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Pedestrian comfort while shopping at the Commercial Nodes of Agra

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ABSTRACT--*People have a pleasant experience of shopping at places which are walkable. Shopping becomes a whole new experience when a pedestrian feels a sense of comfort. This paper will discuss the pedestrian movement at the commercial nodes in Agra, India. The basic objective of the study is to determine the comfort of pedestrians based on their walking experience while shopping. The commercial node studied is well organised and comes under the Cantonment area of Agra. The pedestrian comfort is kept into mind throughout the years of its renovation. The study inferences indicated that the shoppers were satisfied with the facilities provided for them to make their walking experience comfortable. On a general observation the facilities seemed to be proper and well maintained at most of the locations.*

Key words*--Accessibility, Comfort, Connectivity, Pedestrian movement, Safety, Walkability*

I. INTRODUCTION

Pedestrian movement is known to be most used mode of transportation. Pedestrian is a person walking on foot. Walkability is directly connected to pedestrians. Walkability is a measure of how friendly an area is to walking. Factors influencing walkability include the presence or absence and quality of footpaths, sidewalks or other pedestrian rights-of-way, traffic and road conditions, land use patterns, building accessibility, and safety, among others. A commercial centre is walkable when it has the above mentioned facilities. The commercial centre is said to be pedestrian friendly or say walkable when the shoppers can enjoy their walking experience and stroll through one shop to another shop on foot.

Agra apart from being a tourist city is a trading hub since historic times. The city has many commercial centre which have developed since centuries (R. Nath, 1997). Most of these commercial centre are densely populated and many have been closed for any vehicular traffic from 10 am to 10 pm, while there are commercial centre that have witnessed changes of more than 100 years and still cater both pedestrian as well as vehicular movement.

The aim of this paper is to analyse the pedestrian comfort level with the reference of accessibility and safety of the commercial centre. The identification of parameter was done on the basis of level of comfort of the shoppers during their shopping experience of foot.

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II. LITERATURE REVIEW

2.1. Walkability

Pedestrian movement is directly connected to walkability. Walkability has been defined by many researchers. Walkability refers to the built environment that is friendly with the presence of diverse activity (Abley, 2005). Walkability as the level of pedestrians' comfort and safety such as the existence of casual surveillance, spaces between pedestrians and vehicles as well as high quality connected pedestrian pathways (Llewellyn et.al. 2000). Walkability is the extent to which walking is readily available as safe, connected, accessible, and pleasant mode of transport (Steve, 2005). Walking activity can be a pleasant mode of travel if the area provides the quality of walking conditions, safe, comfort and convenience (Litman, 2004).

The pedestrian surroundings are not a stand-alone design solution; they are conceived by the form and structure of the built environment. The main characteristics of the street network are the streetscape, the sidewalks, the building elevations and walkways. Pedestrian movement is effected by the planning and placement of walkways and sidewalks.

An environment is perceived to be walkable when it has more walkable features (Brown et al., 2007). Environment that could increases the use of public transportation facilities, therefore, supports walking activity (Griffin, 2000).The types of walkable environments that are significant in providing walkable place (Southworth, 2005). A walkable place has a short distance to the destination. It provides proximity, connectivity and accessibility for pedestrian to reach their destinations.

2.2. Comfort of walking

Pedestrian movement is also accountable to the comfort of walking. Comfort is defined as the person's level of ease, convenience and contentment (Alfonzo, 2005). Comfort is described as the pleasant state of physiological, psychological and physical harmony between the human body and the environment (Sarkar, 2002). Both researchers refer to the pleasant feeling that people feel when they interact with the environment. The buildings and spaces designed to human scale, good design, materials, space for walking and good surfaces to walk are determinants of pedestrian comfort (Kumar, 2010).

The built environment gives a greater impact on the trip lengths than trip frequencies (Handy, et al. 2005). The level of comfort could be determined by the length of time people would spend at the public space. It is not easy to determine comfort, as every person perceives it differently, but by observing the reaction of people towards the surrounding can identify it (Carmona et al., 2003). This pedestrian's pattern of use and activities provides indicators for comfort of walking. It is observed that pedestrians are comfortable being outdoors when high intensity of street activities takes place at the area.

A space to walk provides directness of pedestrian paths and connectivity of the street network. The street networks and sidewalk should be built and designed properly to allow for easy walking (Park, et al. 2006).The presence and continuity of sidewalks and pedestrian routes that connect pedestrians to frequent transit services with safe crossings (Hutabarat Lo, 2009). In addition, the place should also provide access to people with different abilities.

Based on literature, it is noted that the quality of environment and the arrangement of physical elements influence pedestrian comfort. For the purpose of this study, physical parameters and condition are examined to understand the impact of walkability parameter on pedestrian's comfort of walking.

2.3. Connectivity and accessibility

Connectivity and accessibility are important criteria for pedestrian comfort (Hutabarat Lo, 2009). Connectivity relates to the ease of moving from origins to destinations is the major factor influencing the pedestrian route choice (Kumar, 2010). The street networks need to be well connected with proper sidewalks to varied destination to encourage people to walk in the city. A well-planned street network has streets that are well linked to other modes of transportation (Southworth, 2005). The streets should also provide varied uses of buildings and spaces, good quality of paths, adequate width of walkways, clear signage. The street design creates the visual interest of the built environment. All of these elements are important to facilitate walking with ease.

Accessibility is an important factor for walkability. A place is accessible when there is an equal opportunity for everybody to use the spaces meant for their use. A normal person can feel disabled if natural accessibility is not provided. On the other hand, physically challenged persons do not feel disabled in an accessible environment. Street with wide parking spaces makes pedestrian access to buildings quite difficult as pedestrians will require to cross the entire width of the parking space. Different physical settings may affect the walking pattern and route choice (Handy et al., 2006).

For example, pedestrians may consider the distance to travel over the destination as more important to reduce the time consumed and physical energy required. They may prefer a place that has short walking distance and well-connected walkways. In other words, as per the pedestrian movement, the distance of walking should be decreased and connectivity should be increased in order to reduce the time and physical energy required to travel.

The proximity, connectivity and accessibility are significant criteria for pedestrian movements. In this respect, the study highlights the current condition and accessibility, proximity and connectivity of the walkways in providing physical comfort and pleasant experience for pedestrians.

2.4. Safety of walking

Safety is very important for pedestrian movement. A safe pedestrian environment allows the pedestrians to walk comfortably and also decreases the sense of fear from accident or crime. The quality of the walking environment might influence pedestrian intensity and crossing times for people of varied mobility and handicapped differ, they need a criteria of safety of walk able environment (Southworth, 2005). The intensity of pedestrian is required to increase safety because the places become more transparent (Jacobs, 1969). The component of the pedestrian safety also associated with motorist behaviour and crossing exposure and security. Good structure of street networks, clearly define pedestrian district can create a better, comfortable and safer condition for pedestrian. Safety also can be increase by providing visible and transparent environment. The urban designs are important to avoid formation of hidden and obscured niches in order to reduce crime on the streets (Newman, 1996). Hidden spaces can be criminal hideout. The streets also should provide crosswalks. Besides that, traffic speeds, pedestrian and traffic signal are crucial inproviding safe pedestrian environment. Width of sidewalks and their condition, lighting and surveillance are equally important for safety of walking.

To summarise, the literature explains that a safe environment influences pedestrian activity. This study will examine pedestrian's level of satisfaction of the physical safety of that influence visitors' walking experience in the study areas.

III. METHODOLOGY

The results of the study were based on a questionnaire survey conducted on randomly selected visitor as respondents. Based on the primary field observation, three commercial nodes in Sadar Bazar, Agra were chosen as the study areas as shown in fig 1. The areas include Main Market, the organised Kiosks on the median of the main road and market adjacent to the stadium. The places represent the major nodes in the Sadar Bazar that have the highest pedestrian volume of the shoppers.

The Main Sadar Market attracts many visitors. It has an organised walkway of 6 meter in width with adequate street furniture. Opposite the main market are 8 Kiosks constructed on a raised median of 4.5 meter width and total length of 300 meters and opposite to it are shops along the stadium boundary walls, these shops have their fronts facing a parking lot of 30 meter by 80 meter.

Figure 1: The study area.

Source:https://www.google.com/maps/place/Sadar+Bazar,+Agra+Cantt,+Idgah+Colony,+Agra,+Uttar+Pradesh+282001/@27.1596007,78.0100114,158m/data=!3m1!1e3!4m5!3m4!1s0x397476cf1dd013ff:0xc101f3f492f77af1!8m2!3d27.1587371!4d78.0100124

The questionnaire was designed using Dichotomous Scales. A dichotomous scale is a two-point scale which presents options that are absolutely opposite each other. This type of response scale does not give the respondent an opportunity to be neutral on his answer in a question. For Examples: Yes- No; Satisfied – Not Satisfied; Agree –Disagree etc.

The questionnaire was designed to assess the shopper's level of comfort while walking in the study area. The parameters include comfort, connectivity, accessibility and safety. 240 questionnaires were distributed at the

delineated area. Out of 240 questionnaires only 200 were used after scrutiny. Incomplete and unreliable answers were rejected.

The data analysis was done by descriptive as well as inferential components. Correlation analysis was used to analyse the relationship between the parameters.

IV. RESULT AND DISCUSSION

4.1. Visitors profile

The study area caters to both locals and tourist. The locals were 62% and tourist were 38%. 22% were aged between 15 to 24 years old, 27% were aged between 25 to 34 years old. 25% were aged between 35 to 44 years old, 17% between 45 to 55 years old and 9% more than 56 years old. Female were 44% and Males were 56%. In term of travel pattern, 30% travel with their family, 28% with their spouses, 29% with their friends 13% of them travel individually. 54% visit the area for shopping. 46% visited for fast food or entertainment and meeting friends.

4.2. Comfort of walking

The Sadar Bazar has a walkable environment and it attracts people from throughout the city. Fig. 2 indicates that 87% were satisfied with pedestrian facilities. 79% were satisfied with the proximity between places they wanted to visit. 65% of them were satisfied with streetscape of the Sadar Bazar. 21% of the respondents were dissatisfied on air quality at market, and 55% dissatisfied with the provision of disabled facilities.

Proximity between places of attraction and quality of the streetscape both scored high satisfaction level. Proximity facilitates the user with comfort while walking (Kumar, 2010). Proximity is distance between trip origins to destination and streetscape can influence the distance of people's willingness to walk (Southworth, 2005). The visual quality of streetscape and place attractiveness influenced people's perception on the distance travelled and their willingness to walk. The people who visit the market park their vehicles at the allocated parking spaces and walk to the market area. As the walking is safe and comfortable, the area attracts many visitors.

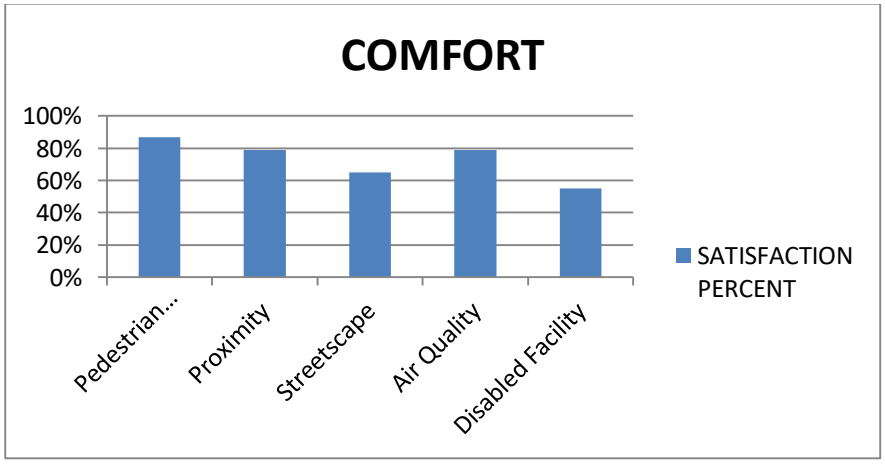

Figure 2: Satisfaction on comfort

Figure 3: Walkways at Sadar Bazar and Kiosk Lane

Comfortable pedestrian walkways should be free of obstruction, safe and should provide smooth movement for stroller and wheelchair users. The pedestrian facilities in someplaces are well maintained but lacked in facilities for users with special needs. Fig. 3 shows a walk way in Main Market area and Kiosk area that is sufficient and walkable from parking area. The walkways create friendly pedestrian environment while at Kiosk area, people can walk between two kiosks but to reach the third they have to walk through the street as kiosks occupy the whole width of the median. The walkways are not covered. The shops along the stadium have covered corridor of 3 meter width.

4.3. Connectivity and accessibility

Higher connectivity could be achieved by continuity of sidewalks and safe pedestrian system and directness to destination (Southworth, 2005). The findings on respondent's satisfaction on connectivity and accessibility of walkways at the study area are shown in Fig. 4. The results indicate that 83% were satisfied with the accessibility of destinations while 65% were satisfied with the accessibility of parking spaces. 68% were satisfied with the availability of alternative routes while 76% of them were satisfied with the continuity of walkways and routes. The results indicate that walkways along shopping areas have been improved to cater the pedestrian needs. It was observed that the pedestrian connectivity between main market, kiosks median and market along the stadium is through the main road. This discourages visitors to explore the market along the stadium while visiting the main market and vice versa.

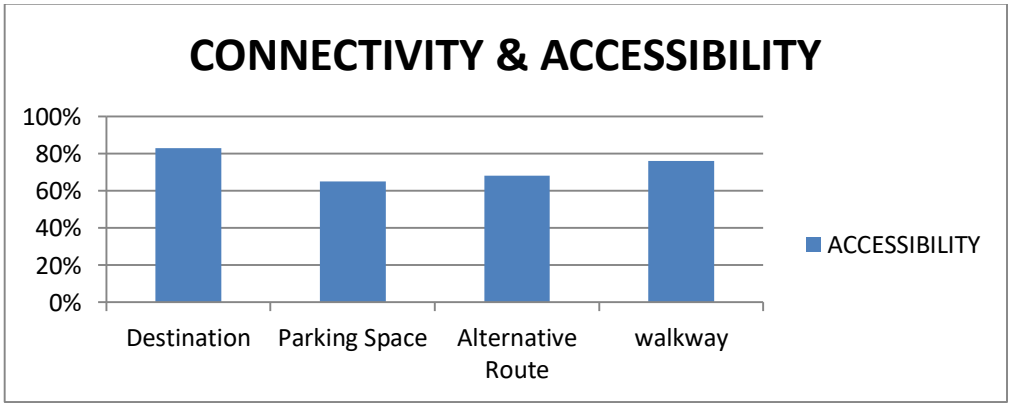

Figure 4: Satisfaction on connectivity and accessibility

Figure 5: Parking Space in front of Market along the Stadium

Walking distance may vary between users depending on the willingness of the people to walk and the level of comfort.The walkable distances in the western context range from 0.12 kilometres to 0.4 kilometres, but it is expected that the distance in a tropical Asian city is much lesser due to the hot and humid conditions (Weinstein et al. 2008).

4.4. Safety of walking

Pedestrian environment is mostly dependent on safety as it encourages people to explore the area on foot. As shown in Fig. 6, the analysis reveals that 87% were satisfied with the pavement condition at the study areas. 89% were satisfied with the freedom to walk with fewer obstacles. 92% were satisfied with traffic safety, and 77% were satisfied with the safety from strangers.

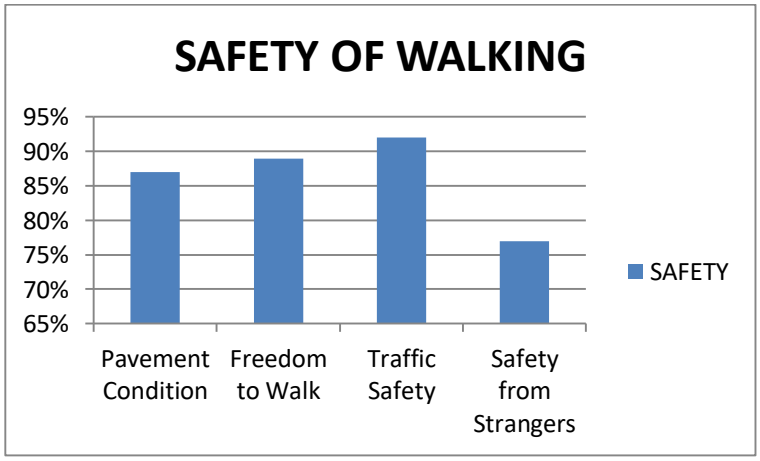

Figure 6: Satisfaction on safety

Safety and quality of pathways affects place walkability (Kumar, 2010). The observations of the physical condition of the walkways in the study area were satisfactory. The frequencies of visit as per the satisfaction of pedestrian experience were calculated. The result of the analysis shows that 62% have visited the place more than

twice. 22% were first time visitor and 16% visited the place for the second time. The respondents have high satisfaction percentage on traffic safety.

4.5. Relationship between comfort, safety and connectivity

The correlation coefficient was computed to assess the relationship between the comfort and safety, connectivity and accessibility (Table 1). There was a high, positive correlation between two variables, C = .798. Result of the analysis also indicates that comfort has high, positive relationship with connectivity, C =.801. Meanwhile, correlation analysis between safety and connectivity were high, positive correlation between two variables, C = .788.

Table 1: Correlation between variable (n=200)

	1. Connectivity	2. Comfort	3. Safety
1. Connectivity	----	.801*	.788*
2. Comfort	.801*	----	.798*
3. Safety	.788*	.798*	----

*Correlation is significant at the .01 level

V. CONCLUSION

The findings suggest that the Sadar Market at Agra is comfortable to walk. Road crossing facilities should be improved further. The pedestrian walkways along the main market require being shaded with more attractive appearance to provide pleasant walking experience. Safe and pleasant pedestrian environment may influence the visitor's choice to experience the area on foot with ease and comfort. The main observations was that as these commercial nodes fall under Cantonment area and are directly controlled by the army, the safety is of high level and the area is well maintained. Taking example of this area the planners shall follow the steps taken by the cantonment authorities and implement the same in the Main city commercial nodes.

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