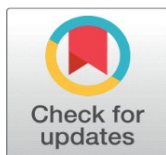


# INVESTIGATING THE RELATIONSHIP BETWEEN STREET DESIGN AND URBAN VITALITY THROUGH 'SMART-CITY INITIATIVE' CASE OF PUNE, MAHARASHTRA, INDIA

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## ABSTRACT

The design and use of street furniture play a vital role in the design of public places and in making vibrant urban places. The street and seating area serves as a public meeting place for a variety of interactions and activities. This study aims to explore how street furniture can be designed based on its location, and how it can be improved by comparing real-world scenarios to theoretical principles. This study takes into consideration the context and surroundings of the streets developed under the Smart City initiative, as well as their interaction with the citizen's life. Accessibility, livability, and connectivity are the defining characteristics of urban vitality. The urban street design has become more prevalent in locations with obvious commercial activity. The study aims to investigate the elements of street design and street furniture and their effect on urban vitality and its relationship with the surrounding land use. This analysis is done using qualitative methods such as on-site observations, content analysis of photographs, and walk-along interviews with the users.

**Keywords:** Activity Street Mapping, Seating Space, Visual Image, Urban Vitality, Urban Affairs, Street Pattern

## 1. INTRODUCTION

The Ministry of Housing and Urban Affairs (MoHUA) and all state and union territory (UT) administrations collaborated to launch the Smart Cities Mission (SCM) on June 25, 2015. The SCM will increase infrastructure and services while keeping the environment clean and sustainable and boosting urban vitality [Aijaz](#)

(2021). As part of the Pune Smart City project, 27 km of streets have been designated for redevelopment, and 100 km are covered by the city's yearly budget. In Pune, the initial stage of these street design initiatives has already turned several roadways into lively public areas. By a large majority, Pune residents constantly cite traffic and transportation as their biggest concerns. The street-Road relationship generally prioritizes vehicular traffic and ignores the human quality of street life. By creating an engaging place for pedestrians, street furnishings provide an essential part in the growth of the city. In general, the streets are crowded by vehicles or people walking on the road. Providing a decent walkway and adding urban vitality to it can help to create proper street circulation. The seating space developed aids in increasing social interaction amongst individuals by providing a designated place free of cars. There has been an increase in the use of urban street design in areas where commercial activity is visible. By developing an urban vitality, it adds character to the street while also providing human comfort. The research is divided into four parts. The first is a representation of a literature review on methodologies for analyzing street furniture and urban vitality. The field study is carried out with activity mapping, on-site observations, and interviews with the users. This study aims to investigate the relationship between street design and the surrounding context and how street furniture brings vitality to urban streets.

## 2. LITERATURE REVIEW

Radwan & Morsi (2016) has attempted to show the importance of street furniture design and its functionality on the human level. It demonstrates the significance of blending street and urban design in city planning. To shed light on the aspects of street design and street furniture, as well as their impact on the surroundings and given practices from various countries. The study has concluded how designers seek to create fashionable street furniture while ignoring its practicality, and usefulness, and how the immediate surroundings, safety, and materials all contribute to the overall experience. Yücel (2012) aims to look at the significance of urban furniture and its connections to public areas. Urban furniture may be utilized in both unpopulated and densely populated sections of a city. As a result, urban furniture has become an integral element in cities. It is also mentioned in the paper that designs that do not reflect the sense of urban identity may leave pleasant impressions of the space, but in the foreseeable future, they are short-lived designs that do not represent the historical nature of the city and cannot effectively develop a contemporary urban image.

Urban furniture design encourages more social interaction. Street furniture plays a crucial role in city beautification and aesthetic balance. Additionally, it describes the vibrant environment that attracts individuals who will spend hours there for social purposes Allahdadi (2017). In reality, more factors such as group activities, being visible and participative, and serving as a gathering spot for people to visit one another impact the development of social interactions in public areas. The primary purpose of city furniture is to improve the quality of life for city dwellers by giving them access to comfortable living areas in their urban environment Şatir & Korkmaz (2005). There exist regions with a wider focus that argue for emphasizing an integrated strategy for research on city furniture and urban designs, when two sides of a roadway are rearranged, the point of view demands that cars and pedestrians' perceptions should be evaluated.

Solanki (2021) expressed how much an increase in attractiveness could encourage urban vitality. Attractiveness, one of the walkability factors, appears to be crucial in enhancing urban vitality and is closely tied to urban regrowth. While

Urban furniture is a broad group of objects with various shapes, sizes, and purposes that are used in urban settings. Additionally, it also examines both practical and visually appealing solutions as well as the building materials that are most frequently used [Grabiec et al. \(2022\)](#)

'The impact of urban form on urban vitality' [Atak \(2020\)](#) argued that residential areas' urban form influences whether urban vitality is encouraged or not. However, streets must be locations where people are meeting, interacting, and engaging in social activities in order to establish livable and sustainable cities. Urban vitality promotes street utilization, people to communicate, and the development of areas that are safe and easy to navigate on foot.

[Aram et al. \(2019\)](#) examines how UGSs (Urban Green Space) are used to produce a cooling effect. The intensity of the heat is significantly reduced by urban green spaces and pause points in urban areas. According to the paper, the increased buildup of greenhouse gases in the Earth's atmosphere has caused abrupt changes in global temperature patterns and the climate. Hence, as a result, all UGSs, including parks, are crucial for lowering UHI, producing cooling, and giving residents thermal comfort.

Every citizen in a city comes into contact with the street at least once a day, either physically or with a visual connection. The purpose of the study is to identify the needs of users in Pune and the type of street environment they like [Patki \(2017\)](#). Additionally, the research is based on the comfort and satisfaction of the user. [Basar \(2021\)](#) Finding and analyzing actual designs of urban furniture that uses renewable energy is the goal of the study. As a result, it aims to reduce excessive energy usage in city parks, minimize negative environmental effects, and utilize appropriate renewable resources as a material for urban street furniture.

The main design, visual, and physical aspects are evaluated in this study, along with how they affect the activity pattern, and user behavior. Pedestrian preferences are closely related to the variety and perceived comfort of the surroundings, which includes things like facades, colours, aspect ratios, upkeep, and greenery [Balsubramanian et al. \(2022\)](#). While the suggestion arouses that some design interventions concerning two public realm Streets and Nodes that cater to various user groups in a commercial and residential region, respectively. The standard user theory, which is highly correlated with the kind of functionality and character of the streets, applies to the urban streets in many Indian cities. Every module's design is centered on user comfort, street-appropriate size, and nature [Bhaghyalaxmi et al. \(2014\)](#)

Street furniture is seen as a crucial component that can be seen in urban space, that helps people live better lives in urban settings. Usually, the presence of street furniture encourages pedestrians to visit by providing a necessary comfort. This paper's major goal is to examine the criteria that should be taken into account while designing by analysing the demands of users of street furniture in urban settings [Dhaou et al. \(2022\)](#)

In relation to the Internet of Things and digitalization, the study presented in this article reflects the applicability of design and evaluates the performance of street furniture products. It helps in understanding the present situation with urban furniture design and the distinctive requirements in the digital context. The paper explores the effects of the variables on the security of urban furniture from the viewpoints of urban development, economics, and user groups. The findings demonstrate that urban furniture, a traditional design field, may be further modernized and improved against a backdrop of digitalization and the Internet of Things. It offers new perspectives and assistance for human use and advanced urban

development [Yang et al. \(2022\)](#). [Bhat \(2022\)](#) This research is focused on understanding the primary open-space criteria on the basis of which the context's microclimate may be improved. [Khorasgani et al. \(2023\)](#) continues by introducing the articulated landscape characteristics, relationships with places, and associated components and elements.

### 3. METHODOLOGY

In this study, we qualitatively analyzed the relationship between street design and urban vitality at the city level using visual data to determine where, why, and to what measure we may improve urban vitality.

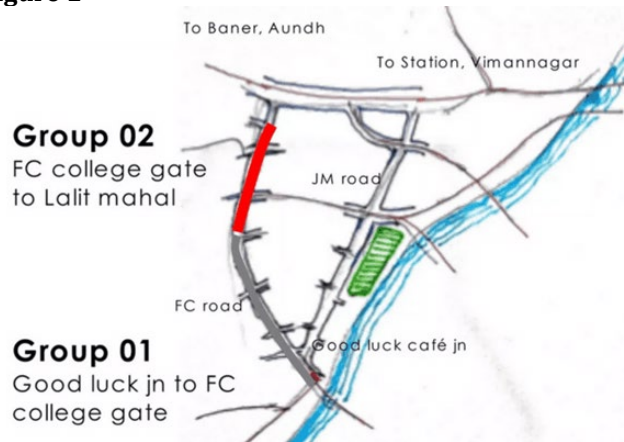
Two important streets in the city of Pune were selected for this study: Fergusson College Street (F.C. Street) and Jangali Maharaj Road (J.M. Road). They were chosen intentionally for their similarities and differences: First, they were transformed from non-walkable footpaths and street parking areas. Second, they were transformed with similar approaches, such as removing parking, inviting recognizable colorful paintings, green plants, and various types of outdoor urban furniture, such as chess tables, bike racks, and so on. Later, interviews were conducted with persons strolling down the street or utilizing street furniture to learn about their experiences. This analysis is done through the visual data comparison and observation along with street activity mapping. Pune under the smart city initiative has implemented the smart streets project having the potential to redevelop. The analysis and observation can be documented by comparing different locations like JM Road and F.C. Street and doing activity mapping along with understanding the context and surroundings.

[Lynch \(1960\)](#) According to Lynch, every city has a comparable collection of pictures in the minds of those who have experienced it. Based on Lynch's five characteristics that influence such images, some of them are considered viewpoints on the research area. There are pathways that the observer can go along. This is the aspect of the city that influences people's perceptions of it the most. JM Road and FC Road serve as a path where there is a concentration of uses by people. Landmarks are a different kind of point reference that can only be observed from the outside. Typically, it is referred to as a physical thing, such as a sign, mountain, building, or store. Given the Goodluck Cafe has been located on FC Road since 1935 (Refer to [Figure 1](#)), it serves as a landmark for people. The legibility of a city often depends on landmarks since they serve as crucial indicators for everyone in the city to find their way around.

#### 3.1. A CASE STUDY OF PUNE – F.C. STREET

FC is an abbreviation for Fergusson College, which is an institution. F.C. Street is a fully functional commercial street. It provides you with commodities from practically every category, including cuisine, clothing, culture, business, and science. (See [Figure 1](#)) A number of educational campuses such as Gokhale Institute, Fergusson College, Marathwada Mitra Mandal's College, Modern College of business administration, and Agharkar Research Institute abutting the streets. Young users are attracted to F.C. Road for two major reasons: food and clothes.

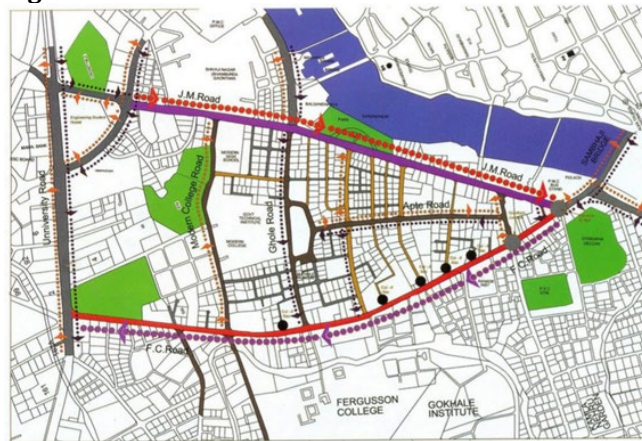
**Figure 1**



**Figure 1** Map of F.C. Street and J.M. Road

Source [Street Design Workshop Slideshare. \(n.d.\)](#)

**Figure 2**



**Figure 2** Map of F.C. Street and J.M. Road

Source Prasanna Desai architects [Oasis Designs. \(n.d.\)](#)

Pune smart city development corporation Ltd. created a roadway that will cater to people of all ages as part of the smart city program. There is enough space division in terms of vehicular roads, pedestrian pathways, cycling paths, and sitting areas. At regular intervals, an equal amount of green landscape area is provided. The prominent observation is the usage of urban street furniture has increased in regions where commercial activity is prominent while Seating is not available in certain areas where shops or restaurants are located.

The research is carried out by conducting interviews with people walking down the street or using street furniture to learn about their experiences. Further, the context and surroundings in which it was studied, as well as its relationship with the citizen's life were analyzed. Questions were asked of people while they were using the street furniture.

- 1) Are you able to freely move around the street without any obstructions?  
(For example - street lights, bins, signage poles, etc)
- 2) Do you enjoy walking down this street?
- 3) How frequently do you visit this street?





- (To determine regular users) - once a week/once a month/first visit
- 4) Why have you visited this particular street today?  
(e.g., passing through, shopping, or eating)
  - 5) What is it about this street environment that you enjoy?
  - 6) Is there enough shade to sit here during the day?
  - 7) Which specific place do you avoid sitting in?
  - 8) Do you sense a cultural and artistic and peaceful presence near the seating space?



The number of people interviewed was nine. And a random process was used to choose individuals for the interviews. Through this method, it was discovered how frequently visitors visit this place and their reasons for visiting. The necessity for it as determined by its location heavily influences how street furniture is used. Regardless of gender, the majority of visitors were young people in their early 20s who came for a variety of reasons but mainly for shopping and food.

The responses elicited are as below:

**Table 1**

**Table 1 Field Observations & Interviews (Case Study: F.C. Street)**

1.		<ul style="list-style-type: none"> <li>• <b>Gender:</b> Male</li> <li>• <b>Age:</b> 55-year-old</li> <li>• <b>Visiting Time:</b> Every day for one hour</li> <li>• He is a heart patient who lives near FC Street.</li> <li>• He likes this street because it has everything he needs, from food to peaceful shaded pathways</li> </ul>
2.		<ul style="list-style-type: none"> <li>• <b>Gender:</b> Female</li> <li>• <b>Age:</b> 23 to 24-year-old</li> <li>• <b>Visiting Time:</b> Once a week</li> <li>• They are all friends who meet on FC Street. They usually visit in the morning or evening, but they have also visited in afternoon, and they always find shade when they sit wherever.</li> </ul>
3.		<ul style="list-style-type: none"> <li>• <b>Gender:</b> Female</li> <li>• <b>Age:</b> 26-year-old</li> <li>• <b>Visiting Time:</b> Twice a week</li> <li>• She was looking for a place to wait for her friend, and the pair under the tree was the only one she could find that day. Except for this one, there was no seating on the entire footpath opposite the FC College.</li> </ul>
4.		<ul style="list-style-type: none"> <li>• <b>Gender:</b> Female</li> <li>• <b>Age:</b> 28-year-old</li> <li>• <b>Visiting Time:</b> Twice a week</li> <li>• She came to the street for shopping the day I interviewed her.</li> <li>• She would not prefer this designed block because it lacks tree shade and proper shade. And the blocks are spaced apart so that only one person can sit.</li> </ul>

<p>5.</p>		<ul style="list-style-type: none"> <li>• <b>Gender:</b> Female</li> <li>• <b>Age:</b> 21-year-old</li> <li>• <b>Visiting Time:</b> Once a month</li> <li>• She had visited this place for shopping. She prefers seating area near the FC College to this one because there is no tree shade, no landscape, and no buffer zone bifurcation created between the road and footpath.</li> </ul>
<p>6.</p>		<ul style="list-style-type: none"> <li>• <b>Gender:</b> Female</li> <li>• <b>Age:</b> 25-26-year-old</li> <li>• <b>Visiting Time:</b> Twice a month</li> <li>• They go to FC Road to shop and catch up with each other. They prefer the seating area outside FC College to the one near Wadheshwar because it is better maintained.</li> </ul>

Source Author

Figure 3

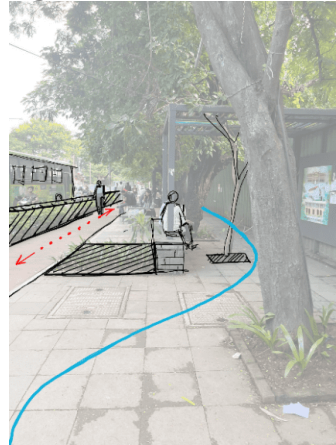


Figure 3 Landscape Behind Seating Space

Source Author

Figure 4

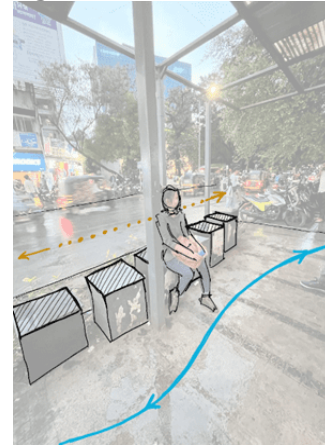


Figure 4 Urban Furniture at Different Height

Source Author

Figure 5

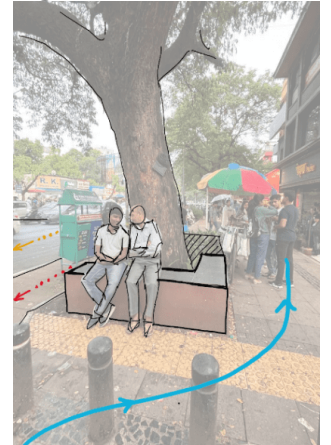


Figure 5 Seating Space Under the Tree Shade

Source Author

Table 2

Table 2 Visual Analysis and Observations from F.C. Street

No.			Observations
1.	Street-Road Connection		<p>This image provides a clear illustration <b>between the sidewalk and the road</b>. The <b>separation</b> is created through landscape and bollards. The <b>roadside plantation</b> provides good privacy as well as safety for those using the footpaths.</p>



2. Dark avoided Space



The entire pathway is shaded by **large old trees** that provide shade throughout the day. However, in some places, it creates a negative **dark space** that might have been avoided at night. Part of the reason could also be the green corrugated sheet on one side.

3. Parking area



A roadside plantation was **missing** in some places where urban furniture was **not there** due to commercial shops. Instead, a two-wheeler **parking space** was accommodated and replaced in that area while still taking the height of the walkway into consideration.

4. Garbage



There were separate containers for **dry and wet garbage** set at equal intervals throughout the whole roadway.

They were set just alongside the walking path.

5. Seating space near Commercial shops



There is a **commercial section** with a busy pedestrian on the **opposite** side of the urban furniture street design.

The only seating on that side was **beneath the tree**, which could only accommodate 8-10 people.

People had to **cross the road** after shopping and dining to use the sitting area provided.

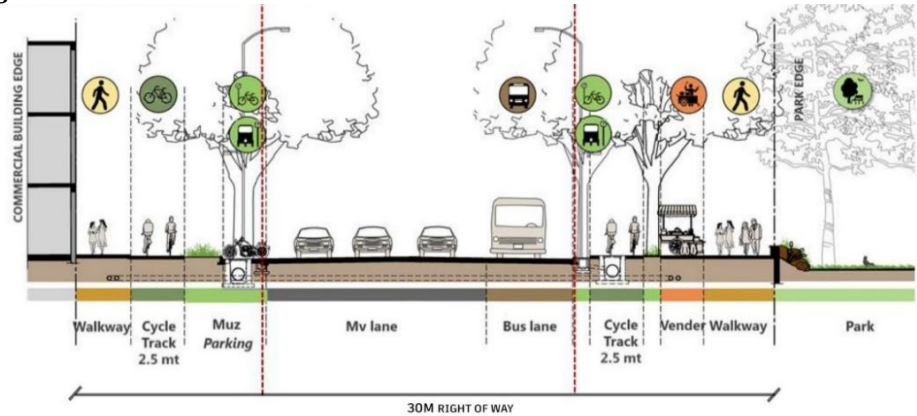




### 3.2. A CASE STUDY OF PUNE – J. M. ROAD

Jangali Maharaj Road (JM Road), like FC Road, is a one-way street with a traffic flow. As a result, proper vehicular and pedestrian movement is observed. The street is planned with cycle tracks and large pedestrian paths to allow people to wander across safely. Each street designated as a public open space must strive to integrate with all parks, restaurants, landmark buildings, heritage, retail shops, and so on, to create a cohesive, all-inclusive connected streetscape for the city.

**Figure 6**



**Figure 6** Section of Jangali Maharaj Road

Source Oasis Designs. (n.d.)

**Figure 7**



**Figure 7** Sketch of Jangali Maharaj Road

Source Author

Figure 6 shows the section across JM Road Street helps us understand how green space separates spaces and widens the pathways. In Figure 7, the segregation of Vehicular and pedestrian and vehicular movement leads to safety and encourages walk-ability on urban streets.

The landscape has been used to provide separation for walking paths, footpaths, and cycling routes. This landscape division allows for a sitting area in between. While the trees along the walkway cover the entire width of the road and

give shade on bright days. The activity was more concentrated on the commercial side, with fewer seats occupied. While on the other side of the road, opposite the business area, is a garden where people of various ages come at various times to relax and socialize. PMC did not just widen the walkways but also provided seating spots and fun game areas on the roadside for children. There is a famous Sambhaji garden on the side of the pathway, which will affect the usability of the space more with different age groups. While there is a residential area beside a road with no commercial use, the design of urban furniture is lacking and the design is impeding the walkway constructed in a very small space. "As residents can see the visible change on JM road, many elected members are making demands to replicate the model in their areas. It is not possible to beautify all the roads by considering the space available in those areas but wherever possible PMC will try to execute the same", said Raut – Indian Politician [Tomar \(2018\)](#)

**Table 3**

**Table 3 Visual Analysis and Observations from J. M. Road**

No.			Observations
1.	Landscaping near street furniture		<p>Urban furniture bench is surrounded by <b>nature and landscape</b>, making us forget that we are sitting on the side of the road.</p> <p>There is a <b>tree canopy</b> above and a <b>plantation barrier</b> for a sidewalk.</p> <p>Making it an absolutely ideal location for an evening stroll.</p>
2.	Isolated space w.r.t shrub plantation		<p>The sidewalk is <b>lined with shrub plantations</b> on both sides, creating an isolated space for walking and jogging.</p> <p>It also separates the seating area from the road.</p>
3.	Safety from vehicles through a landscape		<p>There is a special landscape path that <b>separates</b> the seating area and the footpath along with the road.</p> <p>It creates a <b>barrier</b> for people looking over the road via urban furniture.</p> <p>It also helps to <b>reduce noise</b> from vehicles. From the footpath.</p>
4.	Signages		<p>J.M. Road has more visible and <b>clear signage</b> at proper intervals while walking.</p> <p>All of the signage is set precisely, making it <b>easier to understand</b> the space.</p>

5. Play area



There are **chess tables** for people to come and utilize the space for walking and seating and not only for using the commercial area but use an outdoor play area.

Source Author

#### 4. FINDINGS AND DISCUSSIONS

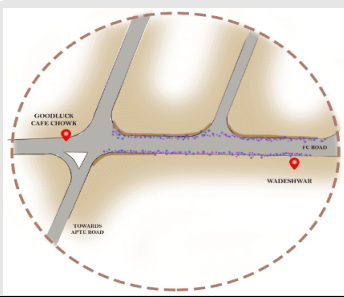



After the implementation of the smart city project, the street has become a place rather than a space of only vehicular movement. The frequency of visiting the streets has increased although not for the activities surrounding the streets, but people are using the streets as places to meet, chat, and interact. The vehicular and pedestrian movement are segregated so this gives safety for the pedestrian. It's intriguing to explore the unique relationship between street furniture and urban vitality. Sitting inside a city setting offers a chance to pause as well as a physical and more personal connection to a place than one would have while standing or moving around it. The greatest areas for benches are places with high pedestrian traffic, such as shopping mall walkways, transit stations, plazas, and areas outside of institutions and organizations; regions with minimal activity are considered to be in bad places to redesign the street. The street furniture incorporates landscaping to add life and shrub plantings at the edge to protect people from moving vehicles. Bus stations, bike paths, and seating places are also present. The adjoining-built form identity has a significant influence on the street. In terms of tactile blocks, accessibility, etc., the street conditions also benefit those with special needs and benefit all age groups. Proper comprehension of signage for various tasks to optimize user flow and mobility. In Pune, where there is a lot of traffic, bollards are mostly used to prevent vehicles from driving on pavements. Dustbins, bus shelters, etc. are sufficiently distributed around the sidewalk. The urban street pattern was created using a variety of spatial, visual, and sensory approaches.

F.C. Road and J. M. Road have a similar approach in terms of the street pattern but differ in terms of use and context. The commercial area just adjacent to the street is the same in both locations, however the area utilization directly outside the store changes.

**Table 4**

**Table 4 Common Observations and Findings**

Common Observations	Sketches / Images	Findings
<p>1. Street Section</p>		<p>The street section demonstrates how green space divides areas and broadens routes while providing safety.</p>

<p>2. Activity Mapping (Time- 5:00 pm to 7:00 pm) Male: 120-160 Female: 150-180</p>		<p>The vital urban environment and perceived safety lead to <b>gender equality</b> in the use of active streets because of the commercial use</p>
<p>3. Seating space near the commercial area -</p>		<p>Providing <b>seating near commercial areas</b> improves the usability and functionality of the street, as well as the value of the commercial space.</p>
<p>4. Bollards -</p>		<p>Bollards are only positioned to facilitate cycling activity in order to prevent the flow of road cars onto the sidewalk. It leads to a safe environment and increases people's walk-ability and urban vitality</p>
<p>5. Integration of art in the street</p>		<p>The seating space is semi-covered with tree shade above which helps on sunny days. A few artistic paintings are kept to enhance the space along the landscape.</p>

Source Author

## 5. CONCLUSIONS

This study examined the relationship between space usage patterns on urban vitality and street furniture, taking into account the physical characteristics of the street environment, and basing its findings on observations and human experience. Beyond simple comfort, these furnishings' main purpose is to give a location personality and individuality and to entice people to use outside areas. When waiting for transportation, street furniture might provide sitting and shelter, for instance. It may also improve a site's aesthetic elements, image, and identity if properly planned and created. In recent years, high quality in the design of street furniture has drawn attention to landscape design in addition to its functional aspects. Emphasis is now placed on the fusion of function and aesthetics with new materials and technologies, creative concepts, and artistic applications in the user-



friendly urban landscape. With the help of street furniture, a city may develop a stronger sense of community and become a place where people can meet, interact, and share in daily life. Having badly designed street furniture highlights a city's disorder, lack of cohesion, and sense of community. In recent years, cities have focused on establishing urban interactive space as well as well-planned roadways in order to better regulate vehicular circulation and commercial space utilization. Instead of not offering one, locations, where commercial space is not available, should build an alternative street plan and furnishings based on its context and surrounding.

### **CONFLICT OF INTERESTS**

None.

### **ACKNOWLEDGMENTS**

None.

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