


FOR DISCUSSION



**AHMEDABAD  
BUS RAPID TRANSIT SYSTEM  
(ART)**

**WORKING PAPER - 6  
LAND USE RESTRUCTURING**

FEBRUARY 2006

Gujarat Infrastructure Development Board (GIDB)

Ahmedabad Municipal Corporation (AMC)

Ahmedabad Urban Development Authority (AUDA)

Centre for Environmental Planning & Technology University,  
Ahmedabad

## **AHMEDABAD bus RAPID TRANSIT SYSTEM (ART)**

*“Buses, More Buses, Better Buses”*

*The present initiative of Gujarat Infrastructure Development Board (GIDB), Government of Gujarat, in collaboration with Ahmedabad Municipal Corporation (AMC) and Ahmedabad Urban Development Authority (AUDA), to develop BRTS is in recognition of the fact that no single mode will completely serve the accessibility and mobility needs of the city, and the bus system, both in its basic form (regular bus) and rapid form (Bus Rapid Transit System), makes it a critical and major component in an integrated transit system of any mega city.*



## **Steering Committee**

The Bus Rapid Transit Project for Ahmedabad city has been guided by the steering committee chaired by Shri. K. Kailashnathan, (I.A.S), Secretary, Urban Development and Urban Housing Department, Government of Gujarat.

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**Mr. Anil Mukim**

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*Managing Director, Gujarat Urban Development Company (GUDC)*

## Preface

BRTS consists of several components designed to function together so as to generate superior services, which are comparable with other mass rapid transit system including metro rail system. Some or all of these elements are integrated to form BRTS, which will ensure fast, reliable, secure, high capacity service, which also has a distinct identity.

### Elements of BRT

CHARACTERISTICS	System Performance				
	Travel Time Savings	Reliability	Identity and Image	Safety and Security	Capacity
<b>RUNNING WAY</b>					
Running Way Segregation	•	•	•	•	•
Running Way Marking			•		
Running Way Guidance	•		•	•	
<b>STATIONS</b>					
Station Type	•		•	•	•
Platform Height	•	•	•	•	•
Platform Layout	•	•			•
Passing Capability	•	•			•
Station Access			•	•	
<b>VEHICLES</b>					
Vehicular Configurations	•	•	•	•	•
Aesthetic Enhancement			•	•	
Passenger Circulation Enhancement	•	•	•	•	•
Propulsion Systems	•		•		
<b>FARE COLLECTION</b>					
Fare Collection Process	•	•	•		•
Fare Transaction Media	•	•	•	•	•
Fare Structure	•		•		•
<b>INTELLIGENT TRANSPORTATION SYSTEMS</b>					
Vehicle Prioritization	•	•	•		•
Driver Assist & Automation Technology	•	•	•	•	•
Operations Management	•	•		•	•
Passenger Information	•	•	•	•	
Safety and Security Technology				•	
Support Technologies					•
<b>SERVICE &amp; OPERATING PLANS</b>					
Route Lengths		•			
Route Structure	•		•		
Span of Service		•			
Frequency of Service	•	•		•	•
Station Spacing	•	•			

The system being planned in Ahmedabad will have most of these components. While planning for the system, several issues have to be addressed. These may be with regard to the advantages of inclusion of a component, the way to include the component in terms of its type, magnitude or quality etc., It is necessary that these issues are addressed both at the general principal level as well as at the specific design level for Ahmedabad.

As the BRTS concept for Ahmedabad is being developed, for better decisions a wider debate within the planning and design team as well as with the professional circle is necessary. Wider information dissemination is also required. To facilitate this, a series of working papers have been planned.

We would like to thank Lea Associates South Asia Ltd., New Delhi our partners in planning and design of the project. ITDP New York is providing technical support to CEPT in preparation of BRTS project. We express our gratitude to Mr. Walter Hook, Ms. Shreya Gadepalli and their colleagues.

**Prof. H.M. Shivanand Swamy**  
Team Leader

# Working Paper on Land Use Restructuring

## Table of Contents

1.	BACKGROUND.....	2
2.	LAND USE STATUS OF IMMEDIATE TRANSIT INFLUENCE ZONE.....	2
3.	LAND AMENABLE FOR DEVELOPMENT AND REDEVELOPMENT .....	6
3.1.	POTENTIAL FOR DEVELOPMENT AND REDEVELOPMENT IN TERMS OF SIZE AND TYPE OF BUILDINGS .....	10
3.2	VARYING USAGE OF FSI IN DIFFERENT AREAS .....	11
3.2	VARYING USAGE OF FSI IN DIFFERENT AREAS .....	12
3.3	ASSESSMENT OF THE USES AND USERS FOR ADDITIONAL AREA GENERATED .....	15
3.4	LAND PRICES.....	15
3.5	LAND DEVELOPMENT OPTIONS AND ASSUMPTIONS .....	16
4.	LAND USE RESTRUCTURING: .....	17
4.1	RESIDENTIAL LAND USE .....	17
4.2	COMMERCIAL DEVELOPMENT/EMPLOYMENT GENERATION .....	18
4.3	PROPOSED LAND USE RESTRUCTURING .....	20
5.	IMPACTS OF LAND USE RESTRUCTURING: .....	22
5.1	TRAFFIC .....	22
5.2	IMPACTS ON SUPPORTING INFRASTRUCTURE .....	24
	ANNEXURES .....	25
	Annexure 1-Impact Fees Regulations .....	26
	Annexure 2-Development Control Regulations .....	28
	Annexure 3-Projections for Land Use Restructuring.....	30
	Annexure 4-Impacts of Intensification of Land Use.....	31

# **1. BACKGROUND**

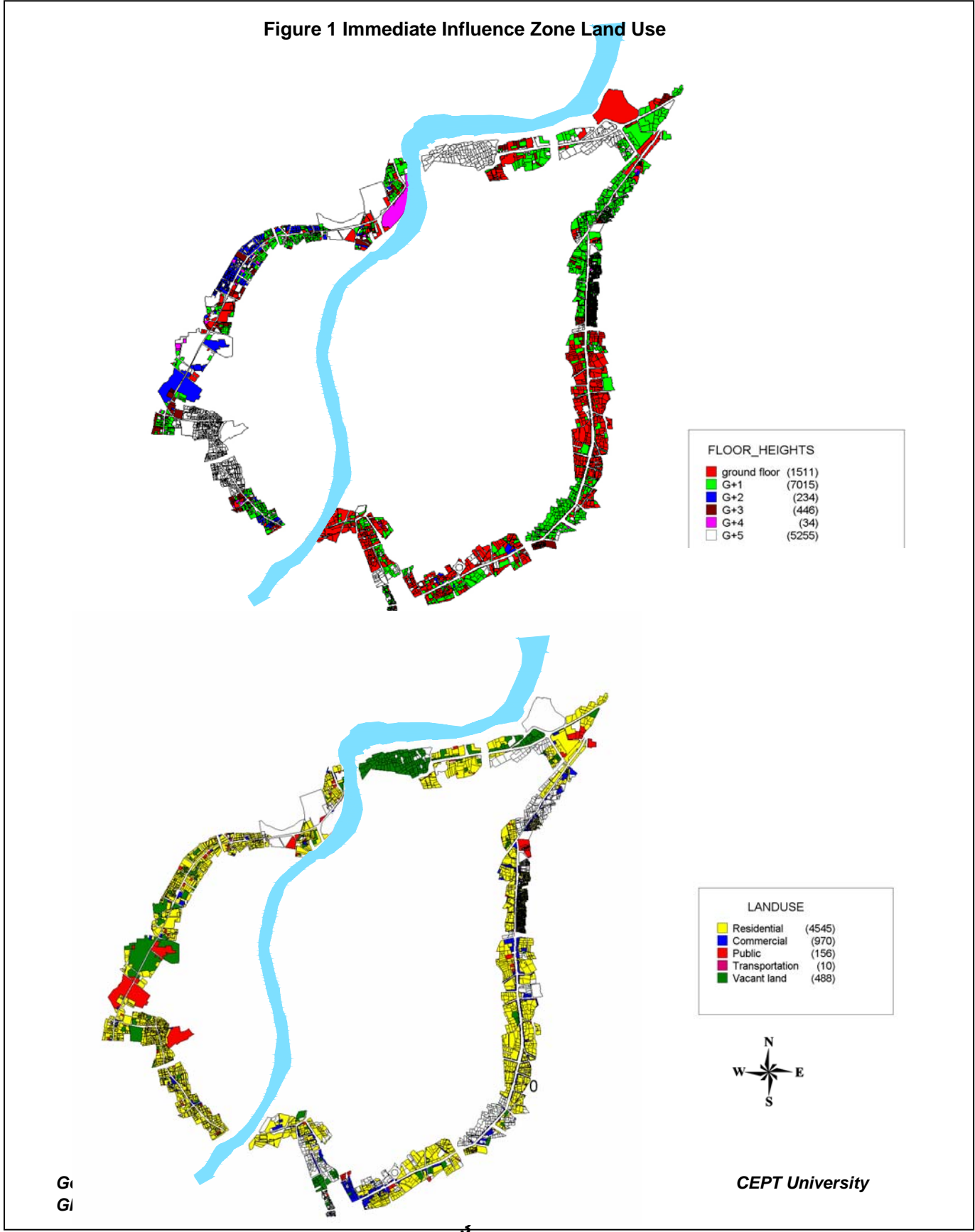
Public transit is a practical means to access employment, education and public services, therefore the land use can be enhanced such that its restructuring to an extent brings about changes in the sprawl of population and the mobility needs of the people are served. In the process there is also scope for rationalizing the land use and improving living environment. Community benefits could be optimized in terms of improvement of landscaping, infrastructure and environment.

This paper deals with restructuring of land use confined to the immediate boundaries of the BRTS Corridor. The study focuses on the market demand and the technical and social acceptability.

# **2. LAND USE STATUS OF IMMEDIATE TRANSIT INFLUENCE ZONE**

Public transit impact would be significantly higher in the walking distance zone of transit routes. A distance of 500 meters is generally taken as Traffic Influence Zone. Within this zone the areas closer to the road are likely to experience higher level of impact, as the accessibility changes would be more favourable. Hence a zone extending along the Rapid Transit Corridor extending to 250 meters on either side or the nearest road, whichever is farther has been taken as Immediate Transit Influence Zone. Near junctions, the influence is expected to extend longer. Hence a distance of 500 mts along the roads meeting the corridor has been taken as Immediate Transit Influence. The Corridor, its immediate influence zone, land uses and the intensity of use in this area are marked below.

Figure 1 Immediate Influence Zone Land Use



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Figure 2 Immediate Influence Zone Land Use (Inner Link)

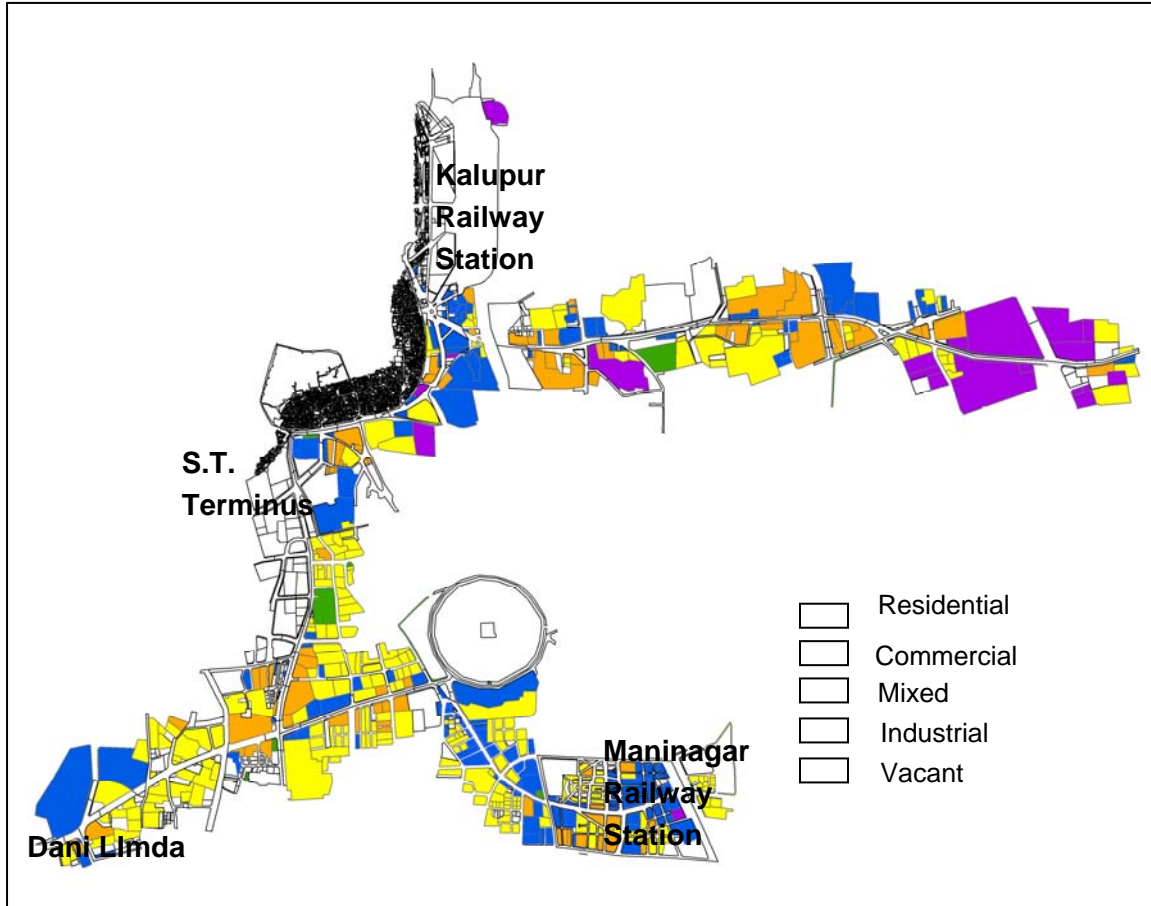


Table 1 Existing Land Use (Area in sq.kms)

Links	Residential	Commercial	Public	Ind.	Vacant	Total
Chandranagar - Shivranjani	3.96	0.091	0.351	-	0.261	4.663
Shivranjani - Helmet Junction	1.316	0.009	0.727	-	0.899	2.951
Helmet Junction - Akhbarnagar	6.50	0.063	0.156	-	0.461	7.51
Akhbarnagar - Sabarmati (New Bridge Alignment)	10.137	0.484	2.589	0.504	2.373	16.087
New Bridge - Naroda-Himmatnagar Highway Intersection	4.56	0.027	0.148	0.057	1.563	6.355
Naroda-Himmatnagar Highway Intersection-Soni ni Chali	8.801	1.006	0.792	0.292	0.715	11.606
Soni Ni Chali-C.T.M Crossroads	2.78	0.107	0.001	0.027	0.002	2.917
C.T.M. Crossroads-Dani Limda Bridge	5.30	0.572	0.0958	0.416	0.658	7.0418
<b>Total</b>	<b>43.354</b>	<b>2.359</b>	<b>4.859</b>	<b>1.296</b>	<b>6.932</b>	<b>58.8</b>

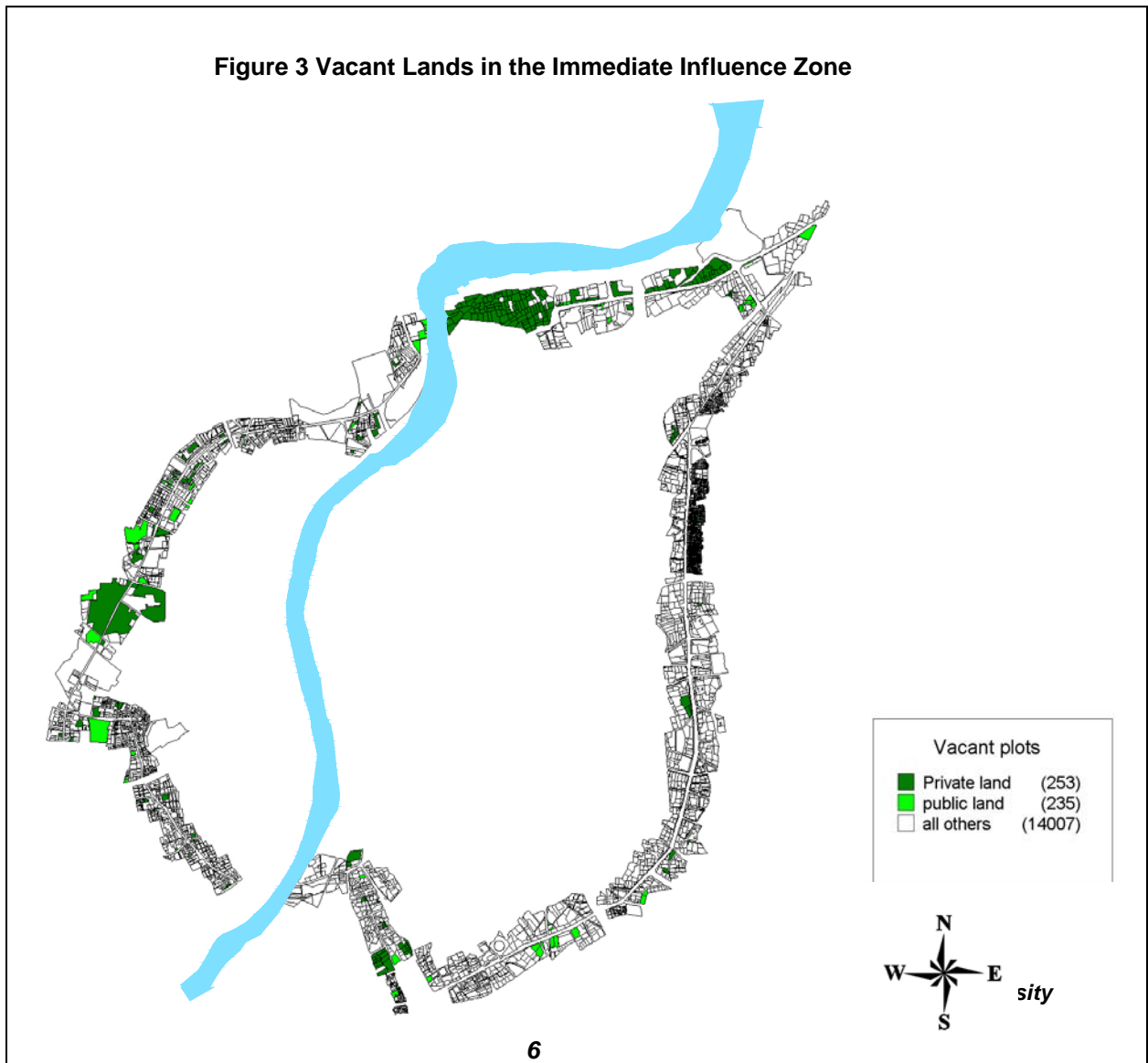
Table: Land Use of inner link (Dani Limda-Maninagar Station, Dani Limda-Kalupur Station and Sarangpur Bridge-Soni ni Chali)

Sr.No.	Type of Landuse	Area (sq.kms)
1	Residential	1.23
2	Commercial	0.81
3	Mixed	0.56
4	Industrial	0.44
5	Vacant	0.07
6	Others	2.76
	<b>Total</b>	<b>5.88</b>

### 3. LAND AMENABLE FOR DEVELOPMENT AND REDEVELOPMENT

The vacant land and the area under slums, which are in the immediate corridor influence zone, are likely to be influenced by road and transit development. They are likely under go development pressure in the immediate future. Giving extra FSI for new construction undertaken can intensify the land use in the catchments area of the corridor. The land occupied by slums under private ownership is 1.34 sq. km whereas under government ownership is 0.54 sq km. The vacant land owned by government is 5.92 sq. km whereas 0.77 sq. km land is privately owned. The total land, which is amenable for development and redevelopment, is 13.47 sq.km. Areas of GHB have been developed as housing colonies and hence may not be readily amenable for redevelopment.

Figure 3 Vacant Lands in the Immediate Influence Zone



**Table 2 Vacant Land and Slums in the Immediate Influence Zone**

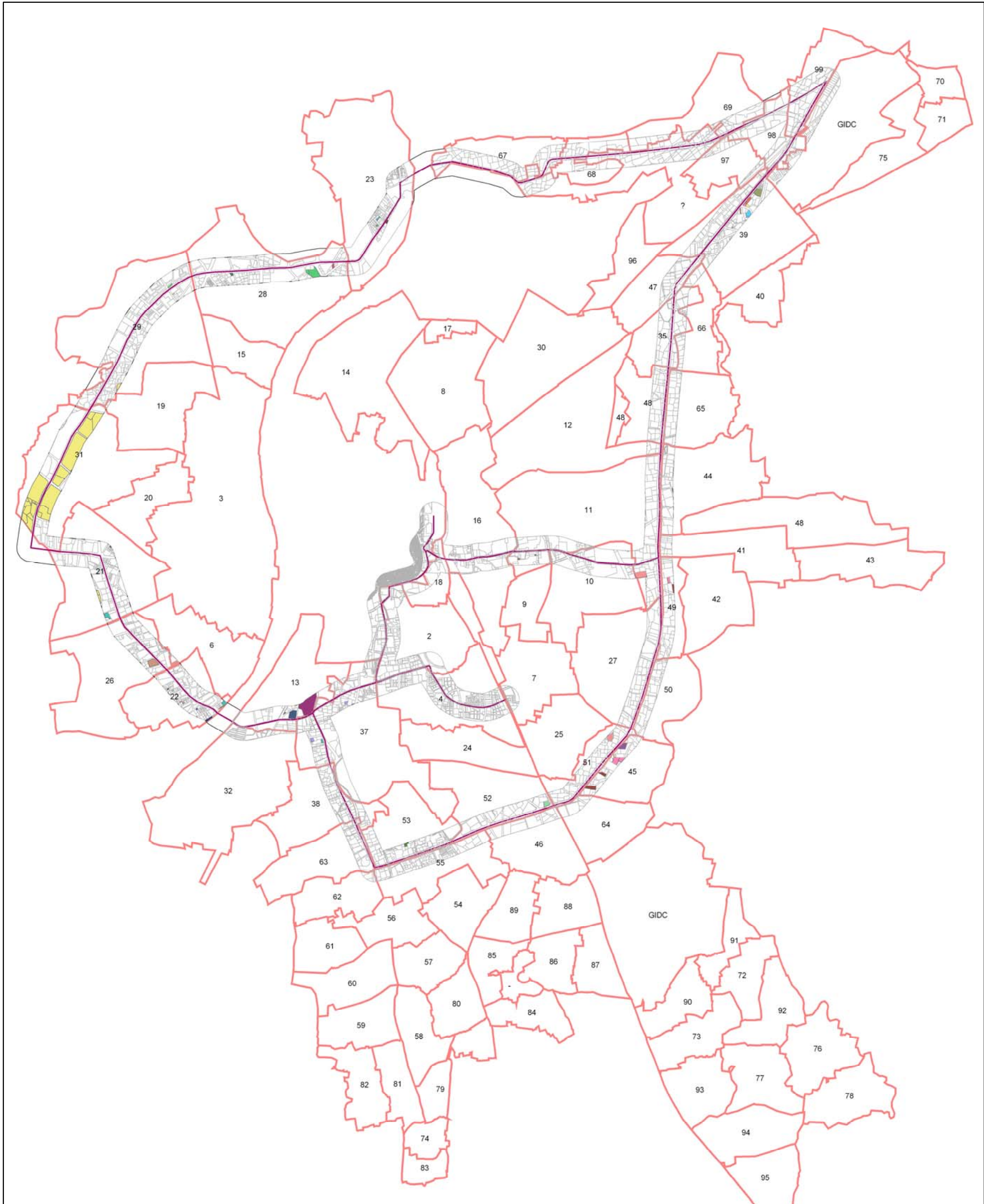
Links	Slums (sq.kms)	Vacant Government owned (sq.kms)	Vacant (Privately Owned) (sq.kms)
Chandranagar – Shivranjani	0.063	0.162	0.099
Shivranjani - Helmet Junction	0.006	0.820	0.078
Helmet Junction – Akhbarnagar	0.492	0.263	0.197
Akhbarnagar - Sabarmati (New Bridge Alignment)	2.694	2.265	0.107
New Bridge – Naroda-Himmatnagar Highway Intersection	0.183	1.449	0.114
Naroda-Himmatnagar Highway Intersection-Soni Ni Chali	2.472	0.706	0.008
Soni Ni Chali-C.T.M Crossroads	0.179	0.001	-
C.T.M. Crossroads-Dani Limda Bridge	0.801	0.253	0.163
<b>Total</b>	<b>6.89</b>	<b>5.919</b>	<b>0.766</b>

**Table 3 Government Owned Land reserved for various purposes within 500m of the corridor**

<b>Sr.No.</b>	<b>Purpose</b>	<b>T.P.Scheme No.</b>	<b>Area (sq.m)</b>
<b>1</b>	<b>Residential</b>		<b>54151.33</b>
	GHB	11,29,51	35105.24
	Residential for Sale	44	1605.74
	SEBC Housing	39	17440.36
<b>2</b>	<b>Public</b>		<b>1767854.10</b>
	Cattle Bazar	13	18627.24
	Civic Centre	29	2214.15
	Community Hall cum social centre	29	446.69
	Education	31,39	1534429.73
	Epedemic Hospital	13	311.62
	Garden	22,39,45,49	28398.05
	Grave Yard	13	70794.19
	Health & Recreation Centre	13	0.93
	Health Centre	37	6897.99
	Market	22,39,27	20055.75
	Neighbourhood and Civic Centre	52	8168.43
	Open land	39	8227.86
	Playground	11	2082.12
	Public Purpose	45	2107.94
	Recreation Ground	21	50.33
	School	21	2458.55
	School & Playground	29	1201.82
	Shopping Centre	39	9215.02
	Social Centre	21,29,31	30133.90
	Trade Centre	45,49	22031.78
<b>3</b>	<b>Government</b>		<b>12852.61</b>
	AMC	29	1012.37
	GOG	29	5772.30
	Government	53	3556.00
	Collector	21,39	2511.95
<b>4</b>	<b>Utilities</b>		<b>35372.01</b>
	Bus Terminus	31	2872.44
	Electric Sub Station	29	18394.58
	Ex. Engineer (R&B)	45	12524.35
	Muster Station	13	1505.09
	Tube well Station	21	75.55
	<b>Total</b>		<b>1870230.05</b>

**Total land owned by government within 250 m both sides of the corridor is 1.87sq kms.**

Map 1: Land along the corridor reserved by AMC for various purpose



AMC	Epidemic Hospital	Health Centre	Residential for Sale
Bus Terminus	Ex. Engineer (R&B)	Market	SEBC Housing
Cattle Bazar	GHB	Muster Station	School
Civic Centre	GOG	Neighbourhood and Civic Centre	School & Playground
Collector	Garden	Open land	Shopping Centre
Community Hall cum social centre	Government	Playground	Social Centre
Education	Grave Yard	Public Purpose	Trade Centre
Electric Sub Station	Health & Recreation Centre	Recreation Ground	Tube well Station

## 3.1. POTENTIAL FOR DEVELOPMENT AND REDEVELOPMENT IN TERMS OF SIZE AND TYPE OF BUILDINGS

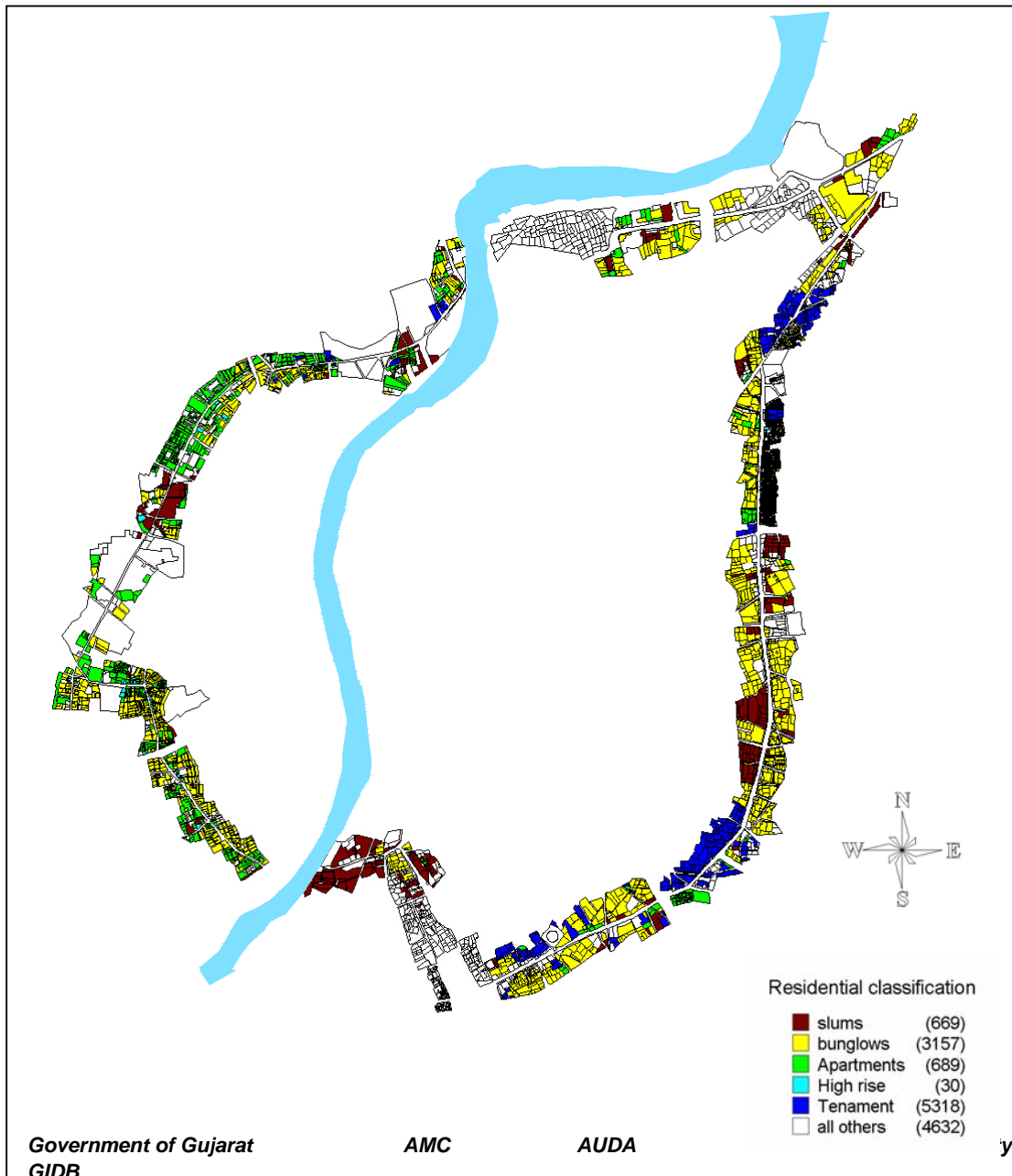
Table 4 Type of Residential Land Use in the Immediate Influence Zone

Link No.	Detail of Link	Type of Building									
		Bungalows		Tenements		Slums		Apartments		High-rise Buildings	
		Area(km <sup>2</sup> )	No. of Plots	Area(km <sup>2</sup> )	No. of Plots	Area(km <sup>2</sup> )	No. of Pockets	Area(km <sup>2</sup> )	No. of Plots	Area(km <sup>2</sup> )	No. of Plots
1	Chandranagar - Shivranjani	1.95	456	1.18	550	0.063	11	0.73	269	0.05	19
2	Shivranjani - Helmet Junction	0.91	151	0.23	460	0.006	1	0.168	15	-	-
3	Helmet Junction - Akhbarnagar	2.01	187	1.18	552	0.492	21	2.78	169	0.035	6
4	Akhbarnagar - Sabarmati (New Bridge Alignment)	3.15	199	1.89	566	2.694	21	2.11	109	0.15	1
5	New Bridge - Naroda-Himmatnagar Highway Intersection	2.12	232	1.18	547	0.183	14	0.185	23	-	-
6	Naroda-Himmatnagar Highway Intersection- Soni Ni Chali	3.81	1331	2.21	1345	2.472	475	0.13	26	0.004	4
7	Soni Ni Chali-C.T.M Crossroads	1.37	259	1.23	565	0.179	37	-	-	-	-
8	C.T.M. Crossroads- Dani Limda Bridge	2.06	342	2.10	727	0.801	89	0.22	78	-	-
	<b>Total</b>	<b>17.38</b>	<b>3157</b>	<b>11.2</b>	<b>5312</b>	<b>6.89</b>	<b>669</b>	<b>6.323</b>	<b>689</b>	<b>0.239</b>	<b>30</b>

Considering the fact that the FSI utilization in Bungalows and Tenements is quite low and they have more potential for redevelopment compared to Apartments and High-rise Buildings. In addition, with the removal of slums, the potential land available for redevelopment is approximately 36 sq. km.

The type of residential land use in the immediate corridor influence zone is shown in the figure below. As shown in figure 3, a majority of the land is occupied by bungalows and tenements, which in most cases do not have multiple ownerships. Such property can be redeveloped.

**Figure 4 Type of Residential Land-use in Immediate Influence Zone**



**3.2 VARYING USAGE OF FSI IN DIFFERENT AREAS**

The permissible FSI is 1.8, whereas the utilized FSI in majority of the stretches is quite low which indicates that the land is under utilized and its full potential can be exploited. The average FSI utilized is 0.645.

**Figure 5 FSI usage in Immediate Influence Zone**



**Table 5 Utilization of FSI in the Immediate Influence Zone**

Link No.	Detail of the Link	Existing Utilized FSI
1	Chandranagar - Shivranjani	0.80
2	Shivranjani - Helmet Junction	0.70
3	Helmet Junction - Akhbarnagar	0.66
4	Akhbarnagar - Sabarmati (New Bridge Alignment)	0.62
5	New Bridge – Naroda-Himmatnagar Highway Intersection	0.50
6	Naroda-Himmatnagar Highway Intersection-Soni ni Chali	0.68
7	Soni Ni Chali-C.T.M Crossroads	0.57
8	C.T.M. Crossroads-Dani Limda Bridge	0.63

**Table 6 Areas having High-rise Development along the Corridor**

Sr.No.	Link	No. of Plots with high rise development	Area (sq.kms)
1	Chandranagar - Shivranjani	19	0.050
2	Helmet Junction-Akhbarnagar	6	0.035
3	Akhbarnagar-Sabarmati	1	0.146
4	Naroda Himmatnagar Jn.-Soni ni Chali	4	0.004

**Table 7 Availability and cost of land**

Link. No.	Detail of Link	Existing Land Value (Rs./sq.yard)	
		Residential	Commercial
1	Chandranagar - Shivranjani	5000-6000 (Chandranagar) 8000-8500 (Shreyas Crossing/Nehrunagar)	10000 (Chandranagar) 15000-17000 (Shreyas Crossing/Nehrunagar)
2	Shivranjani - Helmet Junction	8000-10000	20000-25000
3	Helmet Junction - Akhbarnagar	-	-
4	Akhbarnagar - Sabarmati (New Bridge Alignment)	7500-8000	10000-15000
5	New Bridge – Naroda-Himmatnagar Highway Intersection	4500-5000	6000-8000 (Nr. Chintamani Soc.)
6	Naroda-Himmatnagar Highway Intersection-Soni ni Chali	1200-1300	2000
7	Soni Ni Chali-C.T.M Crossroads	1000-1200	1300-1500
8	C.T.M. Crossroads-Dani Limda Bridge	1000-1500	2000

### 3.2.1 New buildings and utilized FSI

The recent development in the AMC and AUDA limits indicate that all the commercial and corporate houses have fully utilized the FSI. The residential units like flats and apartments have also utilized the available FSI. In areas consisting of low rise buildings due to height restrictions of 16 m, the builders have utilized an extra FSI of 0.45 by making impact fee and built using FSI of 2.25. The bungalows have utilized FSI ranging from 1-1.2.

**Table 8 Permission for construction given in AMC in recent years**

Year	Plans pending at the beginning of the year	Plans received during the year	Total no. of plans	Plans disposed	Plans pending
2001-2002	1600	796	2396	962	1434
2002-2003	1434	768	2202	2193	9
2003-2004	9	1092	1101	1030	71

**Table 9 Building use Permissions issued in recent years in AMC Limits**

Year	No. of Residential Buildings	No. of Commercial Buildings
2002-2003	82	33
2003-2004	360	83
2004-2005	450	110

**Table 10 Newly Constructed Conventional Dwellings**

Year	Newly Constructed Conventional Dwellings	Number of Rooms			
		One	Two	Three	Four and above
2001-02	2260	1968	173	117	2
2002-03	1309	8	768	402	131
2003-04	1076	91	323	332	330

**Table 11 Building use Permissions issued in recent years in AUDA Limits**

Year	No. of Plans Sanctioned	No. of Building Use Permissions Issued
2001-2002	673	105
2002-2003	1202	293
2003-2004	1807	420
2004-2005	2302	466

### 3.3 ASSESSMENT OF THE USES AND USERS FOR ADDITIONAL AREA GENERATED

A survey of real estate developers indicates that for an increased FSI upto 0.45 there shall be willing buyers provided relaxations are given in height regulations. The potential for the commercial development is more along roads wider than 60ft. Pedestrian accessibility, which is about 500m or a 10 minutes walking distance should be the prime consideration in deciding the distance for intensification on either sides of the corridor. The stretch between Nehrunagar and Shivranjini, being the widest road in the western part of city and being a part of the proposed BRT corridor has the highest potential for commercial development. The feasibility of commercial development (retail and wholesale) is higher on the ground and first floor of a building considering the past trends of development of shopping areas in the city. The property rates for office and residential development on second floor and above are Rs. 1000-1100 per sq. m. Another alternative could be issuing FSI tickets for the entire T. P. Schemes through which the corridor passes. Rules and regulations can be formulated according to the use of these tickets. The development due to the increased FSI shall be vertical. Considering the fact that the commercial space on higher floors shall be utilized only as office premises and such properties do not have a good sale price, the impact fees for increased FSI shall be fixed at 50-60% of the impact fees charged by Ahmedabad Municipal Corporation. Presently, the impact fee levied by Ahmedabad Municipal Corporation is Rs. 1500 per sq. m and that by Ahmedabad Urban Development Authority is Rs. 1000 per sq. m. However the Narol-Naroda stretch, a predominantly low income group area can be charged an impact fee of Rs. 500 per sq. m. It is observed that the land use has been transformed in the east recently. Restaurants, banks and commercial complexes are a few of the recent developments along this stretch in past 2 years. In due course of time land prices along the corridor would escalate.

### 3.4 LAND PRICES

The land prices vary significantly between the areas situated along the 132' ring road and the Old N.H.8 on the other side. The residential and commercial land value along Shivranjani crossroads is significantly high due to substantial commercial development of late. The land value on the Old N.H.8 is lower due to existence of low income group housing for the workers working in the nearby industrial estates of Odhav, Vatva and Narol and the diamond polishing units located in Bapunagar and Thakkarnagar.

**Table 12 Availability and cost of land**

Link. No.	Detail of Link	Existing Land Value (Rs./sq.yard)	
		Residential	Commercial
1	Chandranagar - Shivranjani	5000-6000 (Chandranagar) 8000-8500 (Shreyas)	10000 (Chandranagar) 15000-17000 (Shreyas)

		Crossing/Nehrunagar)	Crossing/Nehrunagar)
2	Shivranjani - Helmet Junction	8000-10000	20000-25000
3	Helmet Junction - Akhbarnagar	-	-
4	Akhbarnagar - Sabarmati (New Bridge Alignment)	7500-8000	10000-15000
5	New Bridge – Naroda-Himmatnagar Highway Intersection	4500-5000	6000-8000 (Nr. Chintamani Soc.)
6	Naroda-Himmatnagar Highway Intersection-Soni ni Chali	1200-1300	2000
7	Soni Ni Chali-C.T.M Crossroads	1000-1200	1300-1500
8	C.T.M. Crossroads-Dani Limda Bridge	1000-1500	2000

### 3.5 LAND DEVELOPMENT OPTIONS AND ASSUMPTIONS

1. Total area available for Development and Redevelopment: 13.47 sq. km
2. 50% of this land will be available for development.
3. The development will be staggered beyond 20 year time period and by 20<sup>th</sup> year 50% plot owners will use additional FSI
4. FSI to be increased to 2.7 on either side of the road for 250 meters and 500 meters along the intersecting road
5. For the rate chargeable for additional FSI three scenarios have been developed
  - Rs. 500 per sq mt
  - Rs. 750 per sq mt
  - Rs. 1000 per sq mt

**Table 13 Revenue Yield From Sale of FSI**

Year	End of 3 <sup>rd</sup> year	End of 5 <sup>th</sup> year	End of 10 <sup>th</sup> year	End of 15 <sup>th</sup> year	End of 20 <sup>th</sup> year	Total
Pace of Restructuring (%)	5	15	25	30	50	
Land Development	0.6735	1.347	1.347	0.6735	2.694	6.735
Amount Rs. Lakh @ 500/sq mt	1515	3031	3031	1515	6062	15154
Amount Rs. Lakh @ 750/sq mt	2273	4546	4546	2273	9092	22730
Amount Rs. Lakh @ 1000/sq mt	3031	6062	6062	3031	12123	30308

## 4. LAND USE RESTRUCTURING:

### 4.1 RESIDENTIAL LAND USE

An analysis was carried out for estimating residential land use intensification along the corridor. The population for the year 2001 was taken as the base year population and population for 2011, 2021 and 2035 was projected considering the decadal growth rates for various zones in the city. Two scenarios were considered to analyse the impact on the gross densities due to intensification:

Scenario 1:

Year 2021-Natural Population Growth-Existing FSI utilisation and Existing area under land use

Link	Total Area	Existing area under residential	Existing FSI	Built-up-residential	Population (No Intervention Scenario)	Existing Gross Density
Chandranagar -Shivranjini	4.663	3.96	0.80	3.17	71504	181
Shivranjini-Helmet Junction	2.951	1.316	0.70	0.92	22546	171
Helmet Junction-Akhbarnagar	7.51	6.5	0.66	4.29	109772	169
Akhbarnagar - Sabarmati	16.087	10.137	0.62	6.28	321744	317
New Bridge-Naroda-Himmatnagar Highway Intersection	6.355	4.56	0.50	2.28	65754	144
Naroda - Soni ni chali	11.606	8.801	0.68	5.98	416071	473
Soni ni chali - CTM Crossroads	2.917	2.78	0.57	1.58	87879	316
CTM Crossroads - Danilimda Bridge	7.0418	5.3	0.63	3.34	95387	180
Total	59.131	43.354		27.85	1190657	

Scenario 2:

Year 2021-FSI of 2.25 and area under residential reduced to 50%

Link	Total area (sq.kms)	Area under residential land use @50% (sq.kms)	Proposed FSI	Built-up-residential (sq.km)	Population	Proposed Gross Density-ppha (2021)
Chandranagar Shivranjini	4.663	2.33	2.25	5.25	262294	662
Shivranjini-Helmet Junction	2.951	1.48	2.25	3.32	165994	1261
Helmet Junction-Akhbarnagar	7.51	3.76	2.25	8.45	422438	650

Akhbarnagar Sabarmati	-16.087	8.04	2.25	18.10	904894	893
New Bridge-Naroda-Himmatnagar Highway Intersection	-6.355	3.18	2.25	7.15	357469	784
Naroda - Soni ni chali	11.606	5.80	2.25	13.06	652838	742
Soni ni chali - CTM Crossroads	2.917	1.46	2.25	3.28	164081	590
CTM Crossroads Danilimda Bridge	-7.0418	3.52	2.25	7.92	396101	747
<b>Total</b>	<b>59.1308</b>	<b>29.57</b>		<b>66.52</b>	<b>3326108</b>	<b>Average-791</b>

The existing gross residential densities were also calculated for various links along the corridor to prioritise links for land use intensification. The analysis of the residential densities indicates that the Naroda-Soni ni chali and Soni-ni-chali-CTM Crossroads has high residential densities primarily consisting of low income groups households working in industrial areas in vicinity.

#### 4.2 COMMERCIAL DEVELOPMENT/EMPLOYMENT GENERATION

The commercial development was analysed in the context of the employment that existed along the various links along the corridor. There is a clear demarcation between employment densities along the western and eastern part of the corridor. The employment densities along the eastern corridor from Naroda to CTM crossroads are high due to presence of a number of industries along the stretch. The employment densities on the western sides are lower primarily to residential development, although there is high level of commercial activity around Shivranjani junction towards Satellite. The employment is also high in the Akhbarnagar-Sabarmati stretch due to presence of AEC-Torrent Power Plant.

Table 14 Employment Generation

Link	Employment Density	Employment
Chandranagar to Shivranjani	5220	24340
Shivranjani-Helmet Junction	1406	4149
Helmet Junction-Akhbarnagar	4066	30539
Akhbarnagar - Sabarmati	3349	53882
New Bridge-Naroda- Himmatnagar Highway Intersection	2230	14174
Naroda - Soni ni chali	9409	109206
Soni ni chali - CTM Crossroads	4672	13629
CTM Crossroads - Danilimda Bridge	2046	14411
<b>Total</b>		<b>264330</b>

Fig: Distribution of Commercial Development-Link wise along the corridor

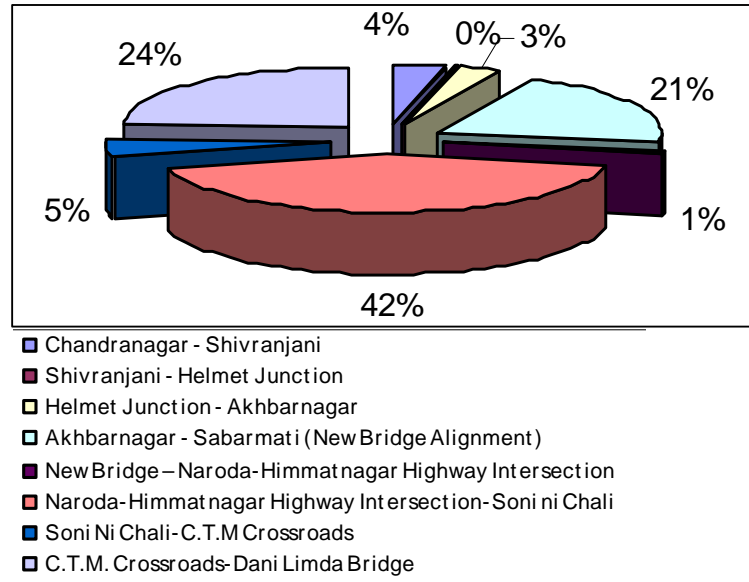
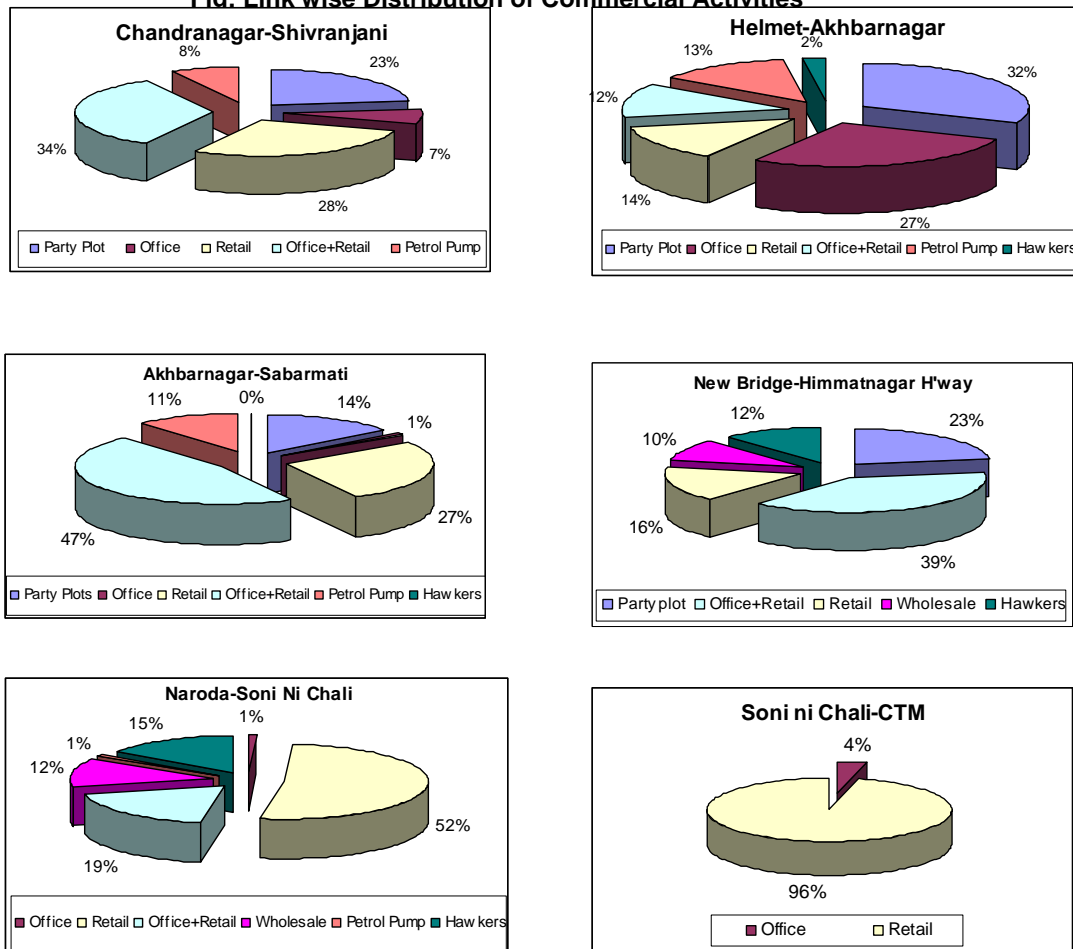


Fig: Link wise Distribution of Commercial Activities

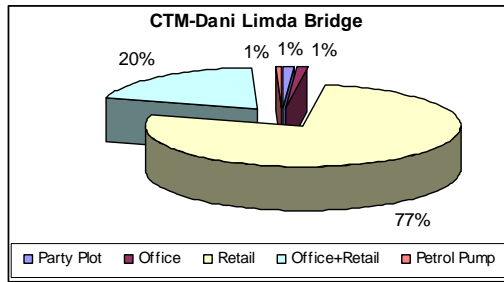


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### 4.3 PROPOSED LAND USE RESTRUCTURING

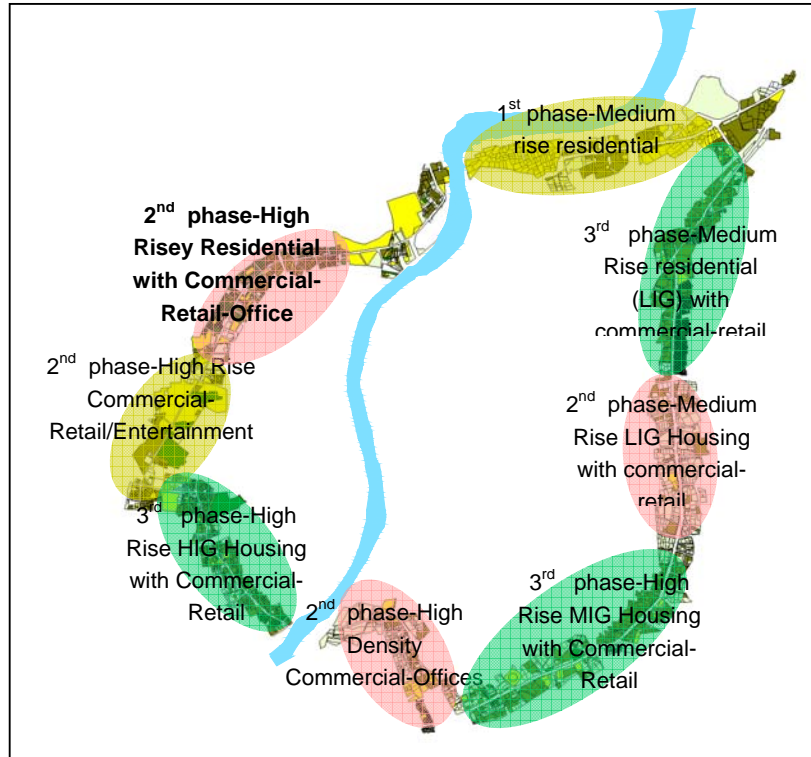
The land use restructuring for the corridor was arrived after analysing the development trends along the corridor and contextual development in proximity of various links along the corridor. The following table illustrates the proposed phase wise land use restructuring along the links.

**Table 15: Phase-wise Development for various links**

Sr.No.	Link	Phase	Type of Development	Justification	
1	Chandranagar - Shivranjani	Third	High Residential with Commercial-Retail	Rise with HIG/MIG households	Proximity to
2	Shivranjani-Helmet Junction	First	High Entertainment-Student Centres	Rise Activity	Number of Educational institutes in vicinity
3	Helmet Junction-Akhbarnagar	Second	High Residential with Commercial-Retail	Rise with	Recent development of Apartments with retail shopping on ground and first floors
4	Akhbarnagar - Sabarmati	Second	High Residential with Commercial-Retail	Rise with	Proximity to a high density residential areas in vicinity
5	New Bridge-Naroda-Himmatnagar Highway Intersection	First	Medium Residential	Rise	Proximity to airport
6	Naroda - Soni ni chali	Third	Medium Residential with commercial-retail	Rise (LIG)	Presence of LIG households consisting of workers
7	Soni ni chali - CTM Crossroads	Third	Medium Residential with commercial-retail	Rise (LIG)	Presence of LIG households consisting of workers
8	CTM Crossroads - Danilimda Bridge	Second	High Commercial-Retail and Office	Rise	Many transport operators are located here so favourable for

				commercial development
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**Fig: Phasing of Land Use Restructuring along the Corridor**



The land use restructuring for residential land use would be phased over a period of 30 years. The first phase (2011) would consist of conversion of vacant plots, slums and tenements into high-rise development, which would be followed by bungalows in the second phase (2011). The third phase (2035) would consist of conversion of apartments into high-rise development. The corridor has been divided into links based on similar residential land use typology and income group households. The phasing for the restructuring has been presented below in Table 15.

**Table 16: Residential Land Restructuring along the corridor**

Links	Restructuring of area (area-sq.km)		
	2011 (1st phase)	2021 (2nd Phase)	2035 (3rd Phase)
Chandranagar – Shivranjani	1.504	1.95	0.73
Shivranjani - Helmet Junction	1.135	0.91	0.168
Helmet Junction – Akhbarnagar	2.133	2.01	2.78

Akhbarnagar - Sabarmati (New Bridge Alignment)	6.957	3.15	2.11
New Bridge – Naroda-Himmatnagar Highway Intersection	2.926	2.12	0.185
Naroda-Himmatnagar Highway Intersection-Soni Ni Chali	5.397	3.81	0.13
Soni Ni Chali-C.T.M Crossroads	1.411	1.37	0
C.T.M. Crossroads- Dani Limda Bridge	3.559	2.06	0.22
Total	25.022	17.38	6.323
Total land proposed to high rise development	48.725		

1st phase-Vacant plots, slums and tenements

2nd phase-Bungalows

3rd phase-Apartments

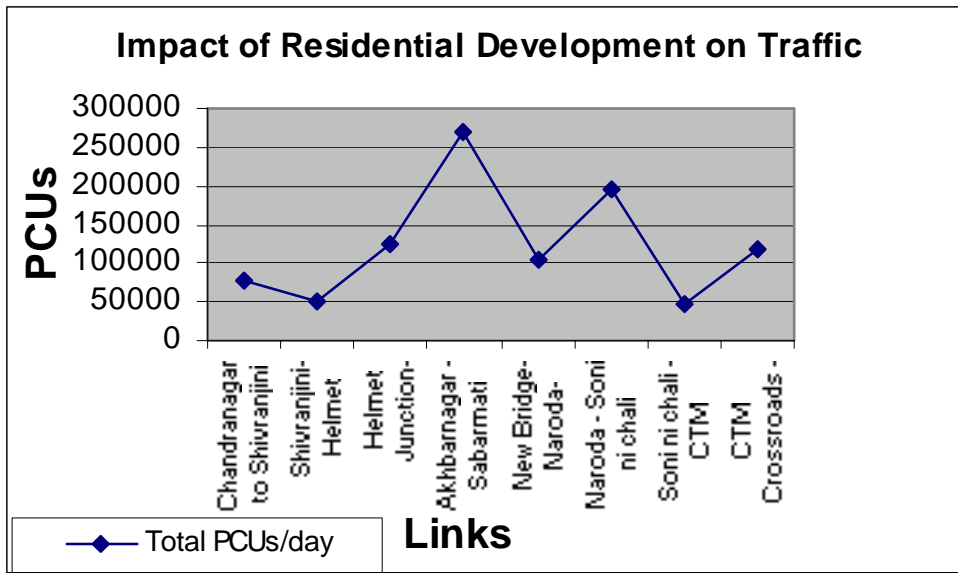
## 5. IMPACTS OF LAND USE RESTRUCTURING:

### 5.1 TRAFFIC

The impacts of land use restructuring were calculated for the intensification in residential and commercial development. The increase in traffic volume was predicted for the year 2021 for FSI utilisation of 2.25 and assuming that 50% of the land would be developed as residential land.

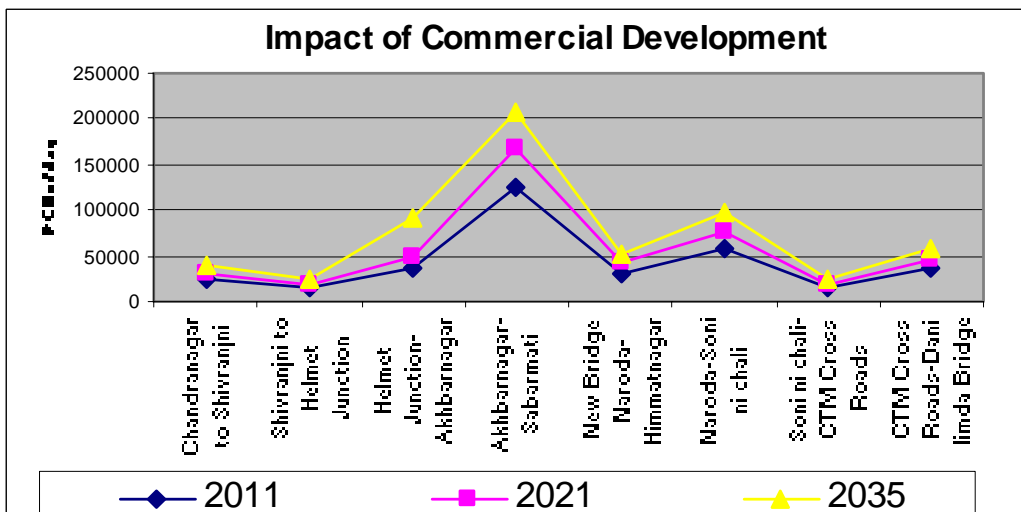
**Table 17: Impact on Residential densities due to Land Use Restructuring**

Link	2021-FSI-2.25 & Residential Land Use 50%						
	Total area	Area under residential land use @50%	Proposed FSI	Built-up-residential (sq.km)	Population	Proposed Gross Density-ppha (2021)	No Intervention Gross Density (2021)
Chandranagar to Shivrangini	4.663	2.33	2.25	5.25	262294	662	153
Shivrangini-Helmet Junction	2.951	1.48	2.25	3.32	165994	1261	76
Helmet Junction-Akhbarnagar	7.51	3.76	2.25	8.45	422438	650	146
Akhbarnagar - Sabarmati	16.087	8.04	2.25	18.10	904894	893	200
New Bridge-Naroda-Himmatnagar Highway Intersection	6.355	3.18	2.25	7.15	357469	784	103
Naroda - Soni ni chali	11.606	5.80	2.25	13.06	652838	742	358
Soni ni chali - CTM Crossroads	2.917	1.46	2.25	3.28	164081	590	301
CTM Crossroads - Danilimda Bridge	7.0418	3.52	2.25	7.92	396101	747	135
<b>Total</b>	<b>59.1308</b>	<b>29.57</b>		<b>66.52</b>	<b>3326108</b>	<b>791</b>	



The increased commercial activity along the corridor would result in increase in traffic volume along the corridor. This impact on increase in traffic generation was analysed for residential and commercial development. These scenarios were built for various levels of FSI utilisation and percentage allocation to residential and commercial land use. The figure below refers to the impact on traffic along the corridor due to the residential development. **(Refer Annexure-4 )**

The figure below indicates the impact of intensified commercial development along the corridor. The traffic generation along the corridor would be due to the additional employment generation and visitors to the offices.



## 5.2 IMPACTS ON SUPPORTING INFRASTRUCTURE

The intensification of land use would have impacts on the supporting infrastructure along the corridor. This impact has been quantified for the year 2021 for the following scenario:

- (a) FSI utilization of 2.25 and area under residential land use is projected to be 50%.

**Table 18: Impact on Residential densities due to Land Use Restructuring**

Link	Population (No Intervention)	Population (FSI-2.25)	Additional Load on Infrastructure	Water Supply @ 135 lpcd (MLD)	Solid Waste @ 450gm/capita/day (kg/day)	Sewerage @ 500 gm/capita/day (kg/day)
Chandranagar to Shivranjini	71504	262294	190790	25.76	85855	95395
Shivranjini-Helmet Junction	22546	165994	143448	19.37	64552	71724
Helmet Junction-Akhbarnagar	109772	422438	312665	42.21	140699	156333
Akhbarnagar Sabarmati	321744	904894	583150	78.73	262417	291575
New Bridge-Naroda-Himmatnagar Highway Intersection	65754	357469	291715	39.38	131272	145857
Naroda - Soni ni chali	416071	652838	236766	31.96	106545	118383
Soni ni chali CTM Crossroads	87879	164081	76202	10.29	34291	38101
CTM Crossroads Danilimda Bridge	95387	396101	300715	40.60	135322	150357
<b>Total</b>	<b>1190657</b>	<b>3326108</b>	<b>2135451</b>	<b>288.29</b>	<b>960953</b>	<b>1067725</b>

## **ANNEXURES**

*Government of Gujarat  
GIDB*

*AMC*

*AUDA*

*CEPT University*

## Annexure 1-Impact Fees Regulations

Table: Impact Fees for unauthorized construction (Applicable to construction before 2000):

Sr.No.	Type of Unauthorised Development	AMC	AUDA
1	Independent Building (Excluding Flat/Apartment & Commercial use)	(i) Building unit/plot upto 40 sq.mts.- Rs.1000/- per unit (ii) Incase of building unit/plot above 40 sq.mtrs. – (a) Upto 100 sq.mts-built up area: Rs.10000/- for each unit for “A” type developed area Rs.7000/- for each unit for “B” type developing area (b) Above 100 and upto 150 sq.mts-built up area: Rs.12500/- for each unit	(i) Building unit/plot upto 40 sq.mts.- Rs.1000/- per unit (ii) Incase of building unit/plot above 40 sq.mtrs. – (a) Upto 100 sq.mts-built up area: Rs.8000/- for each unit for “A” type developed area Rs.5500/- for each unit for “B” type developing area (b) Above 100 and upto 150 sq.mts-built up area: Rs.10000/- for each unit
2	Flat/Apartment type residential buildings (i) Where development permission is obtained	<u><b>Upto 60 sq.mtrs. built up area.</b></u> Rs.7500/- for each dwelling unit for “A” type developed area. Rs.5000/- for each dwelling unit for “B” type developing area <u><b>Above 60 sq.mtrs.</b></u> Rs.10000/- for each dwelling unit for “A” type developed area. Rs.7500/- for each dwelling unit for “A” type developing area.	<u><b>Upto 60 sq.mtrs.built up area.</b></u> Rs.6000/- for each dwelling unit for “A” type developed area. Rs.4000/- for each dwelling unit for “B” type developing area <u><b>Above 60 sq.mtrs.</b></u> Rs.9000/- for each dwelling unit for “A” type developed area. Rs.6000/- for each dwelling unit for “A” type developing area.

	(ii) Where development permission is not obtained	<p><b><u>Upto 60 sq.mtrs. built up area.</u></b> Rs.12000/- for each dwelling unit for “A” type developed area. Rs.8000/- for each dwelling unit for “B” type developing area</p> <p><b><u>Above 60 sq.mtrs.</u></b> Rs.15000/- for each dwelling unit for “A” type developed area. Rs.10000/- for each dwelling unit for “A” type developing area.</p>	<p><b><u>Upto 60 sq.mtrs. built up area.</u></b> Rs.9000/- for each dwelling unit for “A” type developed area. Rs.6000/- for each dwelling unit for “B” type developing area</p> <p><b><u>Above 60 sq.mtrs.</u></b> Rs.12000/- for each dwelling unit for “A” type developed area. Rs.9000/- for each dwelling unit for “A” type developing area.</p>
3	<p>Unauthorised commercial use</p> <p>(i) Upto 25 sq.mtrs. carpet area of each unit for ground and first floor only excluding basement</p> <p>(ii) More than 25 sq.mtrs. carpet area of each unit for ground and first floor only excluding basement</p> <p>(iii) For basement and other floor excluding ground and first floor irrespective of any carpet area for each unit</p>	<p>Rs.15000/- for each unit</p> <p>Rs.1000/- per sq.mtr. of unauthorized development subject to minimum of Rs.15000/- for each unit</p> <p>Rs.500/- per sq.mtrs. of unauthorized development subject to a minimum of Rs.7500 for each unit</p>	<p>Rs.10000/- for each unit</p> <p>Rs.800/- per sq.mtr. of unauthorized development subject to minimum of Rs.10000 for each unit</p> <p>Rs.400/- per sq.mtrs. of unauthorized development subject to a minimum of Rs.5000 for each unit</p>

Source: Gujarat Regularisation of Unauthorised Development (Amendment) Rules, 2003, Urban Development and Urban Housing Department, Government of Gujarat.

## Annexure 2-Development Control Regulations

The formulated rules and regulations as laid down by the Development Authorities would be applicable for all types of developments.

### a) Approaches to the Building:

*For Residential Building*

3.00 m in case of length of approach is equal to 15m

4.50 m in case of length of approach is equal to 15-45m

*For other than residential use*

4.50 m in case of length of approach is equal to 15m

6.00 m in case of length of approach is equal to 15-45m

### b) Common Plot:

*Residential and Commercial*

Common plot shall be provided in high-rise building irrespective of the height of the building.

*Other categories (excluding industries)*

In a building unit of 2000 sq. m or more in area, the common plot shall be provided at the rate of 20% of plot area.

In case of residential use 50% of the total common plot may be allowed to be used as parking space including driveway and aisles.

### c) Length of a Building

The length of a building shall not be more than 150 m. In case of flats, apartments, institutes where length of building exceeds 50.00 m, a through passage of 7.5 m in clear width and clear height of 6.0 m shall be provided at every 30.00 m interval at ground level.

### d) Height of a Building

The height of building shall not exceed 40 m.

The height of building shall not be more than twice the width of the abutting roads plus the setback provided at ground level required as per the regulations laid down by Development Control Regulations. Provided that in case of building unit abutting on more than one road with different widths, the maximum heights shall be twice the width of wider road from the regular level of street.

NOC from Fire Officer/Fire Safety Consultant should be obtained for all high-rise buildings.

**e) Relaxation in FSI**

Where permissible height is not achieved even after consumption of permissible FSI, additional FSI upto 25% of permissible FSI may be permitted subject to other provision of the regulation

**Table: FSI and Built up areas:**

Sr. No	Building unit in m <sup>2</sup>	Max permissible built up area on Ground Floor	Max Permissible FSI
01	Upto 90	75%	2
02	90-150	65% or 67.5 m <sup>2</sup> whichever is more	2
03	150-1500	50% or 90 m <sup>2</sup> whichever is more	2
04	1500 & above	45%	2

**f) Margins:**

The minimum margins on the sides other than road side margins for low-rise buildings are as provided in the table below:

**Table: Margins for the Buildings**

Plot Size	Margins other than Road side	Maximum built up area on any floor
Upto 150 m <sup>2</sup>	2.25m (on any one side)	60%
150-250 m <sup>2</sup>	2.25m (on rear side) 1.5 m (any one side)	50% or 9m <sup>2</sup> which is more
> 250 m <sup>2</sup>	3.0 m on all sides except road side	45% or 150m <sup>2</sup> which is more
For High-rise building	0.3H or 6.0m 0.2H or 6.0m	30%

Margin between two buildings shall be 2 times the margins required on remaining side as mentioned above.

Viewing all the regulations the increased FSI can be provided for the intensification of the land use by giving relaxations in the restrictions for height of the building, without classifying the building as a high-rise structure.

### Annexure 3-Projections for Land Use Restructuring

Table: Population projection along the corridor (No Intervention)

Link	Area (sq km.)	Population		
		2001	2011	2021
Chandranagar to Shivranjani	4.663	67530	69489	71504
Shivranjani-Helmet Junction	2.951	21293	21910	22546
Helmet Junction-Akhbarnagar	7.51	103672	106679	109772
Akhbarnagar - Sabarmati	16.087	303864	312676	321744
New Bridge-Naroda- Himmatnagar Highway Intersection	6.355	63699	64719	65754
Naroda - Soni ni chali	11.606	403070	409519	416071
Soni ni chali - CTM Crossroads	2.917	85133	86495	87879
CTM Crossroads - Danilimda Bridge	7.042	92406	93885	95387
<b>Total</b>	<b>59.131</b>	<b>1140668</b>	<b>1165371</b>	<b>1190657</b>

Table: Gross Population Density along the corridor (No Intervention)

Sr.No.	Link	Existing FSI Utilisation	Average Population Density (ppha)			
			2001	2011	2021	2035
1	Chandranagar to Shivranjani	0.80	145	149	153	219
2	Shivranjani-Helmet Junction	0.70	72	74	76	109
3	Helmet Junction-Akhbarnagar	0.66	138	142	146	209
4	Akhbarnagar - Sabarmati	0.62	189	194	200	286
5	New Bridge-Naroda- Himmatnagar Highway Intersection	0.50	100	102	103	128
6	Naroda - Soni ni chali	0.68	347	353	358	445
7	Soni ni chali - CTM Crossroads	0.57	292	297	301	374
8	CTM Crossroads - Danilimda Bridge	0.63	131	133	135	168

## Annexure 4-Impacts of Intensification of Land Use

Link	No of people commuting by various modes of travel				Total PCUs/d
	Modes	No of people	No of Vehicle	PCUS	
Chandranagar to Shivranjini	Buses	52459	2098	6295	
	Two Wheeler	157376	104918	52459	
	Cars	13115	4372	4372	
	Others	39344	19672	14754	77879
Shivranjini-Helmet Junction	Buses	33199	1328	3984	
	Two Wheeler	99596	66398	33199	
	Cars	8300	2767	2767	
	Others	24899	12450	9337	49286
Helmet Junction-Akhbarnagar	Buses	84488	3380	10139	
	Two Wheeler	253463	168975	84488	
	Cars	21122	7041	7041	
	Others	63366	31683	23762	125429
Akhbarnagar - Sabarmati	Buses	180979	7239	21717	
	Two Wheeler	542936	361958	180979	
	Cars	45245	15082	15082	
	Others	135734	67867	50900	268678
New Bridge-Naroda- Himmatnagar Highway Intersection	Buses	71494	2860	8579	
	Two Wheeler	214481	142988	71494	
	Cars	17873	5958	5958	
	Others	53620	26810	20108	106138
Naroda - Soni ni chali	Buses	130568	5223	15668	
	Two Wheeler	391703	261135	130568	
	Cars	32642	10881	10881	
	Others	97926	48963	36722	193838
Soni ni chali - CTM Crossroads	Buses	32816	1313	3938	
	Two Wheeler	98449	65633	32816	
	Cars	8204	2735	2735	
	Others	24612	12306	9230	48718
CTM Crossroads - Danilimda Bridge	Buses	79220	3169	9506	
	Two Wheeler	237661	158441	79220	
	Cars	19805	6602	6602	
	Others	59415	29708	22281	117609

Table: Traffic generation due to intensification (residential)