Feasibility Study of Providing Cycle track in East Zone Area of Vadodara City

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Abstract: Cities in developing countries owning of motor vehicles to increase in population and motor vehicles are facing problems such as congestion, traffic jams, environmental population, high cost of travel, more fuel consumption, etc. Last mile problem is increasingly serious problem during the process of development of the public transit. Public transit hardly meets the residents door to door travel demand, which reduced passenger satisfaction. The central concept to increase bicycles for short distances trips in urban area as alternative to private vehicles, thereby reducing traffic congestion, noise and air pollution. The main obstacle to boost the bicycle as a regular mode of transport is safety due to mix motorised traffic. Targeted at low-income groups the prime reasons for subscriptions were savings in time and money spent over other modes of transport. One opinion is to separate cyclists from motorised through bicycle priority lanes. A questionnaire survey was carried out from public what they want features in the bicycle track. Using that data we can design the bicycle track as per IRC-11 (cycle track design and layouts 1962 and 2015). The purpose of this paper is the safeties of cycle tracks in order clarify the safety record of these facilities relative to cycling in the street and to point to areas where further research is needed.

Index Terms - cycling, cycle infrastructure, safety, separate cycle track

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I. INTRODUCTION

First and last mile connectivity is a term used in transportation planning to describe the difficulty people face in reaching their origin and destination from transportation network stops and stations. In India, public transport users generally complete these trips by walking or on Intermediate Public Transport (IPT) modes such as cycle rickshaws, auto rickshaws, and shared auto rickshaws. While substantial efforts have been made to provide and improve sustainable mass transportation in India, the focus on first and last mile connectivity and linking IPT with mass transit into an included system to aid easiness of access for users is lacking. The challenges to effective, reliable and affordable public transportation solutions to address this inadequacy include: poor customer service, fare uncertainty by the informal transport sector (rickshaws, auto rickshaws and private mini buses); lack of NMT infrastructure; and urban design issues related to disconnect between public and private development.

The non-motorized transportation modes such as being realizable for shorter distances only, and lower speeds make them suitable for providing access to any transportation system under congested conditions or to any land use in the locality of our homes. NMT modes are an important and integral element of urban transport worldwide. Non-Motorised Transport includes walking, cycling, small-wheeled transport (skates, skateboards, push scooters and hand carts) and wheelchair travel. These modes provide both recreation (they are an end in themselves) and transportation (they provide access to goods and activities), although users may consider a particular trip to serve both objectives. For example, some people will choose to walk or cycle rather than drive because they enjoy the activity, although it takes longer.

NMT is often a key component of effectively encouraging clean urban transport. It can be a very attractive mode of transport for relatively short distances, which make up the largest share of trips in cities. The key to reversing the tendency towards more personal vehicle use is making walking and cycling good-looking, together with improving public transport. This can be done by a range of activities including construction of sidewalks and bike lanes, bike sharing programmes, urban planning and pedestrian-oriented development. NMT is an extremely money-making transportation strategy and brings about large health, economic and social co-benefits, particularly for the urban poor.

Engineers and planners in Indian cities continue to design around the needs of the automobiles- width of roads, a location of road space, high speed roadways, flyovers- in the process ignoring the requirements of the urban poor and the surroundings. Though India is growing economically, there is still a large segment of the population living in deplorable circumstances in cities and villages – many come to cities from rural locations in search of a better life.

However, access to opportunities is often challenging since the very poor rely on walking, biking or on collective, mostly public travel modes such as buses. The bicycle is a safer vehicle compared to the car. The majority of accidents related to bicycles occur because the user has to share the city streets with other vehicle. Nevertheless, many cities have worked to improve the safety for the bicycle users. The streets have become more bicycle and pedestrian friendly. An additional result of this is that the streets are friendlier to the more fragile citizens: the children, the elderly, the handicapped or disable.

It is rather easy to improve the infrastructure for safer bicycle traffic; good examples are ramps in the sidewalks and stairs, cycle paths or cycle lanes and safe places to park the bicycles. It is important that the planning of the city encourage the use of bicycles. There are five main aspects of planning to improve the infrastructure for this mode of transport: safety, direct/fast route, coherence, comforts and attractiveness. The infrastructure will attracts more cyclists the safer, faster, more direct, more comfortable, more continuous and coherent way it can offer.

II. DESIGN DETAILS
- **Design speed**

The average speed range of NMT is about 5 km/h – 15 km/hr. In rare cases, it can be seen to be 20 km/hr. It is important for cyclist gain a cruising speed for constant usage. Interruption due to parking, side roads, access the properties affect the desirable speed and make it difficult to cyclist. Hence variation in alignment, levels and form of the bicycle infrastructure should be avoided. Vertical gradients need to be well accommodated.

- **Clearance and Width**

The width requirement for NMT in movement is higher than its physical dimensions. This is on account of two main factors; i.e. zigzagging moment and fear of obstacles. Bicyclists carrying goods and pillion riders may experience higher zigzagging on account of extra weight carried, while cycle rickshaws experience minimal or no zigzagging.

- **Turning radius**

Bends are required for smooth connection between cycling path and also to ensure continuity of the infrastructure. The radius of curves used in bending a path affects the speed of NMVs using it. Sharper the bend, lower the speed. Minimum design speed for stability requirement of a bicyclist is 12 km/hr. Bends of 30 m radius or more are preferred on segregated bicycle tracks to maintain visual directness and continuity of the path and also to reduce the path widening requirement due to additional with requirement for a ride negotiating bends.

- **Pavement surface**

Asphalt, concrete, interlocking tiles, pavers, granites, stones, etc have been used as surface material for cycle facility. Cyclists have a clear preference for closed surfacing such as asphalt and unevenness and the least resistance and most comfortable. The component of bicycle infrastructure mentioned will actually consist of the inner subsurface material and surfacing material. There are bound to be some irregularities in closed surfacing materials like cracks, fissures and projections.

- **Edge treatments**

The path of cyclist is identified by the edge on the both sides of the infrastructure. Depending upon the form and type of NMV infrastructure provided, the solution of the edges differs with the use of a kerb, green hedge, bollards, etc. Green areas provide shades, qualitative spaces and an ambient environment for not only cyclists but all road users. It should be kept in mind that the height and the level of the edge condition should be treated as a vertical obstruction and adequate shy away should be provided so as not to compromise the requisites of NMT infrastructure.

III. METHODOLOGY

Cycling is a sustainable transportation option, and a city that implements a bicycle share system may strengthen its image as a "green" or innovative city. Below fig shows my methodology for dissertation topic, in which initially form my literature finding objectives then selecting study area in which residential, commercial, educational and shopping areas are included. Lastly data will be collected by socio-economic survey and o-d survey which will be conducted by home interview surveys and road-side interview surveys. Lastly on the basis of data analysis and its results will be concluded.

- **Home-interview survey**
- Home-interview survey is one of the most reliable types of survey for collection of origin and destination data.
- The survey is essentially intended to yield data on the travel pattern of the resident of the household and the general characteristics of the household influencing trip-making.
- The information on travel pattern includes number of trip made, their origin and destination, purpose of the trip, travel mode, time of departure from origin and time of arrival at destination and so on.
- The information on household characteristics includes type of dwelling unit, number of residents, age, gender, vehicle ownership, number of drivers, family income and so on.
- **Roadside interview survey**
- Roadside interview data is manually collected from drivers travelling through a specified study area.
- Its main purpose is to identify existing travel patterns.
- Roadside interview surveys are generally used to collect origin and destination data, but can also be used to collect additional information such as purpose of journey, frequency of journey, vehicle occupancy, and purpose of trip.

IV. STUDY AREA

- **Location**

Vadodara formerly known as Baroda. Vadodara has been rising as an organizational, commercial and educational centre. Today it is the third most populated city in Gujarat after Ahmedabad and Surat with a total population of 16.6 lakh (Census 2011) within 12 wards. The city serves as an administrative headquarters of its district and spreads over an area of 125 sq km. The establishment of Indian Petrochemicals Corporation Limited (IPCL) and Gujarat Refinery transformed the socio-economic landscape and attracted many rural inhabitants to the city. The city is popular for its palace, park, museum and temples. It is also known for its "Gateway to the Golden Corridor".
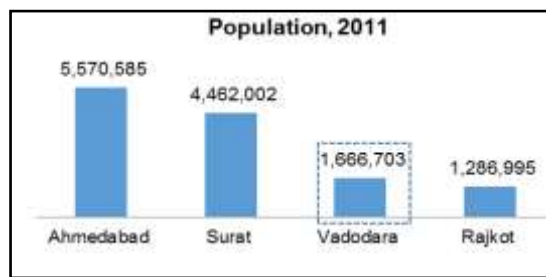

Fig no: 1: Population of Vadodara compared to other cities in Gujarat (Source: Census 2011)

Vadodara is located in south eastern part of Gujarat on the banks of the Vishwamitri River. The city has fairly flat topography. It experiences three main seasons; summer, monsoon and winter. Summers are hot with average temperature of 36 ˚C which goes up 40-44 ˚C during the month of March to May. Average annual precipitation is 131mm, with more or less 8-day rainfall each month from June to November. The winters are generally mild with temperature varying from 12˚C to 16˚C lasting from November to February. The overall weather is dry in Vadodara and rainfall is infrequent. These climatic situations make Vadodara helpful to cycling for 8 to 9 months of the year. The flat topography makes cycling in the city less strenuous and is not a barrier to the use of the system.

Vadodara has a mix up of land use category circulated unequally across the city. During the last 15-20 years, new residential areas like Gorwa, Gotri, Harni, Sama, Bapod, Tarsali, Manjalpur and Channi have come to support the population of the expanding city and industrial areas. My study area located around Vrundavan chokadi, Parivar chokadi, Kaladarshan chokadi, Uma chokadi to Vrundavan chokadi accessibility to important destination such as grocery stores, banks, restaurants and some educational buildings. And in this area maximization is residential area. In this area generating more short trips. This characteristic nature of Vadodara with its mix of land uses provide opportunities for the bicycle to act as a viable mode for utility-based short trips.

V. Data Collection
7.1 General
Four lane divided urban road are selected for the present study of Vadodara city. For collecting data first of all take the physical measurement of road. Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. Two methods are available for conducting traffic volume counts: (1) manual and (2) automatic. Manual counts are typically used to gather data for determination of vehicle classification, turning movements, direction of travel, pedestrian movements, or vehicle occupancy. For study area all the roads fig shows below.
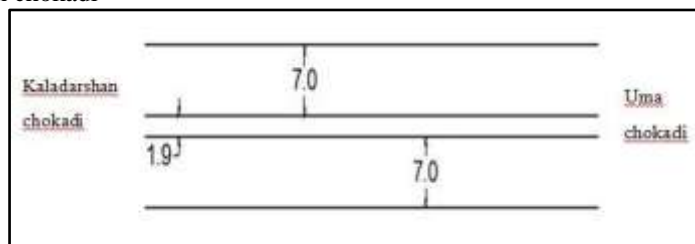
1)   Uma chokadi to Kaladarshan chokadi

Fig no: 2: Key plan of uma to Kaladarshan road
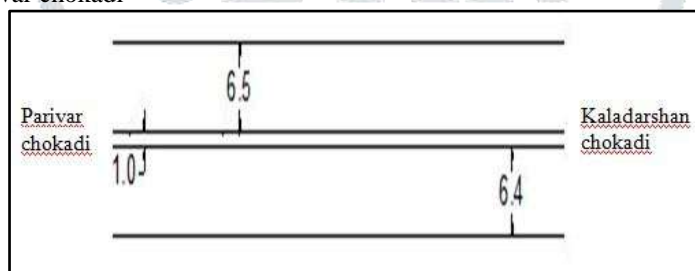
2)   Kaladarshan chokadi to Parivar chokadi

Fig no: 3: Key plan of Kaladarshan to Parivar road

3)   Parivar chokadi to Vrundavan chokadi

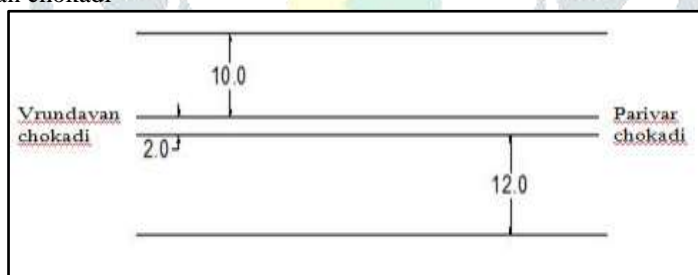
Fig no: 4: Key plan of Parivar to Vrundavan road

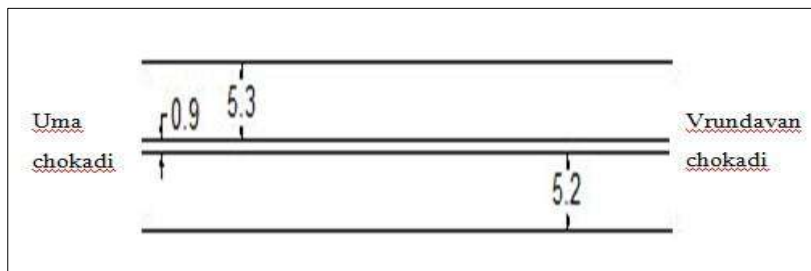4) Vrundavan chokadi to Uma chokadi

Fig no: 5: Key plan of Vrundavan to Uma road

The collection of data is an integral and critical part of the research process. This module will discuss data acquisition, its importance to research, management of data, and data management plans and tools. For this study, house hold survey and road side interview were carried out with an objective to study the socio economic and household characteristics of the people (worker and student) being interviewed and the travel behavior in commuting their daily trips (work or educational trips).

For collecting the data survey was conducted to study people how would respond to the questionnaire. The time for data collection was after 6pm in weekdays and during daytime on weekend, on there is many possibilities of finding workers and students at home.

The survey questionnaire is divided in to three parts. The format for survey forms was kept simple with minimum requirement of writing and the question were arranged under specific headings. In which in my questionnaire first part about socio-economic, second one about trip characteristics and in third part what people thinking about bicycle, bicycle trend and if providing separate bicycle then will they use that path.

VI. DATA ANALYSIS

Socio-economic and household characteristics such as gender, age, occupation, household size, household income and vehicle ownership play an important role in the travel characteristics. In this research work analysis is done by SPSS. For collecting data taking 384 samples for analysis. Which are analyzed by SPSS IBM spastics 20 below shows graphs.

- Given below graph shows that 20.9% respondents are female and 79.1% respondents are male and 43.8% respondent's are in 10-19, 11.7% respondent's are in 20-29, 13.5% respondent's are in 30-39, 18.2% respondent's are in 40-49, 9.4% respondent's are in 50-59 and 3.4% respondent's are above 70 years.
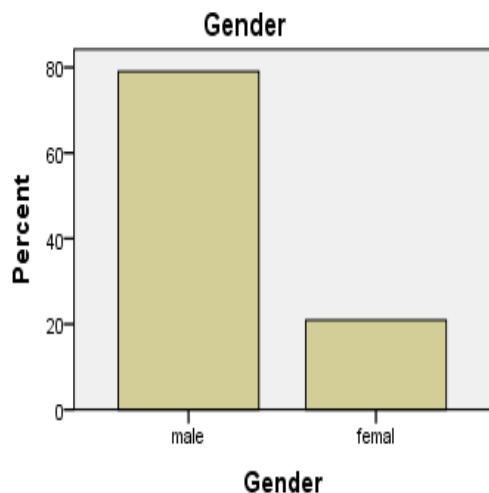

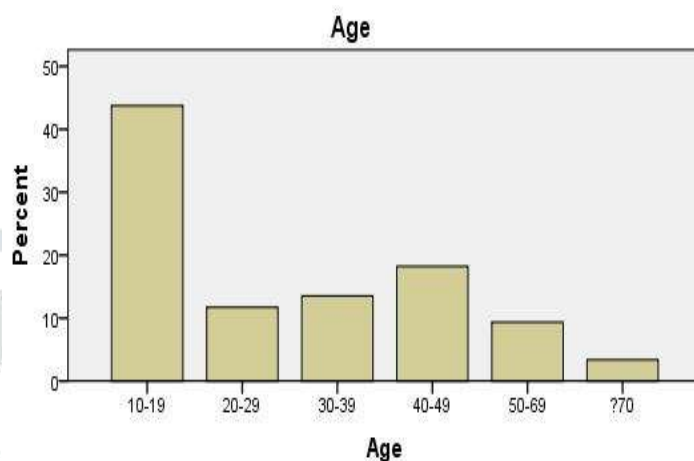Fig no: 6: Gender   Fig no: 7: Age

- Given below graph shows that 60.9% respondents having bicycle, 39.1% respondents having no bicycle and maximum 38.3% respondent's daily no of trips are more than six and minimum 6.3% respondent's daily no of trips are two or three.
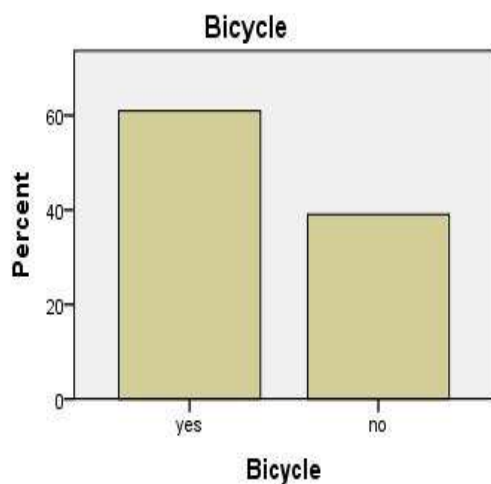

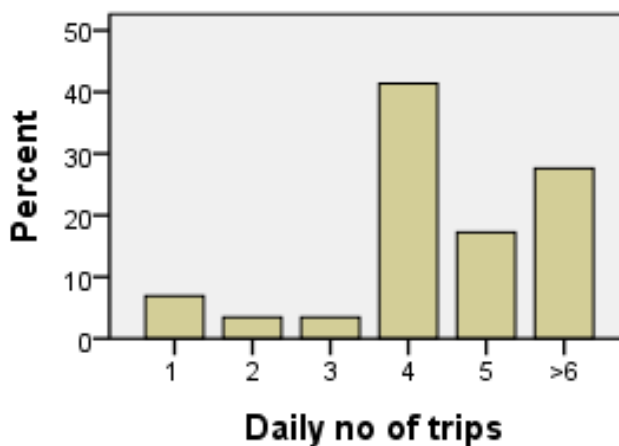Fig no: 8: vehicles having Bicycle   Fig no: 9: daily no of trips

- Given below graph shows that maximum 40.6% respondent's using bicycle for education and the respondent's response about, if providing bicycle track would they use it and in which maximum public's review is positive.
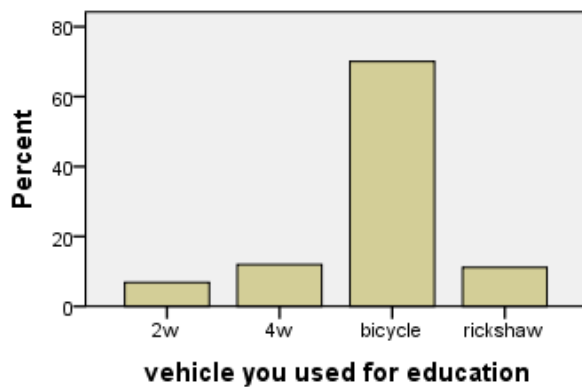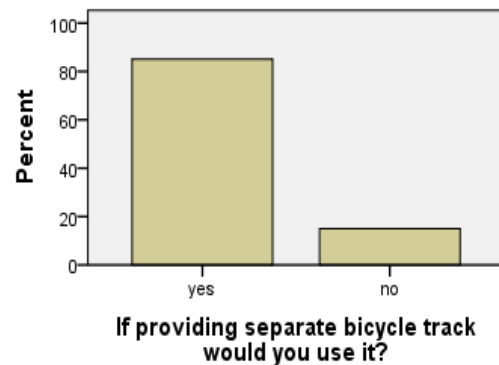
Fig no: 10: Vehicle used for education

Fig no: 11: Use for bicycle track

VII. CONCLUSION

- Transport system of the city heavily affected by the fast growth rates of two wheelers and three wheelers vehicles and public transport with its decreasing service level, become less attractive to the people.
- As per IRC: 11-1962 if motor vehicles are more than 200 per hour separate cycle track justified if the cycle traffic is only 100 per hour. As shown in data collection the peak hour cycles are around or more than 100 in one hour and other vehicles are also more than justification so we can proved separate cycle track.
- As per analysis in study zone 44% respondents are using bicycle for working and 51.8% respondent's using bicycle for education. In which 51% are student and 43.8% respondents are in age group of 10-19 which are students and 60.2% respondent's are thinking because of lack of bicycle paths they are facing problem to use bicycle for their safety and 71.4% respondents are thinking if we providing separate bicycle track then they are using that track which is safer than no cycle facilities between junctions. There are however problems with parked cars on shoulder of the road.

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