



## Proposing the Design of Pedestrian Zone Facility at Bhaga Talav main Road of Surat City

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**Abstract** — Due to rapid urbanization over the last decade there has been a steep rise in the volume of traffic in Surat. This has led to congested and jams packed roads. Simply to walk is a challenging exercise in this area especially in peak hours and weekends. Walkability provides safety, comfort and security for the city resident. It will increase use of public transit, decrease car dependence, increase pedestrian, lead to cleaner air. With the burgeoning traffic, the lives of pedestrians are highly endangered. So the need of the hour is to provide a safe environment for pedestrians without any conflicts with other modes of transportation.

The Bhaga Talav Main Road is CBD area of Surat City. The street of Bhaga Talav Main Road of Surat City is almost choked by mixed traffic, usually by Para transits and personalized two/four wheelers. Dense urban corridors and existence of busy commercial set ups are visible along major road. A visitors questionnaire survey will be carry out in the Bhaga Talav Main Road of Surat city which is residential cum commercial area. Observational data collection was also done to determine pedestrian and vehicle volumes and a mapping exercise to determine the location and quantity of parking for two-wheelers and four-wheelers in and around this area. The research finally reveals that there are opportunities to make area as walkable or no.

**Keywords-** CBD; burgeoning traffic; pedestrianization; walkable; Observational data;

### I. INTRODUCTION

Walking is oldest form of human transportation. With the exception of devices to enhance the mobility of the disabled, walking demand no special equipment. Thus the walking is most affordable and accessible of modes. People who walk know their neighborhood. A community that is designed to support walking is livable and attractive. Today, People are restrained from walking comfortably around especially in the city center due to rapid urbanization and vehicle traffic. It is socially, economically and aesthetically important to provide people restrained by the urbanization moment with the open space that are secure, comfortable, partially and totally free from cleansed from vehicle traffic.

Kinds of Pedestrian Zone

- Full time pedestrian zone
- Part-time pedestrian zone
- Traffic calming zone

#### 1.1 Definition of Pedestrian Zone

“A pedestrian zone may be define as a simply area where vehicles are restricted and reserved for pedestrians who are free to occupy the entire space.” The zone entrance and exits are often designated with signage to make all users of the road aware when they are entering or exiting such an area.

#### 1.2 Characteristics for Development of Pedestrian Zone

- High rates of walking and cycling.
- Very low level of car use, resulting in much less traffic on surrounding roads.
- Less land taken for parking and roads-more available green or social space.
- More independent movement of people.

#### 1.3 Advantages found Developments of Pedestrian Zone

- Low traffic congestion.
- Increased safety for visitors, especially for the elderly and children.
- Low atmospheric emission.
- Encouragement of active modes.
- Discouraging of private cars and other motorized vehicle.

#### 1.4 Objectives of Study

- To design the street in such a way that it improve the pedestrian walking environment.

- To improve safety and mobility of pedestrian.
- To minimize traffic congestion.
- To encourage walking and enhance people to motivate for neighborhood.
- To promote pedestrainisation and enjoyment with shopping.

## II. LITERATURE SURVEY

1. **Ar. Navin Gupta(2015)** was discussed that today, people are retrained from walking comfortably around especially in the city center due to rapid urbanization and increasing vehicle traffic. The goal of this research paper was to apprise the agencies to plan, design and implement well connected, safe, comfortable and sustainable pedestrian facilities that encourage and inspire number of people to choose waking as their preferred mode of travel for shorter trip (trips less than 2-3 km) in cities.

2. **Dibyendu Bikash Bhattacharyya and Soumen Mitra(2013)** were discussed that the prospects for walkability and related issues has been analyzed for Siliguri city and effort was made to identify possibilities of transforming Siliguri into walkable city.

3. **Hariom Maheshwari and Soumya Mondal(2014)** were summarizes Nagerbazar's transportation system and travel behavior, analyzes the extent and causes of the most severe problems and recommends policy improvements that would help to mitigate Nagerbazar's transport crisis.

4. **Juriah Zakaria and Norsidah Ujang(2014)** were focused on walkability of urban places in the city center of Kuala Lumpur. The objective of this study was to determine pedestrians' satisfaction of comfort based on their walking experience.

5. **Purnima Parida, Jiten Shah and S. Gangopadhyay(2014)** discussed Chandni Chowk area of Delhi to assess the feasibility of providing a grade separation facility (sky walk) for distance of 1305 meters.

6. **Dr. Jaydip Barman and Chintan Daftardar(2010)** supported for developed pedestrian infrastructure, which provides safe, secure and convenient pedestrian infrastructure for the true owner of city: 'the people'. The parameter was identified to evaluate the walkability index of Lucknow city.

## III. STUDY METHODOLOGY

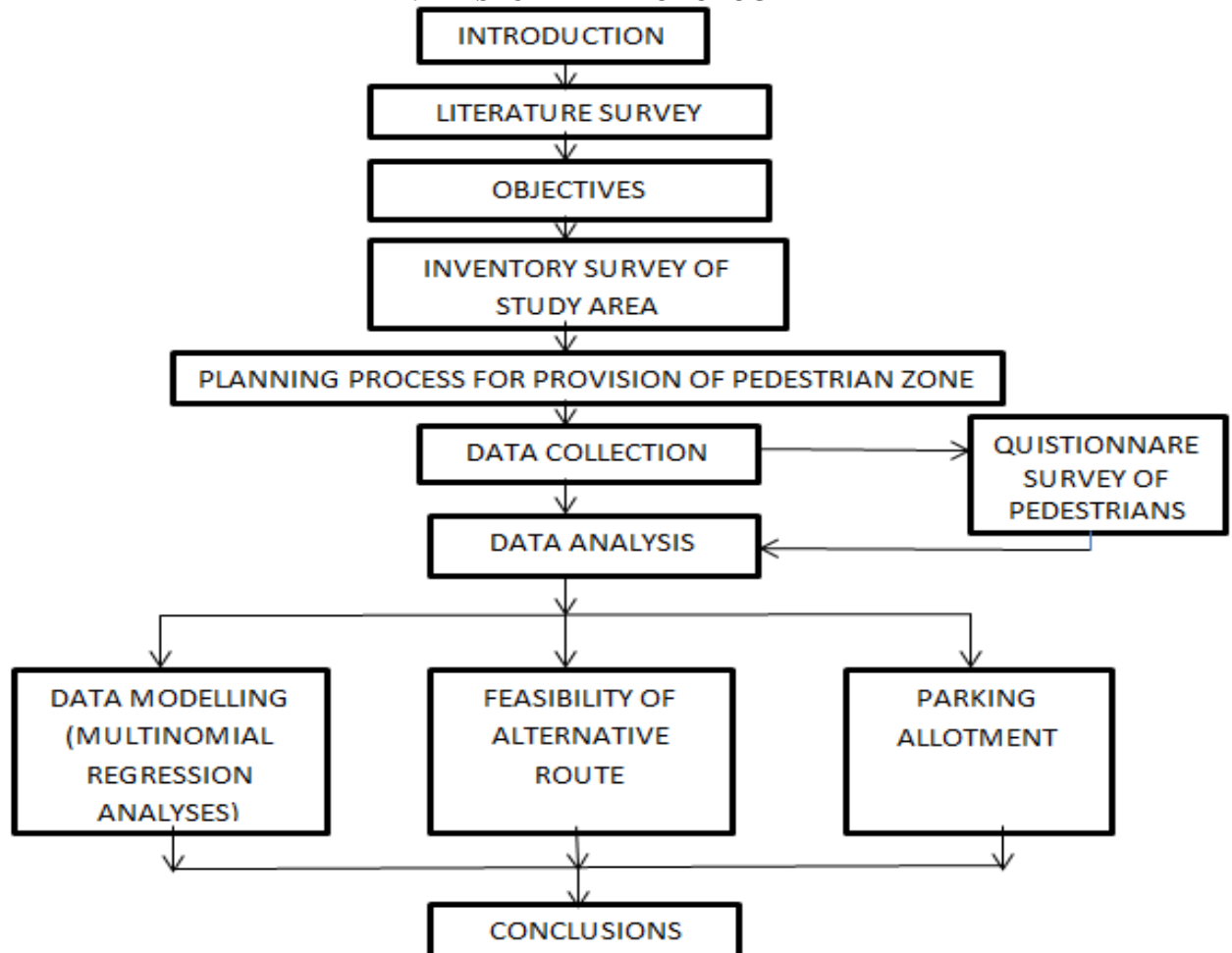
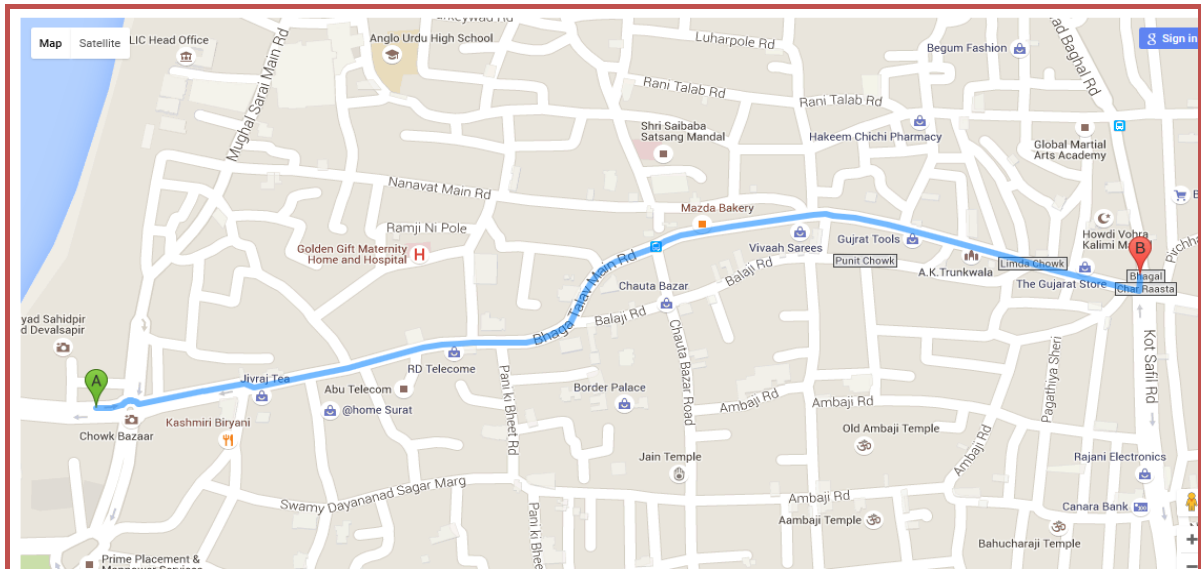


Figure 1. Study Methodology

#### IV. STUDY AREA

Surat is a city located on the western part of India in the state of Gujarat.

The vehicular population of Surat city is increasing at an alarming rate. The vehicles registered in Surat RTO area had raised from 4 lacs in 1994 to 14 lacs in 2008 and the number has reached to around 19 lacs as on march, 2013. The rate of growth has remained high at 10 to 11%. Surat is known for its shopping facilities and the wide choice it offers for all kinds of shoppers. Chautapul-Bhagal are two of the oldest, most popular and frequented shopping places in Surat, Situated in the Central Business District (CBD) of Surat. Chautapul and Bhagal are shopping streets that sells international brands alongside locally produced items. It lies between Chawk and Surat railway station on Raj Marg. Garments, hosiery, textiles, and shoes form the major part of the shops. In addition, there are shops selling artifacts and art materials, jewelry, hardware goods, sport goods and other general goods. These are the most frequented shopping places in Surat.

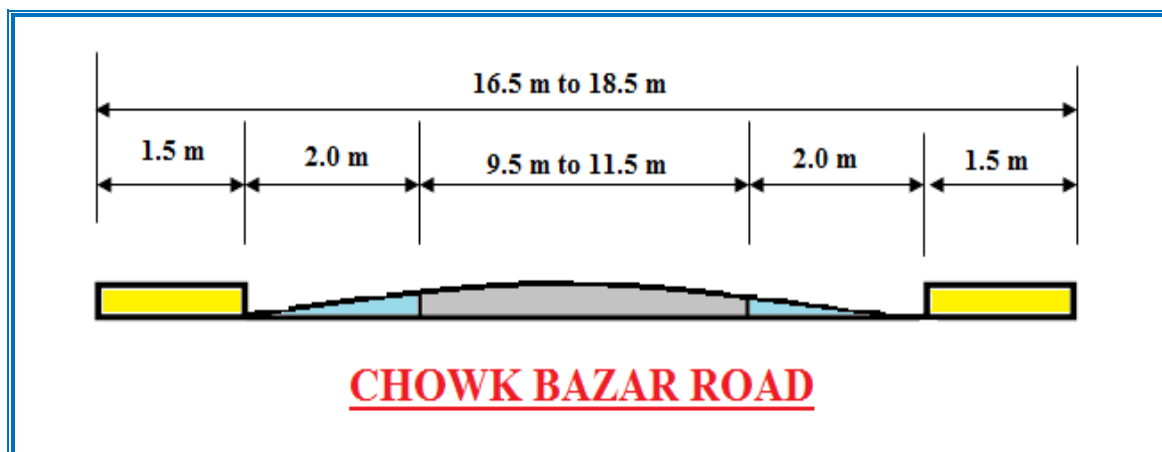


**Figure 2. Study area**

#### V. DATA COLLECTION

##### 5.1 Inventory Study

##### 5.1.1 Geometric details of the Bhagal Talav Main Road



**Figure 3. Section View of Chowk Bazar Road**

**Table 1. Commercial Shops on Chowk Bazar Road**

Shop type	No of shops	Shop type	No of shops	Shop type	No of shops
ATM	4	Hospital	1	Dairy	1
Bank	2	Bakery	3	Bag shops	12
Readymade Cloths	141	Hotel	-	Cosmetics	7
Hardware	35	Police Station	1	Tobacco	3
Medical Store	9	Vessel	5	Cycle	7
Shoes	21	Restaurant	7	Toy	5
Spectacles, Belt, Cap	14	Stationary	6	Tea	1
Temple	1	Cosmetic	1	Open Plot	3
Watch	12	Electronics	25	Tailor	4
<b>Total No. of Shops: 331 NO</b>					

## **5.2 Number of Pedestrian per Hour at Bhaga Talav Main Road of Surat City**

### **5.2.1 Number of Pedestrian per Hour in Weeks Day**

**Table 2. Number of Pedestrian per Hour in Weeks Day**

Time	No. of Pedestrians per hour in both direction
09:00am to 10:00am	752
10:00am to 11:00am	1890
11:00am to 12:00pm	1873
12:00pm to 01:00pm	1765
01:00pm to 02:00pm	1663
02:00pm to 03:00pm	2021
03:00pm to 04:00pm	2352
04:00pm to 05:00pm	2945
05:00pm to 06:00pm	2983
06:00pm to 07:00pm	2752

### **5.2.2 Number of Pedestrian per Hour in Weekend**

**Table 3. Number of Pedestrian per Hour in Weekend**

Time	No. of Pedestrians per hour in both direction
09:00am to 10:00am	956
10:00am to 11:00am	2405
11:00am to 12:00pm	2463
12:00pm to 01:00pm	2254
01:00pm to 02:00pm	2353
02:00pm to 03:00pm	2568
03:00pm to 04:00pm	2742
04:00pm to 05:00pm	3143
05:00pm to 06:00pm	2963
06:00pm to 07:00pm	2761

Based on the table 5.2 and table 5.3, LOS B and LOS C better for design pedestrian zone facility at Bhaga Talav Main Road. So provided 2.5 m walking zone in design of pedestrian zone facility.

### **5.3 Identifying of Parking Allotment**

A mapping exercise to determine the location and quantity of parking for two-wheelers and four-wheelers in and around this area.





Figure 4. Parking facilities around Bhaga Talav Main Road

#### 5.4 Feasibility of Alternative Route



Figure 5. Alternative Route Around Bhaga Talave Main Road

#### 5.5 Expected Section of Existing Bhaga Talav Main Road at Day, at Night and Expected Section of Proposed Bhaga Talav Main as Pedestrian Friendly Street

Impose rule on design coherence and uniformity. Enforce them for street furniture like lighting, paving, benches, planting, etc



Figure 6. Existing Section at Day



Figure 7. Existing Section at Night

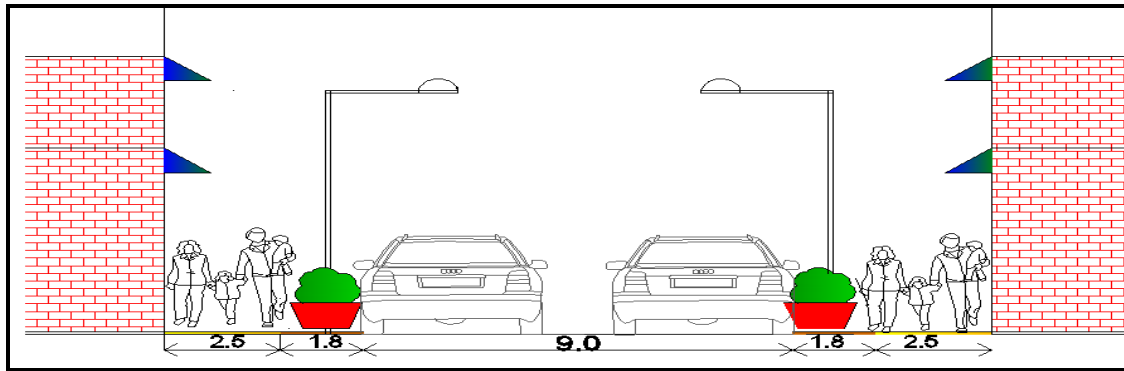


Figure 8. Proposed Section of Bhaga Talav Main as Pedestrian Friendly Street

## VI. DATA ANALYSIS

### 6.1 Questionnaire Survey

- Do they think Bhagal Chautapul Street should be made pedestrian zone in order to make it pedestrian friendly?

Below table and graph shows that how many persons agree to make Bhagal Chautapul Street as a pedestrian street.

Table 6.10 Persons Agree to Make Bhagal Chautapul Street as a Pedestrian Street

Table 4. Persons Agree to Make Bhagal Chautapul Street as a Pedestrian Street

Yes	266
No	34

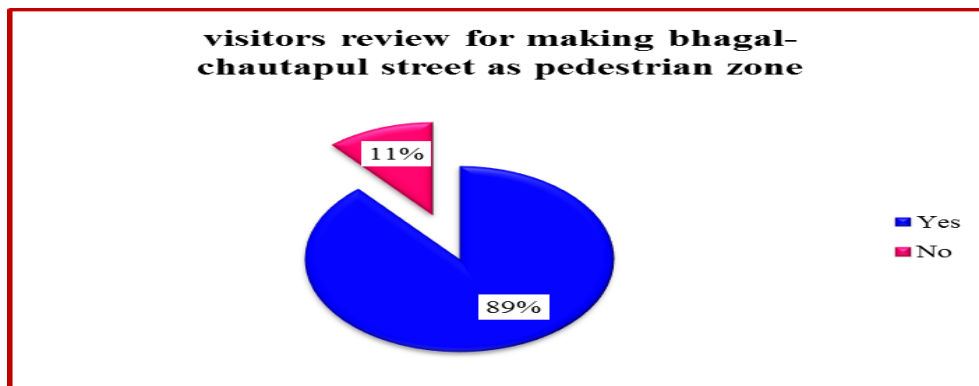


Figure 9. Visitor Review For Making Bhagal Chautapul Street as a Pedestrian Street

- If we provide off street parking facility at this area on chargeable bases, and then would they park their vehicles in it?

Below table and graph shows those numbers of people are ready to park their vehicles in chargeable base parking.

Table 6.11 Persons Park Their Vehicles in Chargeable Base Parking

Table 5. Persons Park Their Vehicles in Chargeable Base Parking

Yes	247
No	53

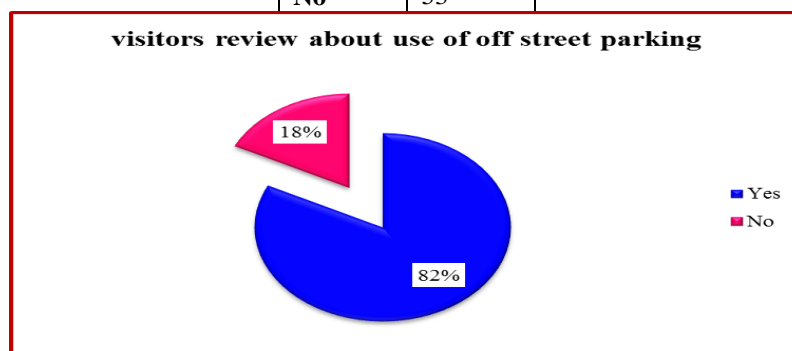


Figure 10. Visitor Review About Use of Off Street Parking

## 6.2 Data Modeling (Multinomial Regression Analysis):

Based on questionnaire survey data analysis done by data modeling (multinomial regression analysis) based on SPSS model, the final output of model are as below tables.

The model estimates the probability that commuters will agree to make the pedestrian zone or will disagree to the proposal. The variables included in the analysis are gender, monthly household income, number of visits to Bhagal Chawk area, age group of visitors and mode of transport. Table 7. shows the likelihood ratio test.

Table 6. Likelihood Ratio Tests

Likelihood Ratio Tests				
Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	131.905 <sup>a</sup>	0.000	0	
Gender	141.434	9.529	1	.002
Income	147.579	15.673	4	.003
No of visits	139.464	7.558	5	.182
Mode of transport	139.854	7.949	3	.047
Age group	147.513	15.608	4	.004
The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.				

Table 7. Parameter Estimates

Parameter Estimates						
Review of visitors for making chautapul as pedestrian zone <sup>a</sup>		B	Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B) Lower Bound Upper Bound
Yes	Intercept	5.314	10.604	.001		
	[Gender=1]	-1.381	9.049	.003	.251	.102 .618
	[Gender=2]	0 <sup>b</sup>				
	[Income=2]	-2.538	6.505	.011	.079	.011 .556
	[Income=5]	0 <sup>b</sup>				
	[No of visits=4]	1.254	1.879	.070	3.506	.583 21.074
	[No of visits=6]	0 <sup>b</sup>				
	[Mode of transport=1]	-3.990	6.605	.010	.019	.001 .388
	[Mode of transport=3]	-2.060	2.284	.031	.128	.009 1.843
	[Mode of transport=4]	0 <sup>b</sup>				
	[Age group=2]	-1.367	1.299	.054	.255	.024 2.674
	[Age group=5]	0 <sup>b</sup>				
a. The reference category is: No.						
b. This parameter is set to zero because it is redundant.						

The table 8. represents the results of the multinomial model for the visitors for making pedestrian zone. The term significant refers to the coefficient being significantly different from zero at a 5% confidence level. The inclusion and exclusion of the variables are dependent on their significance test. From the results it is seen that only transport mode, age group and gender have significance for response to pedestrian zone. The attributes have negative coefficient, which shows that they negatively affect the decision.

**Table 8. Classification**

Classification			
Observed	Predicted		
	Yes	No	Percent Correct
Yes	264	3	98.9%
No	27	6	18.2%
Overall Percentage	97.0%	3.0%	90.0%

From classification table 9. it is observed that the model was validated with 90.0 % with the actual survey. We can consider it as people's positive response towards making the area as pedestrian zone.

## VII. Conclusion

This study aims at providing pedestrian zone at BhagaTalav Main Road of Surat City. The provision of pedestrian zone facilities in commercial areas will provide a safe and comfortable walking to the pedestrian. By providing pedestrian zone facility the vehicular movement will be restricted and pedestrian will be able to move safely. Based on questionnaire survey, it is concluded that 89% people are ready to use this route as a pedestrian zone and 82% people are ready to park their vehicles on charged basis parking. Observational data collection was also be done to determine pedestrian and vehicle volumes and a mapping exercise to determine the location and quantity of parking for two-wheelers and four-wheelers in and around this area and also feasibility of alternatives route decided. it is observed that the model was validated with 90.0 % with the actual survey. From the SPSS (Multinomial Regression Analysis) through we can consider it as people's positive response towards making the area as pedestrian zone.

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