

“Planning of Resilient City: A Case Study of Transportation Planning for North Zone, Surat”

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Abstract- Urban populations are facing increasing challenges from numerous natural and man-made pressures such as rapid urbanization, climate change, terrorism and increased risks from natural hazards. With increasing urbanization and more than 40 percent countries population residing in urban areas by 2030. The need for future cities to be Resilient from the fact now more than in history both natural and man-made hazards. The ability of cities to resist themselves from different disaster is depend on them resilience So that we need to develop resilient cities that can cope with the future hazards. The main purpose of this study was most important resilience related criteria that can be used for development the output of this research would help planners and decision makers to make more informed decision. Surat is considered to be one of the most fastest growing cities in India. This paper deals with the city’s problem like Connectivity & Mobility services and regulation in North zone area of Surat city.

Key Words: Resilience, Connectivity, Mobility, North zone, Surat city, Urban planning.

1. INTRODUCTION

Resilient cities are cities that have the ability to absorb, recover and prepare for future shocks (economic, environmental, social & institutional). Resilient cities promote sustainable development, well-being and inclusive growth (As per OECD). City resilience is defined as “the ability of a city or urban region to resist, absorb, adapt to and recover from acute shocks and chronic stresses to keep critical services functioning, and to monitor and learn from ongoing processes through city and cross-regional collaboration, to increase adaptive abilities and strengthen preparedness by anticipating and appropriately responding to future challenges.”

Theme	Sub- Theme	Criteria
Infrastructure	Water	Permeable pavement and bio swales, urban tree canopy, water demand & consumption, water efficient landscaping, protection of water sensitive lands, water demand and conservation systems, water quantity and quality monitoring, high-efficiency irrigation.
	Energy	Energy demand& consumption, flexibility of grid, urban energy supply systems for increasing shares of renewable energy, reduce end use energy demand, energy monitoring.
	Spatial Configuration & Location	Street connectivity,& pedestrian route connectivity, walking trail, urban form, urban size, mixed use development, variability & spatial heterogeneity, avoiding flood plains.
	Transportation	High frequency schedule public transportation, principle arterial miles per square mile, vehicle ownership, Freight/ logistics transport, Policing to promote safety and security, Law enforcement.
	Green Infrastructure	Parks, forest conservation, waste management.
	Defense structure	Coastal defense structures (dykes, levees, dunes, etc.)
	Sheltering	provision of open space for shelter, percent vacant rental units, number of hotels.

	Technology&Information	Generating and making use of information, geospatial, volunteered and geo- graphic information and communi- cation technology, visuali zation technologies, alerts and emergencynotification system ,embracing e-commerce
Security		Defensible spaces, visibility of security infrastructure, city-wide surveillance networks, biometric borders, surveillance cameras,
Environment	Eco-System	Biodiversity, restoration of hydrologic flows, conservation of ecologically vulnerable areas, proximity of different habitats, erosion rates
Economy		.Self-sufficiency, urban agri -culture, financial stability and flexibility, insurance and compensation system diver -sifie, product service systems, regional economic balance, taxation and fiscal policies, personal economic security, job diversity of residents, housing capital, employment, tourist attraction.
Institution	Planning	Zoning regulations, sub divi- sion requirements that take account of risks and hazard analysis and creation of hazard maps, , scenario-based planning, utilization of push and pull factors, collaborative and proactive planning, level of flexibility, land and property acquisition.
	Governance	Centralized government approach, carbon pricing, public participation, a certain degree of accountability and autonomy, evacuation and emergency management drills, city networking at different levels, transparency.

Table 1 : *Some of the major criteria that can be used in a framework for assessment of urban resiliency*

Aim

To prepare planning proposal for connectivity and mobility service and regulation in North zone of Surat city.

2. STUDY AREA

2.1 Location of Study Area

Surat—a city in the western Indian state of Gujarat (21°10’ N – 72°50’ E with an average elevation of 13 meters), having a population of around 5 million—is one of the fastest developing Indian cities. Situated on the banks of River Tapi and Arabian Sea, for centuries Surat has had well-established trade links with many countries across the globe through its port. After the Moguls, Portuguese, and Dutch, the British came to the city in the early 17th century. East India Company’s ships first arrived in India at the port of Surat in 1608. Today, Surat is an important industrial hub of diamond and textile industries. The city with the nearby Hazira industrial belt is home to manufacturing plants of multinational companies like Shell, Reliance, L&T, etc

2.2 City Growth

Prior to 1961, Surat’s area was only 8.12 sq. km., while in 2009 it had expanded to 326.5 sq. km. The city was originally established on the southern bank of the River Tapi with a castle on the eastern bank of the river. The activities were concentrated within the inner wall, construction of which was started in the year 1664 as a flood protection structure with gates that were closed in the event of a flood. The area of the city at this time within the wall was 178 hectares The construction of the

entire wall was completed in the year 1707 enclosing an area of 736 hectares. In subsequent years, the oldest part of the city developed in the area between the train station and the area known as Athwa lines. Since the 1990s, most of the new development including the most desirable locations for the city’s burgeoning middle and upper class has been the land between the Athwa lines and Arabian Sea. Since the establishment of Surat Urban Development Authority (SUDA) in the late 70s, the city has been growing at a rapid pace though the development in the peri phareas was not that rapid until 2001

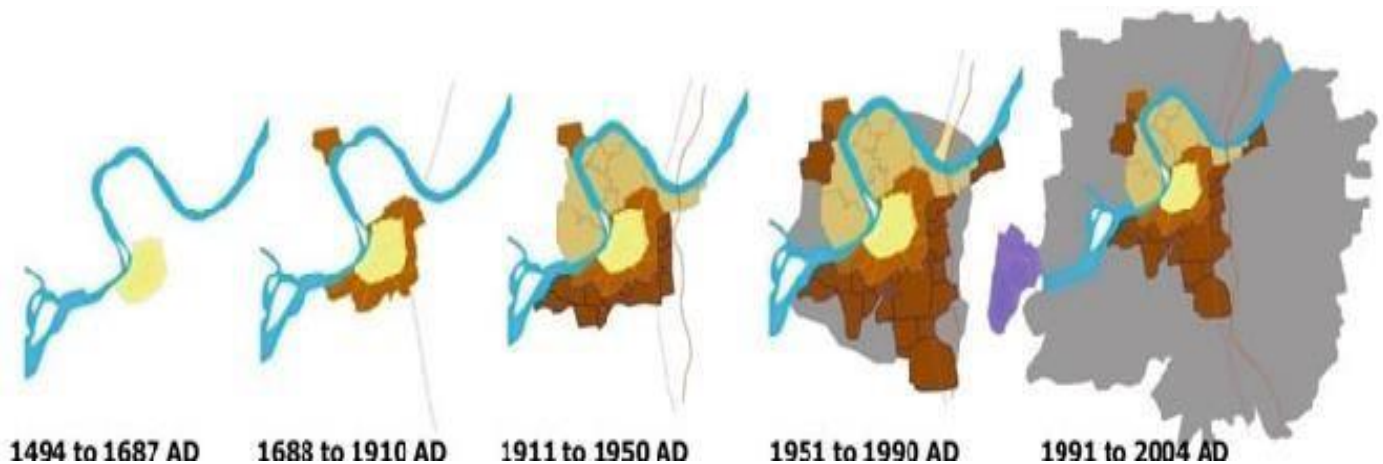


Figure 1: Surat city Growth

2.3 Population growth

Surat is the 9th largest city in India. As per 2001 Census, the population of Surat was 2.89 million. This includes

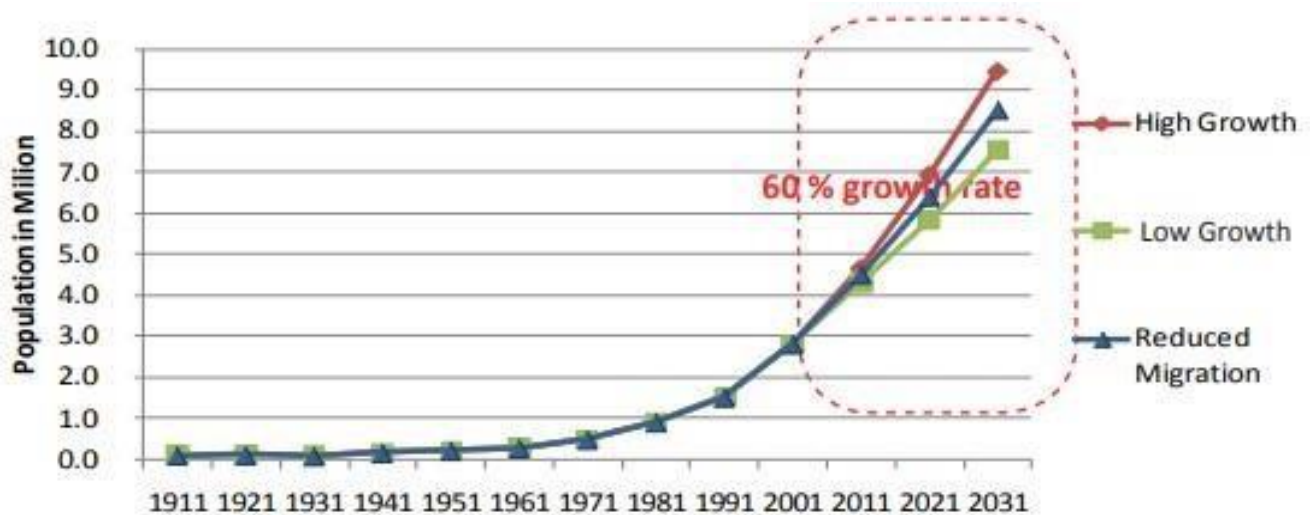


Figure 2: Future Population Projection

total of 1.09 million workers, driven by pull migration induced by the growth of textile and diamond industries especially since the 1970’s. The city has seen an unprecedented growth in last four decades, recording one of the highest growth rates in the country and a 10-fold population rise over four decades. The city area has expanded with time (major expansion being in 2006) and presently covers 326.515 sq.km. The population of the city in 2011 is about 4.5 million. The estimated population of the city 7.1 millions with growth rate 4.52 %.

2.4 North zone Profile

The area of North Zone is about 36.363 sq.km, the total area of 11.13% of Surat city, there are total 12 wards, the population is about 7,05,163 and density about 193.46 (ppha

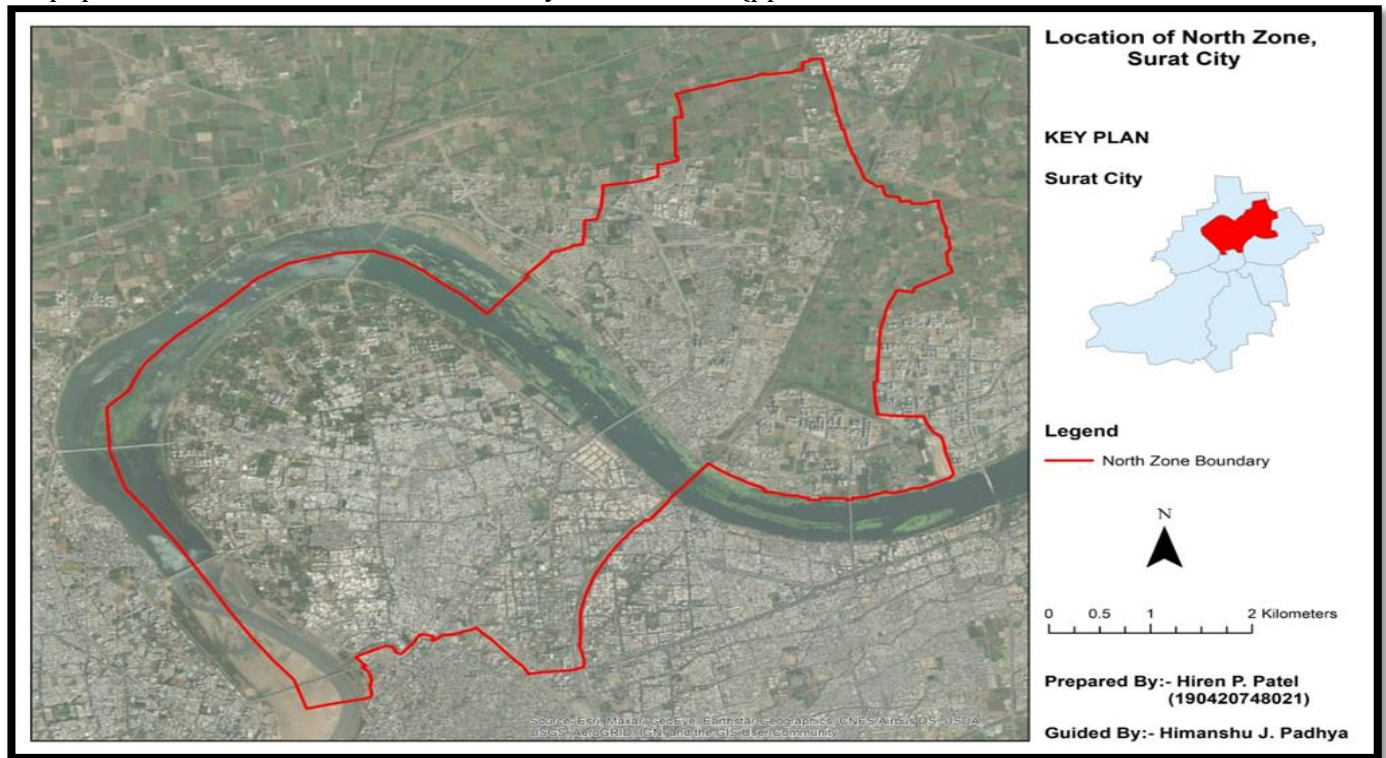


Figure 3 : Gis Image of North zone, Surat

3. DATA COLLECTION AND ANALYSES

The city of Surat suffers from lack of enforcement of the traffic management system. The city lack of organized public transport system and absence of public transport for over the past few years that lead to auto-rickshaw emerging as a major public transport and increasing in use of private vehicles. Issues like

- High growth of private vehicles
- inefficient public transport system
- inadequate parking facilities
- lack of pedestrian facilities
- encroachments on footpaths and road margins
- informal activities and small-time business activities along the major corridors

have increased traffic congestion in the city. The city lack of organized public transport system and absence of public transport for over the past few years that lead to auto-rickshaw emerging as a major public transport and increasing in use of private vehicles.

After that I carried out survey of the BRTS user and I try to know the problems suffer when they are using Public transport with questionnaire First we find sample size of the survey

Hogg and Tannis (2009) formula of sample size calculation

$$n = \frac{m}{1 + \frac{m-1}{n}}$$

n = the sample size of the limited m = the sample size of unlimited N = available population

$$m = \frac{z^2 \times p \times (1-p)}{\epsilon^2}$$

€ = sampling error of the point estimate = 0.05 P = proportion of the population = 0.5

For North zone

Population N = 887079

Margine Of Error : 5%

Confidence Level : 95%

Required Sample Size : 384

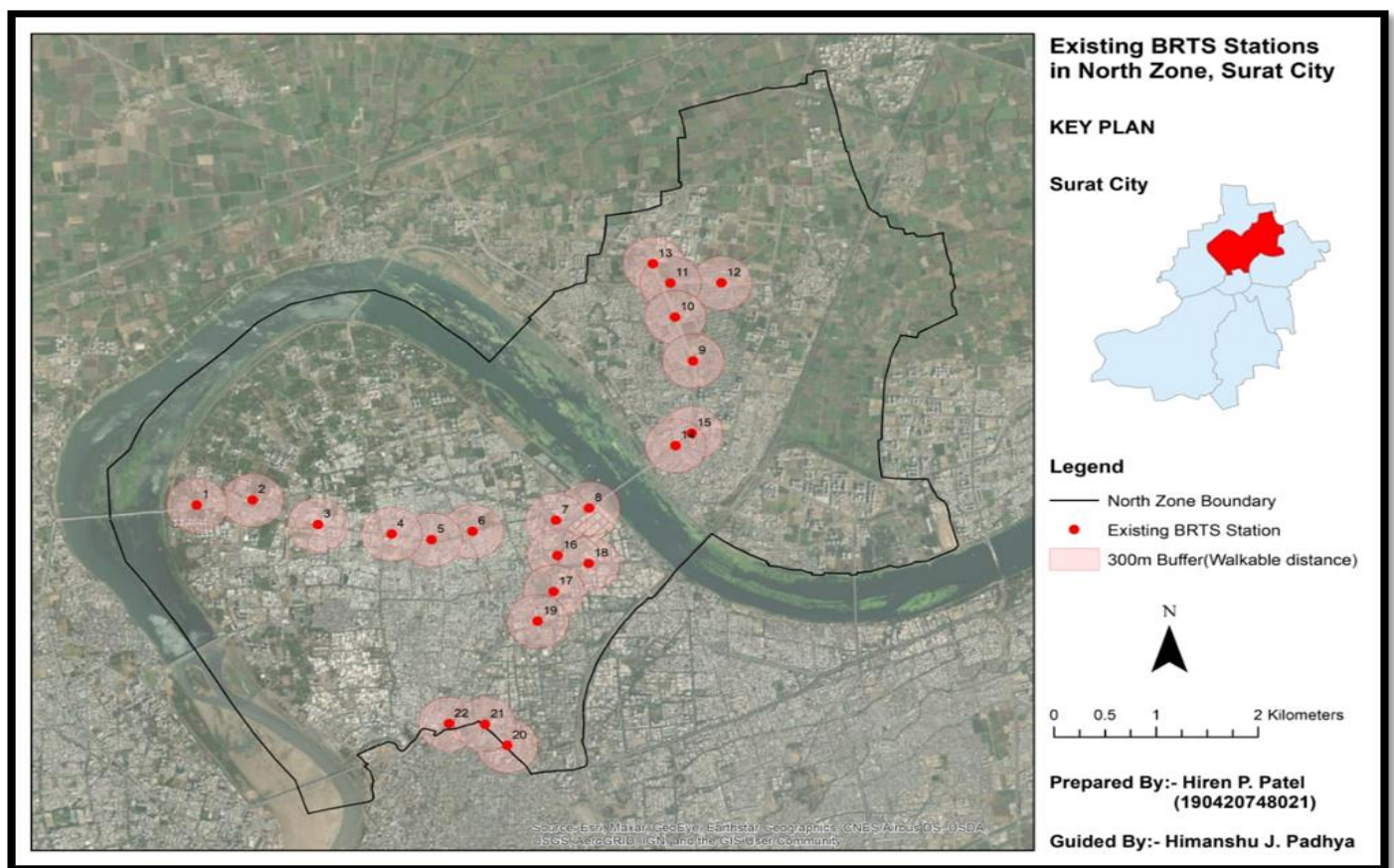


Figure 4 : GIS image of Existing BRTS station

After the survey I find out the Issues of BRTS user like

- Last mile Connectivity
- Limited Network of roads
- Side walks jammed with the Parked vehicle and vendors
- Insufficient parking facilities at BRTS station

4. PLANNING PROPOSAL

- Solve this issues proposed location of intermediate public transport and proposed the E-rickshaw and Public Bicycle sharing as Feeder services of BRTS
- This study identify the location of the 23 station of the PBS and e-rickshaw and also PBS station located on the existing BRTS station with the capacity of small PBS station and one 8-seater rickshaw.

SrNo	Existing BRTS Station	Proposed E-Rickshaw and PBS location	Proposed E-Rickshaw and PBS location
1	Dr Shyam Prashad Mukharji bridge	1.Opposite Nayra Petrol pump	
2	Dabholi gam	1.Beside Manashi Residency	
3	SMVS Mandir	1.Vijay raj circle	2.SBI Bank(SMC Library)
4	Dabholi Char rasta	1.Singapore Char rasta 2.Gurukul Police Chowki	3.Dharmjivan Chowk
5	Bapasitaram chowk	1.S.V school	
6	Lalita chowkdi	1.Sunday Hub	2.Kantareswar mahadev mandir
7	GajeraSchool	1.Laxminarayan mandir (Gokul Park)	2.Government School Dairy Faliyu
8	Gajera circle		
9	Fulpada road		
10	Dr. Shyam prashad Mukharji Lake Garden		
11	Katargam	1.Bala Ashram school (Under bridge)	2.Alka puri Circle

12	Pandit Shyam Prashad Amroli Bridge		
13	Mansarovar	1.Amroli gam Bus stop 2.Chhaparabhatha,sitaram Chowkdi	3.Swaminarayan Mandir chhaparabhatha
14	Amroli Cross road	1.Satadhar Chowkdi	2.Opposite Char bhuja arcade
15	Kosad Fire station	1.Rajwadi Party plot	
16	Kosad Housing Board	1.Gruham Empire	
17	Kosad Bus depot	1.Kosad Sewage Treatment Plant	
18	Kosad EWS-1		
19	Katargam Darwaja		
20	Gotalawadi	1.Opp.Parishi Diamond	
21	Kabir Mandir Rampura	Available	
22	Zilani Bridge		

Table 2: Suggest location of Feeder Services of BRTS

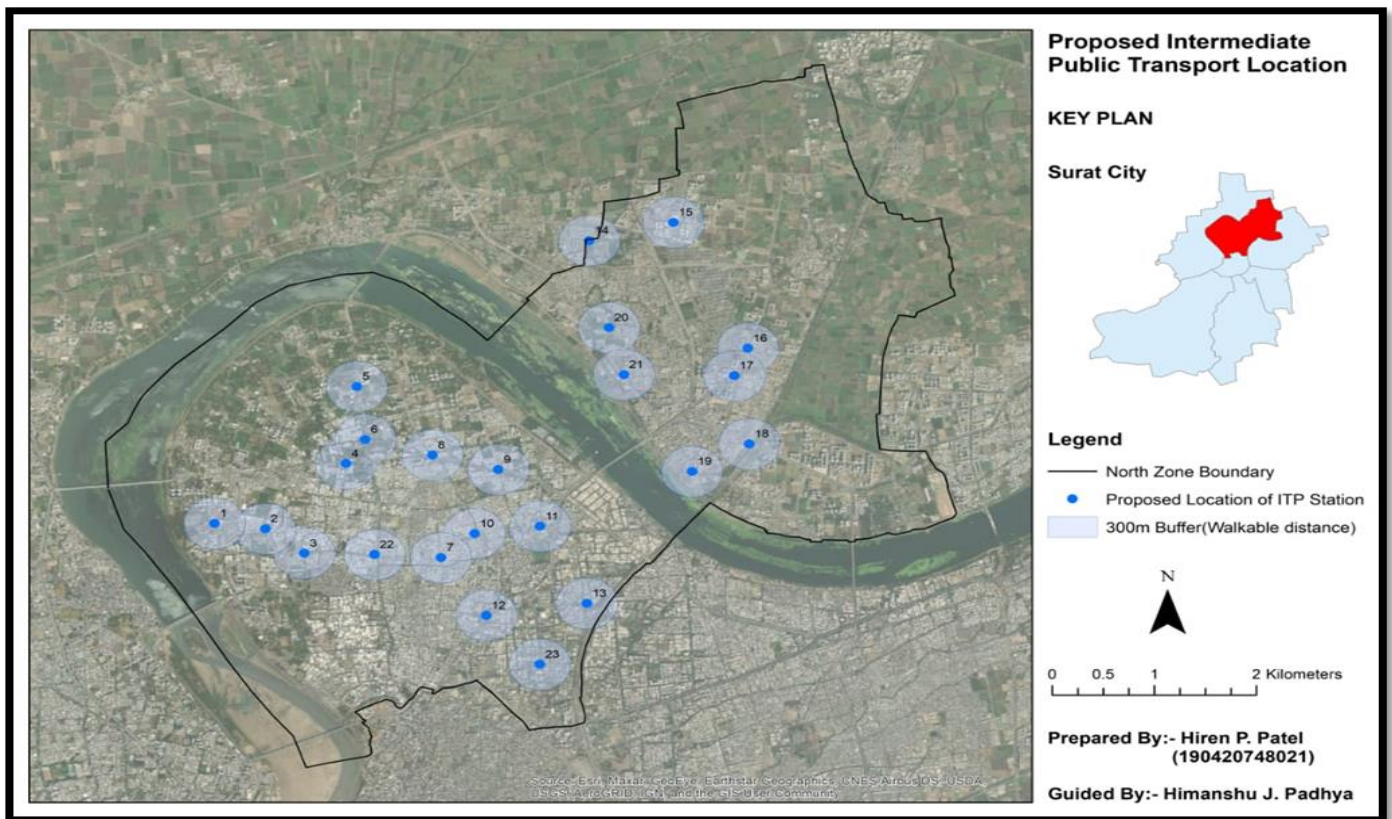


Figure 5 : GIS Image of Proposed Feeder Services Location

Integration of Feeder

Origin :Singanpore gam

Destination :Morabhagal

Parameter	Shared auto + BRTS	E Rickshaw +BRTS	PBS+BRTS	Two-Wheeler	Car
Time Taken	10+min	3+min	5+min	10min	11min
Trip cost	18	11	8	9	18
Cost per km	4.5	3	2	2.5	5

Origin :Karada (Ram katha Road)

Destination : Amroli Cross-road BRTS

Parameter	Shared auto + BRTS	ERickshaw+BRTS	PBS+ BRTS	Two-Wheeler	Car
Time Taken	5 + min	5 + min	8 + min	9min	10min
Trip cost	16	13	8	8	18

Cost per km	4.5	3.5	2	2.5	5
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5. CONCLUSIONS

- Surat is one of the fastest growing city in india as well as world. The city of surat suffers from lack of enforcement of the traffic management system..Aim of the current study was to prepare planning proposal for connectivity and mobility service and regulation in North zone of Surat city . Hence it is important to design integrated transport system where public transport use in most efficient way.
- This study demonstrates the planning of the integrated BRTS system in North zone of Surat city. Effectiveness of BRTS depends on the presence of complementary transport options such as a promotion of public bicycle sharing and e-rickshaw as a integrated feeder services of BRTS.
- This study identify the location of the 23 station of the PBS and e-rickshaw and also 22 PBS station located on the existing BRTS station with the capacity of small PBS station and one 8-seater rickshaw.

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