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Pedestrian Pathways: A Comprehensive Walkability Analysis of Pedestrian Infrastructure & Livability Assessment

Janvi Dipeshkumar Patel

Final Year Student, M. Plan - Sem. IV. Faculty of Architecture and Planning, Department M. Plan. Parul University; P. O. Limda, Tal. Waghodia Dist. Vadodara - 3917 (Gujarat), India
Email: *janvip006[at]gmail.com*

Abstract: ***This project analyzes the pedestrian walkways within and surrounding Surat Railway Station, one of the main transport hubs in the region. For these objectives, we integrated GIS map analysis, field surveys and observations, as well as feedback from pedestrians for comfort and safety evaluations regarding walking in the area. We assessed the footpath and pavement conditions, spatial constraints, obstructions, lighting, drainage, and general usability by different types of people. The findings highlight numerous critical issues like unsatisfactory footpath width, dangerous walking space, and complete negligence of design inclusivity. Qualitative indicators of livability such as comfort, safety, ease of access and use, convenience, flow, and enjoyment recorded exceedingly low ratings, demonstrating the lack of urban planning attentiveness specifically designed for inclusivity, pedestrians, and basic urban needs. The findings advocate a defined strategy to improve pedestrian accessibility, safety, and overall environment around Surat Railway Station. Through these findings, urban planners and policymakers are informed about the need for integrated planning approaches dedicated to pedestrian pathways and connections, improving livability for all residents. Integrating these strategies encourages sustainable and livable cities.***

Keywords: Pedestrian Infrastructure, Walkability Index, Urban Livability, and Public Space Design.

1. Introduction

Pedestrian infrastructure is indeed considered a basic concern for building green and livable cities in modern urban planning. While walkability meaning the extent to which walking is encouraged and supported in urban spaces is fundamental to realizing health, social inclusion, accessibility, and a lesser environmental impact, pedestrian networks that are inclusive and efficient serve to enhance daily movement and give a boost to the reduction of air pollution, a healthy society, social bonding, and active public arenas. Despite these benefits, many rapidly urbanizing cities in India face persistent issues concerning pedestrian planning and design. Cities like Surat deal with serious problems like encroachments, dangerous crossings, narrow or uneven paths, and a general lack of pedestrian - focused planning. These issues result in less walkability, a higher dependence on motorized transportation, and ultimately a worse standard of living in urban areas

This study's goals are to assess the walkability and livability of specific metropolitan areas in Surat, Gujarat, as well as the current condition of the pedestrian infrastructure. This study clarifies how people move across cities and how infrastructure influences their choices. It also shows how pedestrian experience, urban shape, and social well - being are related. To counteract inactive lifestyles, environmental degradation, and increasing urban congestion, better non - motorized travel options are needed. Even though several regulations support inclusive transit networks, very little of a walkable environment is implemented. Therefore, by providing an empirical assessment of walkability and its relationship to urban livability, this study closes a substantial gap.

The main goal of this article is to investigate how pedestrian movement patterns relate to transportation and land use systems.

Evaluates accessibility, connectivity, and safety of pedestrian infrastructure.

a) Identifies and removes obstacles that make walking difficult.
b) By improving pavements for pedestrians, it seeks to promote environmentally beneficial car - free mobility.
c) Develops concepts supported by data to make walking areas more user - friendly, safer, and more welcoming.

The study methodology combines quantitative and qualitative methods, such as perception - based surveys, spatial mapping with GIS tools, and field observations, to furnish a thorough understanding of user needs and infrastructure deficiencies.

The study's main research questions are as follows:

a) How is the pedestrian infrastructure in the study area currently performing?
b) What is the relationship between pedestrian mobility and traffic flow and land use patterns?
c) What factors most influence pedestrian safety and satisfaction?
d) In what ways might Surat's urban livability be improved through walkability?

Finding walkability gaps, developing urban design solutions, and producing policy - level recommendations to promote inclusive, sustainable, and human - centered urban development are the ultimate goals of this study. Although Surat is the study's geographic focus, its conclusions are meant to be generalizable and relevant to other Indian towns dealing with comparable issues.

The study applies a mixed - methodology but both quantitative and qualitative data are collected and analysed in surveys, direct observation and interviews. It also incorporates the spatial interaction between the distribution of land use and the pedestrian movement. Accessing current municipal data is a barrier, survey responses may be subjective, and converting recommendations into legally binding civic policy is a larger challenge. Surveys, questionnaires, observations, interviews, and secondary data analysis are some of the mixed - methods methodologies employed in this study to evaluate pedestrian paths.

2. Literature Review

2.1. What is Walkability?

Walkability is a measure of how friendly an area is to walking while walking for forward transportation in addition to recreation and entertainment. It includes the actual spaces through which we move as well as the factors of the social experience that affect our ability, the frequency and timeliness of doing so. It is generally associated with having an interconnected street network that provides access to destinations ranging from schools, businesses and shops to parks and public transportation. Specific physical features include connected and maintained sidewalks, marked crosswalks, pedestrian signals, and traffic calming devices like speed bumps that contribute to pedestrian safety. But walkability is about more than that. The role of aesthetics, comfort and convenience Public art, engaging building facades, decorative sidewalks, and alliances with communities to keep the streets we walk on at a human and aesthetic scale. . . Nicer places are likelier to be places where people want to walk.

Also important is that they be universally accessible – walkable communities need to work for people of all ages and abilities, for kids and for elderly people and people using assistive devices. The positives of making places more walkable are innumerable: It encourages physical activity, reduces car dependency, decreases emissions, boosts local business by getting people out walking, and creates healthier social and environmental relations. In the end, walkable communities help create vibrant, equitable and sustainable cities.

2.1.1. The hierarchy of needs for walkability

This hierarchy places walkability factors in ascending order of importance, beginning with the basic requirements of safety and accessibility. It then moves on to features that enhance comfort and beauty, culminating in a visually appealing, walkable, and livable environment. As the benefits of each step continue to build, it's more than just an exercise; it's something to deeply engage your mind and spirit. In addition to helping towns that want to make their roads better for everyone, this systematic approach gives them a solid understanding of what makes a neighbourhood walkable.

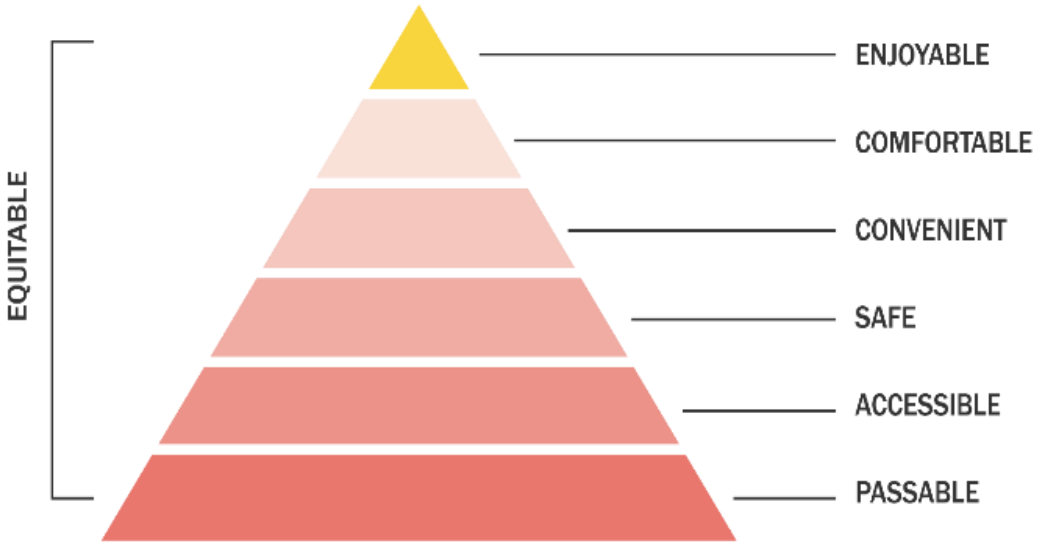

Figure 1: The hierarchy of needs for walkability

2.1.1.1. Key components of walkability

a) **Passable:** It is physically feasible to travel from one point to another due to the urban environment's allowance for strolling between locations.
b) **Accessible:** From typical starting sites, the surroundings offer locations that are manageably close for walking. Wheelchair users and those with special requirements may be supported by "accessible" in the eyes of many, but these features are mostly addressed by "passable" and "safe. "
c) **Safe:** The urban setting shields cross - street pedestrians from traffic hazards and criminal activity.
d) **Convenient:** By cutting down on the amount of time required to walk as opposed to other forms of transportation like driving or cycling, the design prioritizes walking.
e) **Comfortable:** With careful design elements, the space reduces physical pain brought on by things like crowding, exhaustion, bad weather, or darkness.
f) **Pleasurable:** Art, entertainment, and facilities that enhance the experience of walking make it more pleasurable.
g) **Pleasurable:** Art, entertainment, and facilities that enhance the experience of walking make it more pleasurable.

2.2. Concept of walkability

Walkability is how friendly and easy a neighbourhood is to navigate on foot. This is partly to do with design elements that make walking fun and useful. One concept that supports walkable areas, which can be traced back to urban planning and transportation theories, is New Urbanism, or mixed - use neighbourhoods in which daily needs are within walking distance. When we create smaller, pedestrian - oriented communities that are well - served by transit, transit - oriented development (TOD) also advances walkability and makes trips more sustainable and efficient.

2.3. Walkability criteria

Table 1: Walkability criteria

Key Criteria	Description	Examples of Attributes
Infrastructure	It is crucial to create an urban area that is connected, accessible, and has walkable paths. Prioritizing pedestrian comfort, safety, and a variety of access alternatives is crucial for fostering a vibrant and all - encompassing urban environment.	Street or road character, pedestrian infrastructure, crossings, hard landscape materials, street furniture, street lighting, pedestrian stops, slope, use of sidewalks, traffic volumes, pedestrian volumes, traffic safety, speed level, pollution and noise level, barrier free architecture, public transportation, defined parking areas.
Built Environment	In order to encourage regular physical activity, the built environment must have design elements that make walking more productive and pleasurable.	Density, proximity, connectedness scale, orientation of buildings, block sizes, permeability, urban structure, pedestrian network, parking lots landmarks, focus points borders, urban spaces and parks, green, street furniture.
Surroundings Activities	This includes the behavioural characteristics seen in the social setting that affect a person's thoughts and behaviour.	Destinations, activities, people walking/staying, mix of functions, facades, vibrancy, wayfinding, experienced safety, maintenance.

A walkability assessment looks at the layout and characteristics of urban areas, focusing on the physical environment, infrastructure, and activities that occur there. Although the scope, data gathering strategies, and particular methodology of various approaches may differ, these elements frequently overlap.

3. Study Area Profile

Surat is a city in the Indian state of Gujarat. It used to be a large seaport and is now the commercial and economic center in South Gujarat, which is famous for its diamonds and textiles Industries and as a shopping Centre for apparels and accessories. It is 462 square kilometres with a tropical savannah climate and a population of 4.46 million and growing. It is administered by the Surat Municipal Corporation (SMC) and is the capital of the Surat district.

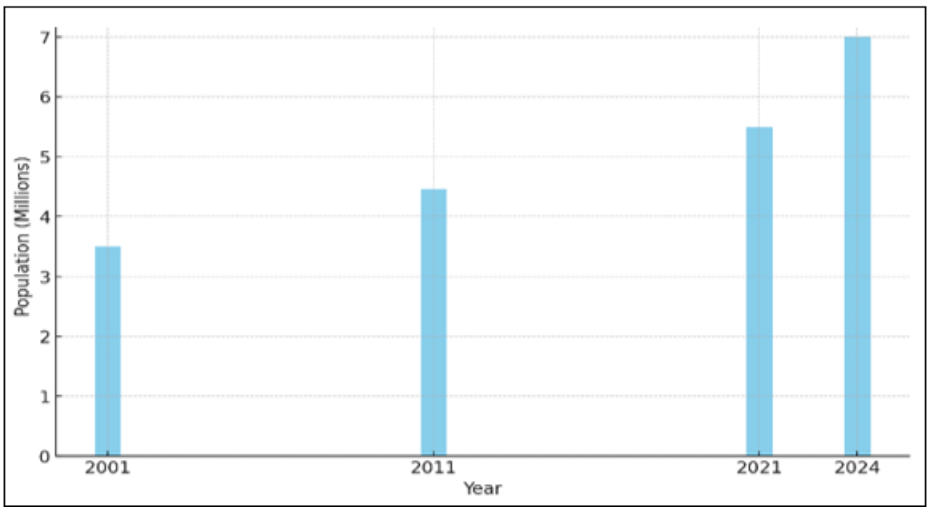

Figure 2: Population growth

Table 2: Economic profile

Sector	Details
Diamond Industry	Surat processes ~90% of the world's rough diamonds. ~5 lakh workers
Textiles	30% of India's man - made fibre production. Known for synthetic sarees & dress materials
Petrochemicals & Heavy Industry	Hazira Industrial Belt (ONGC, Essar, Reliance Industries, L&T)
Ports and Shipbuilding	Magdalla Port, Hazira Port (major cargo handling)
IT & Services	Emerging IT hubs, DREAM City

Surat, however, struggles with long standing challenges such as flooding, air pollution, traffic congestion and limited pedestrian infrastructure especially in industrial area. The city has implemented a series of flood control, environmental and smart city projects to improve governance and quality of life. Culture Surat is a melting pot of different traditions Solanki

tradition defines this city more than anything else Gujarati is the mother - tongue of the majority of the population Muslims here juxtapose hyperbolic splendour against their basis in simplicity of living and thinking traditional outlook particularly compared to Bombay Often, people consider Surat closer to Maharashtra in terms of culture. Though slum - dwellers are a worry, most city - dwellers depend on cheap housing and public transport. Land use patterns (commercial, residential, industrial) affect walkability, and denser and more mixed land use patterns in city centres and TODs provide more conducive walking environments.

3.1 Selected Study Areas

Based on preliminary analysis and urban characteristics, the following areas have been selected for a detailed walkability assessment:

- **City Center (Ring Road and Textile Market Area):** High commercial activity and pedestrian footfall.
- **Residential Zones (Adajan and Vesu):** Emerging residential hubs with mixed land use.
- **Institutional and Recreational Areas (Sarthana Nature Park and SV National Institute of Technology):** Public spaces promoting pedestrian activity.
- **Transit - Oriented Development (BRTS and Railway Station Precincts):** Impact of public transport on pedestrian movement.
- **Commercial Areas (Chauta Bazaar Street):** Pedestrian congestion is a result of high foot traffic areas like retail centres and textile markets

4. Study & Data Analysis

Surat Railway Station and is surrounded by a crowded and commercially active area with all types of traffic involving complex pedestrian movements, heavy vehicle traffic and mixed land use. This specific part is an over extensive micro - level analysis of how people move in the city, how the infrastructure is and the "walkability factors" in a radius of 1 km, that´s supposed to orient the strategies to make the city more livable

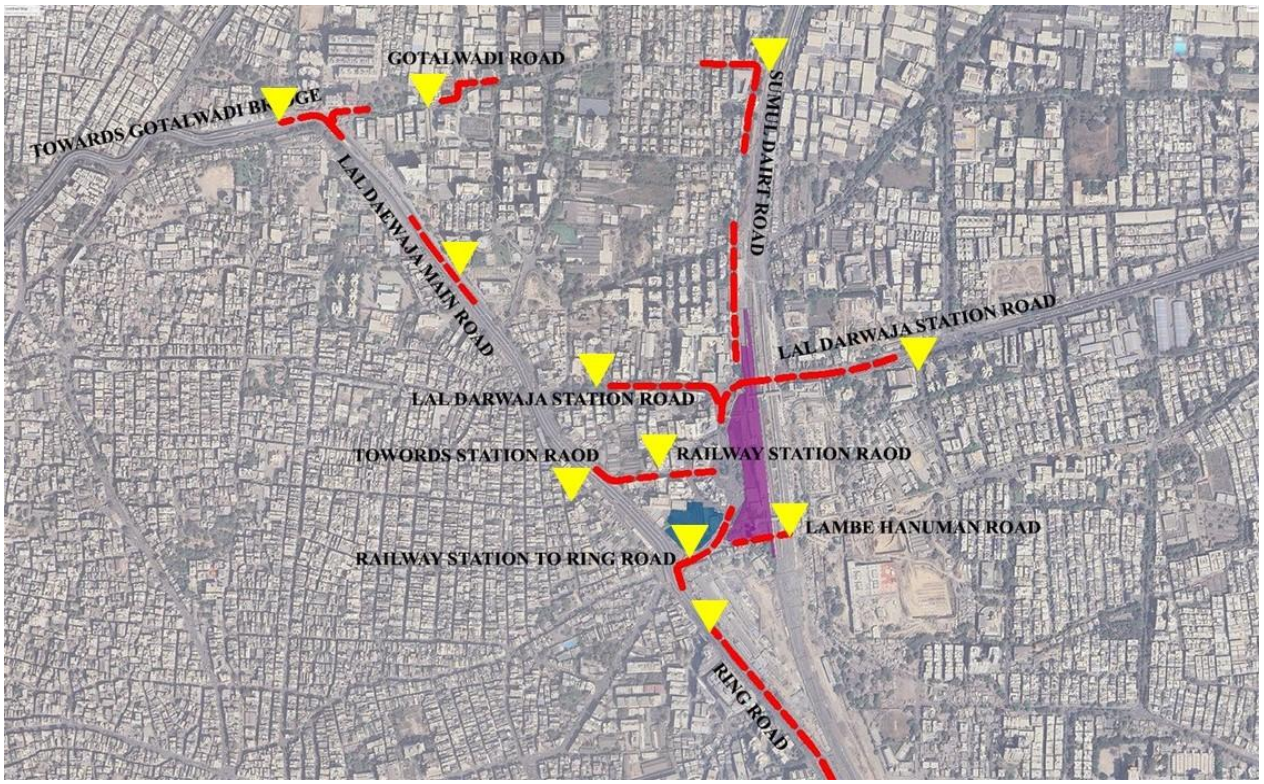

Figure 3: Site connectivity

4.1. Site connectivity

The railway station is currently situated between Unapani road on the west, Varachha Road on the north, Lambe Hanuman on the south. The way to the station building from the east can be made through railway station road, which is connected to Lambe Hanuman road in the southern direction. This road ends in the booking office of the present and the vehicles need to turn back in order to get out of the same road that is they have no decent connectivity between Lambe Hanuman road and Varachha road. The approaching side of the station building is through the west direction and this is why passengers must invariably move to the western side of the station building.

4.2. Land use map

The map of land use was analyzed to show the allocation of the various functions of the land across the study area. According to the pie chart, commercial (blue) and industrial (purple) occupy most of the site, with the rest being residential (yellow). Important infrastructure is the station building, bus station and the railway line on the eastern side. Open ground (gray) and areas as green spaces are scarce, pointing at the dense urban development and the prioritization of commercial and transportation infrastructure.

- Commercial (40%) – Markets, shops, hotels, eateries.
- Residential (30%) – Railway colonies, apartments, chawls.

- Industrial (25%) – Dimond Factories, Market.
- Railway Station (5%) – Surat Railway Station.
- Bus Station (2%) – Surat Bus Depot
- Open/Vacant Land (10%) – Undeveloped or temporary encroachments.

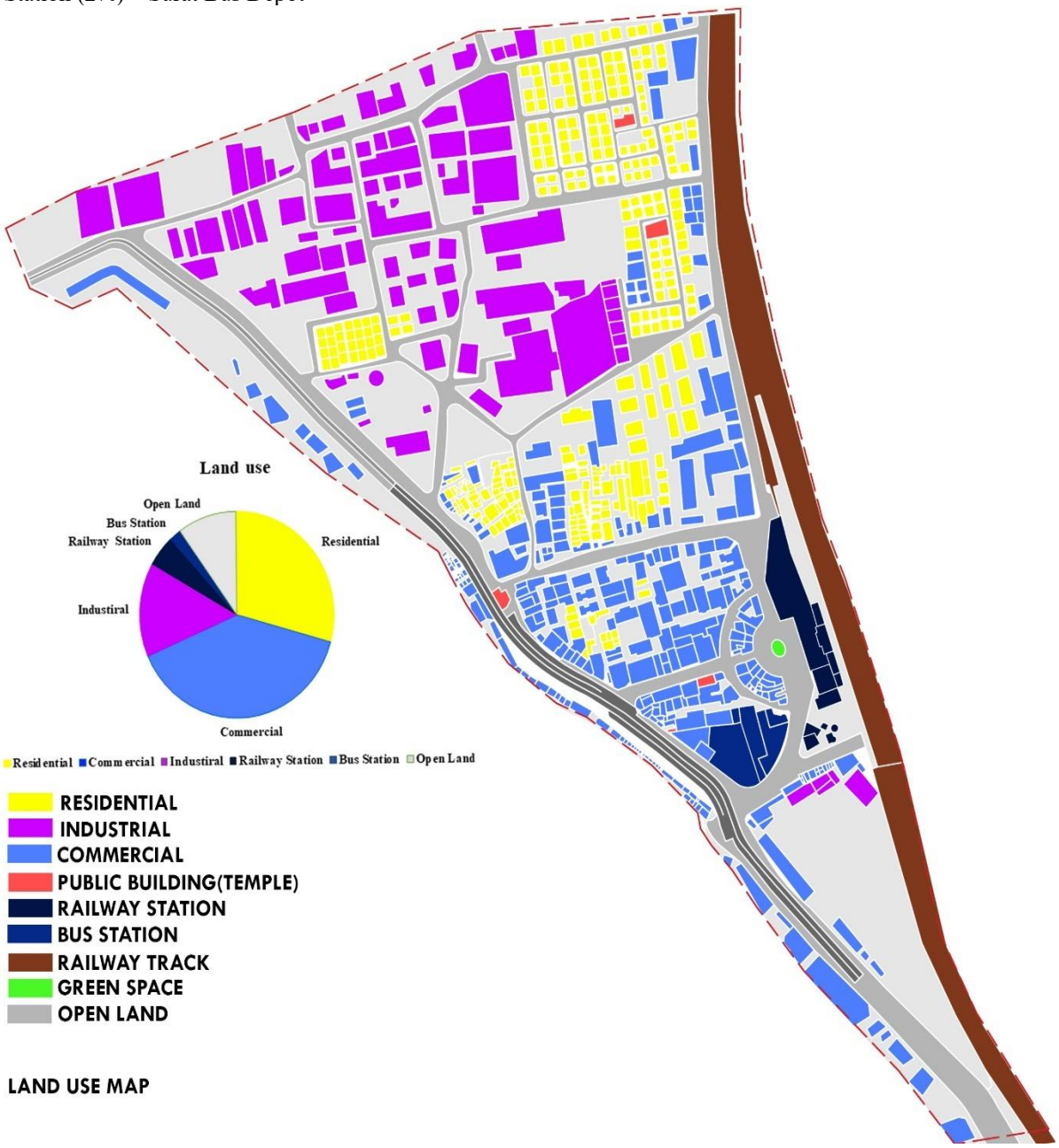

Figure 4: Land use map

4.3. Pedestrian Infrastructure Overview

4.3.1. Pathway width & continuity

The average useable width, barrier identification, and walking surface continuity all crucial factors that have a big influence on pedestrian safety and comfort were used to evaluate the pathway conditions surrounding Surat Railway Station.

- **Width Variation**: Many footpaths, especially in busy areas, were under 1.5 meters wide and obstructed by vendors, poles, or parked vehicles.
- **Continuity Issues**: Several paths were discontinuous, merging with roads or ending abruptly, with limited accessibility features like ramps or tactile paving.
- **Improved Segments**: Some areas showed better width and surface quality due to recent upgrades but still lacked shade and seating.

Field surveys reveal that many of the footpaths are broken, are unpaved or are blocked by elements including trees, and that usable area is further diminished.

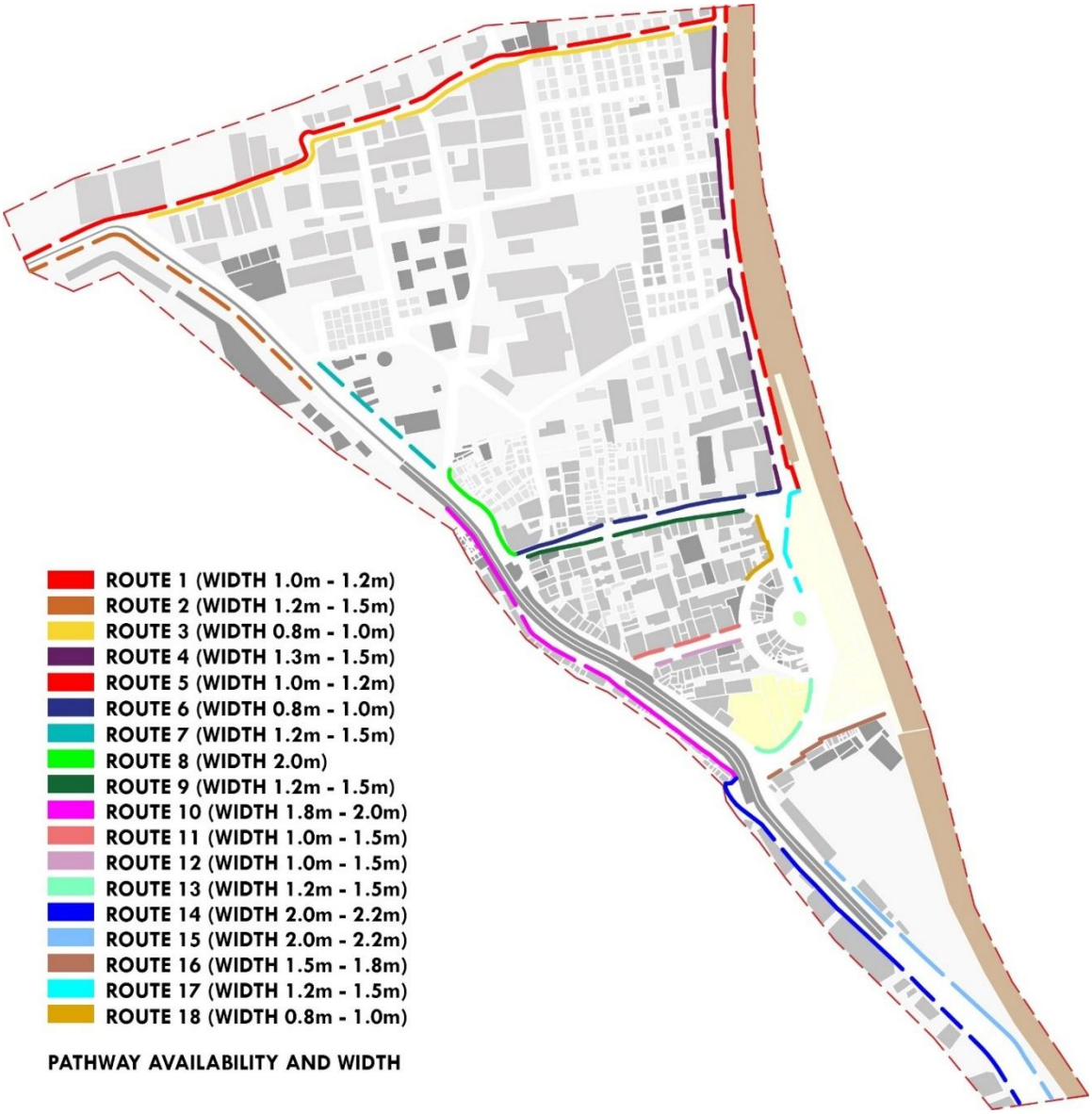

Figure 5: Pathway Availability and width

Figure 6 : Analysis of pedestrian activities and Vehicle movement

Figure 7: Analysis of pedestrian activities and Vehicle movement

Figure 8: Analysis of pedestrian activities and Vehicle movement

Figure 9: Analysis of pedestrian activities and Vehicle movement

4.3.2. Surface quality

Figure 10: Analysis of surface quality

Figure 11: Analysis of surface quality

Surrounding Surat Railway Station, the quality of pedestrian surfaces has a major impact on pedestrian friendliness, safety, and ambience. Field surveys reveal that many of the footpaths are broken, are unpaved or are blocked by elements including trees, and that usable area is further diminished. Typical problems are uneven surfaces, pavers that have come loose, exposed roots, and trash, particularly on routes from station to street markets and transit hubs. These inhospitable settings turn into conflict zones during rush hours and become unbearable during the monsoon due to drainage failures. Elderly people, children and handicapped persons are particularly confronted by these obstacles. Lack of universal design is also a barrier to accessibility. Improving the quality of surface is necessary for good walking and for non - motorized transport and universal access.

4.3.3. Obstruction elements

The image underscores the relevance of obstruction in walkability studies, especially for the pedestrian environments close to roads. There is a dedicated tactile - tile path, but this path is rendered somewhat useless by incursions by street vendors, labourer's and poorly installed tiles. Surface water is drained by a blue strip, but poor water drainage may cause waterlogging and damage to materials and can become slippery. Both streets and sidewalks are visible, marked in red, the one from the other, yet there's no separation other than the hues on the street, and potential safety concerns may arise, especially in mixed - use or high - traffic areas.

Figure 12: Encroachments from street vendors

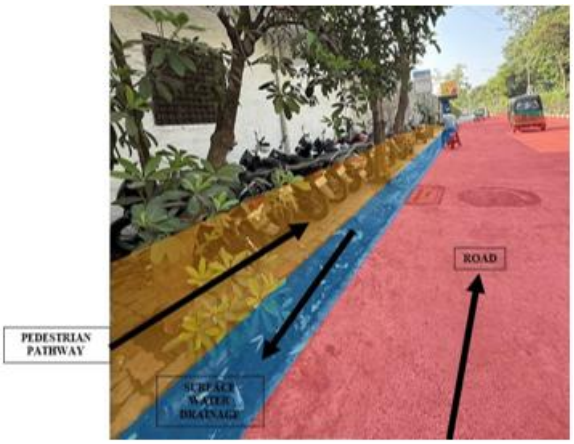

Figure 13: Daily workers parked their vehicles

4.3.4. Drainage

The drainage system near the Surat Railway Station and localities such as Gotalwadi, Lal Darwaja, Sumul Dairy and Varachha Road is poor and it does not have proper maintenance, resulting in water - logging almost every year during the rainy season. " Open and box type RCC drains in several streets are heavily silted and damaged or blocked to an extent of 70% hampering the flow. Encroachment by vendors, illegal parking and broken ramps are other factors that contribute to obstructing the drainage, and smooth flow of traffic particularly at busy junctions. Inappropriate grade and low - lying areas are contributing to back flow problems such as were seen on Station Road. Peripheral bypass roads (such as Lambe Hanuman and around Sumul Dairy) are not provided proper drainage system. The Ring Road is doing better because of its engineered slope and trunk drains but it still has runoff pressure from upstream.

4.3.5. Lighting and safety

Walking near Surat Railway Station especially around Gotalwadi, Lal Darwaja, and Varachha Road feels unsafe at night due to terrible street lighting. Dark stretches like Sumul Dairy Road and Lambe Hanuman Road make pedestrians vulnerable to accidents or crime. While CCTV cameras cover the station, the surrounding areas lack surveillance, encouraging mischief. Crossing roads is risky with poor visibility, encroachments, and no proper walkways. Though spots like Ring Road have better lighting, these neglected zones urgently need upgrades for public safety.

4.3.6. Crossing & shade

Walking around Surat Railway Station feels unsafe and uncomfortable, with poorly designed crossings and almost no shade. Roads like Gotalwadi, Lambe Hanuman, and Sumul Dairy lack proper pedestrian amenities, forcing people to dart across traffic at risky, unmarked spots. Even zebra crossings and signals don't work well, while shade is limited to a few trees or makeshift vendor stalls. Though the station's front and Ring Road have better planning, most areas remain exposed, chaotic, and dangerous for walkers. To fix this, we need tree - covered walkways, clear crossings, working signals, and shaded bus stops basic upgrades that would make streets safer and more bearable in the heat.

4.4 Pedestrian movements patterns

4.4.1. Observation point map

A recent walkability study around Surat Railway Station (within a 1 km radius) revealed major challenges for pedestrians. Near the main entrance, heavy foot traffic mixes with chaotic auto - rickshaws and no proper crosswalks, creating constant bottlenecks. The Gotalwadi - Lal Darwaja stretch is clogged with street vendors and broken sidewalks, forcing walkers onto the road. Over at Ring Road's textile hub, pedestrians play a dangerous game of dodging vehicles due to missing signals and mid - road crossings. The Central Bus Terminal entrance and Subhash Garden's narrow lanes also scored poorly, with overcrowding and zero pedestrian priority. Unregulated vendor sprawl, crumbling walkways, and reckless traffic make the entire zone feel unsafe and stressful. These issues highlight an urgent need for better sidewalks, crosswalks, and traffic management to protect pedestrians and smooth the flow.

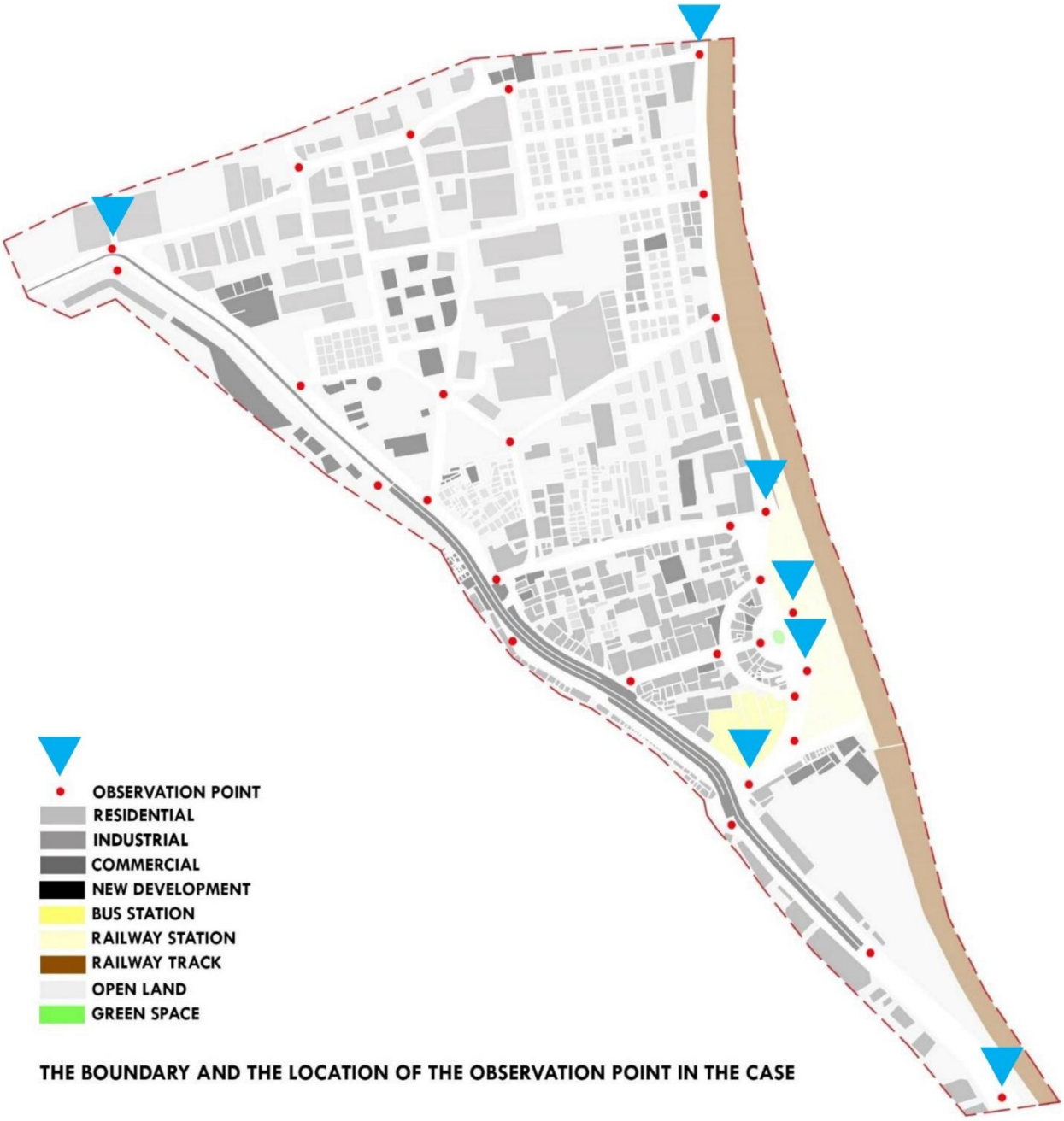

Figure 14: The boundary and the location of the observation point in the case

4.4.2. Road network and road hierarchy

Commercial Map of Surat Railway Station This map illustration depicts a hierarchy of major (red), secondary (orange) and tertiary (yellow) roads surrounding Surat Railway station in India. The major roads are looped around the southern and western sides, giving the railway station a high volume of vehicular connections. Other roads are cut into residential and downtown areas that can relieve congestion while connecting neighbourhoods to major routes. Tertiary roads: They are the most, reach through the fabric of the city and they are intended primarily for local traffic and pedestrian traffic. The dense local urban grid arterials and collector streets in the immediate vicinity of the station are effective in providing access, although may result in congestion without complementary pedestrian facilities and traffic management.

Figure 15: Road network and road hierarchy

4.4.3. Generated walking experiment route

The walking experiment route map of Surat Railway Station has 13 colored segments which are separate pedestrian ways. These routes were chosen to sample a breadth of walking environments throughout the site. Route 1 and Route 13 together sweep the primary pedestrian sheds affected by the railway station, heading north and east and west into dense mixed - use areas. The lines cover the places of high pedestrian movement like outside GSRTC Bus Terminals, Textile Market streets and Ring Road hence can analyse conflict points, pedestrian facilities, crossing etc. The station access road - connected Routes 7 and 13 are illustrated in cyan and magenta, respectively, and so are critical observation areas for pedestrian volume as well as infrastructure bottlenecks. Overlapping segments enable comparative analysis of walkability across various land uses and urban morphologies.

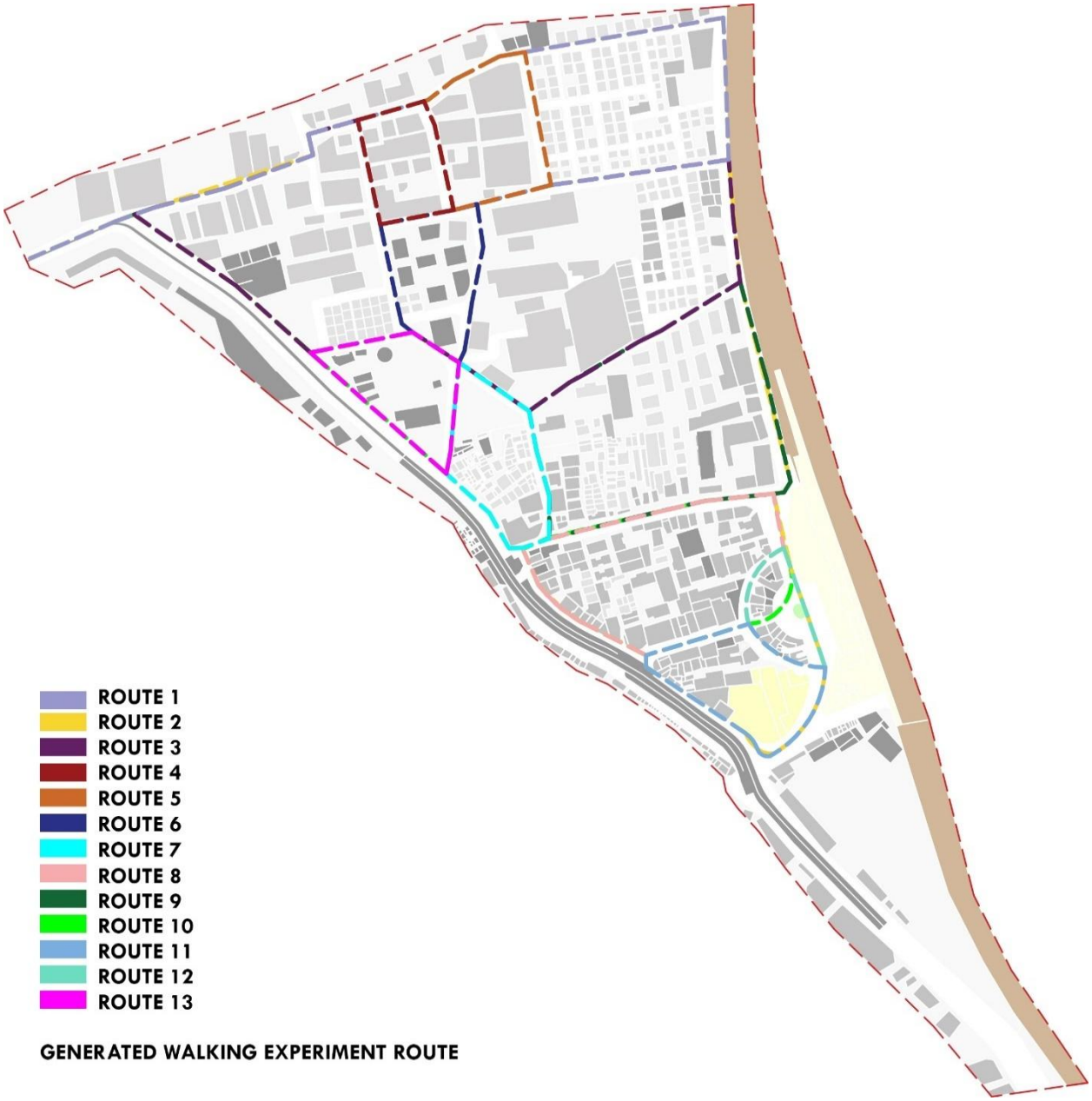

Figure 16: Generated walking experiment route

4.4.4. Area of congestion or conflicts

Strategic design interventions may support in improving walking conditions at the conflict spots and congestion zones. Signalized pedestrian crossings, raised crosswalks, curb extensions, and refuge islands could be provided at Gotalwadi Main Junction to eliminate exposure to traffic and shorten crossing lengths. An exclusive, well - lit, monitored and barrier free pedestrian underpass can provide for a safe and hassle free commuting. By promoting wider sidewalks, pedestrian - priority streets and tactile paving, it is possible to make an area more comfortable and accessible. For example, at railway station entrances and exits, a vehicle - free pedestrian plaza, clearly marked pickup and drop - off areas, a good way - finding signage and sheltered walkways can help organize people flow and alleviate congestion. Exclusive pedestrian paths, designated vending areas and facilities around the GSRTC bus station can make the area walkable and also decongest the place.

Main congestion or conflicts area:

- Gotalwadi main junction
- Surat railway station entry/exit point
- Laldarwaj to varachha road

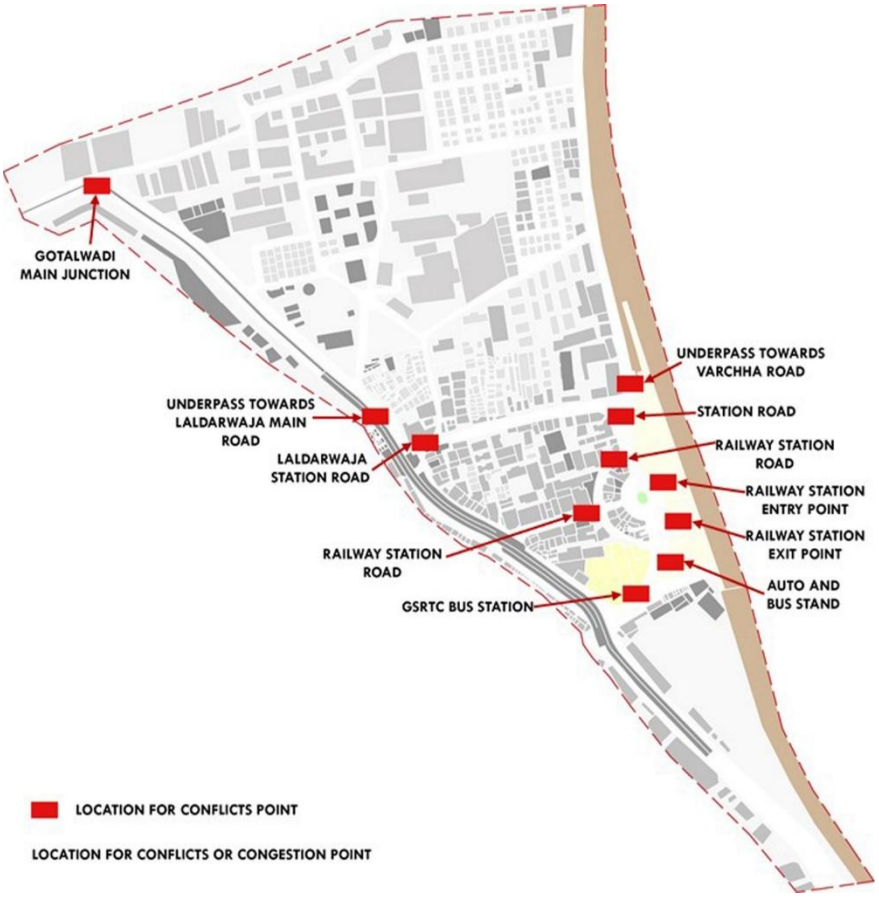

Figure 17: Area of congestion or conflicts

4.4.5. Pedestrian count at entry and exit gate of Surat railway station

The Surat Railway Station's pedestrian entry analysis reveals two peaks of the footfall during peak hour. Morning peak hour, 8: 30–09: 30 AM, records maximum of 1, 560 passengers (approximately), clearly showing a heavy rush of passengers in journey to work and travel. The second peak during the evening, taking 1, 450 trips (between 6: 30 pm and 7: 30 pm) probably represents commuters coming back and passengers using evening trains.

Figure 18: Pedestrian entry at Surat railway station during peak hours

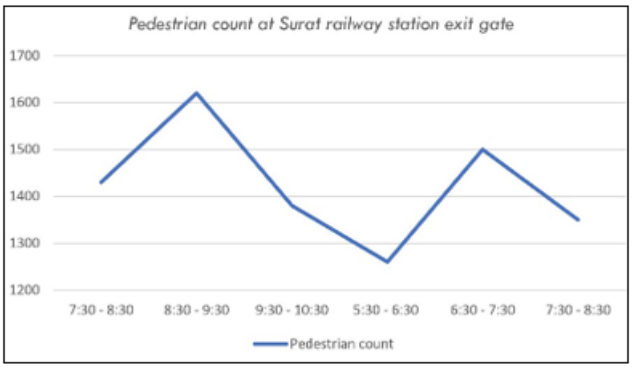

Figure 19: Pedestrian exit from Surat railway station during peak hours

Pattern of pedestrian exit at Surat Railway Station: Traffic at the Surat Railway Station is in the form of surges and the exit count varies between 1600 to 1500 pedestrians/hour as major intercity as well as the local trains arrive at the station. The station environs suffer from congestion and safety concerns - including insufficient pedestrian space, no designated paths to the station and few clear signs.

Table 3: Comparison of Pedestrian count at entry gate at Surat railway station during peak hour

Time slot	pedestrian count	Day		
		Day 1	Day 2	Day 3
7: 30 - 8: 30	1410	1450	1400	1380
8: 30 - 9: 30	1560	1600	1530	1550
9: 30 - 10: 30	1370	1350	1400	1370
5: 30 - 6: 30	1050	1000	1050	1100
6: 30 - 7: 30	1450	1500	1450	1400
7: 30 - 8: 30	1240	1250	1200	1260

Table 4: Comparison of Pedestrian count at exit gate at Surat railway station during peak hours

Time slot	pedestrian count	Day		
		Day 1	Day 2	Day 3
7: 30 - 8: 30	1430	1400	1550	1330
8: 30 - 9: 30	1620	1690	1600	1570
9: 30 - 10: 30	1440	1380	1480	1450
5: 30 - 6: 30	1330	1360	1300	1380
6: 30 - 7: 30	1540	1500	1550	1580
7: 30 - 8: 30	1360	1350	1400	1320

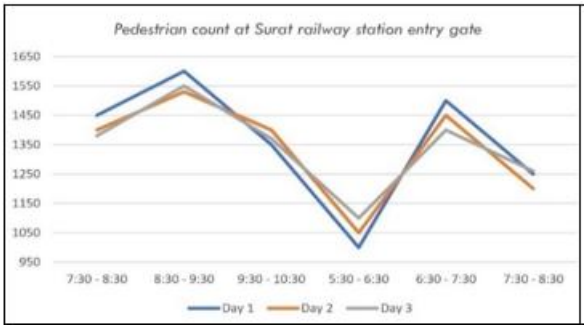

Figure 20: Comparison of Pedestrian count at entry gate at Surat railway station during peak hours

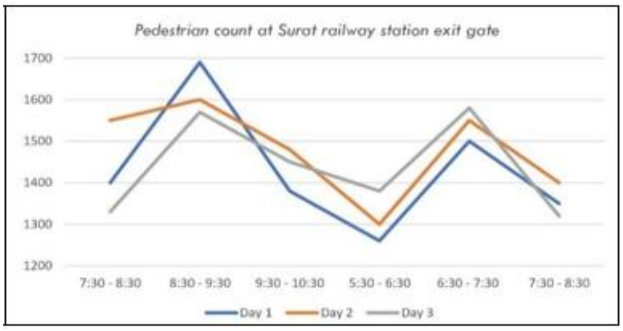

Figure 21: Comparison of Pedestrian count at exit gate at Surat railway station during peak hours

4.4.6. Pedestrian count along laldarwaja to varachha road during peak hours

Heavy pedestrian movement occurs at peak hours in the Laldarwaja to Varachha Road corridor, thus indicating the significance of this area as key urban corridor in Surat. It's a passage between busy business and residential areas with lots of people walking through particularly during morning and evening commutes. Examination indicates that the number of pedestrians achieves the maximum at morning (8: 30−9: 30 am) and evening (6: 30−7: 30 PM), which is in accordance with the proper working hours for commuting. On these peaks we got an average on - foot flow projected up to 2230 in the morning, and 2210 in the evening, showing how important the corridor is for daily urban transport. But the infrastructure at this route encounters problems in handling the high pedestrian volume. Problems like congested, unusable footpaths, poor crossing facilities, and encroachments result in congestion and lack of safety. Even access to the street is not properly separated and creates chaotic traffic flows between the Metro and the bus station.

Table 5: Comparison of Pedestrian count at entry gate at Laldarwaja to varachha road

Time slot	pedestrian count	Day		
		Day 1	Day 2	Day 3
7: 30 - 8: 30	1860	1800	1890	1910
8: 30 - 9: 30	2230	2000	2200	2500
9: 30 - 10: 30	2130	2100	2000	2300
5: 30 - 6: 30	1710	1660	1770	1700
6: 30 - 7: 30	2210	2100	2250	2300
7: 30 - 8: 30	1960	1980	2000	1900

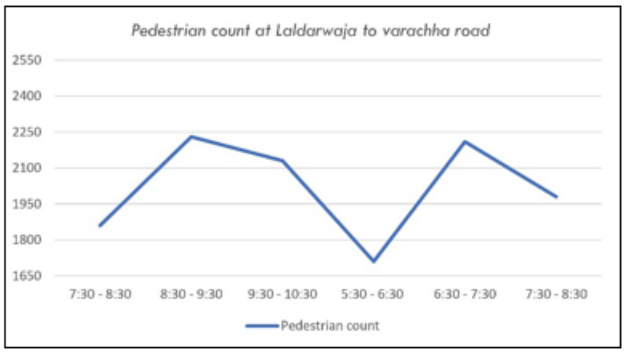

Figure 22: Pedestrian count along Laldarwaja to Varachha road during peak hours

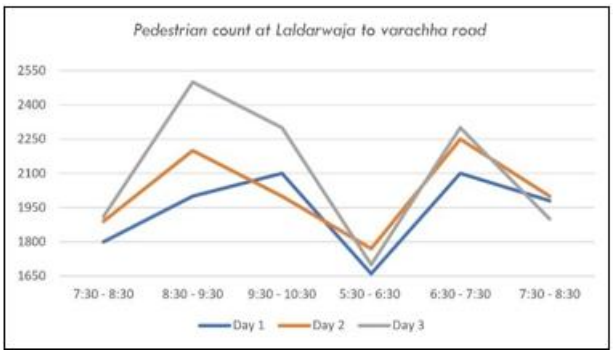

Figure 23: Comparison of Pedestrian count at entry gate at Laldarwaja to varachha road

4.4.7. Vehicle movement analysis

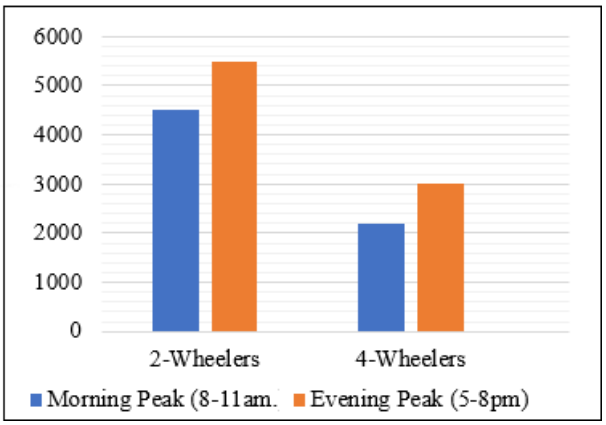

Figure 24: Vehicles count near Surat Railway Station

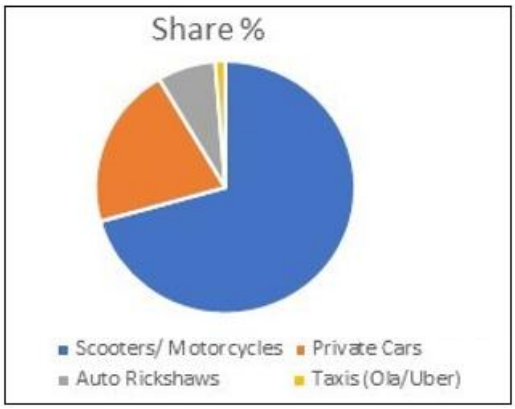

Figure 25: Vehicle composition around Surat Railway Station during peak hours

The map shows the accident - prone areas around Surat Railway station in both high and medium risk area. There are more high - accident zones (dark red in the inner map), confining to areas around the main station entrance as well as key passage directly connected to the main entrance and access roads, where pedestrian and vehicular interactions are higher and less controlled.

Such areas generally have high volumes of traffic, haphazard parking, street sales, and pedestrian areas that are difficult to circulate on foot; all these factors increase the risk of conflict. Also located at red are medium accident zones, shown in light red, zones with moderate safety issues such as poor lighting, lack of signs, bad road lines and unstructured crossings.

Table 6: Vehicles count during peak hours

Vehicle Type	Morning Peak (8–11 AM)	Evening Peak (5–8 PM)	Daily Average
2 - Wheelers	4, 500–5, 000	5, 000–5, 500	25, 000–27, 000
4 - Wheelers (Cars, Autos)	2, 200–2, 500	2, 500–2, 800	12, 000–14, 000

Table 7: Vehicles types and share

Vehicle Type	Share (%)	Comments
Scooters/ Motorcycles	68%	Parked at roadside, pedestrian blocking
Private Cars	20%	Limited parking; often spill over onto footpaths
Auto Rickshaws	7%	Cluster at Railway East/ West Gates
Taxis (Ola/Uber)	3%	Standing near exits

5. Conclusion

The recent walkability analysis conducted in the vicinity of Surat City Railway Station and surrounding has identified significant deficiencies in pedestrian infrastructure that compromise safety, accessibility, and overall mobility. Key findings reveal that substandard sidewalk widths (below the recommended 1.8 - meter minimum), frequent obstructions from parked vehicles and street furniture, and deteriorated pavement conditions with uneven surfaces and inadequate drainage collectively force pedestrians into conflict with vehicular traffic. Furthermore, the absence of universal accessibility features including tactile paving, curb ramps, and designated crossing points disproportionately affects persons with disabilities and reduced mobility, reflecting a systemic lack of inclusive urban design. These conditions are exacerbated during peak hours when pedestrian volumes exceed infrastructure capacity, particularly around station exits and transit junctions, creating hazardous congestion points.

The analysis underscores an urgent need for comprehensive pedestrian infrastructure upgrades to align with sustainable urban mobility principles. Priority interventions should include sidewalk widening and decluttering, pavement rehabilitation with non - slip materials, and installation of compliant accessibility features. Enhanced street lighting, pedestrian - priority crossing systems, and traffic calming measures are critical for improving nighttime safety and reducing vehicle - pedestrian conflicts. Additionally, strategic placement of street furniture, shaded walkways, and micro - green spaces would elevate pedestrian comfort and encourage non - motorized transport. Implementing these measures would not only address immediate safety concerns but also advance broader goals of equitable access and urban livability, ultimately supporting Surat's transition toward a more walkable and people - centric urban environment.

References

[1] https: //pedestriansfirst. itdp. org/about
[2] https: //cleanairasia. org/sites/default/files/202105/35. %20Walkability%20in%20Indian%20Cities. pdf
[3] Walkability | City Health Dashboard
[4] https: //www.google. com/url?sa=i&url=https%3A%2F%2Fwww.researchgate. net%2Ffigure%2FFramework - to - analyze - walkability - relationship - with - health - sustainability - and_fig1_354944079&psig=AOvVaw3bl9y3XpG6DE7Rnj_kjsTw&ust=1747025241135000&source=images&cd=vfe&opi=89978449&ved=0CBcQjhxqFwoTCKDfgKrOmo0DFQAAAAAdAAAAABAE
[5] https: //depts. washington. edu/open2100/Resources/1_OpenSpaceSystems/Open_Space_Syste ms/copenhagen. pdf
[6] https: //globaldesigningcities. org/publication/global - street - design - guide/streets/pedestrian priority - spaces/pedestrian - only - streets/pedestrian - streets - case - study - stroget - copenhagen/
[7] https: //www.sciencedirect. com/science/article/pii/S0198971522001806
[8] https: //theconversation. com/how - superblocks - can - free - up - and - improve - cbd - space - for - the people - of - melbourne - a - step - by - step - guide - 193860
[9] https: //en. wikipedia. org/wiki/Surat
[10] https: //www.suratmunicipal. gov. in/