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Enhancing the Urban Livability through Pedestrianisation as a Catalyst of Walkability-A Case of Old Bathinda City

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Abstract

This research explores the interconnection between pedestrianisation and walkability, with an emphasis on their collective role in enhancing urban sustainability. By reimagining streets as active public spaces for pedestrians, urban planners are increasingly recognising the value of walkable environments in improving quality of life, reducing environmental degradation, and supporting local economies. This paper investigates different types of pedestrianisation strategies and their environmental, economic, and social impacts. Through a combination of literature review, analytical frameworks, and a focused case study on Bathinda, the research evaluates how pedestrianisation initiatives can reshape the urban experience. Recommendations for walkability enhancement are proposed based on global best practices such as Living Streets, Pedestrian Precincts, and Shared Zones, with insights contextualised for Indian mid-sized cities.

Keywords: Walkability, Infrastructure, Traffic volume study, sidewalks, planning, services

1. Introduction

Rapid urbanisation and motorisation in Indian cities have contributed to traffic congestion, pollution, and a deterioration of public realm quality. As cities strive for sustainable development, pedestrianisation prioritizing pedestrian movement over vehicular traffic has emerged as a powerful urban intervention. This paper aims to critically examine the role of pedestrianisation in enhancing walkability and contributing to the broader goals of sustainable urban development, with Bathinda serving as a contextual case study.

2. Literature Review

2.1 Role of Pedestrian Walkable Streets in Urban Sustainable Development

Walkable streets are central to urban sustainability. They encourage non-motorised transport, reduce emissions, and promote social cohesion. The literature indicates that pedestrian-friendly design improves health, safety, and local economies while reinforcing sustainable land use patterns.Appleyard (1981) in his book "livable streets" claims that streets should have social functions as well as facility functions. Gehl (1987) discusses about the appropriate planning of streets for pedestrian by highlighting social activities. Simpson (1988) believes that developing old city centres might increase walkability and the quality of urban spaces. in this regard, Bahreini (1998, 292) states that, Street related issues are self-governing subjects in new urbanism, as well as safety, social aspects, attraction, pedestrians, mixed land

uses. Previously, cities were recognized by its tall and huge building and construction, but nowadays pedestrian streets are the main streets to identify the identity and characteristic of a city. Compensations of pedestrianized streets and alleys presents the flexibility, exhilaration, dynamism comfort, breezing, clarity, connection, not using unsustainable energy resources, reliability. *Table 1* illustrates the role of pedestrianisation in increasing the quality of urban environment.

Environmental Importance	**Definition**	**Role**
Preventing pollution and activating people	Most contemporary cities are automobile-oriented, which leads to less activity and high risk (Ahmadi& Habib, 2007; Montgomery et al., 2008).	The role of physical and mental health
Increasing public control on environment and preventing harms	Pedestrian streets are beds of social interactions, which increase public control and lower crime and disorder (Ahmadi& Habib, 2007; Montgomery et al., 2008).	Social role
Decreasing fuel consumption, traffic, etc.	Pedestrian streets affect economic issues seriously and cause citizens' interaction with financial land uses.	Economic role
Decreasing unsustainable energy consumption and CO_2 production, increasing greenery	25% of pollution is from automobiles, while transportation system energy consumption is about 12% in different countries (Ahmadi& Habib, 2007; Montgomery et al., 2008).	Ecologic role
Comfort, vitality, exhilaration, linked natural and human-made environments	Pedestrian spheres pave the way for social interactions which create memories. They strengthen people's image of the city (Ahmadi& Habib, 2007; Montgomery et al., 2008).	Perceptual role
Decreasing pollutants, conserving land, optimizing transportation system	Using non-motorized vehicles affects quality of life severely (Ahmadi& Habib, 2007; Montgomery et al., 2008).	Non-motorized vehicles
Compatibility with ecology, being inclined to walking, reduce the use of cars	Walking is the healthiest and cheapest way of moving in cities, in harmony with the environment (Montgomery et al., 2008).	Proper spaces for walking
Using clean energies, meeting needs by walking, decreasing	Vehicles need to be environment-friendly, have low energy consumption with no sound pollution	Trip management using pedestrianisation

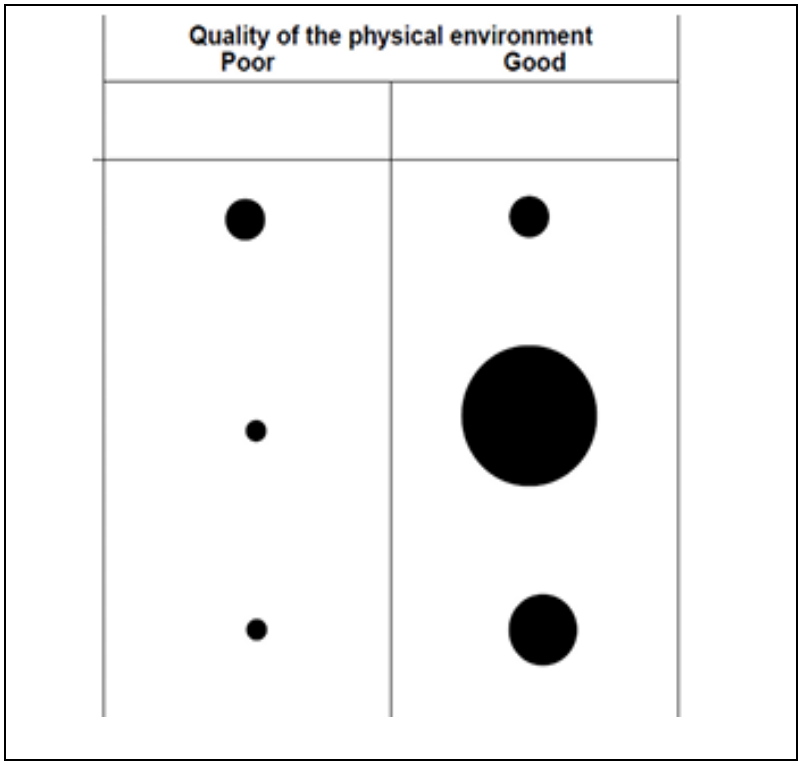
trips and contamination	and be safe for the users. Optimized management is necessary for each city, designed for human priorities.	

Table 1. *The role of pedestrianisation in increasing the quality of urban environment*.

2.2 Walkability and Its Interrelation with the Quality of Urban Environment

Walkability directly impacts environmental quality through reduced air/noise pollution and enhanced public space design. Studies highlight that high walkability correlates with improved mental well-being, social interaction, and urban vitality. The quality of urban environments such as landscaping, shading, seating, and street connectivity that reinforces or hinders walkability. Gehl (1996) defined social activity while two people are together in one specific place. So the purpose of being with each other might vary. The meeting is somehow represent as a seed for inclusive forms construction is pedestrianisation of social activities. This important in relate to Even if the physical component and its organization does not have a direct effect on the quality of urban environment and intensity. By respecting to the outcomes of pedestrianisation can affect the possibilities for meeting, seeing, and hearing people.In this regard it is hypothesized in this research that the quality of public urban spaces has direct relation with walkability in urban spaces. It means that in order to increase the amount of users in urban spaces. The environment should fulfill people's requirements by applying the principals of pedestrianisation

Figure 1. *The interrelation between walkability and quality if physical environment based on Gehl, 1996.*



3. Pedestrianisation

Pedestrianisation is a process of closing streets to vehicle traffic. It might be during certain hours or permanently. Pedestrianisation improves safety and accessibility for pedestrians. From the other hand it brings larger environmental, economic and social benefits for its cities. It develops public health by preparing a chances of physical activity over traffic safety and active transport. Pedestrianisation by decreasing traffic and the cars on the road helps to decrease greenhouse gas. Therefore it mitigate global climate change. Lastly, pedestrianisation help to fosters businesses in small scale and economic growth by considering cultural exchange and tourism. By combination and implementation of pedestrianisation in context of urban spaces it leads to generate urban spaces that are sustainable and livable by refining quality of life for residents of urban spaces.

3.1 Types of Pedestrianisation

There are different type and methods on the pedestrianisation of urban spaces regarding to the problem of the context and aim of the projects in urban spaces the methods of applying one of them might be different in different contexts:

A-Full time pedestrian streets

In this method of design of streets for urban spaces the main aim in to increase and highlight the social activity and livability of public urban spaces in sum part of the city. Therefore, the method of design is based on abandoning the vehicular traffic inside ofthe streets. It means that the streets will just belong to the pedestrians and only emergency service vehicles will be allow to enter to Full time pedestrian streets.

Figure 2.*Full time pedestrian streets*

B- Part-time Pedestrian Streets

There are some pedestrian streets which are allow for vehicles to come streets for one specific time. In this kind of streets there is no parking spaces for cars along the streets. But loading bays are obtainable

Figure 3.*Full time pedestrian streets.*

C- Traffic Calming Streets

The last type of streets regarding to pedestrianisation designed to decrease the speed and dominance of road vehicles. In this kind of streets there are no limits for access of motor vehicles. But footpaths for pedestrians extended and parking spaces are reduced as much as possible. In these streets they are using different methods and technique to slow down the speed of cars by using diverse colors and road textures to tell the drivers that they are in traffic calming streets

Figure 4:-*Traffic Calming Streets*

3.2 Why Pedestrianisation is required

The context may call for the application of pedestrianization principles for a number of reasons. The safety and mobility of pedestrians will improve as a result of pedestrianization. By limiting automobile access, pedestrianization also helps to lessen pollution and noise, which benefits the environment. By improving the quality of the urban environment, it also makes places more walkable. In an urban setting, pedestrianization initiatives may lead to an improvement in social interaction and safety.As a result, pedestrianization may produce a fun environment that people from many social and cultural backgrounds may participate in. It has an impact on the standard of tourism as well. The study also showed that pedestrianization can boost a community's economy. The successful design of pedestrian infrastructure is a prerequisite for pedestrianization. The designer ought to take into account the fact that human demands varies depending on one's culture and background. Additionally, every criteria should

be included in the successful design.In light of Maslow's hierarchy of requirements, the researchers created a framework (figure 5) that may be used and integrated into pedestrianization initiatives. Thus, the pedestrianization program begins with the fundamental structural and physical requirements of metropolitan areas. Then, by reducing vehicle traffic and preventing crime in public urban areas, pedestrianization should promote and enhance safety. Socialization needs should be the designer's next priority after meeting the physical needs in pedestrianization designs. It implies that the design should facilitate easy interaction between individuals and create opportunities for self-actualization.

Figure 5:-*The hierarchy of human needs regarding to walkability*

The importance of pedestrian activities in environmental configuration is thus revealed by Sobri and Sulaiman's (2004) belief that a large community's participation with the body of local institutions can be able to create a more pedestrian-friendly, responsive environment with high quality. In this sense,

A) Walking ability

B) Passing freedom allow for a qualitative evaluation of pedestrian flow.

C) Stopping at junctions with signals.

D) The capacity to navigate a pedestrian flow.

E) The capacity to move without encountering obstacles.

F) The ability to choose the desired pace.

Consequently, the study suggested classifying the pedestrianization of compensation into three primary categories:

3.3 Environmental Impacts of Pedestrianisation

Considering the effects of pedestrianisation on physical objective environment it would be possible to mention that decrease noise and air pollution by reducing the number of vehicles around the pedestrianized area. Pedestrianisation by preparing the opportunity towalk as one of the modes of transportation without any need to oil, so pedestrianisation can reduce fuel consumption as well. Pedestrianisation also prepares opportunities for additional planting areas and improving landscaping and street furniture and as a result of pedestrianisation it's possible to conclude that it helps to create a better environment and beautify the local streets.

3.4 Economic Impact of Pedestrianisation

Pedestrianization reduces heavy motor vehicle traffic and saves money on air pollution and medical bills. It also promotes a healthy atmosphere in cities.There is frequently a reduction in costs because there is less traffic and pollution after pedestrianization. Therefore, lower air pollution will result in lower linked medical expenses. However, by increasing the amount of people who use the spaces because of the opportunity that pedestrianization creates through walkability, the area's retail revenue will rise. However, the occupancy rate and rental income will also play a bigger part.People will embrace coffee shops and grocery stores in pedestrianized areas. However, tourists are also invited to visit the pedestrianized streets and take use of the potential and quality that the environment may provide its users.

3.5 Social Impact of Pedestrianisation

The implementation of pedestrianization's guidelines and tenets may have a variety of social effects. First of all, it makes walking easier. People will have the chance to socialize with one another as a result of walkability, which will enable them to become more acquainted with the locals and their culture. In many cities, pedestrianized avenues also functioned as recreational and cultural hubs where people congregated not just on regular days but also on special occasions and during festivals. Without a car Traffic Street frequently contributes to the creation of a welcoming atmosphere for people to participate in a range of social activities through walkways, streetfurniture, and landscaping. Iranmanesh (2008) additionally, pedestrianization can improve safety by separating cars from people in Urban Spaces.

4. Walkability and Its Relation with Pedestrianisation

The degree to which a location is conducive to walking is known as walkability. There are numerous financial, physical, and environmental advantages to walkability. Road and traffic conditions, sidewalks or other pedestrian rights-of-ways, building accessibility and safety, land use patterns, and the standard of walkways are all factors that affect walkability. One of the pedestrianization strategies, walkability, has numerous positive effects on both individual and community health. Increasing the number of friends in a social setting is one way to increase the likelihood of social engagement. On the other hand, there will be less crime because there will be more people observing and crossing the street.The Merriam Webster dictionary defines "walkability" as "suitability for walking," which makes it possible to walk to various locations with ease.According to Abley& Turner (2011), the primary function in establishing a proper state for walking can be prepared by the ambient configuration. Therefore, according to the MARC report (1998) "Walkability is the quality of walking conditions and the degree to which the built environment encourages walking by providing pedestrians a safe, comfortable, convenient and appealing travel corridor" It is essential to note that walkability is a

component of the pedestrianization strategy in order to evaluate the relationship between walkability and pedestrianization. The strategy environment is being pedestrianized. Requires the focus of various urban design dimensions, including morphological, social, economic, and environmental aspects. It appears to be a sort of master plan that must first analyze and appraise the context before being implemented. On the other hand, walkability is defined in the preceding paragraphs as a qualitative evaluation of the surroundings to determine the degree to which pedestrianization is successful in an urban setting.**Figure 5** below provides some effective illustrations of the application of pedestrianization principles in an urban setting.

5. Concepts for Improving Walkability

There are four primary categories in this literature that are heavily influenced by the applicable context, according to the NZTA (2009) study on the principles of improving the pedestrian environment. These possibilities include A) pedestrian precincts, living streets, and shared areas and the main roadway. These ideas are explained in depth in the paragraphs that follow. Knowing the elements of each classification will make it easier to understand the many approaches and strategies for enhancing walkable urban areas.

Figure 6:- *Examples of applying pedestrianisation principals in urban spaces.*

Living streets

The idea of living streets (LS) refers to the fact that Streets must designed with community and living interface. It objectives of LS is to create an increase the quality of life and urban environment by creating a balance between pedestrians and cyclists with cars, residents, businesses. Therefore LS will lead to greater rage of street and community activity. LS may include:

A) Designing soft and hard landscape area.

B) Methods of Traffic-calming.

C) Designing places for social activity which are inclusive for all range of peoples.

D) Designing with the purpose of mixed activities.

E) Designing public art, and essential requirements of street infra-instructors.

F) Increasing infrastructures of lightening in the night time. In theory the idea of LS can be applicable to any other streets. Therefore there is always a solution for designing a livable streets.

Pedestrian precincts (PP)

Approximately all pedestrian places designed in such a way that to limit the access of vehicles to the pedestrianized area. There are four type of PP which are:

A. Using of alleys and lanes.

B. Modified PP which in this case one block is locked for only pedestrian use.

C. cross-streets and several blocks are closed.

D. Plaza

Conflicts, heavy pedestrian activity, retail or mixed development. Therefore, the access should design in such way that to emergency services.

Shared Zones Shared zone (SZ) is a method to apply and regenerate Living Street in the streets which entering the vehicles to the area are inevitable.in this regard the will be specific restrictions for vehicels wile enterin shared Zones such as speed limits.“Shared zones are most suitable for streets and compact areas with a low demand for through traffic movement. Their maximum size is restricted by the need to maintain response times for emergency services and to limit the extent of roadway that must be negotiated at low speeds by motorists accessing their properties.” (Gerrard, 2005). Figure 8 illustrates some examples of shares zones in urban spaces.

Sharing the Main Street Sharing the main streets refers to the idea of peaceful coexistence of pedestrians and cars next to each other. Therefore the design strategy for main streets by considering the principals of sharing the main streets refers to the Ida of improving quality of street environment and safety for all people (Grant, et all 2005). In this kind of street there are some concern which needs to consider while designing it:

A. Businesses should design in such a way that to increase vitality and livability.
B. Preparing a situation for pedestrian for crossing safely.
C. There should be able of possibility for visitors of street to park along the street.
D. There should be parking spaces for trucks for loading and unloading.
E. Cyclists and Motorists needs to move safely and slowly.

6. Case Study of Bathinda

This is a comparative evaluation of walkability indicators across five major areas within the old city of Bathinda. The indicators are based on adapted Walk Score methodology and Smart Mobility Indicators from MoHUA.

Area	Walk Score (100)	Footpath Coverage (%)	Avg Footpath Width	Intersection Safety (Score/5)	Shading & Amenities	Barrier-Free Access	Modal Share – Walk

			(m)		(Score/5)	(Yes=1, No=0)	(%)
Dhobi Bazaar	52	30	1.0	2	1	0	38
Kikar Bazaar	58	35	1.2	3	2	0	36
Quila Mubarak Plaza	72	60	1.8	4	4	1	33
Court Road	65	45	1.5	3	3	0	35
Fire Brigade Chowk	48	25	0.9	1	1	0	32

Table 2. Comparative evaluation of walkability indicators

Areas Evaluated

1. **Dhobi Bazaar** – Traditional market entry
2. **Kikar Bazaar** – Central spine of the old city
3. **Quila Mubarak Plaza** – Historic plaza area
4. **Court Road** – Access to commercial and public institutions
5. **Fire Brigade Chowk** – Major road intersection

EXISTING LAND USE

Residential

The land use map makes it abundantly evident that a greater portion of the city area is used for residential purposes. About 2178.08 hectares (32.09%) of the 6800 hectares total municipal area—which includes both planned and unplanned development—are used for residential purposes. The town has a gross density of 32.01 people per hectare. Compared to outer areas (less than 50 people per hectare), inner areas have a higher population density (>200 people/hectare). Under the Punjab Apartment and Property Regulation Act of 1995, there are twelve urban estates, seventeen T.P. schemes, twelve development schemes, and seven colonies that are licensed for planned residential development.The majority of these regulated and planned developments are found in the town's eastern region, while the other side is home to haphazard and unplanned residential development. The majority of the city's population lives in its central region.

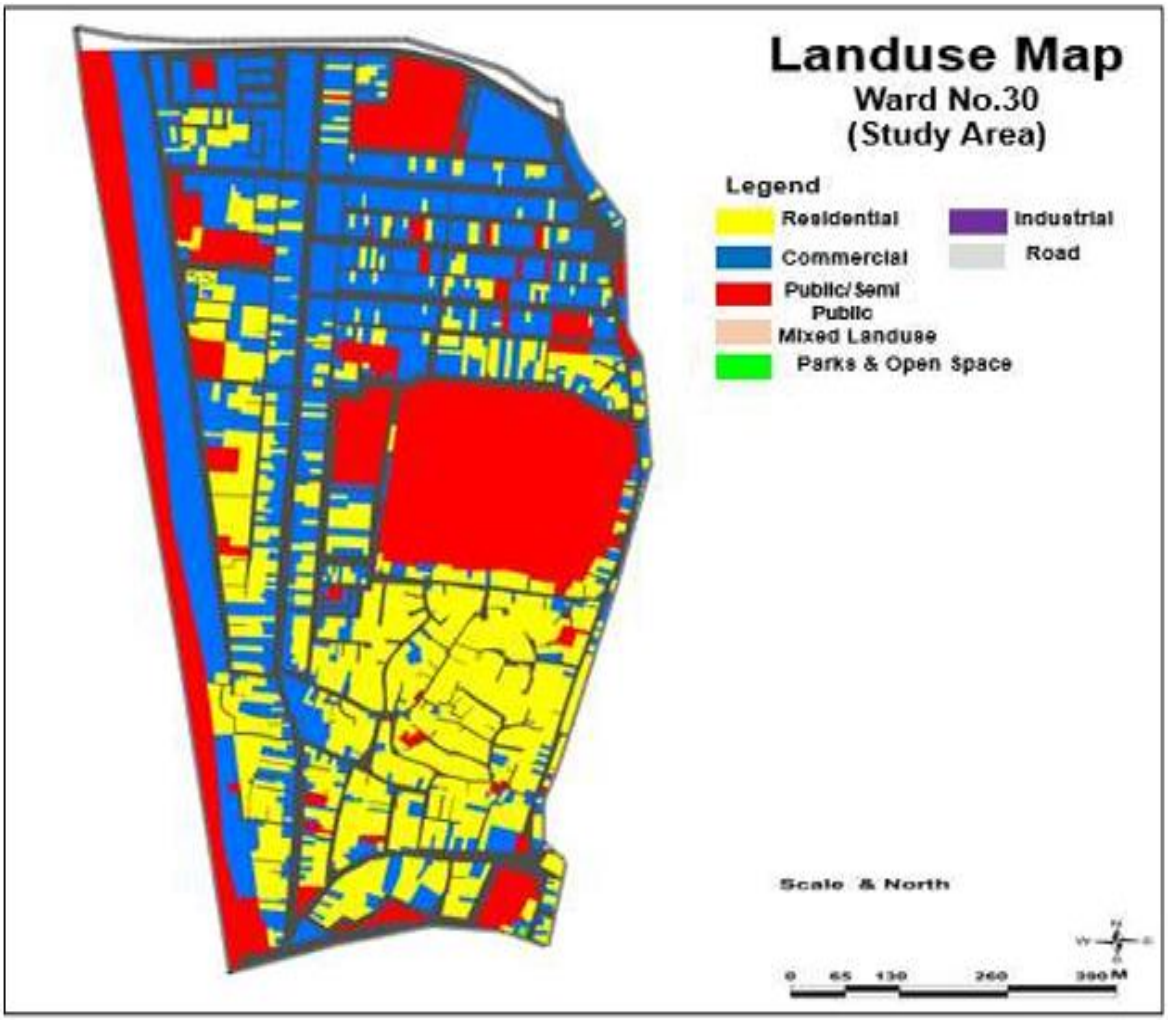


Figure 7: Land use Map of Study Area

Land Use Distribution of study area

Land Use	Study Area (Ha.)	Area - MC (Ha.)	Developed Area Percentage (study area)
Residential	80.19	1033	33.43%
Commercial	42.05	385	17.53%
Mixed	15.09	108	6.29%
Industrial	1.01	342	0.42%
Public & Semi-Public	46.77	776	19.50%
Open Spaces	0.6	150	0.25%
Circulation	54.1	779	22.55%
Total	239.84	3573	100%

Table 3:- Landuse Distribution of study area

Ward Map Bathinda City

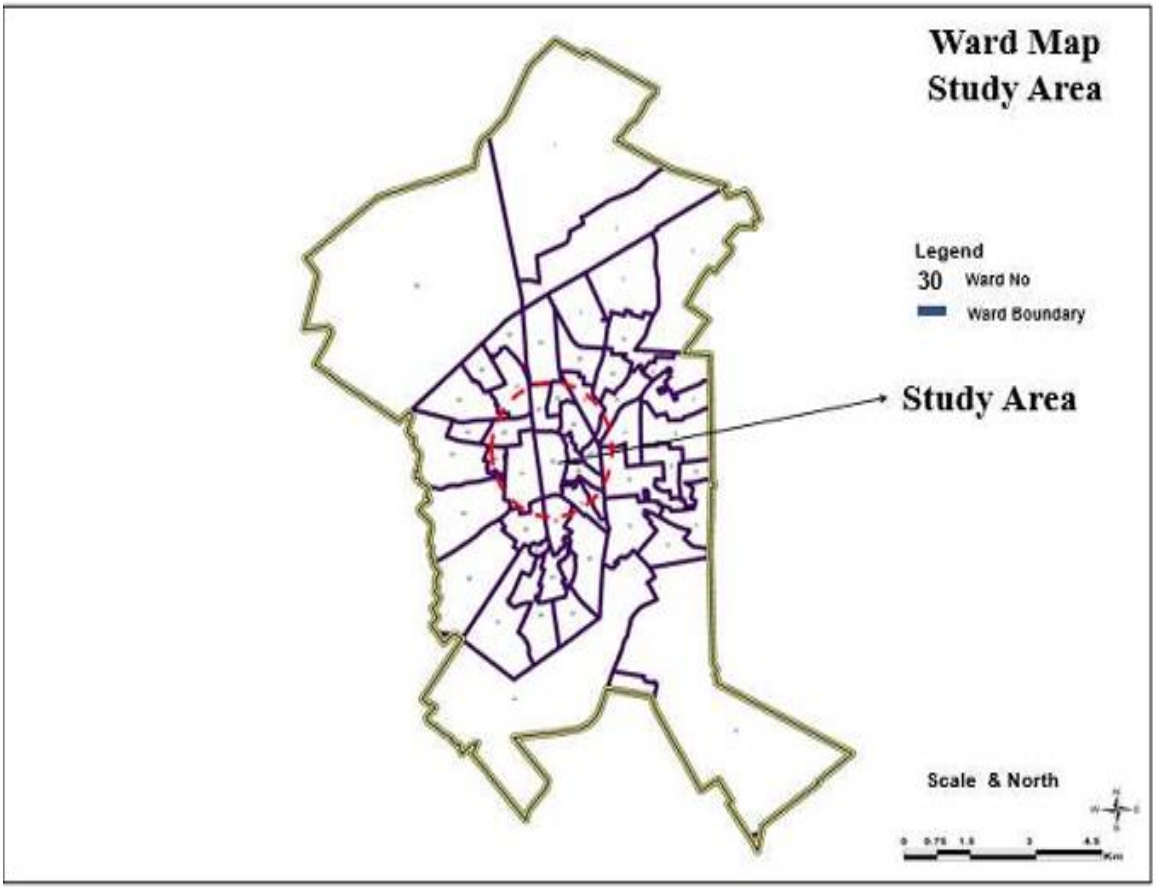


Figure 8: Ward Map of Study Area

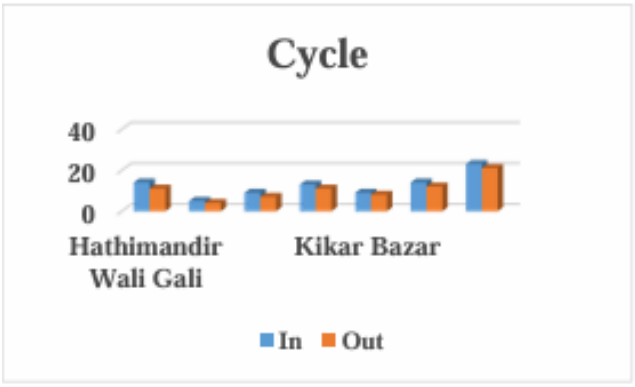
Tucked away in the central region of Punjab, Bathinda is a symbol of the state's vibrant modernity and rich cultural legacy. Bathinda, Punjab's 50th ward, is the state's fifth-largest city with a sizable population. Its lively marketplaces and busy streets convey the impression of a metropolis that is always changing and where progress and tradition coexist peacefully. Bathinda's strategic significance, however, is greater than its demographic significance; this is demonstrated by the fact that it is home to the largest army cantonment area in Punjab. This vast military installation highlights the city's importance to the region's defense infrastructure in addition to attesting to its historical significance. Since ancient times, when it acted as a significant crossroads for traders and travelers, Bathinda has been a vital hub for trade and commerce due to its advantageous location. This legacy of connectedness continues to this day, with Bathinda acting as a center for a number of sectors, including manufacturing,services, and agriculture. Because of the fertile lands surrounding it, agriculture plays a significant role in the city's economy, which is thriving due to its diverse economic base. In addition, Bathinda's industrial sector has grown significantly in recent years, drawing investment and advancing the general development of the city. Bathinda preserves its cultural identity despite the bustle of the city, as evidenced by the many historical sites, places of worship, and festivals it hosts. The people of the city celebrate their heritage through a variety of customs and cultural events because they are proud of it.

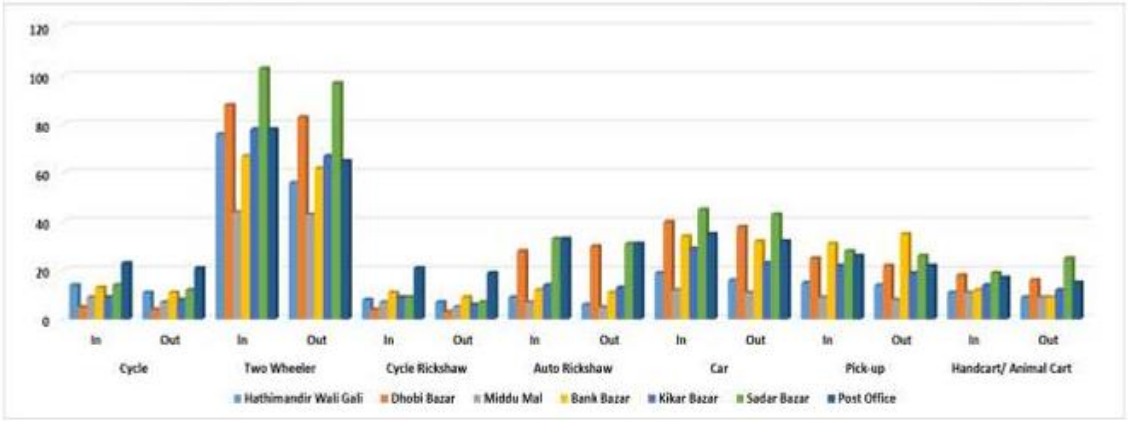
Bathinda's architectural wonders, which include the venerable Gurdwara Sahib and the famous Qila Mubarak fort, are testaments to the city's rich history and enduring legacy. In addition, the city's culinary scene showcases the variety of Punjabi cuisine with a mouthwatering array of flavors. Whether dining at fancy restaurants or indulging in street stall specialties, guests visiting Bathinda are guaranteed to have an amazing culinary experience. Bathinda is essentially the essence of Punjab, where history blends with progress and tradition meets modernity. Bathinda, Punjab's 50th ward with the fifth-largest population, is significant not just within its physical borders but also in shaping the cultural, economic, and geopolitical environment of the area.

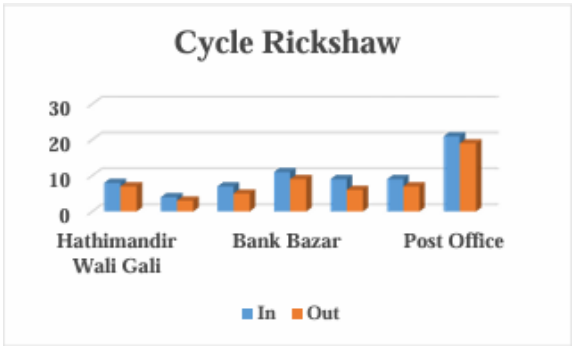
TRAFFIC VOLUME

Along the arterial streets where traffic volume was at its highest, different cordon points were set up for the traffic volume study. The survey was administered between 11:00 a.m. and 4:00 p.m. seven cordon points in total were chosen. The volume was recorded according to the mode, such as truck, bus, 4 WLR, 2-WLR, 3-WLR, cycles, rickshaws, and other vehicles (such as hand carts, horse carts, and bullock carts). Composition of Traffic Depending on the location, two-wheelers make up 65% of all traffic. Approximately 40% of the traffic at the cordon points is made up of cars and vans. Whereas 20% and 20%, respectively, go to trucks and tractors.

Figure 9: Vehicle Wise Traffic Compositon



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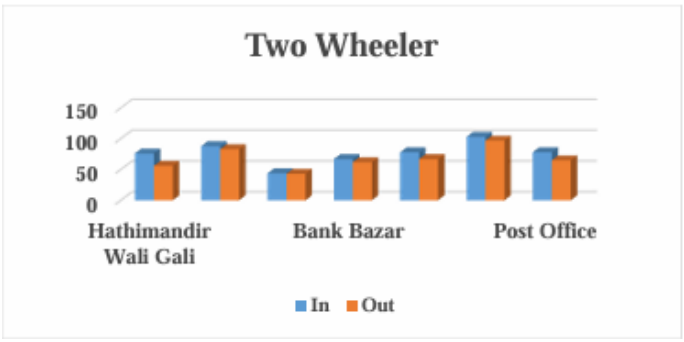
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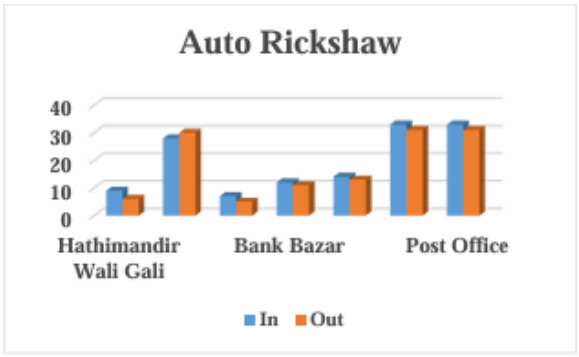
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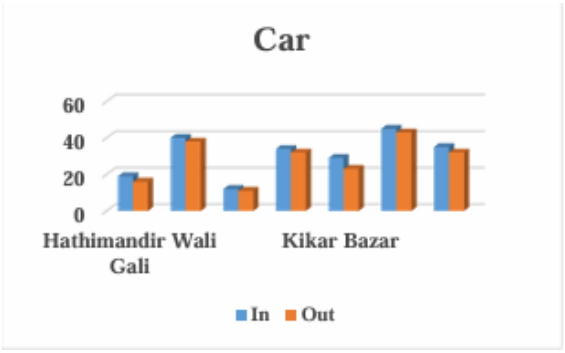
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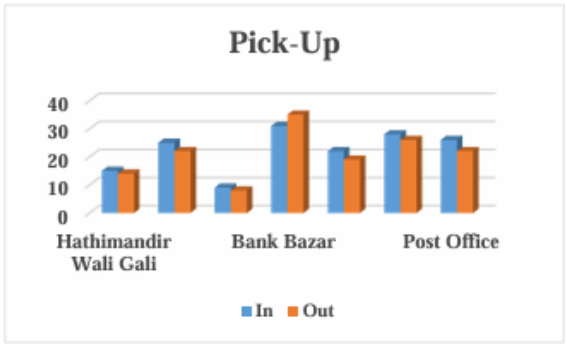
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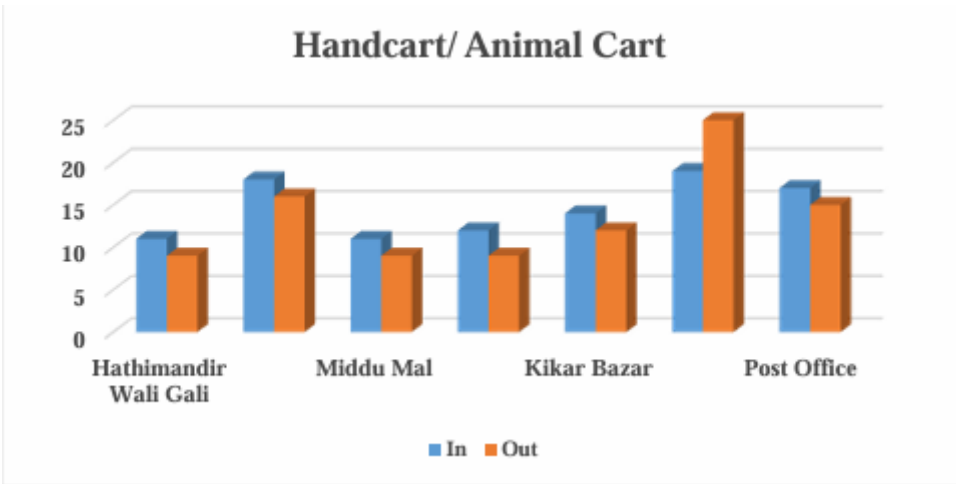
Handcart/ Animal Cart
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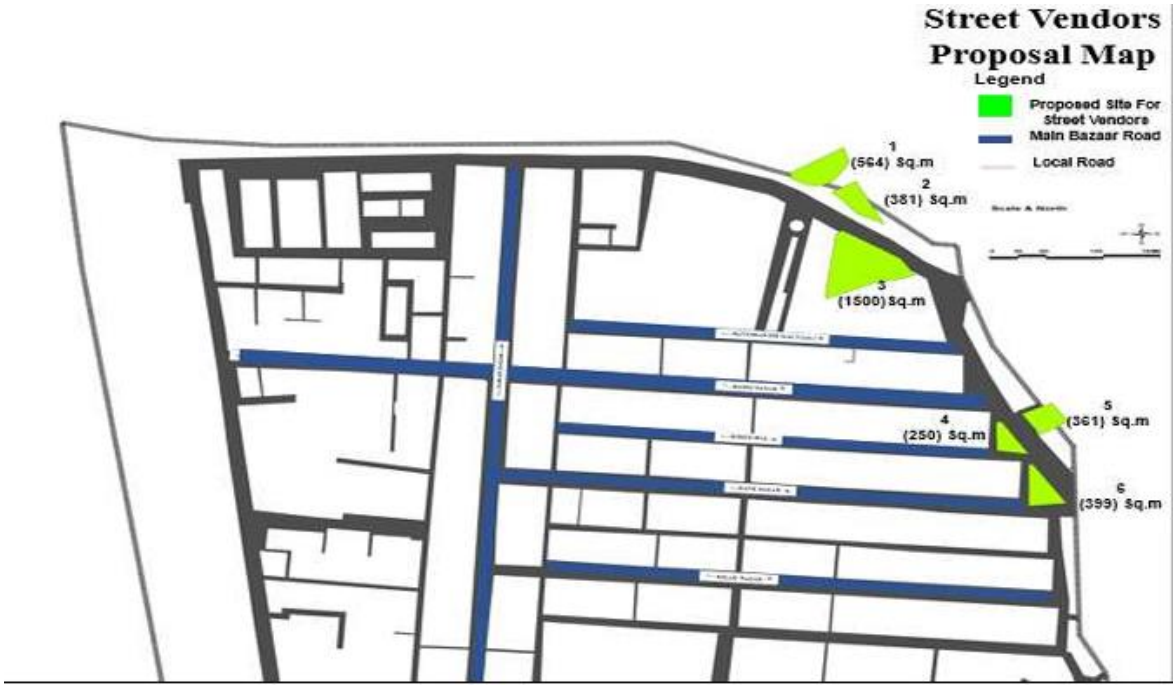
PROPOSAL AND RECOMMENDATIONS

The bustling bazaar road at the heart of Bathinda city has a comprehensive pedestrian infrastructure proposal, which demonstrates the city's commitment to improving the urban experience while putting the safety and convenience of its visitors and residents first. The primary focus of this initiative is the placement of blue and green trash cans in key locations along the pathways used by pedestrians. These unique bins support recycling efforts in addition to responsible waste disposal, which advances the city's sustainability objectives and creates a cleaner, greener environment for everybody. In addition to waste management initiatives, energy-efficient streetlights have been installed to provide a welcoming and warm glow to the main thoroughfare. These contemporary lighting fixtures provide a well-lit and safeatmosphere for night-time strolls and shopping outings, while also improving visibility during the evening hours and pedestrian safety in general. Along the bazaar road, benches have been thoughtfully positioned as part of the proposal to give pedestrians a comfortable place to rest and recharge in between busy days. In addition to being useful amenities, these benches help create hospitable public areas that promote social interaction and community involvement. Additionally, the bollards installed along the pedestrian pathways give the thoroughfare an additional layer of organization and safety. Bollards placed strategically aid in defining pedestrian zones, controlling traffic, and preventing illegal parking, all of which contribute to a smooth and uninterrupted flow of pedestrian traffic along the busy bazaar road. Overall, the planned improvements to the pedestrian infrastructure along Bathinda City's bazaar road represent a comprehensive strategy for urban development that integrates sustainability, beauty, and utility. Through the use of energy-efficient streetlights, benches, bollards, green and blue dustbins, and other pedestrian-friendly features, the city hopes to create a lively, safe, and inviting pedestrian environment. Bathinda city aims to improve pedestrian experience by encouraging a feeling of community, well-being, and pride in its vibrant urban core through these deliberate interventions. Overall, the planned improvements to the pedestrian infrastructure along Bathinda City's bazaar road represent a comprehensive strategy for urban development that integrates sustainability, beauty, and utility. Through the use of energy-efficient streetlights, benches, bollards, green and blue dustbins, and other pedestrian-friendly features, the city hopes to create a lively, safe, and inviting pedestrian environment. Bathinda city aims to improve pedestrian experience by encouraging a feeling of community, well-being, and pride in its vibrant urban core through these deliberate interventions.

Figure 10: Proposal map of the study area

Figure 11: Street Vendors Proposal Map



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