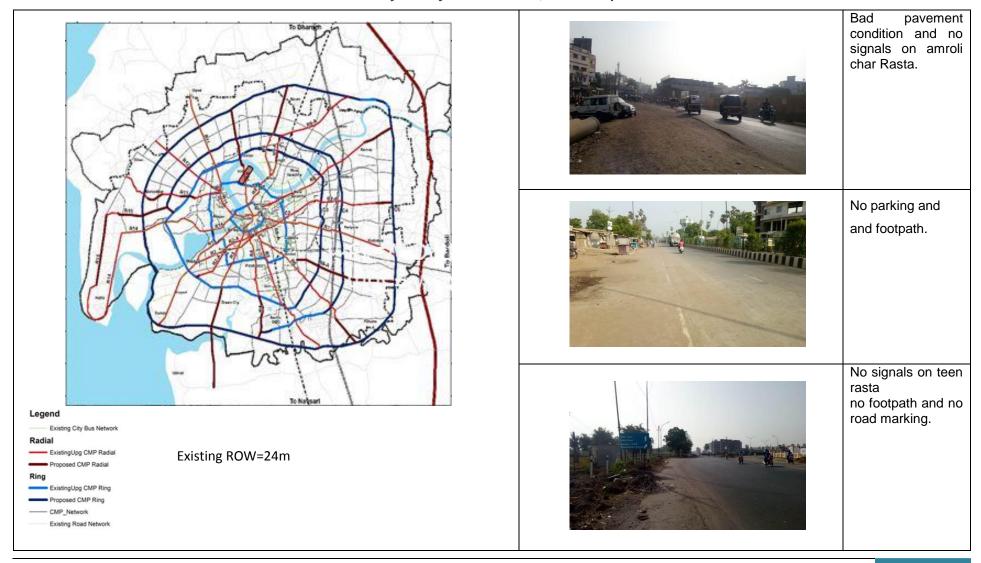
Sr.No	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	But average condition on median.
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Yes Provided	Yes Provided	But not good condition and encroachment on footpath.
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	Only Bhavani circle provided signals.
6	Road Markings	Yes Provided	Yes Provided	Not visible road marking.
7	Pavement Condition	average condition	average condition	Minor cracks are found on the pavement surface.
8	Parking	Not Provided	Not Provided	Adequate parking space should be provided.
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.(sarswati school to gajera char rasta brts bus provided.)
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Sarswati school junction- 1.	Yes Provided	Yes Provided	No signals available on junction.
12	full pada char rasta -2.	Yes Provided	Yes Provided	No signals available on junction.
13	Gajera school char rasta-3.	Yes Provided	Yes Provided	No signals available on junction.

1.95 Corridor: Stretch from Gajera School Char Rasta to Pramukh Chowk (Ved)



Corrido	Corridor: Stretch from Gajera School Char Rasta to Pramukh Chowk (Ved)					
Sr.No	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	Average condition.		
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.		
3	Footpath	Yes Provided	Yes Provided	Encroachment on footpath		
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.		
5	Signals	Yes Provided	Yes Provided	Adequate signals at certain locations should be provided.		
6	Road Markings	Yes Provided	Yes Provided	Not visible road marking.		
7	Pavement Condition	average condition	average condition	Minor cracks are found on the pavement surface.		
8	Parking	Yes Provided	Yes Provided	No parking , on road parking.		
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.		
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.		
11	Vadala char rasta-1.	Yes Provided	Yes Provided	But not developed char Rasta.		
12	Ankur school char rasta-2.	Yes Provided	Yes Provided	But not developed char Rasta.		
13	Pramukh char Rasta	Yes Provided	Yes Provided	Under development Pramukh char Rasta.		

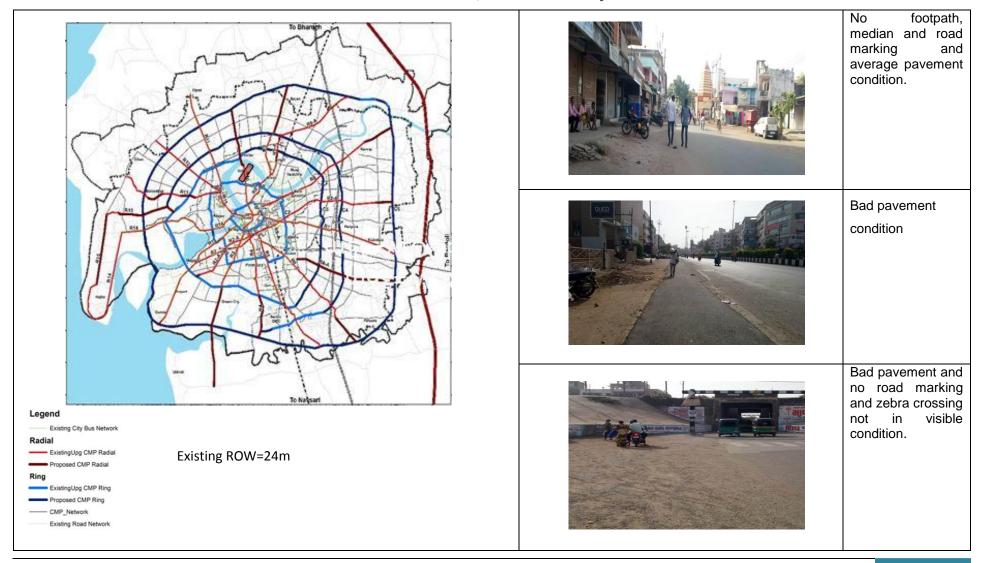
1.96 Corridor: Stretch from Amroli Char Rasta To Sayan-Hajira Main Road, Via Chhaparabhatha Road



Corridor: Amroli Char Ra	a To Sayan-Hajira Main Road,	Via Chhaparabhatha Road

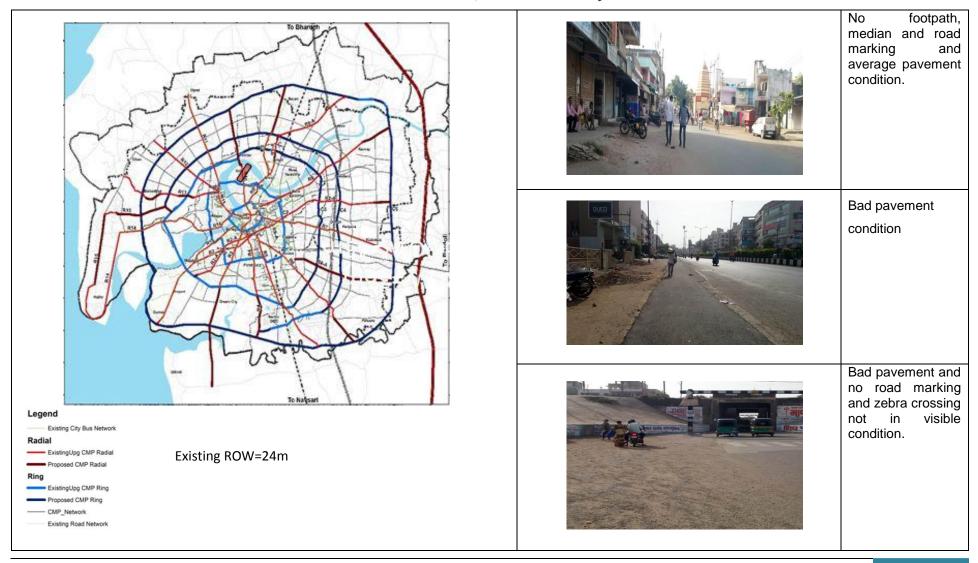
Sr.No	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Average condition.
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Not Provided	Not Provided	
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Yes Provided	Yes Provided	
7	Pavement Condition	Good condition	Good condition	RCC pavement.
8	Parking	Not Provided	Not Provided	No parking , on road parking.
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Kosad-Sayan-hajira teen Rasta	Yes Provided	Yes Provided	Teen Rasta not developed.

1.97 Corridor: Stretch from Amroli Char Rasta To Mota Varachha, Via Utran Railway Station



Sr.No	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Average condition.
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Not Provided	Not Provided	
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Yes Provided	Yes Provided	
7	Pavement Condition	Good condition	Good condition	Amroli to Utran rail crossing not good condition and Utran to Mota Varachha good condition.
8	Parking	Not Provided	Not Provided	No parking , on road parking.
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Utran rail crossing-1	Yes Provided	Yes Provided	Rail crossing not developed and bad condition crossing.
12	Sardar chowk Utran ROB-	Yes Provided	Yes Provided	No developed junction no rotary and no signals on junction
13	Swaminarayan chowk mota varachha-3	Yes Provided	Yes Provided	No developed junction no rotary and no signals on junction

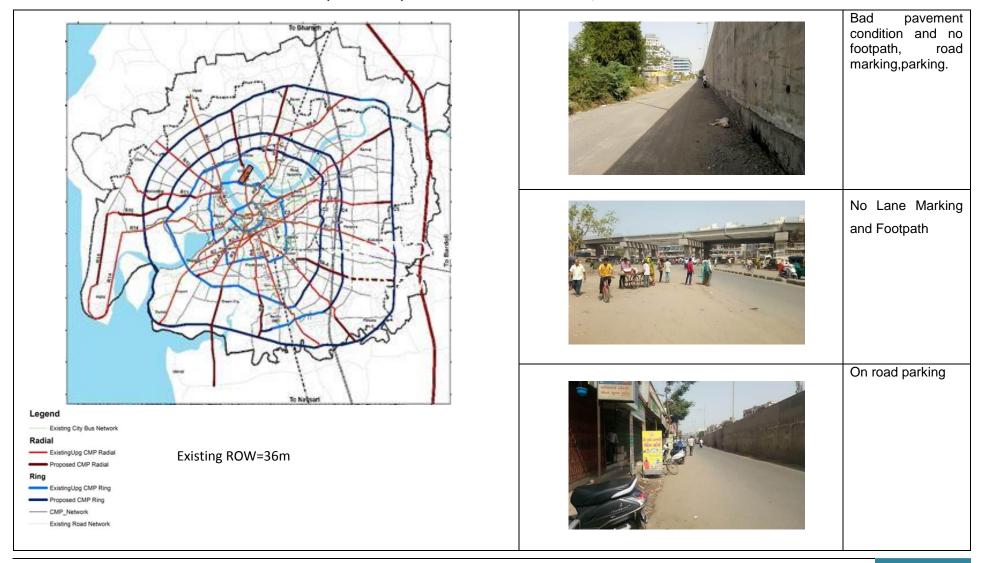
1.98 Corridor: Stretch from Amroli Char Rasta To Mota Varachha, Via Utran Railway Station



Corridor: Amroli Char Rasta To Mota Varachha, Via Utran Railway Station

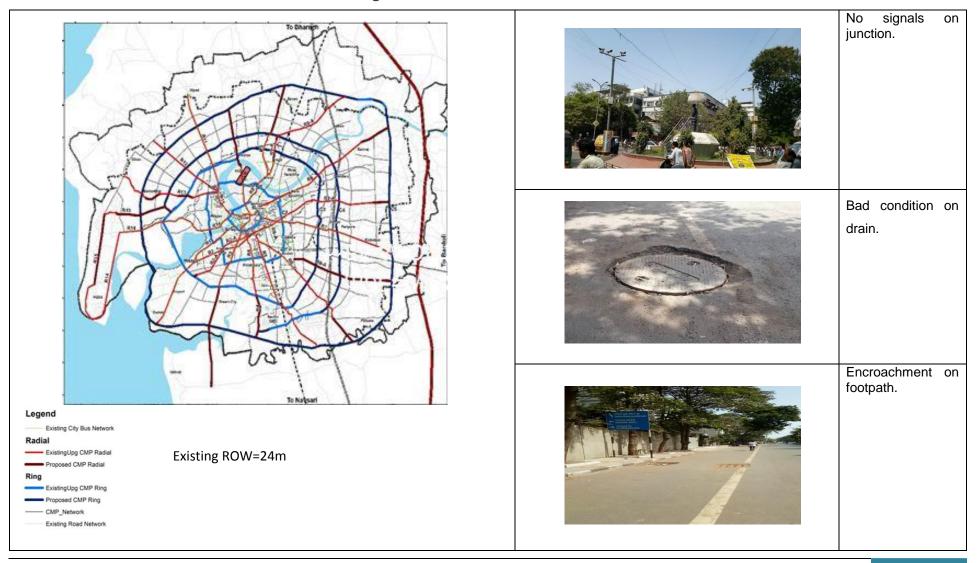
Sr.No	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Average condition.
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Not Provided	Not Provided	
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Yes Provided	Yes Provided	
7	Pavement Condition	Good condition	Good condition	Amroli to Utran rail crossing not good condition and Utran to Mota Varachha good condition.
8	Parking	Not Provided	Not Provided	No parking , on road parking.
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Utran rail crossing-1	Yes Provided	Yes Provided	Rail crossing not developed and bad condition crossing.
12	Sardar chowk Utran ROB-	Yes Provided	Yes Provided	No developed junction no rotary and no signals on junction
13	Swaminarayan chowk mota varachha-3	Yes Provided	Yes Provided	No developed junction no rotary and no signals on junction

1.99 Corridor: Stretch from Sardar Chowk (Utran Rob) to Mansarover Char Rasta, Via Kosad Lake Garden



Sr.No	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Not Provided	Not Provided	
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Not Provided	Not Provided	
7	Pavement Condition	Average condition	Average condition	Sardar chowk to Utran ROB bridge good pavement condition. And Utran rail crossing to Kosad lake garden to Mansarovar char Rasta pavement bad condition.
8	Parking	Not Provided	Not Provided	No parking , on road parking.
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided. (sardar chowk to utran bridge brts lane).
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.
11	Utran rail crossing.	Yes Provided	Yes Provided	Rail crossing not developed and bad condition crossing.
12	kosad lake garden teen rasta.	Yes Provided	Yes Provided	Junction not developed and bad condition.

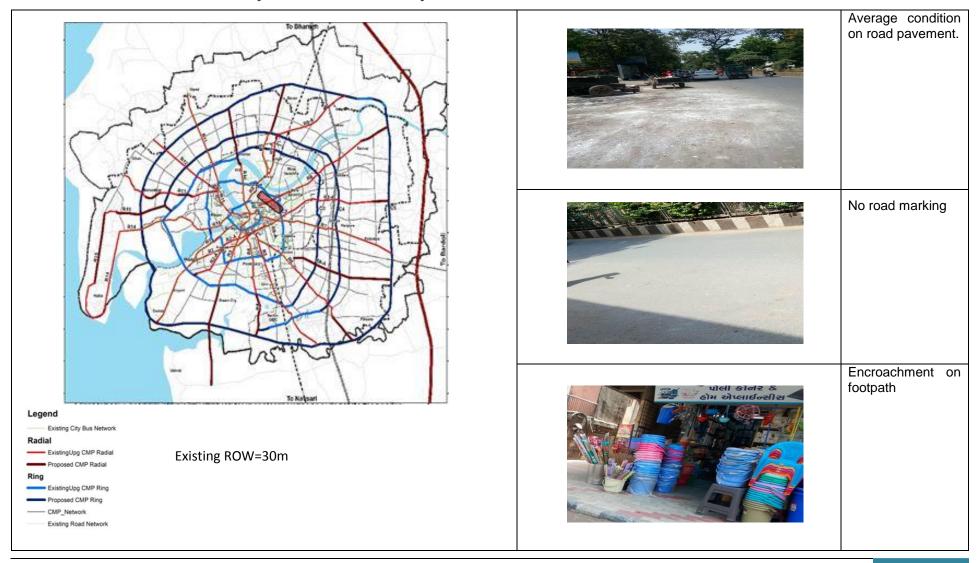
1.100 Corridor: Stretch from Bhavani Circle to Mangath Chowk.



Corridor: Bhavani Circle To Mangath Chowk

Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Average condition on median.
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Yes Provided	Yes Provided	Encroachment on footpath.
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Not Provided	Not Provided	Adequate signals at certain locations should be provided.
6	Road Markings	Yes Provided	Yes Provided	Good condition on road marking.
7	Pavement Condition	Good condition	Good condition.	Good condition on pavement condition.
8	Parking	Yes Provided	Yes Provided	
9	Bus stop	Not Provided	Not Provided	
10	Drain	Yes Provided	Yes Provided	But bad condition on drain.

1.101 Corridor: Stretch from Gitanjali Char Rasta to Shivaji Statue



Corridor: Gitanjali	Char Rasta	To Shivaji Statue
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Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Good condition.
2	Electrical Pole	Yes Provided	Yes Provided	Good condition.
3	Footpath	Yes Provided	Yes Provided	Encroachment on footpath.
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	But not working.
6	Road Markings	Yes Provided	Yes Provided	But not in visible condition.
7	Pavement Condition	Average condition	Average condition	Minor cracks are found on the pavement surface.
8	Parking	Not Provided	Not Provided	On road parking.
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.
10	Drain	Yes Provided	Yes Provided	Not in good condition.
11	Navjivan society circle-1	Yes Provided	Yes Provided	No signals and average condition on junction
12	Guru pushkar devendra circle-2	Yes Provided	Yes Provided	No signals and average condition on junction

1.102 Corridor: Stretch from Bapasitaram Chowk to Simada Canal Junction



Corrido	Corridor:I.R-13-Bapasitaram Chowk To Simada Canal Junction.						
Sr.No.	Elements	LHS	RHS	Remarks			
1	Median	Provided	Provided	Adequate median is provided with landscape.			
2	Electrical Pole	Yes Provided	Yes Provided	Electric pole on footpath is provided on both sides.			
3	Footpath	Yes Provided	Yes Provided	Maintenance required.			
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.			
5	Signals	Yes Provided	Yes Provided	Installed but not working signals.			
6	Road Markings	Yes Provided	Yes Provided	Marking at some places are invisible.			
7	Pavement Condition	Fair condition	Fair condition				
8	Parking	Not Provided	Not Provided	Provided on service road.			
9	Bus stop	Yes Provided	Yes Provided	BRTS bus stations.			
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.			

1.103 Corridor: Stretch from Delhi Gate to L H Road Via Railway Crossing

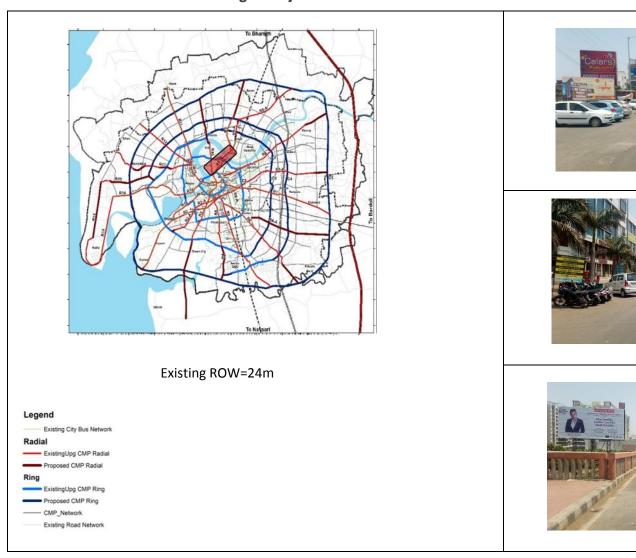


Corridor: I.R-01 & I.R-09-Delhi Gate To L H Road Via Railway Crossing.

Ilements Ilectrical Pole Tootpath	Yes Provided Yes Provided Yes Provided	Yes Provided Yes Provided Yes Provided	Remarks Adequate median is provided but incontinuous at some locations. On median
electrical Pole	Yes Provided	Yes Provided	
ootpath			On median
	Yes Provided	Ves Provided	
		1031 IOVIGEO	Adequate footpath at certain location is provided.
Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
ignals	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
Road Markings	Yes Provided	Yes Provided	Road markings is not visible.
Pavement Condition	Good Condition	Good Condition	Minor cracks are found on the pavement surface.
Parking	Not Provided	Not Provided	On street parking. Adequate parking space should be provided.
	Yes Provided	Yes Provided	City bus stop provided.
)e		rking Not Provided	nrking Not Provided Not Provided

10	Junctions	Yes Provided	Yes Provided	
	J.b.diomond circle-1	Yes Provided	Yes Provided	Signals are not provided on road.
	laxmi narayan circle-2	Yes Provided	Yes Provided	Signals are not provided on road.
	labheswar chowk-3	Yes Provided	Yes Provided	Signals are not provided on road.
	Mamta park circle-4	Yes Provided	Yes Provided	Signals are not provided on road.

1.104 Corridor: Stretch from Dgvcl Urja Sadan to Utran Rob Brts Station





On street parking/Road markings are invisible

On street parking

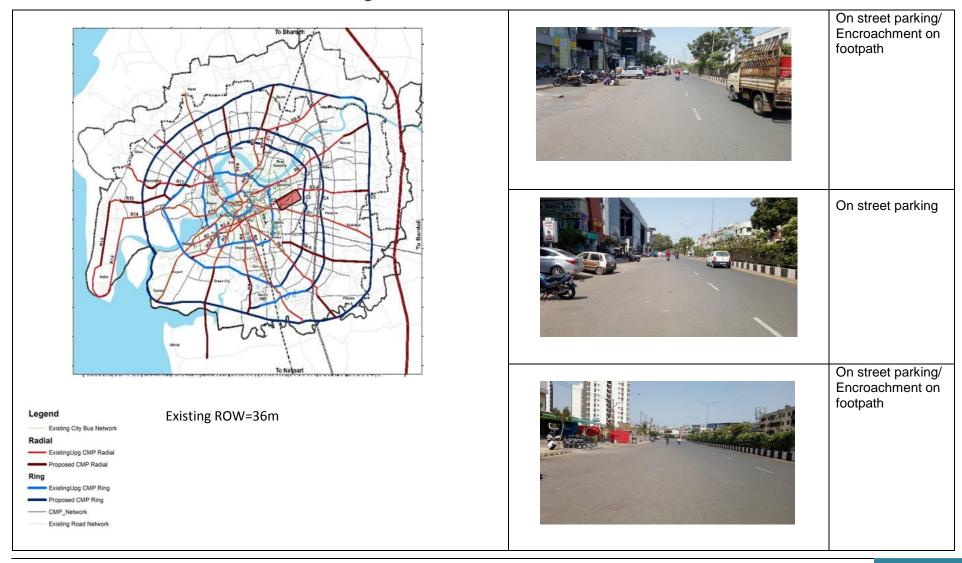


Road markings are invisible at some places

Corridor Name:-I.R-14-Dgvcl Urja Sadan to Utran Rob Brts Station.

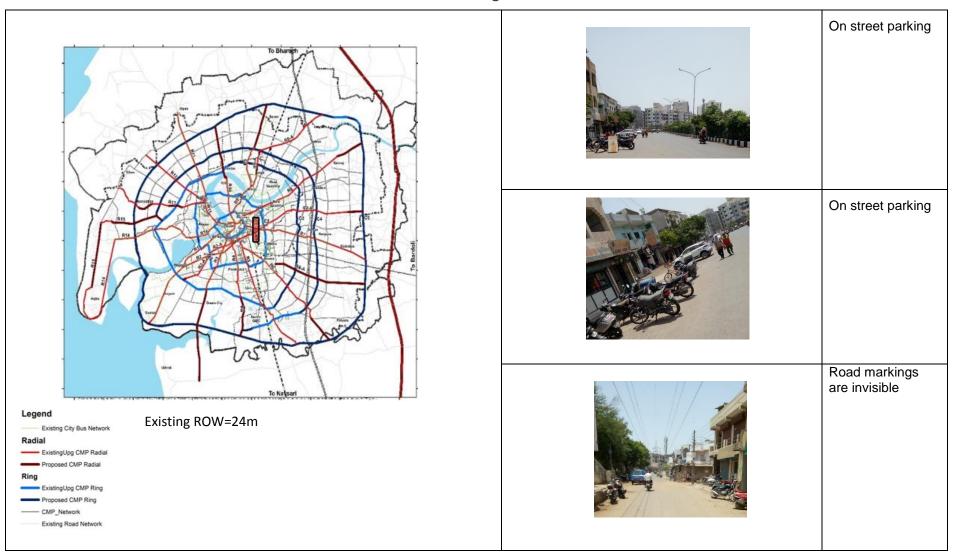
Elements	LHS	RHS	Remarks
Median	Yes Provided	Yes Provided	Adequate medain is provided.
Electrical Pole	Yes Provided	Yes Provided	On median
Footpath	Yes Provided	Yes Provided	At certain locations provided
Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
Signals	Yes Provided	Yes Provided	Signals are not in working order.
Road Markings	Yes Provided	Yes Provided	Road markings are invisible at certain locations.
Pavement Condition	Average condition	Average condition	
Parking	Not Provided	Not Provided	On street parking
Bus stop	Yes Provided	Yes Provided	Brts stations
	Median Electrical Pole Footpath Signs Signals Road Markings Pavement Condition Parking	Median Yes Provided Electrical Pole Yes Provided Footpath Yes Provided Signs Yes Provided Signals Yes Provided Road Markings Yes Provided Pavement Average condition Parking Not Provided	MedianYes ProvidedYes ProvidedElectrical PoleYes ProvidedYes ProvidedFootpathYes ProvidedYes ProvidedSignsYes ProvidedYes ProvidedSignalsYes ProvidedYes ProvidedRoad MarkingsYes ProvidedYes ProvidedPavement ConditionAverage conditionAverage conditionParkingNot ProvidedNot Provided

1.105 Corridor: Stretch from Kiran Chowk to Yogi Chowk



Corrido	Corridor: I.R-07-Kiran Chowk to Yogi Chowk.					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	Adequate medain is provided.		
2	Electrical Pole	Yes Provided	Yes Provided	One sided electrical pole.		
3	Footpath	Yes Provided	Yes Provided			
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.		
5	Signals	Yes Provided	Yes Provided	But not working signals.		
6	Road Markings	Yes Provided	Yes Provided	Good condition road marking.		
7	Pavement Condition	Good condition	Good condition			
8	Parking	Not Provided	Not Provided	On road parking		
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.		
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.		

1.106 Corridor: Stretch from Nalanda School Char Rasta to Gita Nagar



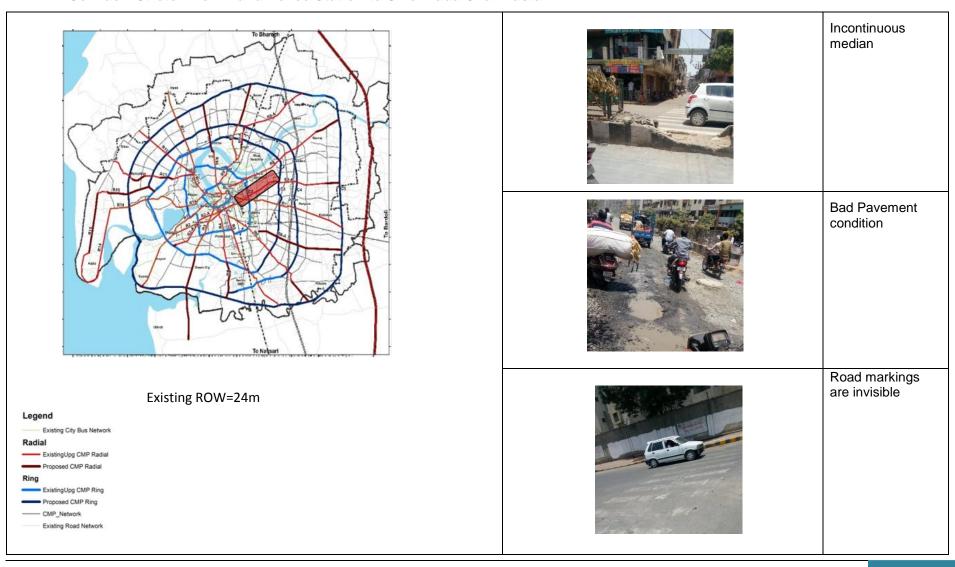
Corridor:I.R-10-Nalanda School Char Rasta to Gita Nagar.					
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided	Adequate medain is provided.	
2	Electrical Pole	Yes Provided	Yes Provided	On median.	
3	Footpath	Not Provided	Not Provided		
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.	
5	Signals	Not Provided	Not Provided	Adequate signages at certain locations should be provided.	
6	Road Markings	Not Provided	Not Provided	No road marking on road.	
7	Pavement Condition	Good Condition	Good Condition	Minor cracks are found on the pavement surface.	
8	Parking	Not Provided	Not Provided	Not provided parking on road.	
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided.	

1.1 Corridor: Stretch from Chowk Terminal to Katargam Darwaja



Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Not Provided	Not Provided	Lane separators at some locations are provided.
2	Electrical Pole	Yes Provided	Yes Provided	One sided electrical pole on road edge.
3	Footpath	Not Provided	Not Provided	
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	But not working in working state.
6	Road Markings	Yes Provided	Yes Provided	Road markings at some location are invisible.
7	Pavement Condition	Average condition	Average condition	
8	Parking	Not Provided	Not Provided	On street parking. Adequate parking space should be provided.
9	Bus stop	Yes Provided	Yes Provided	City bus stops.
10	Drain	Yes Provided	Yes Provided	Catch pit and Drain are on Road.

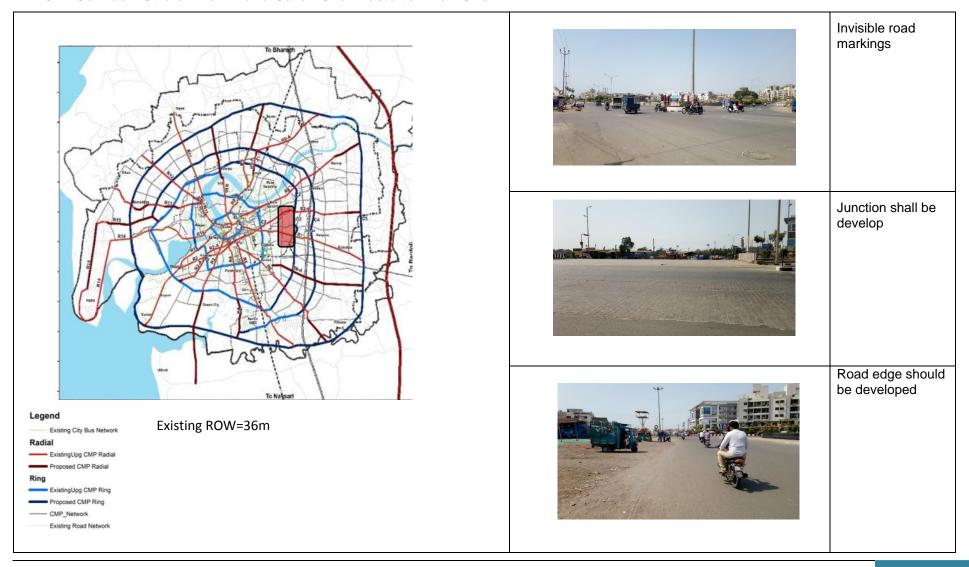
Corridor: Stretch from Puna Police Station to Umarwada Char Rasta



Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Good Condition On Median.
2	Electrical Pole	Yes Provided	Yes Provided	Centre Sided.
3	Footpath	Yes Provided	Yes Provided	Good Condition On Footpath
4	Signs	Yes Provided	Yes Provided	Adequate Signages At Certain Locations Should Be Provided.
5	Signals	Yes Provided	Yes Provided	Adequate Signages At Certain Locations Should Be Provided.
6	Road Markings	Yes Provided	Yes Provided	But Not In Visible Condition Road Marking.
7	Pavement Condition	Average condition	Average condition	Minor Cracks Are Found On The Pavement Surface.

8	Parking	Not Provided	Not Provided	On Road Parking.
9	Bus stop	Yes Provided	Yes Provided	City Bus Stop Provided.
10	Drain	Yes Provided	Yes Provided	Catch Pit And Drain Are On Road.
11	Shree Gusaiji chowk-1.	Yes Provided	Yes Provided	Not Provided Signals On Junction.
12	Sita nagar Chowk- 2.	Yes Provided	Yes Provided	Not Provided Signals On Junction.

Corridor: Stretch from Puna-Saroli Char Rasta to Kiran Chowk



Corridor: I.R-11-Puna-Saroli Char Rasta To Kiran Chowk.

Elements	LHS	RHS	Remarks
Median	Yes Provided	Yes Provided	Adequate medain is provided.
Electrical Pole	Yes Provided	Yes Provided	on median
Footpath	Yes Provided	Yes Provided	
Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
Signals	Yes Provided	Yes Provided	Puna-saroli char rasta signals not working.
Road Markings	Yes Provided	Yes Provided	Invisible at some locations
Pavement Condition	Fair	Fair	required proper patch work on pavement surface
Parking	Not Provided	Not Provided	On Street Parking
Bus stop	Yes Provided	Yes Provided	city bus stops
Jivan jyot junction.	Yes Provided	Yes Provided	No signals on junction.
	Median Electrical Pole Footpath Signs Signals Road Markings Pavement Condition Parking Bus stop	Median Yes Provided Electrical Pole Yes Provided Footpath Yes Provided Signs Yes Provided Signals Yes Provided Road Markings Yes Provided Pavement Condition Fair Parking Not Provided Bus stop Yes Provided	MedianYes ProvidedYes ProvidedElectrical PoleYes ProvidedYes ProvidedFootpathYes ProvidedYes ProvidedSignsYes ProvidedYes ProvidedSignalsYes ProvidedYes ProvidedRoad MarkingsYes ProvidedYes ProvidedPavement ConditionFairFairParkingNot ProvidedNot ProvidedBus stopYes ProvidedYes Provided

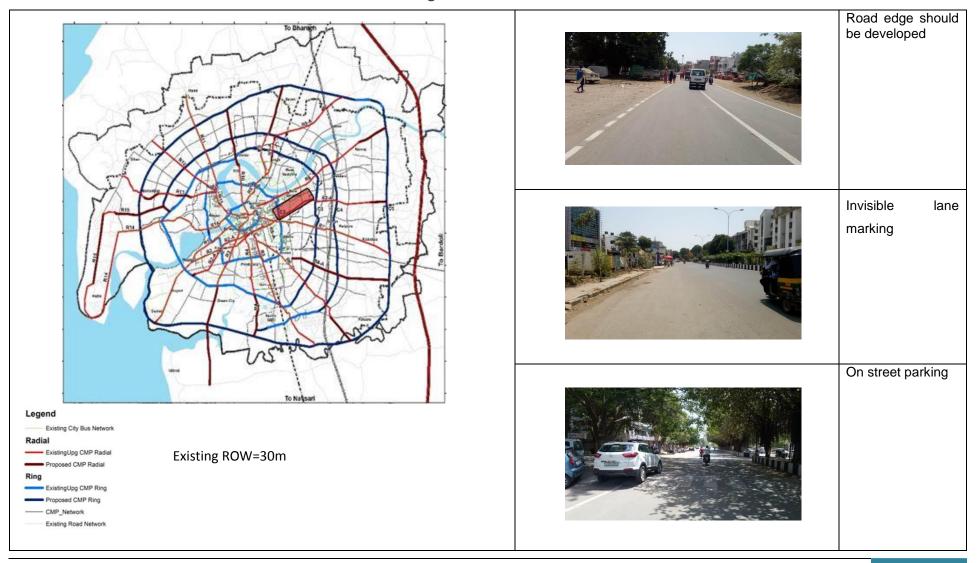
Corridor: Stretch from Sarthana Nature Park to Simada Junction



Corridor: I.R-08-Sarthana Nature Park To Simada Junction.

Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Only at some Portion lane Sepretors are Provided
2	Electrical Pole	Yes Provided	Yes Provided	on center
3	Footpath	Not Provided	Not Provided	Adequate footpath at certain locations should be provided
4	Signs	Yes Provided	Yes Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	
6	Road Markings	Yes Provided	Yes Provided	Invisible at some locations
7	Pavement Condition	Good	Good	Some Portion Bad Pavement
8	Parking	Provided	Provided	On Steet Parking
9	Bus stop	Yes Provided	Yes Provided	In Bad Condition
10	Vraj chowk junction	Yes Provided	Yes Provided	No signal, signage and Lane Marking Provided at junction

1.5 Corridor: Stretch from Sarthana Police Station to Yogi Chowk



Elements	LHS	RHS	Remarks
Median	Yes Provided	Yes Provided	
Electrical Pole	Yes Provided	Yes Provided	On Centre
Footpath	Yes Provided	Yes Provided	Maintenance required
Signs	Not Provided	Not Provided	Adequate signages at certain locations should be provided.
Signals	Yes Provided	Yes Provided	
Road Markings	Yes Provided	Yes Provided	Some Portion Invisible Lane Markings
Pavement Condition	Good	Good	Some Portion Under Constructon
Parking	Not Provided	Not Provided	On Street Parking
Bus stop	Yes Provided	Yes Provided	No Bus stop Pole Provided
	Median Electrical Pole Footpath Signs Signals Road Markings Pavement Condition Parking	Median Yes Provided Electrical Pole Yes Provided Footpath Yes Provided Signs Not Provided Signals Yes Provided Road Markings Yes Provided Pavement Good Condition Good Parking Not Provided	Median Yes Provided Yes Provided Electrical Pole Yes Provided Yes Provided Footpath Yes Provided Yes Provided Signs Not Provided Not Provided Signals Yes Provided Yes Provided Road Markings Yes Provided Yes Provided Pavement Good Good Condition Not Provided Not Provided

Corridor: Stretch from Simada Naka Char Rasta to Mota Varachha



Corridor: 1	1.R-15	Simada Naka	Char Rasta	To	Mota	Varachha
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Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	
2	Electrical Pole	Yes Provided	Yes Provided	on centre
3	Footpath	Yes Provided	Yes Provided	Some Portion in Bad Condition and not Provided
4	Signs	Not Provided	Not Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	
6	Road Markings	Yes Provided	Yes Provided	Invisible at some portion
7	Pavement Condition	Average	Average	Some Portion in Bad Condition
8	Parking	Not Provided	Not Provided	On Street Parking
9	Bus stop	Yes Provided	Yes Provided	
10	Shahjanand Chowk	Yes Provided	Yes Provided	No signal, signage and Lane Marking Provided at junction
11	Sardar chowk junction	Yes Provided	Yes Provided	No signal, signage and Lane Marking Provided at junction

Corridor: Stretch from Vanmali Junction to Maharana Pratap Garden



Corridor: 1.R-12 Vanmali Junction To Maharana Pratap Garden

Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	
2	Electrical Pole	Yes Provided	Yes Provided	On center median
3	Footpath	Yes Provided	Yes Provided	Encroachment by hawkers
4	Signs	Not Provided	Not Provided	Adequate signages at certain locations should be provided.
5	Signals	Yes Provided	Yes Provided	
6	Road Markings	Yes Provided	Yes Provided	Invisible road markings at some locations
7	Pavement Condition	Good	Good	Some Portion in Bad Condition
8	Parking	Not Provided	Not Provided	On street parking
9	Bus stop	Yes Provided	Yes Provided	City bus stops
11	Savaliya junction-1	Yes Provided	Yes Provided	No signal, signage and Lane Marking Provided at junction
12	Divine junction-2	Yes- Provided	Yes Provided	No signal, signage and Lane Marking Provided at junction
13	Tapovan junction-3	Yes Provided	Yes Provided	No signal, signage and Lane Marking Provided at junction

Corridor: Stretch from IR-01 Bhatpore Village to Hazira Highway (3.47km)

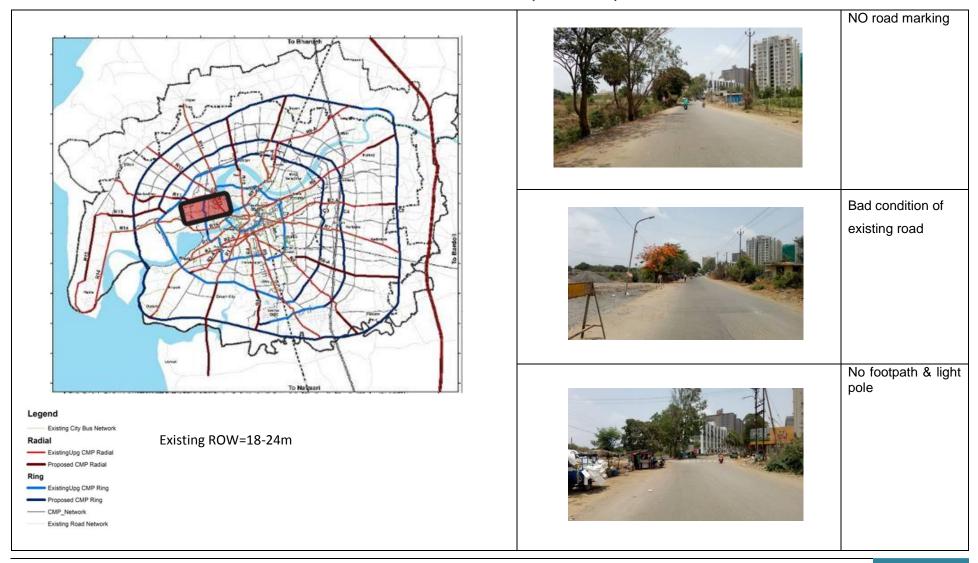


Bhatpore Village to Hazira Highway

Elements	LHS	RHS	Remarks
Median	Not Provided	Not Provided	
Electrical Pole	Not Provided	Not Provided	
Footpath	Not Provided	Not Provided	
Signs	Not Provided	Not Provided	
Signals	Not Provided	Not Provided	
Road Markings	Not Provided	Not Provided	Road markings, zebra crossing etc. are not provided
Pavement Condition	Bad	Bad	flexible pavement one lane two way without separator
Parking	Not Provided	Not Provided	
Bus stop	Not Provided	Not Provided	Marker pole
Drain	Not Provided	Not Provided	
	Median Electrical Pole Footpath Signs Signals Road Markings Pavement Condition Parking Bus stop	Median Not Provided Electrical Pole Provided Footpath Not Provided Signs Not Provided Signals Not Provided Road Markings Provided Pavement Condition Parking Not Provided Bus stop Not Provided Not Provided Not Provided Not Provided Not Provided Not Provided	MedianNot ProvidedNot ProvidedElectrical PoleNot ProvidedNot ProvidedFootpathNot ProvidedNot ProvidedSignsNot ProvidedNot ProvidedSignalsNot ProvidedNot ProvidedRoad MarkingsNot ProvidedNot ProvidedPavement ConditionBad ProvidedNot ProvidedParkingNot ProvidedNot ProvidedBus stopNot ProvidedNot ProvidedDrainNotNotNotNotNotProvidedNot

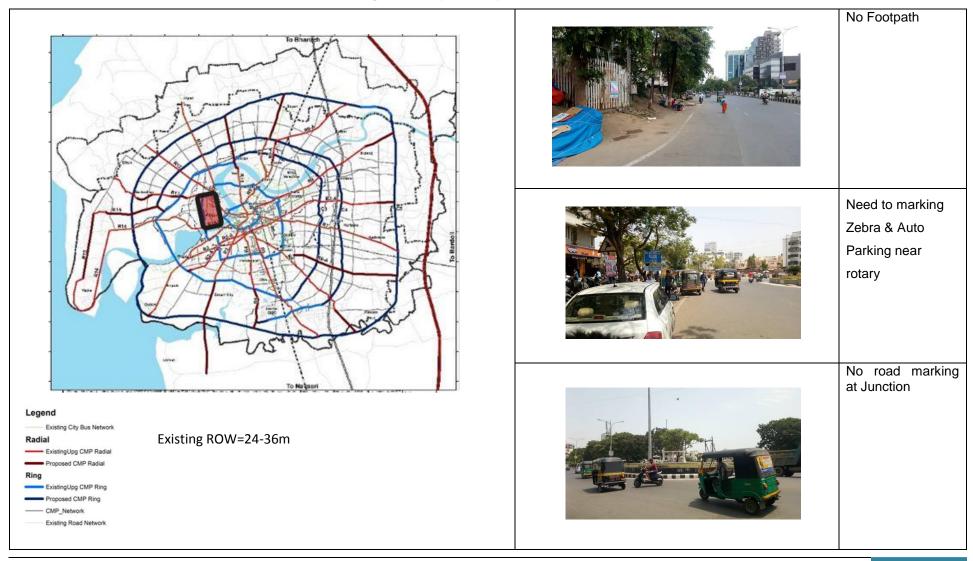
Needs to develop full ROW as per 11

Corridor: Stretch from IR-02+03 Madhuvan Junction to Bhatha Gam(2.0+0.94km)



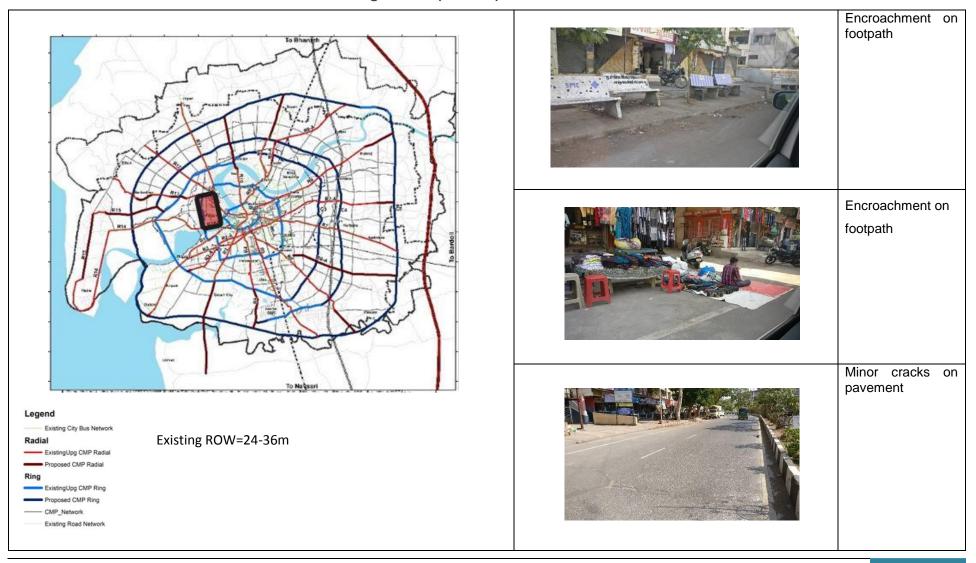
Sr.No.	Elements	LHS	RHS	Remarks				
1	Median	Yes Provided	Yes Provided	Near Bhatha gam not Provided.				
2	Electrical Pole	Yes Provided	Yes Provided	Center				
3	Footpath	Yes Provided	Yes Provided	Needs to provide Footpath after developed area of city.				
4	Signs	Not Provided.	Not Provided.	to be Provided.				
5	Signals	Not Provided.	Not Provided.	to be Provided.				
6	Road Markings	Yes Provided	Yes Provided	Some Portion not Provided and Invisible condition.				
7	Pavement Condition	Average	Average	flexible pavement 4 lane with separator, Near Bhatha gam bad condition.				
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided for some places				
9	Bus stop	Not Provided.	Not Provided.	Marker pole				
10	Drain	Yes Provided	Yes Provided					
11	Junctions							
12	Madhuvan Junction	No paveme	No pavement markings near rotary. Need to provide raised pedestrian					
13	Pratham Char Rasta	No pavemer	No pavement markings near rotary. Need to provide raised pedestrian					
14	Galaxy Junction	No pavemer	nt markings ne	ear rotary.Need to provide raised pedestrian				
15	Bagban Junction	No pavemer	nt markings ne	ear rotary. Need to provide raised pedestrian				

1.10 Corridor:: Stretch from IR-04_Star Bazar to Ugat Road (4.46 km)



Sr.No.	Elements	LHS	RHS	Remarks
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape
2	Electrical Pole	Yes Provided	Yes Provided	Provided on the Centre median
3	Footpath	Yes Provided	Partially provided	Footpath on RHS is partially provided and not properly used for pedestrian activity
4	Signs	Yes Provided	Yes Provided	
5	Signals	-	-	
6	Road Markings	Yes Provided(but invisible)	Yes Provided(but invisible)	Road markings like lane separator, zebra crossing etc. are provided but not visible.
7	Pavement Condition	Yes Provided(with minor cracks)	Yes Provided(with minor cracks)	C.C. topping is providedbut do to excessive usage it becomes slippery and also consist some minor cracks.
8	Parking	Not Provided.	Not Provided.	Adequate parking space should be provided
9	Bus stop	Existing CBS Stop	Existing CBS Stop	
10	Drain	Yes Provided but require maintenance	Yes Provided but require maintenance	Drainage Facility is provided but require periodic maintenance.
11	Junctions			
12	Palanpore jakat naka			Signals are provided but not visible due to hinderence of electric pole. Insufficient Signages. Invisible pavement markings.

1.11 Corridor:: Stretch from IR-04_Star Bazar to Ugat Road (4.46 km)



LP Savani school to Ugat char Rasta

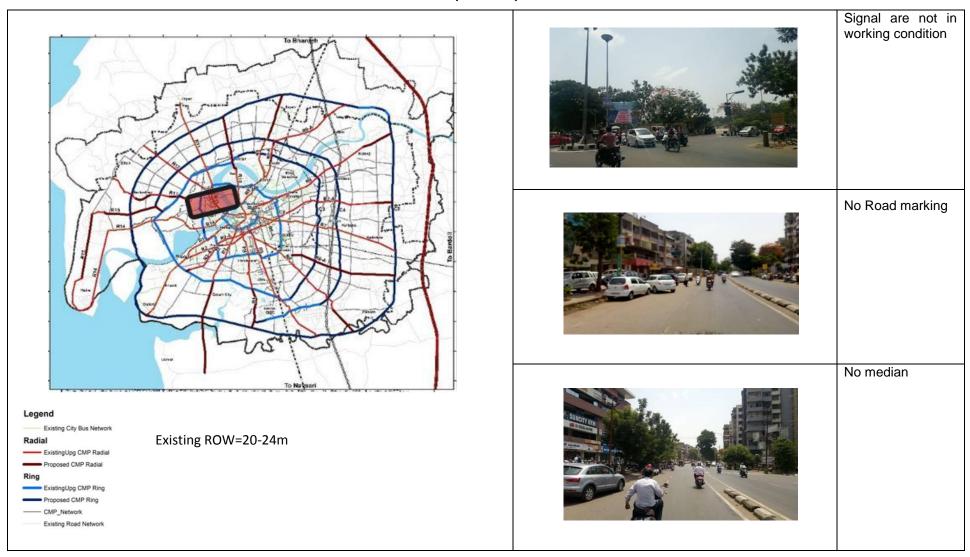
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Yes Provided	Yes Provided	Adequate median is provided with landscape	
2	Electrical Pole	Yes Provided	Yes Provided	Provided on the Centre median	
3	Footpath	Yes Provided	Partially provided	Footpath on RHS is partially provided and not properly used for pedestrian activity	
4	Signs	Yes Provided	Yes Provided		
5	Signals	-	-		
6	Road Markings	Yes Provided(but invisible)	Yes Provided(but invisible)	Road markings like lane separator, zebra crossing etc. are provided but not visible.	
7	Pavement Condition	Yes Provided(with minor cracks)	Yes Provided(with minor cracks)	C.C. topping is providedbut do to excessive usage it becomes slippery and also consist some minor cracks.	
8	Parking	Not Provided.	Not Provided.	Adequate parking space should be provided	
9	Bus stop	Existing CBS Stop	Existing CBS Stop		
10	Drain	Yes Provided but require maintenance	Yes Provided but require maintenance	Drainage Facility is provided but require periodic maintenance.	
11	Junctions				
	Palanpore jakat naka			Signals are provided but not visible due to hinderence of electric pole. Insufficient Signages. Invisible pavement markings.	

1.12 Corridor::Stretch from IR-05- PalanpurPatiya to Krishna Junction- (1.1km)



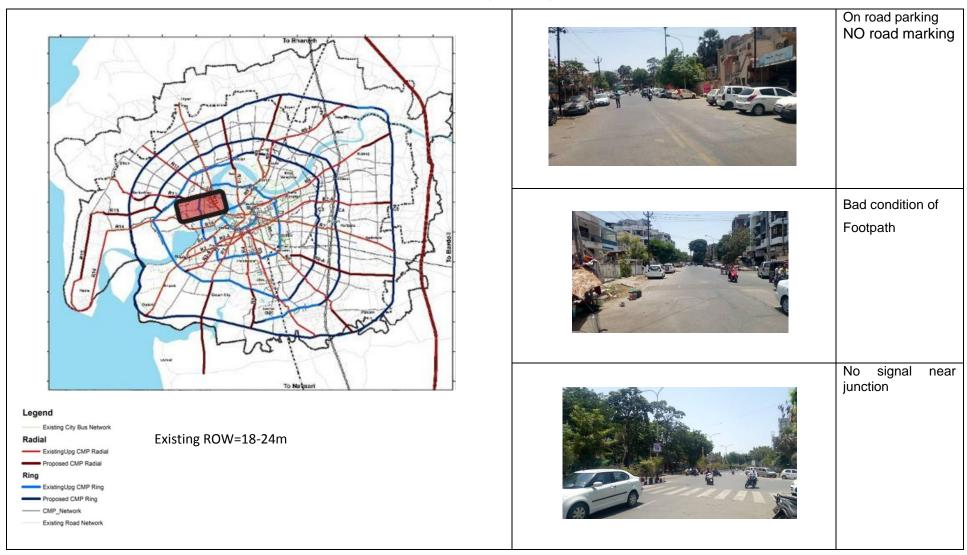
Palanp	PalanpurPatiya to Krishna Junction				
Sr.No.	Elements	LHS RHS Remarks			
1	Median	Not Provided.	Not Provided.	It is narrow road so not possible to median	
2	Electrical Pole	Yes Provided	Not Provided	Only in LHS side	
3	Footpath	Not Provided.	Not Provided.	Needs to provide Footpath, Encroachment near footpath side	
4	Signs	Not Provided.	Not Provided.	Needs to provide signages near junction	
5	Signals	Yes Provided	Yes Provided	Not in working condition	
6	Road Markings	Not Provided.	Not Provided.	Road markings like lane separator, zebra crossing etc. are provided but not visible.	
7	Pavement Condition	Average	Average	2 lane 2way flexible pavement	
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided for some places	
9	Bus stop	Not Provided.	Not Provided.	Marker pole	
10	Drain	Yes Provided	Yes Provided		
11	Junctions				
12	Vichar Kanti Junction	No signage and Lane Marking Provided at Junction			
13	Krishna Char Rasta Junction	No signage and Lane Marking Provided at Junction			

1.13 Corridor:: Stretch from IR-06 LP Savani to Prime Market (1.25 Km)



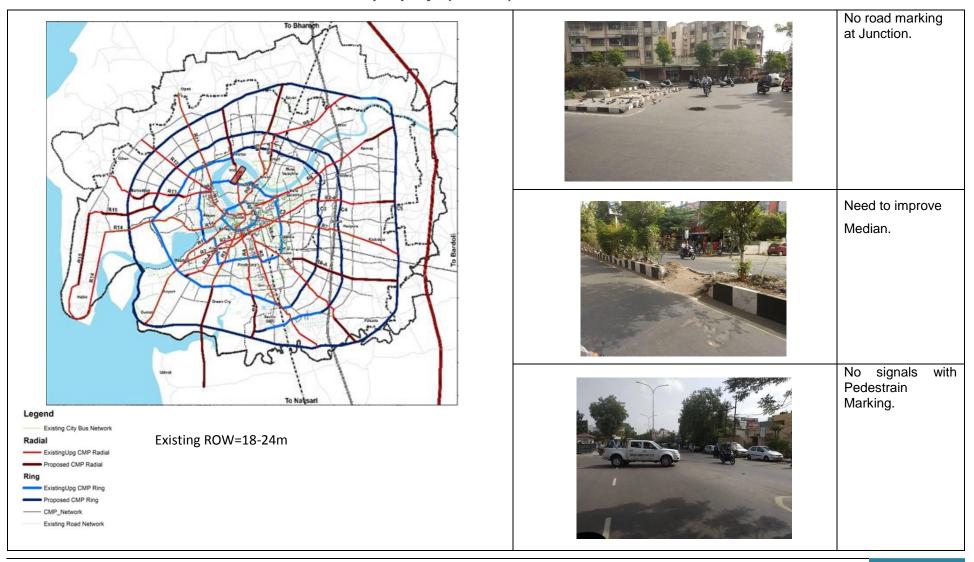
LP Sav	LP Savani to Prime Market					
Sr.No. Elements LHS R			RHS	Remarks		
1	Median	Yes Provided	Yes Provided	Needs to provide median for some missing place		
2	Electrical Pole	Yes Provided	Yes Provided	Center		
3	Footpath	Yes Provided	Partial	Needs to provide Footpath , Encroachment near footpath side		
4	Signs	Yes Provided	Yes Provided			
5	Signals	Yes Provided	Yes Provided	Not in working condition		
6	Road Markings	Yes Provided	Yes Provided	Road markings, zebra crossing etc. are provided but not visible.		
7	Pavement Condition	Good	Good	flexible pavement 4 lane with separator		
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided for some places		
9	Bus stop	Not Provided.	Not Provided.	Marker pole		
10	Drain	Yes Provided	Yes Provided			
11	Junctions					
	Surbhi dairy Char rasta	Signals are not in working condition				

1.14 Corridor:: Stretch from IR-07 TGB circle to Anand Mahal road (1.11 km)



TGB ci	GB circle to Anand Mahal road					
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	There is no median between Anand Mahal road to Mahalaxmi road		
2	Electrical Pole	Yes Provided	Yes Provided	Center		
3	Footpath	Yes Provided	Yes Provided	Needs to provide Footpath for some missing place.		
4	Signs	Yes Provided	Yes Provide			
5	Signals	Not Provided.	Not Provided.	to be Provided.		
6	Road Markings	Not Provided.	Not Provided.	Some Portion not Provided and Invisible condition.		
7	Pavement Condition	Good	Good	flexible pavement 4 lane with Median,		
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided for some places		
9	Bus stop	Yes Yes Marker pole Provided Provided		Marker pole		
10	Drain	Yes Provided	Yes Provided			
11	Junctions					
12	Julelal Junction	No pavement markings near rotary. Need to provide raised pedestrian				
13	Mahalaxmi Char Rasta	No pavement markings near rotary. Need to provide raised pedestrian ,rotary in good condition.				
14	TGB Junction	No pavement markings near rotary.				

1.15 Corridor: Stretch from IR-08_D- mart to Palanpur patiya (1.83 Km)



Corrid	or: D- mart to Palanpur լ	patiya						
Sr.No.	Elements	LHS	RHS	Remarks				
1	Median	Yes Provided	Yes Provided					
2	Electrical Pole	Yes Provided	Yes Provided	Centre				
3	Footpath	Yes Provided	Yes Provided	Beautification of footpath work in progress				
4	Signs	Yes Provided	Yes Provided	provide signs near junction, traffic signage like "speed limit", "Turn left or right", direction signages				
5	Signals	Yes Provided	Yes Provided	Needs to Install at jun.				
6	Road Markings	Yes Provided	Yes Provided	Partial				
7	Pavement Condition	Good Condition	Good Condition	4 lane flexible pavement				
8	Parking	Yes Provided	Yes Provided	Two wheeler parking provided by SMC on road				
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided , Ramp of Bus stop are not match with footpath				
10	Drainage	Yes Provided	Yes Provided					
11	Junctions							
	D-mart (T-Junction)	Needs to improve rotary for Bus movement						
	Chhatrapati Shivaji circle	Lane marking are not visible						
	Gangeshwar Mahadev (T-Jn)	Needs to Provide signal, road marking						
	Jn @ 7seas	Existing Rotary ,No lane marking ,No signages						
	Honey park char Rasta	Needs to Provide signal, road marking						

1.16 Corridor: Stretch from IR-09 Anand Mahal road (2.17 km)



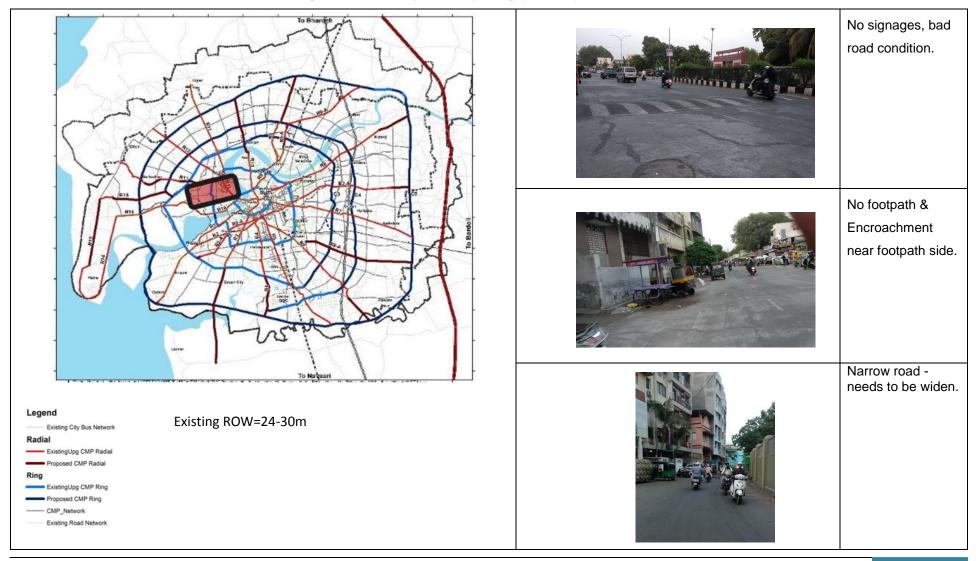
Anand	Mahal road							
Sr.No.	Elements	LHS	RHS	Remarks				
1	Median	Yes Provided	Yes Provided					
2	Electrical Pole	Yes Provided	Yes Provided	Centre				
3	Footpath	Yes Provided	Yes Provided	Beautification of footpath work in progress				
4	Signs	Yes Provided	Yes Provided	provide signs near junction, traffic signage like "speed limit", "Turn left or right", direction signages				
5	Signals	Yes Provided	Yes Provided	Needs to Install at jun.				
6	Road Markings	Yes Provided	Yes Provided	Partial				
7	Pavement Condition	Good Condition	Good Condition	4 lane flexible pavement				
8	Parking	Yes Provided	Yes Provided	Two wheeler parking provided by SMC on road				
9	Bus stop	Yes Provided	Yes Provided	City bus stop provided, Ramp of Bus stop are not match with footpath				
10	Drainage	Yes Provided	Yes Provided	•				
11	Junctions							
	Shreeji arced(T-Jn)	Close , wrong side traffic						
	Varun kidny hospital circle	Needs to improve rotary for Bus movement						
	Presidency circle	Existing Rotary ,No lane marking						
	Prime arcade -T junction	Needs to Provide signal, road marking						
	Palanpore Patiya cross road	Existing Rotary ,No lane marking						

1.17 Corridor: Stretch from IR-11 Tadwadi to New Rander Road (1.1km)



Tadwadi to New Rander Road						
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	In good condition.		
2	Electrical Pole	Not Provided	Yes Provided	Center		
3	Footpath	Yes Provided .	Yes Provided .	Needs to provide Footpath for some missing portion		
4	Signs	Not Provided.	Not Provided.	to be Provided.		
5	Signals	Not Provided.	Not Provided.	to be Provided.		
6	Road Markings	Not Provided.	Not Provided.	Some Portion not Provided and Invisible condition.		
7	Pavement Condition	Good	Good	flexible pavement 4 lane with separator		
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided for some places		
9	Bus stop	Not Provided.	Not Provided.			
10	Drain	Yes Provided	Yes Provided			

1.18 Corridor: Stretch from IR-12 Ramnagar BRTS to Arya Samaj Marg (0.61km)



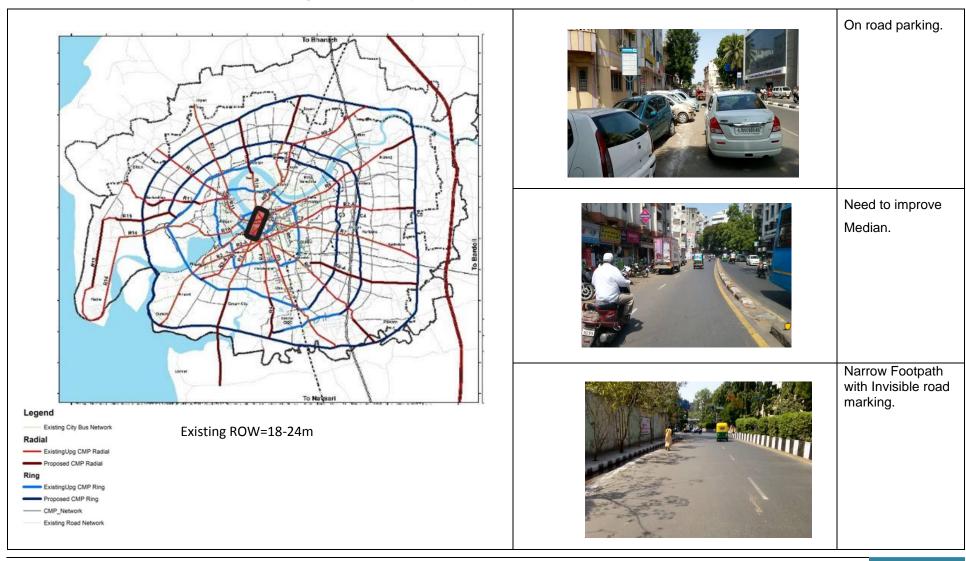
Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Not Provided.	Not Provided.	there is median for some portion	
2	Electrical Pole	Yes Provided	Yes Provided	Center	
3	Footpath	Not Provided.	Not Provided.	Needs to provide Footpath after developed area of city.	
4	Signs	Not Provided.	Not Provided.	To be Provided.	
5	Signals	Not Provided.	Not Provided.	To be Provided.	
6	Road Markings	Not Provided.	Not Provided.	Some Portion not Provided and Invisible condition.	
7	Pavement Condition	Average	Average	Flexible pavement 4 lane with separator for First 200mtr, Two way single lane after some portion.	
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided for some places	
9	Bus stop	Not Provided.	Not Provided.		
10	Drain	Yes Provided	Yes Provided		
11	Junctions				
12	PiparDiwali school T-Jn	No pavement markings near rotary. Need to provide zebra marking, Provide traffic signage ,Provide sign			
13	Aryasamaj marg rotary	No pavement markings near rotary. Need to provide raised pedestrian			

1.19 Corridor: Stretch from IR-01 Athwa gate to Machhiwadi road (1.0km)



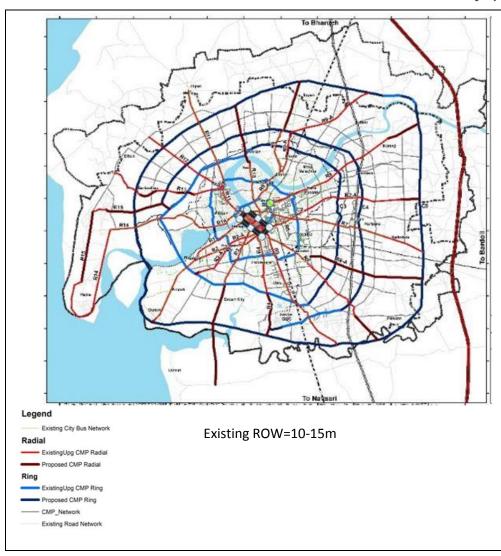
Sr.No.	No. Elements LHS F		RHS	Remarks	
1	Median	Yes Provided	Yes Provided	Not in good condition for some places	
2	Electrical Pole	Yes Provided	Yes Provided	Center	
3	Footpath	Yes Provided .	Yes Provided	Encroachment on footpath.	
4	Signs	Not Provided.	Not Provided.	to be Provided.	
5	Signals	Yes Provided.	Yes Provided.		
6	Road Markings	Yes Provided	Yes Provided	But not in visible condition.	
7	Pavement Condition	Average	Average		
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided for some places.	
9	Bus stop	Yes Provided.	Yes Provided.	City bus stop provided.	
10	Drain	Yes Provided	Yes Provided		
11	Junctions				
12	Kevat circle junction	Yes Provided. Yes	Provided. Some p	ortion not working Signal on Junction.	

1.20 Corridor: Stretch from IR-03 Athwa gate to Chowk (1.19km)



Athwa gate to Chowk						
Sr.No.	Elements	LHS	RHS	Remarks		
1	Median	Yes Provided	Yes Provided	Not in good condition for some places		
2	Electrical Pole	Yes Provided	Yes Provided	Center		
3	Footpath	Yes Provided	Yes Provided	Encroachment on footpath.		
4	Signs	Not Provided.	Not Provided.	To be Provided.		
5	Signals	Not Provided.	Not Provided.	To be Provided.		
6	Road Markings	Yes Provided	Yes Provided	But not in visible condition.		
7	Pavement Condition	Good	Good			
8	Parking	Not Provided.	Not Provided.	On road parking / Adequate parking space provided to some places.		
9	Bus stop	Yes Provided.	Yes Provided.	City bus stop provided.		
10	Drain	Yes Provided	Yes Provided			
11	Junctions					
12	Makai Bridge junction	. Not provided Signal on Junction. No marking near rotary				

1.21 Corridor: Stretch from IR-04 Navsari Bazar to Udhana Darwaja (0.79km)





No footpath & Encroachment near Uthana Jn.



No signage board & Signal not in working condition.



Narrow road needs to be widen.

Sr.No.	Elements	LHS	RHS	Remarks	
1	Median	Not Provided	Not Provided	Narrow road.	
2	Electrical Pole	Not Provided	Yes Provided	One side	
3	Footpath	Not Provided	Not Provided	Needs to provide Footpath.	
4	Signs	Not Provided.	Not Provided.	To be Provided.	
5	Signals	Not Provided.	Not Provided.	To be Provided.	
6	Road Markings	Not Provided	Not Provided	Some Portion not Provided and Invisible condition.	
7	Pavement Condition	Average	Average	Flexible pavement, two way two lane without separate	
8	Parking	Not Provided.	Not Provided.		
9	Bus stop	Not Provided.	Not Provided.	Marker pole	
10	Drain	Yes Provided	Yes Provided		
11	Junctions				
12	Sangrampura junction No pavement markings. No Signal, no signage, no zebra cross			ue, no zebra crossina	

Annexure 5: Summary of the Existing Road network

On site surveys of roads were done within the SMC boundary of the study area. Within this survey major roads covered are Rings, Radials and City Bus Networks. The purpose of the survey was to cite issues in the existing road networks which would give an insight in the future proposals. Primary surveys were carried out on specific locations by mapping the overall observations in a matrix and snapshotting the features found at the respective locations surveyed. Based on the survey, a set issues were extracted and identified to be mapped.

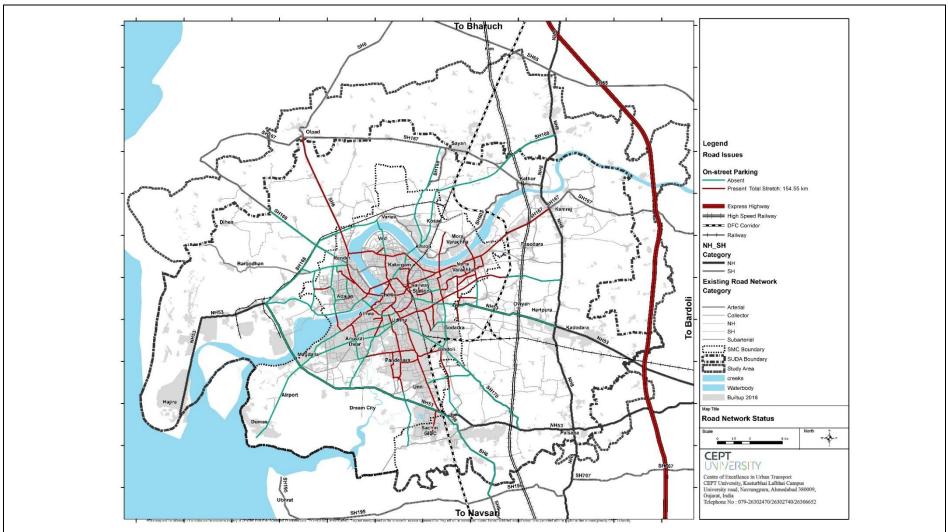
The major issues identified on the surveyed roads are on-street parking, pavement condition, signages, street vending and tree cover. These issues were mapped exclusively in order to understand the respective problem areas and intervene accordingly. The outcome of the survey allowed to have a total length of stretch with the specific issues as per the type of roads that were surveyed i.e. Rings, Radials and City Bus Networks as seen in the Table.

As observed in Map 1, on-street parking is found on majority of the roads within the SMC boundary constituting a total stretch of 154.55 km facing the issue. The pavement condition was surveyed on the basis of type of material used for the pavement of roads and if the condition was good or not as per type. The total stretch comprising a bad pavement condition is a total of 134.33 km as shown in Map 2. If we look at the presence of signages on the surveyed roads, there are some particular stretches where signages are absent as mapped in Map 3. Street vending is found on a total stretch of 42.35 km in the surveyed area as seen in Map 15. Out of the total surveyed area, a total stretch of 152.46 km is devoid of tree coverage and needs intervention.

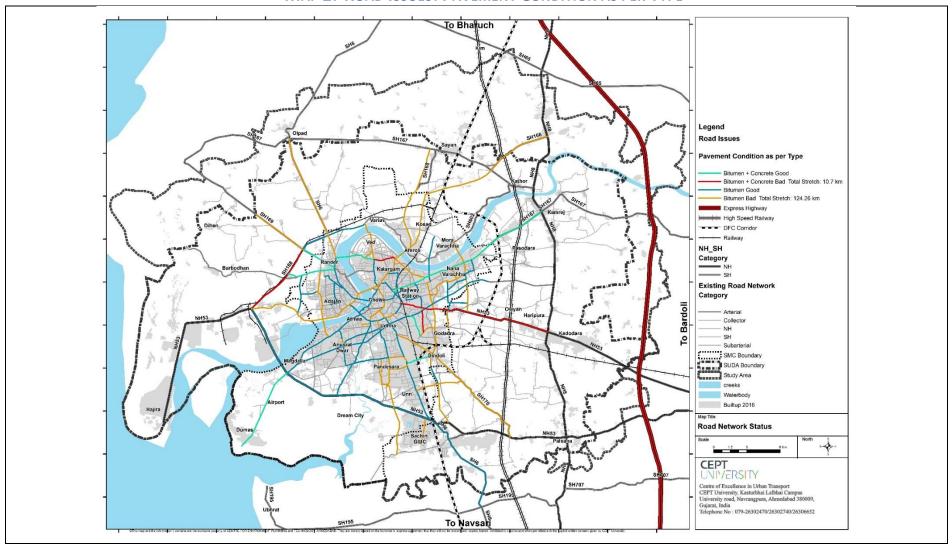
TABLE 1: SUMMARY TABLE OF ISSUES IDENTIFIED ON TOTAL KM OF ROAD NETWORK

Sr. No.	Road	Total Length (km)	On Street Parking Length (km)	Invisible/No Lane Marking Length (km)	Street Vending Length (km)	Pavement Condition Length (km)	Tree Coverage Length (km)
1	Rings	176.7	21.9	60.1	7.55	17.6	9.1
2	Radials	314.95	49.9	190.05	22.9	46.1	41.3
3	City Bus Roads	278.95	82.75	255.11	11.9	71.26	102.06
	Total	770.6	154.55	505.26	42.35	134.96	152.46

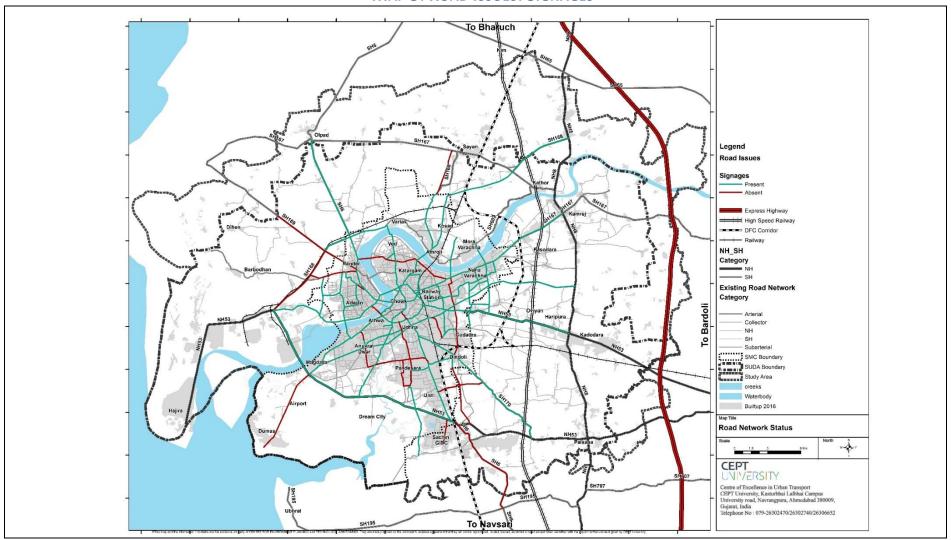
MAP 1: ROAD ISSUES: ON-STREET PARKING



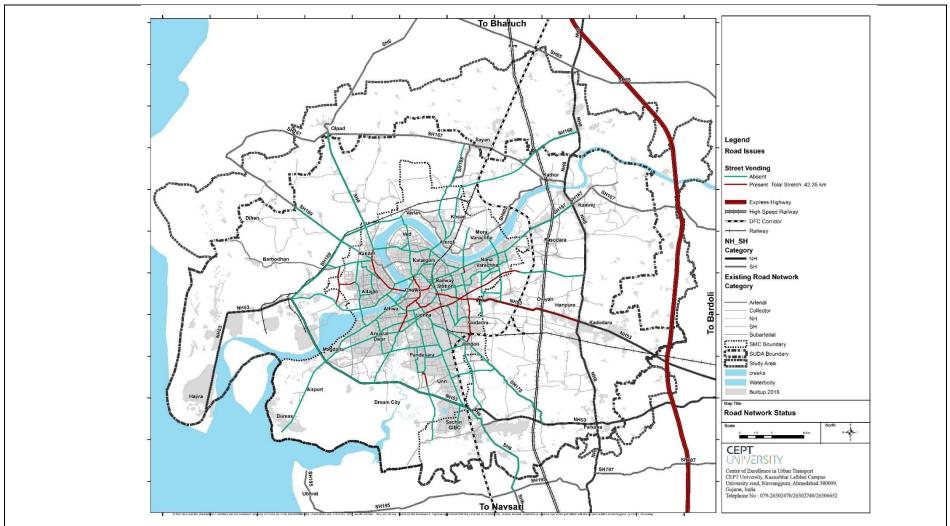




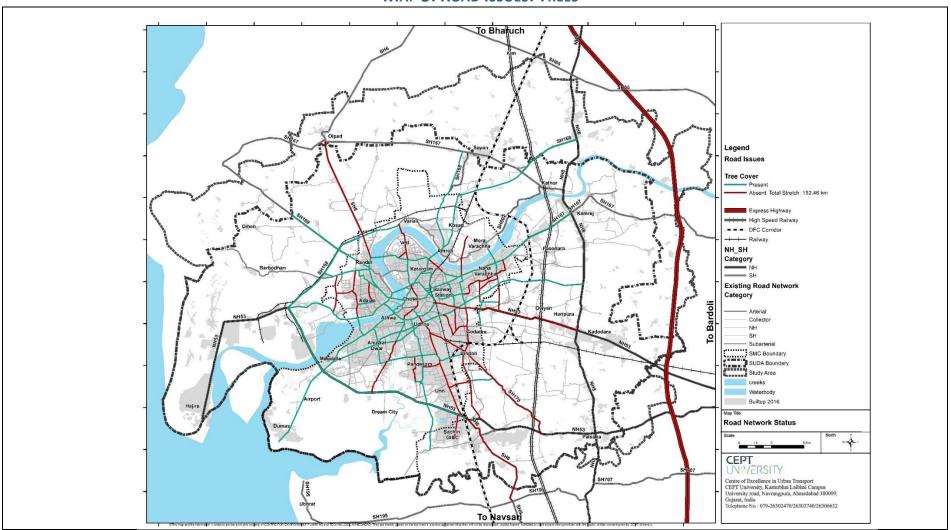
MAP 3: ROAD ISSUES: SIGNAGES



MAP 4: ROAD ISSUES: STREET VENDING



MAP 5: ROAD ISSUES: TREES





Technical Support:

