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Comparative analysis of pedestrian pathways in Anna Nagar West and T-Nagar

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Abstract
This paper aims to Make a Comparative analysis of the pedestrian pathways of Anna Nagar west and T-Nagar to understand the efficiency of policies and guidelines for designing pedestrian pathway and identify the micro and macro-level factors that influence its walkability.

The vehicle population in Chennai was 28.1 million(2008) and it is estimated that by the year 2026 there will be 17.3 million daily vehicle trips[10]. However, in the state of Tamil Nadu motorized vehicles serve only 28% and in Chennai of the total trips made by people[2] and more than 45% are made by pedestrians and cyclists. Yet the roads are designed to facilitate motorized transport and pedestrian pathways are not well equipped to carry the volume of pedestrian traffic it has to accommodate. To analyze the walkability of pedestrian pathways ,standards and design guidelines for pedestrian pathways and pedestrian-friendly streets are to be studied. This helps in identifying and developing parameters required for the comparative analysis of the case studies on the same subject and the conclusions from this analysis will help in comprehending the efficiency of the pedestrian pathway policies and guidelines and in identifying the micro and macro level factors that contribute to the walkability of the site selected. The 2nd avenue road in Anna Nagar west and Pedestrian plaza in Pondy bazaar have been identified as the sites for evaluation and Comparative analysis. The results of the comparative analysis revealed that when the policy recommendations are followed the comfort level in the corresponding pedestrian pathways was also higher . Also existence of bollards turned out to be discomforting the pedestrian due to improper implementation. One important factor that contributed to increasing the walk ability of the pedestrian pathway was the existence of trees in the pedestrian pathway .Thus some factors that encourage and discourage pedestrian comfort have been identified.

Keywords: Comparative analysis, pedestrian traffic, policy recommendations, walk ability

Introduction

When the policies are assessed they reveal the true functionality of these policies. For strong policies to develop they must have been tested in the field over time and multiple surveys conducted ,wide range and even wider diversity of population must be included in these surveys .It should encompass women ,Children Men, people of different age groups in all of this category, vendors, shoppers, transit users, car- park using people and even a wider variety of people who are inclusive representation of all the activities that happen there must be considered, The results of these surveys and testing should only then translate into policies or recommendations for design. Even then these policies and guidelines or recommendations can not be widely practiced as a cookie cut formula for all the cities in the world not even for all the cities in India ;because the context of each and every city barring a few similarities and intensely and widely different. So these policies should always be altered and customized and tailor made to suit the needs and the actual functionality and utility of a pedestrian pathway by all of its diverse users ,should be consider before implementations. Very often these policy level recommendation are not followed because the makers of the policy and those who implement it have a wide gap and this is not made better by the government which very often gives these redevelopment projects for minimum bids. However as evidence has shown good street design or good

pedestrian design will cost money .But money that is well spent. This is also revealed by the results of the study that the pedestrians and the user satisfaction level is high in the footpaths that have been well developed and has taken into consideration the user experience and the opinion of the people who use that place every day after it has been built that is the opinion of the stake holders. Even the reason the bollards did not function to the fullest capacity or as effectively as they could is because they were not implemented properly in a carefully and considerately studied manor but were located in the wrong places which gave window for the rogue motorist to encroach upon the pedestrian pathways and use it especially in the traffic intensive hours or the peak hours of everyday the mornings and the evenings , when hurrying motorist feel entitled to use the pedestrian pathways and completely throw the hurrying pedestrians who are also in the same peak hour situation completely off guard. This can be avoided if the policy maker ,the one who implements it the one who designs the space and the one who uses the space sits down and then designs the space .Two sites with pedestrian pathways are selected each site has been developed by the Corporation of Chennai ,with the difference that the pedestrian plaza in T Nagar also included urban designers , Urban planner, who then included the stake holder I.e. the vendors the shopkeepers the roadside vendor, the ones who owned shops , the shoppers of pondy bazaar into the design. They then came up with a design for the pedestrian pathway which was not immediately implemented but was first tested out in small phases. Only after the vendors who were a part of the testing were happy with the results and that they had actually seen a growth in their sales after the design implementation was the policy taken ahead. This was not at all the case for the 2 nd avenue road in Anna Nagar West .

1.2 Sites

1.2.1 Anna Nagar West

Anna Nagar West was developed primarily as a residential zone by the TNHB. Over the years of development, it now has multiple schools, shops, hotels and its proximity to metro stations and various other amenities it is a prime residential location with a population density of 40303 people per sq km[1] in Chennai. Hence a lot of road users depend on NMT for their commute. It has very pedestrian traffic-heavy roads like the school road,2nd Avenue Road and Ambattur industrial estate road.The pedestrian pathways were developed by the Chennai corporation basing on the NMT policy.

1.2.2 T-Nagar

Nearly 5,000 people walk through Pondy Bazaar during peak hours in a day. Which is why this stretch was selected as test run for a pedestrian plaza project that is beneficial to both the shop owners and users.Ealier the stretch was vechicle centric and the pedestrians had to be wary of of shopping in the sidewalks even though that was the main activity of the road. In 2018 the 1.5 km stretch from Panagal Park to the Thanikachalam Road signal off Thyagaraya Road is the pedestrian plaza developed by Greater Chennai Corporation (GCC) under the Smart City Mission — along with organisations like Institute for Transportation and Development Policy (ITDP).

The evaluation of a project implemented with the same format around the city that is the one that just follows the same guidelines for all of and one that involves the stakeholders in the design process are drastically different and analysis of the two projects will give reveal how the walkability changes with micro level factors and also help in identifying macro and micro-level factors that affect the quality of pedestrian pathways.

Methodology

n The sources identified in the literature study is to be analyzed and the factors that contribute to a good footpath design like width, material, zoning and other amenities that contribute to a good street design like cycle tracks, street furniture, refuge islands, medians are to be identified and the standards for same is to be studied. This study would help in establishing the parameters required for an ideal pedestrian pathway design

n The identified parameters will be used to review the identified case studies and perform comparative analysis for the same.

n The results from the analysis of the case studies and the literature study will be used to develop the parameters that would be used to evaluate and analyze the identified site.

n The selected sites are surveyed and assessed though a filed visit and a questionnaire survey. The results of the collected data will be used to comprehending the efficiency of the pedestrian pathway policies and guidelines and in identifying the micro and macro level factors that contribute to the walkability of the site selected

n The results of the survey can be used to improve the factors that negatively affect pedestrians,also in identifying the factors that encourage walkability and see how effective the existing pedestrian pathway guidelines and policies are.

2. Literature Study

2.1 Walkable City -How Downtown can save America one step at a time- jeff speck

2.1.1 Abstract

American cities like many major cities of the world have increasingly been developed to facilitate the vehicle owners and add pedestrian facilities as an after thought and with the increasing awareness and rise in the value of property with the pedestrian friendliness of the neighbourhood the cities are being rethought and redesigned to encourage pedestrian activity. This book by Jeff Speck explores the method of developing policies for pedestrians in cities and how they should be tailor made to every city and ways of implementation of these policies.

In this book the author lays down a guide for walkability in cities that is considerate of the unique character that every city may present and explains why standard designs for street design does not necessarily encourage people to walk and in turn focus on the elements that contribute to walkability through his 'General Theory of Walkability' according to which a place has to be

- Useful

All the needs of everyday life must be accessible through a small walk for which there must be a variety of mixed use buildings available in walkable distance.

-Safe

This is a very qualitative aspect as to making the users of the space to actually feel safe instead just being safe from the traffic or in the use of the pedestrian pathways

-Comfortable

Offering up enough diversity and activity that pedestrian pathways also act as outdoor spaces that people would like to hang out instead of just being merely utilitarian.

-Interesting ,

This is a continuation of the process of developing comfort one has to make these pathways an experience for the users by offering friendly faces around with various spectrum of uses and activities to offer them for it to be walkable. He then brings in various case study as evidence to substantiate his theory of walkability and to prove that walkable cities have multiple advantages like economic growth , reduced crime, increased real estate value , health and environmental benefits.

2.1.2 He writes about 10 steps to make cities walkable-

The author notes that the influx of auto - mobiles as connecting device has not made us faster just pushed us farther away.In the name of vanity zoning and grouping of facilities with similar functions an average user has to travel in different direction for seemingly different things ,but that are actually a part of the everyday life of a citizen. The facilities required for a person everyday life are scattered and been moved all around the

city.This has been done because of the availability of commuting facilities that are catering only to vehicles and not pedestrians and as a result a man is forced to rely on his vehicle rather than walk and this in turn leads to the roads being used more frequently and vigorously and pushes the pedestrians out of the equation and leads to the poor maintenance or even development plans for pedestrian pathways. This is a cycle that continues in the cities and is left unaddressed..He has identified that there is an inverse relationship between highways and property values.Because the present generation is more aware and wary of its needs and is able to see how the roads are actually detrimental to their comfort and with a little education are able to comprehend that a walkable street is more safe and useful than a multilane road and prefer locals with good pedestrian facilities these areas increase in value and will most definitely continue to do so in the future.

Extensive public transportation system might exist and be well administered .But public transit systems works best only if it is supported by a walkable system because they depend entirely on last mile connectivity for their function. This means that a transit system doesn't just stop at the establishment of lines and respective station or stoppings but should continue to take the user through the full experience of reaching their homes through a safe and comfortable passage way.

He advocates for shortening the distances between destinations which means having mixed use developments for a more vibrant and a safe community and how the roads adjoining the pedestrian pathways should be speed controlled because pedestrians are more likely to use footpaths on smaller roads. He then addresses the psychology of intersections and risk homeostasis, naked streets and shared spaces saying, "nobody drove dangerously through this intersection, precisely because the intersection felt dangerous. "He encourages the existence of a barrier between the pedestrian pathways and roads like a parking strip. This greatly contributes in making the pedestrian pathways seem like a safe space by offering up enough enclosure for the users to feel safe. This circles backs and brings us to the issue of safety in the general theory of relativity where all of these factors come together to offer up safety to the pedestrians because even if the pedestrian pathway is made safe by being presented as a separate element it still doesn't completely offer safety to the users unless it has checked all of these boxes for he pedestrian to feel safe and encourage the pedestrian to continue to use the pedestrian pathways.

Speck hits on one of the more well-known urban design tenets – that pedestrians enjoy a sense of enclosure and need it to feel comfortable .The trouble is, however, that the typical American urban experience is a profound lack of spatial enclosure, "a checkerboard city devoid of two-sided streets," Even if not for extensive setup for the feeling of enclosure inclusion of trees , small street furniture's even off street parking can offer a feeling of enclosure to the people.

Finally, Speck acknowledges there is a finite supply of financial resources to create walkability and therefore it should be spent where the most difference can be made- where there's already an accommodating private realm with comfort and interest to support an improved public realm.

He then uses this logic to create his urban triage plan for walkability that steers financial resources to the identified network. He states that though it may not be viewed as equitable, that this plan should happen first in downtowns as they are shared places and are important to the city image and attracting investment.

2.1.3 Conclusion

The book although written for the American context has a lot of parts that have an universal appeal as they are all factors that can be viewed and applied to many major cities around the world including India. Drawing from the book many qualitative aspects that are required to evaluate pedestrian pathways have been identified .

This mainly includes the factors listed in the general theory of walkability proposed by the author that gives insight into aspects like

-Use -Comfort -safety -Interest

Which are all factors that shed light into the qualitative aspects of a pedestrian pathways as perceived and experienced by the users and at the end of the process almost the only thing that matters because any place has to facilitate the user . It is for perceiving these factors and offering the right experience for the users that the policies and design guidelines come into place and thus these in turn become crucial factors in evaluating the level of performance of these policies and standards.

2.2 Design Standards

The following materials are to be referred for analyzing the pedestrian pathways and developing proposals for interventions -

-The Non-Motorized policy of Chennai(2014) developed by ITDP (Institute for Transportation and Development Policy) provides a detailed vision for improving existing footpaths, cycle tracks and street design that was intended to be completed by 2018.

-The ITDP guidelines that provide information on the optimum dimensions, zoning, elements of a footpath, vending in footpaths and design of footpaths along a bus-stop

-The street design toolkit developed by UTTIPEC will act as a guide for analyzing crossings, medians and refuge islands, street lighting, street furniture and public amenities and other elements of street design.

-UTTIPEC also has a checklist that is used for approval of projects, in this case, can be used for evaluating the street design.

2.2.1 The Non-Motorized policy of Chennai(2014)(A)

This program was launched in the city so as to give importance to pedestrians and cyclists and educe the use of vehicles in the city. The Corporation's Chennai Street Design Project's aim was to ensure that the trips that people of the city take despite not having the adequate or continent infrastructure change this infrastructure into a much safer, healthier, and more enjoyable through a redesigned urban transportation network. This policy was a part of the scheme for the redesigning of the transport network system for the entire city.
This is a policy that is being adopted to achieve the vision of by 2018, build safe and continuous footpaths on at least 80 per cent of all streets, increase the share of walking and cycling trips to over 40 per cent, and, most significantly, eliminate pedestrian and cyclist deaths. The Corporation intended to measure the effectiveness of the policy, using indicators such as walking and bicycling mode share, incidence of traffic crashes involving pedestrians and cyclists, footpath coverage, cycle track coverage, public transport mode share and private motor vehicle kilometres travelled.

Some key features of the policy is that
-It ensures to design streets for the people
Public streets are for public use. Therefore, the planning of streets should not discriminate against users by their age, ability, gender, income, race, ethnicity, or faith. Associate in Nursing equity-based approach to NMT policy should make sure that services and infrastructure meet the wants of all users.

-Every street will have a slow zone where pedestrians have priority.

-Streets ought to function enticing and safe public open area corridors
with generous landscaping, lighting, and foliage. Streets function public
view corridors and supply light-weight and air.
-to design carriageways to provide for efficient mobility of public transport, nonmotorised vehicles, and other vehicles at moderate speeds

-to design footpaths that embrace area for business frontage
(frontage zone), area for pedestrian quality (pedestrian zone) that is at least two meter wide, and area for landscaping and street piece of furniture (furniture
zone).

-

The Non Motorised policy has extensive and detail guidelines on the policies and guidelines that are required.

2.2.2 ITDP Design Guidelines

The ITDP (Institute for Transportation and Development Policy) provides a detailed vision for improving existing footpaths ,cycle tracks and street design and also provide the standards that are optimum for a pedestrian friendly footpath design. Along with this a toolkit developed by UTTIPEC lays down the guidelines for street design . The design considerations from the two guidelines on pedestrian pathway and street design have been combined to develop a toolkit to asses the selected case studies .

I) Footpath

A) Zoning

Every footpath has Three zones

- Frontage zone - 0.5 M along compound wall

  - 1.0 M in commercial zones

- Furniture zone - 1.0 M wide in residetial zones and 1.5 M wide in commercial zones and outside the path of travel

- Pedestrian zone - Clear width of 1.8 M minimum

  Clear height of 2.4 M

Pedestrian zone width for

- Commercial zones - 2.5 M
- Residential zones - 2.0 M
- Commercial nodes - 4.0 M

B) Height of the footpath

The height of the kerb above the carriageway should not exceed 150 mm.

C) Radius of the Footpath

Residential areas - 6 M

Maximum Radius - 12 M

D) Surface

Should have a flat ,continuous surface with proper drainage

II) Multi-Functional Zone

A) Minimum Width - 1.8 M

B) Tree Pit dimensions- 1.8 M X 1.8 M

The trees should not obstruct the clear pathways

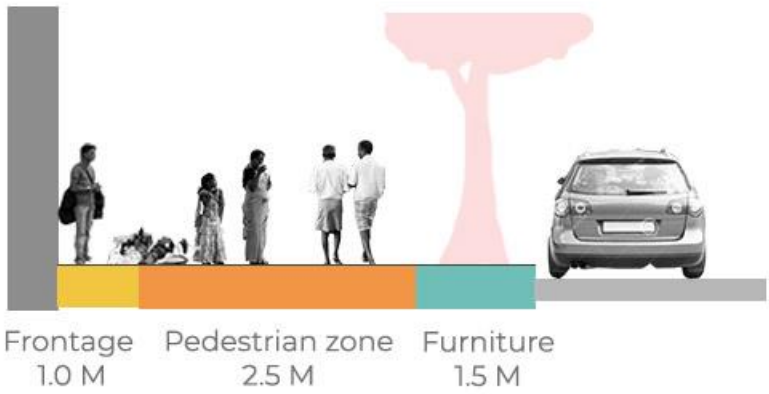


Fig I - Pedestrian pathways zones (Source-ITDP guidelines)

III) Bus- Stops

A) clear width between the bus shelter - 1.8 M

and the edge of the right-of-way.

B) If there is a parking lane between the footpath and the carriageway, the bus stop must be placed on a bulbout in the parking lane, giving passengers direct access to the bus.

This way pedestrians don't have to walk on the road and can board directly from the curb.

Fig ii - Bus stop clear width (Source-ITDP guidelines)

IV) Property Entrance

When footpaths end abruptly at every property entrace it becomes inaccessible to the pedestrians

A) Vehicle ramps should be provided in the furniture zone to the property entrance

Slope - 1:5 M Clear width of footpath - 1.2 M

B) Bollards should be installed to deter vehicles from parking in the footpath

V) Vending

A designated vending zone would avoid the vendors from setting up their shop across the walking zone of the footpath and causing obstruction.

A) The furniture zone or bulbouts in the parking lane should be designated for vending

B) Areas under trees and that are visible to the passer-bys are prefered

VI) Parking

A) Parking lane width - 2.0 M

B) Parallel car park - 2.5 M X 6.0 M

C) Disabled car park bay - 3.6 M X 6.0 M

D) Parallel car parking is prefered over perpendicular as this saves space and also acts as perpendicular car parks for two wheelers.

VII) Barrier free design

A) Ramps in footpaths - 1:12 Minimum Slope at all level change points

B) 1.2 M Width of Ramp- Tactile warning strip to be provided at curbside edge of the slope

C) All walking surfaces should have Tactile pavers (Guiding and warning path) to guide people with vision impairment

2.2.2 UTTIPEC Design Guidelines

1-Walking Zone: Clear Walking Zone should be 1.8 M x 2.4 M High

2-Frontage Zone or Dead Width-For sidewalks in shopping areas, an extra 1M should be added to the stipulated 4.00 M width. This extra width is called “Dead Width”. In other situations where sidewalks pass next to buildings and fences, a dead width of 0.5 M can be added. In busy areas like bus stops, railway stations, recreational areas, the width of sidewalk should be suitably increased to account for accumulation of pedestrians.

3-Universal Accessibility Features/ Barrier Free Design-Universal Accessibility is required for all sidewalks, crossings, parks, public spaces and amenities.

4-Multi-Functional Zone with Planting-Multi-Functional Zones on a Street should be a minimum of 1.8 M Wide, and may locate any or All of the following functions within them: Tree Planting; Planting for Storm Water Management;

Auto-rickshaw Stands; Cycle-rickshaw Stands; Hawker Zones; Car Parking; Street Furniture; Bus Stops, Street lights/ pedestrian lights. Provision of MFZ is most critical otherwise the above uses/ components of streets would

encroach upon pedestrian, cyclist or carriageway space. Common Utility Ducts and Duct Banks should not be located under the MFZ as there may be interference due to trees.

5-Bicycle and NMT Infrastructure-Minimum 2.5 M NMT Path made in Cement Concrete and physically separated from MV Lanes.

6-Pedestrian Scale Lighting-Medians and Pedestrian Resuge Islands are a must on streets wider than 24 M.

3 Methodology

The comparative analysis of the selected sites have to be done in both qualitative and quantitative aspects and evaluate the efficiency in the function of pedestrian pathways of the selected sites to identify the factors that discourage or encourage walking. For this purpose a detail literature study has been done that included understanding pedestrian pathway design through books and existing policies and standards.

The sources from the literature study that have been used for the quantitative analysis of the sites are

- The non motorised transport policy -The ITDP standards -UTTIPEC guidelines

These are all the sources used by various corporations and governments as design guidelines for developing pedestrian pathways .

The Non Motorised Transport policy

Its goal was to create pedestrian friendly footpath that covers at least 8o percent of the city roads by 2018.

The main principles of the policy

- Streets that encourage multiple uses

-Doesn’t discriminate against its users and is designed for everybody

- Provide saftey for the users through at-grade interventions

-qual allocation of roads for vehicles and pedestrians

-Width of the carriageway and all the other elements in the street are accommodating of the function of the street

-Increasing opportunities for controlled street vending

-Policies are developed in consultation with the key stakeholders

Street design

Designing streets that are safe and comfortable for the pedestrians and those using the public transport.

Street network

Provide a fine grain of street network that provides pedestrians with continuous safe and comfortable path.

Built environment regulation

Ensure that the buildings that accompany the pathways are regulation controlled to maintain the vibrancy of the pedestrian pathways.

Special services like cycle sharing to also be introduced at the policy level

3.1 Data Collection

The standards and regulations from the identified sources were studied thoroughly .The Design regulations that were prescribed as ones that contribute to the basics of a well designed pedestrian pathway by all of the standards that were referred and that was seen to be common across the standards considered, were identified as the factors that would be used to evaluate the selected sites .These design regulations are divide into seven categories that majorly focus on the ergonomy of the pedestrian pathways.They are provided in table__

VIII) Footpath

E) Zoning

Every footpath has Three zones

- Frontage zone - 0.5 M along compound wall
  - 1.0 M in commercial zones
- Furniture zone - 1.0 M wide in residetial zones and 1.5 M wide in commercial zones and outside the path of travel
- Pedestrian zone - Clear width of 1.8 M minimum
  Clear height of 2.4 M

Pedestrian zone width for

- Commercial zones - 2.5 M
- Residential zones - 2.0 M
- Commercial nodes - 4.0 M

F) Height of the footpath

The height of the kerb above the carriageway should not exceed 150 mm.

G) Radius of the Footpath

Residential areas - 6 M

Maximum Radius - 12 M

H) Surface

Should have a flat ,continuous surface with proper drainage

IX) Multi-Functional Zone

C) Minimum Width - 1.8 M

D) Tree Pit dimensions- 1.8 M X 1.8 M

The trees should not obstruct the clear pathways

X) Bus- Stops

C) clear width between the bus shelter - 1.8 M

and the edge of the right-of-way.

D) If there is a parking lane between the footpath and the carriageway, the bus stop must be placed on a bulbout in the parking lane, giving passengers direct access to the bus.

This way pedestrians don't have to walk on the road and can board directly from the curb.

XI) Property Entrance

When footpaths end abruptly at every property entrance it becomes inaccessible to the pedestrians

C) Vehicle ramps should be provided in the furniture zone to the property entrance

Slope - 1:5 M Clear width of footpath - 1.2 M

D) Bollards should be installed to deter vehicles from parking in the footpath

XII) Vending

A designated vending zone would avoid the vendors from setting up their shop across the walking zone of the footpath and causing obstruction.

C) The furniture zone or bulbouts in the parking lane should be designated for vending

D) Areas under trees and that are visible to the passer-bys are preferred

XIII) Parking

E) Parking lane width - 2.0 M

F) Parallel car park - 2.5 M X 6.0 M

G) Disabled car park bay - 3.6 M X 6.0 M

H) Parallel car parking is preferred over perpendicular as this saves space and also acts as perpendicular car parks for two wheelers.

XIV) Barrier free design

D) Ramps in footpaths - 1:12 Minimum Slope at all level change points

E) 1.2 M Width of Ramp- Tactile warning strip to be provided at curbside edge of the slope

F) All walking surfaces should have Tactile pavers (Guiding and warning path) to guide people with vision impairment.

These factors were taken as the standards against which the selected sites were compared with .The factors in the table were also observed and noted in the selected site.This helps in comparing them with the standards which would reveal the actual ergonomy of the selected pedestrian pathways and extent to which the standards have been adhered to.

3.2 Questionnaire survey(Appendix)

The comparison of the selected sites against the standards is not adequate in conveying if the standards and the sites actually offer the comfortable and safe experience it is designed to offers the users. Hence the peoples experience should also be taken into account while evaluating the standards and the selected sites .For this reason a questionnaire was designed to be used for a survey of the pedestrians using the respective pedestrian pathways. The questionnaire is designed to try to understand how the pathways are perceived by the pedestrians.

Using the literature study as reference seven factors that contribute primarily to develop and enhance the walkability of pedestrian pathways have identified .This has been done by simultaneously analysing the selected study materials to zero in on the common features and suggestions and also to identify any unique factors that each source has to offer .Once the factors are identified they are simplified and divided into different sections by putting together factors that affect the same aspect of pedestrian comfort together in one category. This way seven major factors were identified; They are

1) Pedestrian comfort 2)Pedestrian saftey 3)Crossing 4)Parking 5)Transit 6)Universal Design

The questionnaire was framed in such a way that it would be able to evaluate the user(pedestrian)'s experience on each of these criteria in the respective sites. The results of the survey would give the perceived user experience.

3.3 Comparative Analysis

The results of the questionnaire survey is then put up against the result from comparing the selected sites to the standards .The comparative analysis of these results done by identifying the policy/standard that is responsible for creating each of the seven factors in the questionnaire and from the results of the questionnaire survey find out if that particular policy/standard has or has not been effective in the eyes of the user.

3.4 Results

It will helps us find out the effectiveness of the existing standards and policies and also give us the micro level factors that are encouraging or detrimental to pedestrian using footpaths.

3.5 Sites

3.5.1 2 nd Avenue Road, Anna nagar.

This road is one of the most busiest road in Anna Nagar Branching from the Grand trunk road it sees a very high volume of of pedestrian and vehicular traffic on every day basis. This is due to the presence of various facilities like the metro station, bus stop , numerous eateries and restaurants including a food street, multiple clothing shops, supermarkets and even banks. So this street offers a full recreational evening experience for the users with multiple places to shop and also eat. These are some of the main reasons why the street pulls so much vehicle and pedestrian traffic.

Fig iii - 2 nd Avenue Road, Anna nagar(Source-Google Earth)

A two fifty meter long stretch of pedestrian pathway in the anna nagar 2nd avenue road was selected.This is the length that would be convinent enough to cover and study thoroughly and also contains all the elements that contribute to the key characteristic of this stretch. Thus it would also have changed itself to suit the needs of the site. The pedestrian pathway in stretch was re done as a part of the NMT policy.

3.5.2 Pedestrian Plazaa ,Pondybazaar

Pondybazaar is what one would call an unique landmark even for the entire city. It is a vey famous shopping street that receives throngs of visitors every day and even more during weekends or festival times. Starting from products targeted for women to home appliances , life style product it has everything and for the same reason attracts an extremely diverse variety of users. So the pedestrian pathway has to be designed in such a way that it is accommodating to all the users and also to the volume of users it recieves. It has to maintain the same level of robustness without the feeling of the place being crowded.

In 2019 the 1.5 km stretch from Panagal Park to the Thanikachalam Road signal off Thyagaraya Road was developed as Chennai's first pedestrian plazaa by using the ITDP as standards for the development. Also the plazaa was developed only after very careful and meticulous study of the users of the spaces and involving the stakeholders was a very crucial aspect in the design development process for this plazaa.

Fig iii - Pedestrian Plazaa ,Pondybazaa**r**(Source-Google Earth)

The plaza has a repetitive module along the entire one and a half kilo meters length , which is the full length of the redeveloped pedestrian plaza .from this one and a half kilometres length , a two Hundred and fifty meters length stretch was selected as this is the size that is feasible to observe the details required to carefully evaluate the site from a user's/pedestrian's perspective.

3.6 Limitations

However some limitations should be noted mainly the actual scope and area of this research is very large and attention has been given only to the basic standard available from existing sources.In terms of selection of site the particular stretches selected have been attempted to encompass all the factors to be studied, however the selected stretches are small and would definitely affect the outcome of the study. The sample size is also not large enough to provide accurate data.But due to the present situation the asking more number and much diverse number of people would hve been ideal but was not possible. So the study relies on existing policies and data.

4.Case study

In addition to these standards learnings from the following case studies is also to be taken into consideration for developing the walkability index for the selected locality

-4.1 **Comprehensive Mobility Plan as a part of a sustainable transport mission in Pune[9]**

The city of Pune has been quite successful in the implementation of the NMT policy and has won the sustainable transport award of 2020.[3]
It has redesigned its streets according to various guidelines
-Urban Street Design Guidelines
-Urban Cycling Design Guidelines
and has also adopted multiple policies like
-Walk smart policy
-Parking policy
-Comprehensive bicycle plan

-4.2 **Pedestrian plaza, Pondy Bazar[11]**

The Pedestrian Plaza transformed 1.4 km of prime commercial space in the heart of the Area-Based Development (ABD) region of T Nagar from Sir Theyagaraya Road, stretching from Panagal Park to Mount Road, covering several retail outlets, malls and office buildings is the area called Pondy Bazaar,which is always bustling with shoppers and tourists.

The project provides all necessary amenities for pedestrians, including seating clusters, sheltered bus-stops, motor-free walkways, toilets, covered dustbins, inclusive play space and so on by converting additional road space into broadened walkways.

-4.3 C.G Road, Ahmedabad [12]

The design of C.G road ensures that it serves as an efficient arterial road for thoroughfare; improving the pedestrian experience of the street, that it functions well as a retail street, demonstrating robust and high-quality construction and making it easy to operate and maintain.

-4.4**Influence of metropolitan physical environment on walkability in Indian context**-thesis submitted by Dharmesh Juremalani[4]

This paper studies the influence of the built environment on walkability, establishes a relation between both and quantifies the Level of Services for walkability in metropolitan pockets of India
It aims to asses the correlation between the two .It focuses on the city of Vadodara, Gujarat.

Methodology
It considers 12 different pockets in the city of vadodora as demonstration sites It uses the Multi-Criteria Decision Making (MCDM) method to arrive at the weightage for various indices that give the value of the walkability of the city.The different pockets that were selected were categorised into different zones based on their walkability levels

Findings and Conclusions
The paper concluded that the urban physical environment does influences the walkability; this
influence of the urban environment in the walkability of pedestrian pathways can as the paper exhibited be quantified, and categorised. Metropolitan walkability can be improved by means of urban planning interventions .But these interventions should support the standing of the WLOS standing of
the Urban environment

-4.5 **The study of Walkability Index-A case study at** Jalandhar **city, India[5]**

The paper determines the Walkability index for Jalandhar city using the Ministry of Urban Development method and identifies the areas of improvement.Jalandar is one of the oldest cities in India and has huge volume of pedestrian traffic .But the city has seen rapid urbanisation and that brought in huge volume of vehicles ,which is a common pattern seen in many of the major Indian cities that is the reason for the selection of this city.

Methodology
A walkability index was developed using Ministry of Urban Development method .This walkability index will be customised to that particular city

Conclusion
The walkability index thus calculated should be used to identify various pedestrian related short comings.
Some basic factors that were considered are - Well being- security economy-and convinence of travelling by foot.

-4.6 **Modelling Perceived Pedestrian Level Of Service Of Sidewalks: A Structural Equation Approach[6]**

The paper focuses on the study of factors that affect the Pedestrian Level of Services (PLOS) in Thiruvananthapuram using the Structural Equation method (SEM) and developed an evaluation model that can also be adapted in different settings and has also identified the factors that have the most weightage in improving the PLOS.

Methodology
One major phenomenon seen in developing countries is the service level of pedestrian pathways.So the paper aims to study how a built environment affects the pedestrian level of service in developing countries by identifying the factors that have the maximum impact on level of services. It uses Structural Equation Modelling (SEM) technique to assess pedestrian satisfaction and thereby qualitative PLOS of sidewalks
and results were categorised into four major categories
I) Saftey ii)Security iii)Mobility and infrastructure iv)Comfort and convenience

Conclusion
Some of the factors that the study found out has a maor impact on pedestrian level of service were

police patrolling, street lighting, cleaner sidewalks, sidewalk obstructions, sidewalk surface. They had a major value in contributing to the service level of pedestrian pathways.The research helps in identifying and understanding aspects of the research that help in or contribute to the PLOS. Thse factors can thus ebe useful in forming guidelines or policies for the designer and planners.

-4.7 **Method to determine** the **pedestrian level of service for sidewalks in** the **Indian context[7]**
The paper proposes a new model for evaluating PLOS in Indian cities based on surveys conducted in Chennai thus taking into account factors that affect PLOS in the Indian context. Thus it also identifies factors that affect the walkability of pedestrian pathways.
There is n proper method to evaluate the pedestrian level of services in India ,so this paper intends to propose a process for developing a evaluation system for pedestrian level of services in pedestrian pathways.

Methodology.
The data for the study was collected by means of video graphic study and questionnaire survey that was conducted at nine pedestrian pathways in the city of Chennai.The important factors that contribute to the pedestrian level of services were identified and the required pedestrian level of service model was developed using a step wise regression analysis method. The model that was thus developed was checked for its correctness using data from the field.the results showed that the model that was developed was more accurate and precise and produced more reliable solutions.

So this model that was thus developed could be used by policymakers or street designers and others intersted in development of pedestrian pathways to find out the efficiency and level of functionality and service for pedestrian pathways.

-4.8 **An investigation into the walkability problem in Indian cities[8]**
The study identifies the major issues faced by a pedestrian in the city of Mumbai based on pedestrian interviews and field walkability survey and proposes recommendations to improve walkability in Mumbai

Methodology
It identifies five typical districts were chose as the site and within these districts the required walking route was mapped. Then a questionnaire survey that had the sample as the middle class people was conducted. The questionnaire conducted contained questions that pertained to the shortcomings of the existing pedestrian footpath facilities and also the suggestive ways of improving the comfort and the safety level according to the users of the footpath. Also through field study the functionality of pedestrian footpath was assessed as well.

Conclusions
With the result of the study revealing that not enough facilities or even pedestrian pathways were available for the users It then highlights the policy recommendations that can be implemented to make the existing pedestrian pathways and its accompanying environment better and also for the implementation of new pedestrian pathways these policy recommendations can be followed.

5.Data Collection

5.1 Site

5.1.1 2nd Avenue, Anna nagar

Table i (Standards data - 2nd Avenue, Anna nagar)

Standards		**Anna Nagar West**
I) Footpath	A)Zoning	Frontage zone	Absent
		Furniture zone	Absent
		Pedestrian zone	3M

	B) Height of the footpath	20mm
	C)Radius of the Footpath-Residential areas	Sharp turns
	D)Surface- flat ,continuous surface with proper drainage	No
II)Multi-Functional Zone	A) Minimum Width	2M
	B)Tree Pit dimensions	Unavailable
III)Bus-Stops	A) Clear width between the bus shelter	1M
	B) Parking lane	yes
IV)Property Entrance	A) Entrance	
	B) Vehicle Ramp-Slope	Unavailable
	C) Clear width	1.2
	D) Existence of bollards	Yes
V) Vending	Designated vending zone	No
VI)Parking	A) Parking lane width	2.0
	B) Parallel car park	2.5M X 6.0 M
	C) Diasabled car parking bay	Unavailable
	D) Type of parking	Parallel
VII)Barrier free design	A) Ramps in footpaths	Unavailable
	B) Width of Ramp (Tactile warning strip)	Unavailable
	C) Tactile pavers	Unavailable
Viii) Planting	A) Clear vertical zone of trees	yes
	B) Tree pit size	Unavailable
	C) Permeable Pavers or Tree Grates should be placed over the pit in busy pedestrian streets so people can walk over the tree pit.	Unavailable
IX) Seating	A)Seating at front edge	Unavailable
	B)Provision of shade	Unavailable
	C)Face Building at furnishing zone-Away from buildings in frontage zone	Unavailable
	D) Material -Durable,Easy and Cheap to maintain	Unavailable

5.1.2 Pedestrian Plaza, Pondy Bazaar

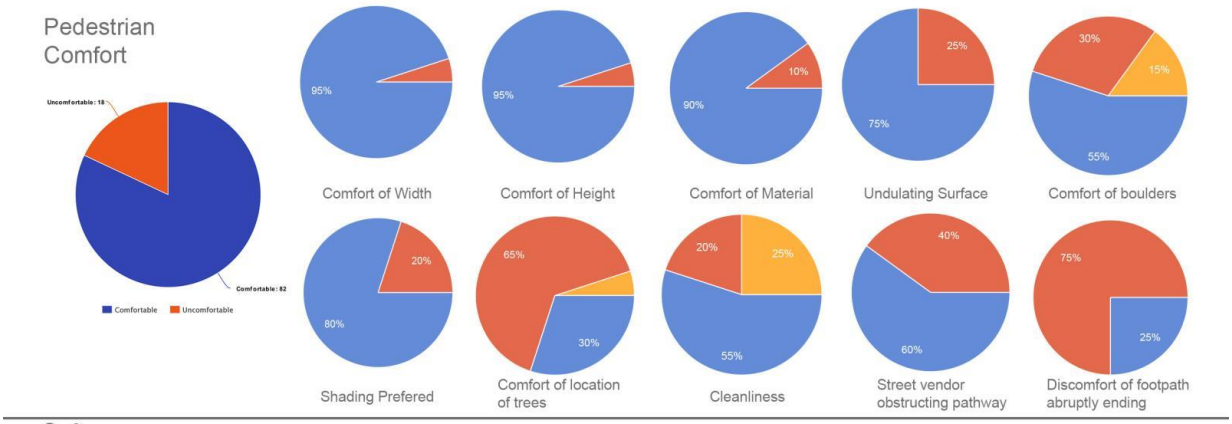
Table ii (Standards data - Pedestrian Plaza, Pondy Bazaar)

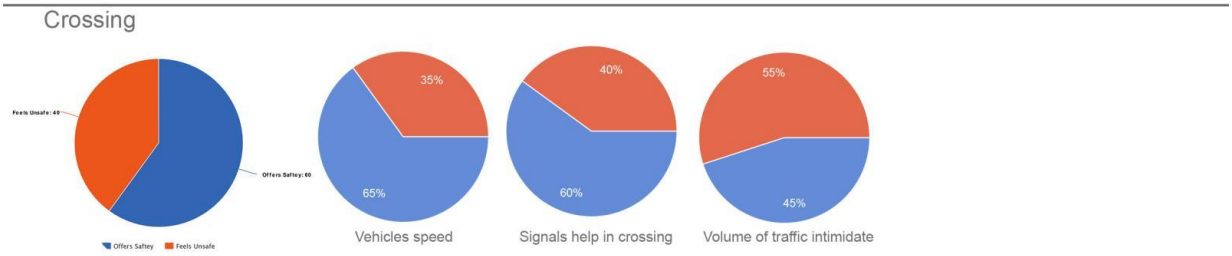
Standards		T-Nagar
I) Footpath	A)Zoning Frontage zone	1M
	A)Zoning Furniture zone	2M
	A)Zoning Pedestrian zone	3M
	B) Height of the footpath	0.15M

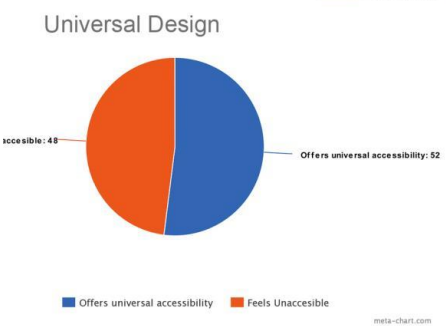
	C)Radius of the Footpat Maximum Radius	
	D)Surface- a flat ,continuous surface with proper drainage	yes
II)Multi-Functional Zone	A) Minimum Width	3M
	B)Tree Pit dimensions	2M X 2M
III)Bus-Stops	A) Clear width between the bus shelter	2M
	B) Parking lane	Yes
IV)Property Entrance	A) Entrance	Sloped
	B) Vehicle Ramp-Slope	
	C) Clear width	3M
	D) Existance of bollards	Yes
V) Vending	Designated vending zone	Yes
VI)Parking	A) Parking lane width	2M
	B) Parallel car park	2.5M X 6.0M
	C) Diasabled car parking bay	Unavailable
	D) Type of parking	Parallel
VII)Barrier free design	A) Ramps in footpaths	Yes
	B) Width of Ramp	Same as footpath
	C) Tactile pavers	Yes
Viii) Planting	A) Clear vertical zone of trees	Yes
	B) Tree pit size	1.8M X 1.8M
	C) Permeable Pavers or Tree Grates should be placed over the pit in busy pedestrian streets so people can walk over the tree pit.	Yes
IX) Seating	A)Seating at front edge	Yes
	B)Provision of shade	Yes
	C)Face Building at furnishing zone-Away from buildings in frontage zone	No
	D) Material -Durable,Easy and Cheap to maintain	Yes

5.2 Questionaire survey

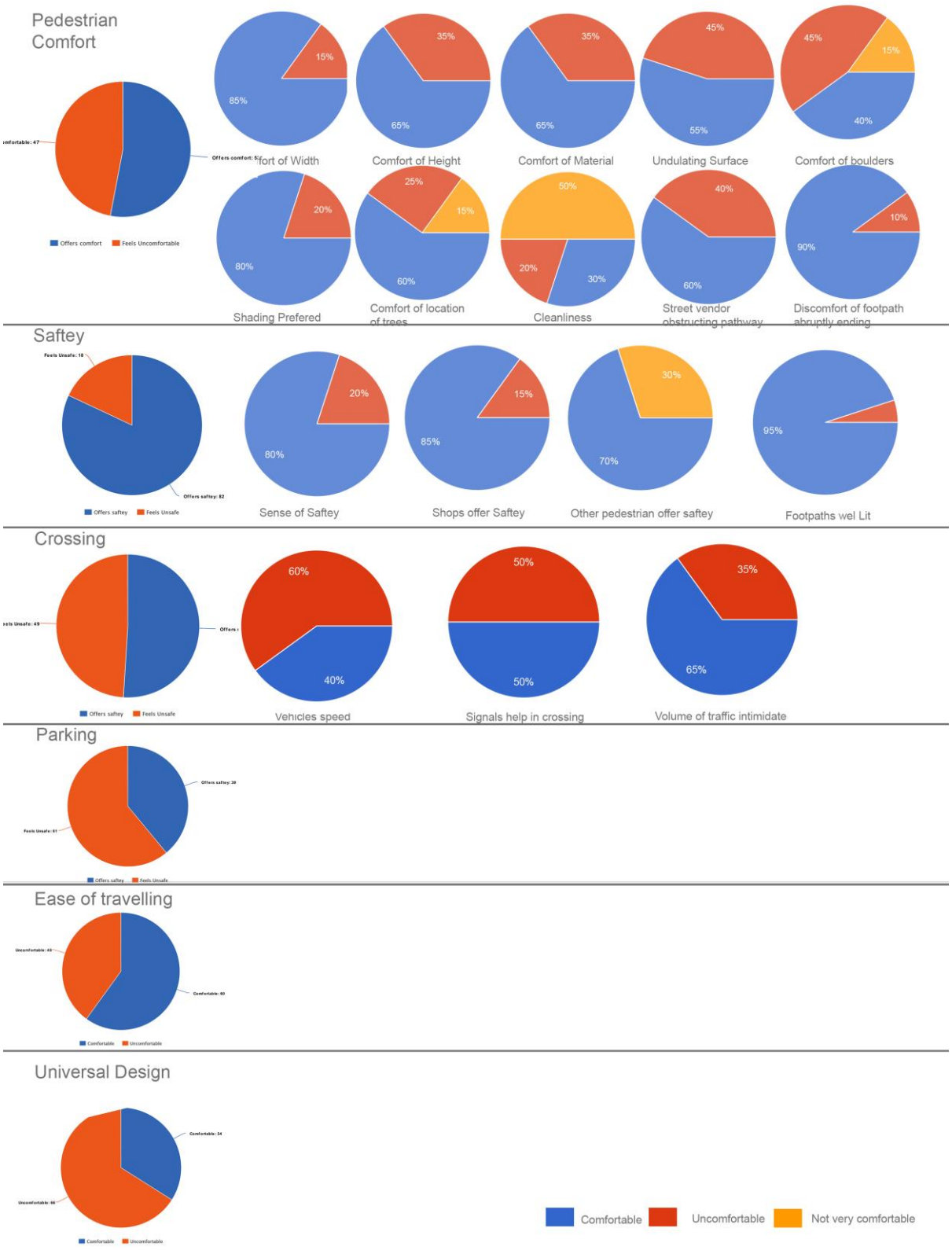
5.2.1 Pondy Bazaar Pedestrian Pathway







5.2.2 2nd Avenue ,Anna Nagar



6. **Comparitive Analysis**

Table iii (Comparision with standards - 2nd Avenue ,Anna Nagar and Pedestrian Plaza, Pondy Bazaar)

Standards			**Anna Nagar West**	**Pondy Baazar**
I) Footpath	A)Zoning	Frontage zone-0.5 M along compound wall	Absent	1M
		Furniture zone-1.0 M wide	Absent	2M
		Pedestrian zone-Clear width of 1.8 M minimum	3M	3M
	B) Height of the footpath-should not exceed 150 mm.		20mm	0.15M
	C)Radius of the Footpath-Residential areas - 6 M Maximum Radius - 12 M		Sharp turns	
	D)Surface-Should have a flat ,continuous surface with proper drainage		No	yes
II)Multi-Functional Zone	A) Minimum Width- 1.8 M		2M	3M
	B)Tree Pit dimensions-1.8 M X 1.8 M		Unavailable	2M X 2M
III)Bus-Stops	A) Clear width between the bus shelter- 1.8 M		1M	2M
	B) Parking lane		yes	Yes
IV)Property Entrance	A) Entrance			Sloped
	B) Vehicle Ramp-Slope - 1:5 M		Unavailable	
	C) Clear width-1.2 M		1.2	3M
	D) Existance of bollards		Yes	Yes
V) Vending	Designated vending zone		No	Yes
VI)Parking	A) Parking lane width -2.0 M		2	2M
	B) Parallel car park - 2.5 M X 6.0 M		2.5M X 6.0 M	2.5M X 6.0M
	C) Diasabled car parking bay-3.6 M X 6.0 M		Unavailable	Unavailable
	D) Type of parking		Parallel	Parallel
VII)Barrier free design	A) Ramps in footpaths-1:12 Minimum Slope at all level change points		Unavailable	Yes
	B) Width of Ramp (Tactile warning strip)-1.2 M		Unavailable	Same as footpath
	C) Tactile pavers		Unavailable	Yes

Viii) Planting	A) Clear vertical zone of trees- 2.4 M	yes	Yes
	B) Tree pit size- 1.8 M X 1.8 M	Unavailable	1.8M X 1.8M
	C) Permeable Pavers or Tree Grates should be placed over the pit in busy pedestrian streets so people can walk over the tree pit.	Unavailable	Yes
IX) Seating	A)Seating at front edge	Unavailable	Yes
	B)Provision of shade	Unavailable	Yes
	C)Face Building at furnishing zone-Away from buildings in frontage zone	Unavailable	No
	D) Material -Durable,Easy and Cheap to maintain	Unavailable	Yes

On comparing the collected data from both the sites the with the standards -the standards that have not been executed or followed in the selected sites can be identified.

6.1 **Tabular Column Analysis**

6.1.1 2nd Avenue, Anna Nagar

The comparison with the standards reveal multiple factors that have not been executed or improperly ecxecuted.

Zoning

In terms of zoning the footpath has not been divided into zones and thus not function in zones. It does not support multiple functions at the same time.

Ergonomy

The height of the footpath is slightly higher than the prescribed height and it make the use of the pedestrian pathway difficult for the users especially the older and challenged users.The turnings were not observed in the selected strech

The surface is not smooth because the footpath stones are broken or missing in certain parts of the strech.

Multi function Zone

The trees are located not in tree pits and in the platform so people have to go around them .They also pull up the pavement tiles in the root area. Also they are not covered by grates which makes that part of the footpath useless and a place which is frequently littered.

Bus stop

The bus stops don’t offer sufficient clear width for the pedestrians to travel wth ease

Property entrance

The platform ends abruptly at every property entrance and makes the pedestrian experience poor.

Barrier free design

None of the recommendations for universal design have been implemented

Seating

There is no seating offered.

6.1.2 Pedestrian Plaza, Pondy Bazaar

It does not have designated parking space for the disabled .All the other factors or the standards that were considered have been adhered to in the stretch that was observed.

On comparing the two stretches it is clearly visible that the pedestrian plaza is way better and well developed than the 2nd avenue road.It satisfies almost all the criteria's.

6.2 **Questionnaire data analysis**

6.2.1 **2nd Avenue Road ,Anna Nagar**

Pedestrian comfort

-The width of the footpath is comfortable to use for majority of the users .This can be attributed to the width of the footpath that has been adhered to standard.

-Height of the footpath is comfortable to a relatively lesser number of users and not at all comfortable to 35% of the users .These users are usually slightly older people.

-The material of the footpath and its laying is not up to standard and this was also felt by the users 45% of whom said that the pedestrian pathway was not comfortable to use.

-Over 60% of the users felt that the bollards did not actually prevent the vehicles from running or being parked iin the footpath.

-The trees and its shade actually encouraged pedestrians to use the footpath more

-However the loaction of the trees were detrimental to the use of the footpath

-The footpath is not clear of trash at all times

-One major detrimental factor for the pedestrian pathways were the pathways ending abruptly at property entrance with over 90% of the users feeling discouraged because of that.

Safety

Due to the location and the usage of the pedestrian pathways it has been perceived as a very safe space by majority-over 90% of its users.

Crossings

This is a factor not immediately Observed at the stretch but the main road and its volume of traffic and the lack of availability of crossings at prescribed intervals actual become detrimental to the users wit 49% of them feeling unsafe.

Parking

The parking bays are not governed or monitored hence become very haphazard and also cause vehicles to be parked on the platforms sometimes or parked in such a way that I completely cuts off access to the platforms.

Transit

Multiple mass transit options are available.

Over 30% of the users feel that the bus stops prevent them from using the passage.

Barrier free Design

In terms of universal design the pathway performs poorly with little to no features made available to make it accessible to old and physically challenged people.

6.2.2 Pedestrian Plaza,Pondy Bazaar

Pedestrian comfort and safety

The perceived level of comfort is significantly higher 82%.

The tree greatly encourage people to use the pedestrian pathways.

The safety felt by the users is also very high at 90%.

Crossings

The users are not intimidated by the road .

Parking

A system of parking exists and is also monitored with 80% of the users being comfortable with the existing parking .

Transit

70 % of the users are comfortable with the availability of transit system as its slightly longer than a walkable distance.

The bus tops have clear width and are not very discouraging to the users.

Barrier free Design.

According to the survey the pedestrian pathway is doing well in terms of barrier free design following the recommendations.

7 Findings

2nd Avenue Road ,Anna Nagar

The bollards that are actually provided to impede vehicles from being used on the pedestrian pathways have been revealed to actually not perform their function effectively. They also turned out to be detrimental for pedestrian comfort . They thus don't perform the function they were intended for .This could be due to lack of proper implementation in carefully selected locations.

A pedestrian pathway shaded by trees is encouraging to the use of the pathways as revealed by the overwhelming response of the opinion of the people.

The satisfaction levels of the users with the pedestrian pathway does depend on proper implementation of the recommendations as evident with the case of pedestrian plaza in T nagar in which the users were mostly comfortable with the usage of the space.

In terms of macro level factors the speed of the vehicles in the road greatly affects the perceived level of safety for the pedestrians ,thus revealing that it is necessary for speed control in pedestrian intensive roads .

This reveals that a pedestrian pathway that has been executed by following the policy recommendations and includes the stake holders in its design and developed process is more effective and functional than what is implemented without involving the stakeholders and improper implementation of the given guidelines.

8 Conclusion

Comparative studies of the selected stretches with each other using the standards developed from the literature study which had two major parts - information from the existing guidelines / policies and from books. The common and the crucial policies and factors from across the literature study was identified and these then became the factors using which the standards for comparing the collected data and for developing the questionnaire as well. The data that was collected was analysed and the factors that encourage and discourage pedestrian use of pedestrian pathways were identified. When the policy recommendations are followed the comfort level in the corresponding pedestrian pathways was also higher . Also existence of bollards turned out to be discomforting the pedestrian due to improper implementation. One important factor that contributed to increasing the walk ability of the pedestrian pathway was the existence of trees in the pedestrian pathway .Thus some factors that encourage and discourage pedestrian comfort have been identified .

Annexure

I)List of Tables

II)List of Images

II. Acknowledgment

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