

# Promoting Public Transport by Improving Pedestrian Facilities

## Abstract

Increasing vehicle ownership, alarming rise in private automobile dependency, traffic congestion and rise in pollution levels have compelled more and more cities in India to opt for public transit systems. Despite this, the problems of congestion in cities are persist. Every transit rider is also a pedestrian, so transit ridership depends very much on the quality of pedestrian environment where the transit stops and starts. The ability and willingness of people to walk a short distance to a stop is what makes it possible to gather many people with many intentions on a single vehicle, which is the major essence of any transit project. The main objective of this study is to improve condition of walking to encourage people to walk. Basic understanding of walking parameters, built environment, factors that affects access and egress mode for walking have been discussed in literature review.

From this study it is inferred that Vadodara having poor quality of pedestrian infrastructure, poor road networks, insufficient sidewalks, lack of amenities. Finally recommendations have been suggested to improve walking facilities for an access and egress trips for public transit.

**Keywords:** Public Transport, Access Trip, Egress Trip, Pedestrian Facilities.

## Introduction

In India, little importance has given by many planning authorities to walking and public transport, yet walking and public transport frequently been interlinked in planning. People living far from public transport services are highly likely to travel with their private mode of transportation instead of choosing walk to get to the public transport stop.

When people look at the public transport around them, many conclude that it doesn't make sense for them to use it. Public transit is not designed to provide door-to-door connectivity like personalized mode of transport. Access and Egress trips are the weakest links to using public transit.

Rapid motorization, inadequate traffic enforcement, and un-walkable built environment prevent public to use walking to reach destination or to reach public transit service, hence they use their private vehicles for their transportation. Despite its important role in providing urban mobility, walking is mostly neglected in process of urban planning practice and research in India.

## Aim of the Study

To study existing physical conditions and need of pedestrian infrastructure for creating walkable infrastructure in Vadodara city. This will help in making suggestions for improving walking for access and egress modes for public transportation.

## Review of Literature

Walking is healthy and we all walk. Any trip by any means includes at least a small distance covered on foot at the beginning and end of each journey. Walking is the most basic urban transport mode that has allowed cities to operate. However, its role has been eroded with the introduction of mechanical means of transportation. Look in turn some of the possible limits of walking that may have led to the negative trend. A benefits and limits table is listed below:

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**Table 1: Benefits and Limits of Walking (Lauren Ledbetter, TamikoPercell, 2014)**

Benefits	Limits
The walking mode involves very little expense, either public or private.	Human does become tired, rather quickly. Studies shows acceptable access distance to a transit station on foot is 400m.
Health benefits; yet walking is the most basic form of exercise	Speed: For short distances, the slow pedestrian speed does not matter, but it becomes a factor with longer trips.
Availability: The mode is always present and ready for use	Adverse weather will reduce considerably any propensity for walking.
Certainty: A pedestrian is in direct contact with the surrounding environment so are others nearby.	Pedestrians have limitations including how much weight they are able or willing to carry with them
Environmental Friendly	Safety may be a concern for vulnerable

A good pedestrian infrastructure is an essential for the success of public transport. Safe and fast passages and routes to public transport stops and stations for walk is essential to integrate walk and public transport. Priority in design of infrastructure and traffic management can encourage the use of walking as an access or egress mode. The safe and fast passage and routes to important destinations are essential. (Srikanth, 2009)

#### **Factor affecting walk as choice of mode for access to public transport**

It is very essential to identify different factors which would directly or indirectly affect the choice of walk as the mode to access public transport.

#### **External Factors**

##### **Built-environment factors**

##### **Urban Form**

Distance act as major factor that influences any mode choice to access till the nearest bus stations. Increase in access distance leads to increase in travel time and physical efforts for travelling, and thus decrease in probability of using walk as the choice of mode to reach the destination. A denser road would be more suitable to access by walk since it would connect more activities. Higher density with mixed land use being predominantly residential is more opt for walking to the station.

##### **Pedestrian Infrastructure**

Appropriate pedestrian facility should be provided as to promote safe and convenient accesses by walk to the nearest PT stations. Pedestrian infrastructure consist of footpaths/sidewalks, pedestrian crossings, grade separated cross walks, street corners, median refuge, pedestrian only streets, lighting the pedestrian network, are the various components of pedestrian infrastructure that affect walk as choice of mode for accessing public transit (Jaydip Barman, 2010).

##### **Pedestrian Amenities**

Adequate pedestrian facility should be provided along the way to the main roads/till the PT stations. Amenities like shelter along the footpaths with ample shady tress, benches to sit and rest, drinking water facilities, public toilets, and footpaths wide enough for at least two users to walk easily should be provided. (U.S department of transportation, 2001)

#### **Natural Environment Factors**

*Land scape:* Using walk as the mode to access public transport stations, it is recommended to provide with shady tress alongside the footpath, so that the pedestrian feel better and are protected from much heat during summers.

#### **Hilliness**

The presence of slopes would have an adverse impact on the mode choice of walk to access the PT stations.

#### **Weather**

The weather varies on daily basis. The commuter by walk depends on the weather at some point.

#### **Internal Factors**

(Wee, Karst T et.al, 2004)

#### **Psychological Factors**

##### **Perception**

Perception is defined as "the individual's beliefs or estimation of the attributes of the alternatives" including perceptions of benefits, perception of barriers, perceived behavioural control or self-efficacy perceptions of safety. Perceived benefits are health, being fit, a regular exercise, avoiding congestion, economic benefits, saving fuel, etc.

##### **Attitudes**

An attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour.

##### **Habits**

Situation specific sequences that are or have become automatic, so that they occur without self-instruction. An individual who has a habit of walking enough already tend to walk to the nearest PT stops without any hesitations. (Triandis, 1977)

#### **Socio-Economic Factors**

There is a strong relationship between socio-economic characteristics like age, gender, vehicle, ownership, income, and occupations, etc. That has major impact on the mode of choice to access the PT stations.

#### **Data**

At present the public transport services in Vadodara City are rather limited and bus is the only mass transport system. Private operators supplement these services with chartered services. With the growth in population, the number of commuters has increased many folds. Around 68% trip of Vadodara

city is less than 5 Km trip length (CMP Vadodara 2012).Bicycle, Walk, and motorised two-wheelers takes over 70% of modal share of the city.The mode share of public transport is only 6%, which is very low. The bus service suffers low ridership due to poor

service and frequency.Auto-rickshaws have a mode share of 14%. They fill the gap created by the inefficient bus service and their share is on the rise catering to the demand unmet by public transit.

**Table 2 - Existing Bus Transportation System**

Sr. No	Parameters	Information
1	Bus Operator	Vinayaka Logistics
2	Type of Operator	Private
3	Number of Buses	67
4	No. of Bus routes	30
5	Coverage	VMSS
6	Operating vehicle-distance	10785 Km/Day
7	Passengers carried per day	>1,00,000
8	Frequency	15-30 Minutes
9	No. of Bus stops	105
10	Location of bus terminals	Opposite railway station
11	Service period	16 hours/day
12	Concessions on fares	50% for students and 30% for senior citizens
13	Total No. of drivers and conductors	250
14	GPS/Other ITS system	No
15	Typical route speed	20-30 kmph

There are around 105 bus stops in the city, to know the scenario of walking as mode for access and egress trip for public transit, a survey was conducted at the busiest bus routes. 5 bus stops were selected where more number of people coming and having different land uses. Station to Mandvi route is the busiest route of Vadodara, on that route stations; Tower and Mandvi were selected which were comprise of mixed land use, residential, commercial etc. Another route is station to sama, on that route Delux and Abhilaxa char-rasta bus stops were selected which were comprise of predominantly residential and somewhat commercial land use. To know the existing condition of walking and using of

walking as an access and egress mode 200 bus commuters have been directly interviewed. Commuters were interviewed mostly in morning at 6:30 to 11:00 AM and in Evening at 5:30 to 8:00 PM

### Analysis and Results

#### Road Network around Selected Bus Stops

The road network length around selected bus stop for 500 m radius has been calculated using GIS tool. It was assumed that the road network density within this distance around bus stop is significant for pedestrians. The road network around three bus stop; Ablilasha, Delux and Central bus stops are shown in the Figure given below:



**Figure 1– Road network around Abhilasha, Delux and Central Bus stops**

The road lengths for selected five bus stops under study area were derived using GIS tool as tabulated in the Table below:

**Table 3 – Road network length for bus stops**

Bus Stops	Road Length (in kilometre)
Abhilasha	12.94
Delux	13.44
Central depot	7.35
Tower	12.30
Mandvi	13.39

The road length varies from 7.50 km to 13.50 km; almost 100 percent variation has been observed

in terms of road density.

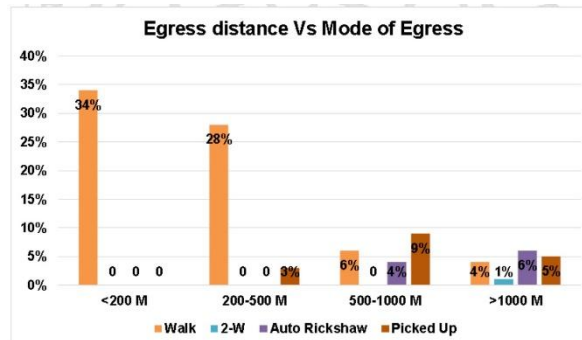
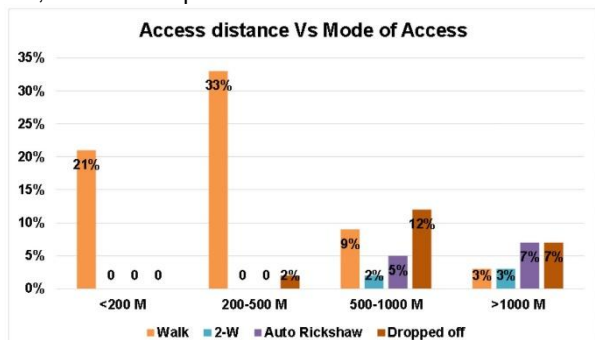
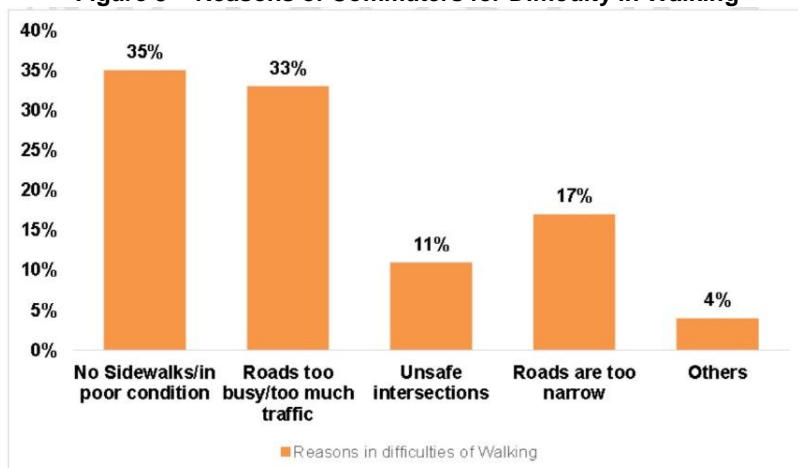


Figure 2– Access and Egress Trip length with their mode

From above Figure 2 of access and egress trip distance vs access and egress mode it is seen that with gradually increase of the distance people shift from walking to other mode of transportation. It is

seen that people do not likely to walk after the distance of 500 metre and auto-rickshaw, dropped off and picked up as a mode is increases.

Figure 3 – Reasons of Commuters for Difficulty in Walking



Above Figure 3 displays reasons behind difficulties experienced by respondents during walking. This rating was given by commuters who walks for access and egress trips. Almost 50% of commuters feels difficult in walking, major reason behind that is No sidewalks or sidewalks in poor condition and due to heavy traffic on roads.

When question was asked regarding type of vehicle imposing risk on them while walking or bicycling, their response on magnitude of perception about risky vehicle type in ascending order was auto-rickshaw, motorised two-wheeler, car, bus and truck with 45%, 23%, 13%, 9% and 6% respectively.

Table 4 - Availability of Footpath Around Bus Stops

Bus stop	Road length (KM)	Footpath/Side walks length (KM)	Percent of Footpath	Obstructed Footpath (KM)	Percent of Obstructed Footpath
Abhilasha	12.94	4.32	33.38	2.08	48.14
Delux	13.44	4.71	35.04	1.73	36.73
Station	7.35	2.30	31.29	1.19	51.73
Tower	12.30	2.64	21.46	1.57	59.46
Mandvi	13.39	3.21	23.97	1.86	57.94
<b>Total</b>	<b>59.42</b>	<b>17.18</b>	<b>Avg. 28.91 %</b>	<b>8.43</b>	<b>Avg. 49.06 %</b>

From above Table-4 it is seen condition of footpath around selected bus stops. Only 28.91% footpath of total road length is available around selected bus stops in 500 M radius and among that footpath 49.06% footpath is obstructed with the parked vehicles, encroachment of shops, street

vendors, electric cables and transformers, etc. which create un-walkable condition on those footpaths.

**Conclusion**

The walkability survey provided important insights into many aspects of the pedestrian experience in Vadodara, including on the availability

of footpaths and on the preferences of pedestrians for walkability improvements. Survey revealed that with the increase in the distance for access and egress trips, commuters shift from walking to auto rickshaw, dropped off, and picked up mode for access and egress. Majority of pedestrian who choose walking as an access and egress mode rate that there is need of improvement in walking condition in that area. 50% of commuters feels difficulties in walking. Vehicles wrongly parked on the footpaths force pedestrians to step onto the busy road, which creates the risk of being hit by a vehicle. Commuters who were not walking as mode for access and egress trips mainly due to built environment factor which is pedestrian infrastructure, amenities, etc. more than 50% commuters who were not walking accepts built environment is the major factor and then natural and psychological factor.

There are still long stretches of road with no footpaths on either side. All high volume roads should have footpaths on both sides, while medium volume roads should have footpath on at least one side of the road. The study has revealed that there is a considerable amount of physical disorder in the pedestrian environment, which makes walking unpleasant. Motor vehicles, parking on sidewalks, shops encroachment, narrow or no sidewalks, informal activity on footpaths cause significant obstructions and make walking difficult or impossible. More than 85% people who walk or not walking agrees upon that there is a need to improve walking facilities to encourage people to walk. Pedestrian amenities such as seating, trees, public toilets, trash cans and vendors all contribute to a comfortable and enjoyable walking experience. Most of the segments studied had very few or no amenities. Study reveals that better pedestrian facilities serve as inducement to people to make walk for longer distance without using an automobile.

#### **Encourage people to Walk by Changing Attitudes and Behaviour**

Encourage people to walk in Vadodara- Where walking is value, both for itself and benefits it gives to the community

A positive community attitude to walking will influence people to walk more frequently. More people

walking creates a safer, more socially engaged community.

The decision to walk to school, work, public transport, shops or any other activities and opportunities can be influenced by a range of factors including distance, the weather, the need to carry things and safety. In many cases decisions are made without all the necessary information.

Programs that change people's behaviour are vital to bring about a shift to more sustainable forms of transport, such as walking.

#### **Safety Measures**

Traffic-calm all streets to achieve the desired speed limits to improve pedestrian safety

1. Speed of vehicles should be 30 kmph
2. Introducing raised intersections at regular interval to achieve desired speed
3. Continuous stretch of unbroken footpaths
4. Provide appropriate levels of lighting on walking paths to improve pedestrian security and safety
5. Continue to review pedestrian crash data and identify counter measures to improve infrastructure safety and road user behaviour

#### **References**

- Dr. Jaydip barman (2010), "Planning for Sustainable Pedestrian Infrastructure with upcoming MRTS", Institute of Town Planners, India Journal*
- Lauren Ledbetter, Tamiko Percell, Malahat Owrang (2014), "Pedestrian access to transit plan", Valley transportation authority*
- Michael Southworth (2005), "Designing the Walkable Cities", ASCE 131:4(246)*
- Mr. Srikanth (2009), "importance of non-motorised transport as public transport", SUMA*
- MSU, MURP (2015), "Vadodara Development Plan"*
- Patel D. J. (2017), Improving Walking for as Access & Egress Trips for Public Transit, Dissertation Report, The M. S. University of Baroda.*
- Transport NSW (2001) "Integrating Land Use and Transport", Department of Urban Affairs and Planning*
- Wee, Karst T, Bert van (2004), " Accessibility evaluation of land use and transport strategies and research direction", Journal of transport geography, Pg128-129*