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Urban Safety through Environment Design: A Case Study of Public Places of Delhi Using RIDIT & OLS Regression Method

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Abstract

This study investigates the significant impact of individuals' perceptions of safety on public spaces' utilization and commercial importance. People tend to avoid places perceived as unsafe, emphasizing the need to enhance safety perceptions through regeneration or retrofitting in urban design. For this purpose, the research explores the various areas in Delhi and how individuals perceive safety in public places such as bus stops, markets, railway stations, subways, and metro stations. The primary data was gathered through questionnaires and secondary sources, and a safety index was developed using RIDIT analysis for different locations. The study identifies factors crucial to enhancing perceived safety and utilizes ordinary least squares (OLS) regression to pinpoint critical elements. The finding reveals that public spaces in specific areas are perceived as safe. In contrast, others are considered unsafe or marginally safe, emphasizing the potential for improving safety perceptions through urban design modifications.

Keywords

Crime, Safety, Urban Design, Built Environment, Public Places

1. Introduction

The safety concern of people determines their access and free movement to different public places located in other parts of cities (Tandogana & Simsek, 2016). The perceived safety determines the use of public places (Ceccato & Nalla, 2020), decreases free walkability (Lee & Contreras, 2020), influences mobility paths (Loukaitou-Sideris, 2012), and impacts the satisfaction and choice of public places (Lee et al., 2016). People's concern regarding safety in public places influences their access to

different urban opportunities such as schooling, employment, and recreation (Cattell et al., 2008). The safety concern of visitors in public spaces is a priority at the international level, as it has been designated as a target within the Sustainable Development Goals for the nations to accomplish by 2030. However, attaining this target requires specific changes in the design of the urban built environment, which can enhance the safety of people in public places. The transformation in the urban built-up environment is considered a significant planning strategy to ensure that people sense public places as safe. (Ratnayake, 2013, Navarrete-Hernandez & Laffan, 2019). These environmental strategies are usually based on the theory of crime prevention, which focuses on reducing the offender's intention and opportunities to commit a crime (Cohen & Felson, 1979; Gupta, 2020).

Crime distribution in urban settings is not uniform across geographical areas. Research indicates that specific localities within the city are more prone to crimes, making them highly vulnerable and predictable. (Goldsmith & McGuire, 2000). This shows that the protection and safety of individuals in public places varies from location to location and is influenced by various factors, among which the design of the urban built environment holds significant importance. This has drawn attention to the study of urban localities and design aspects that threaten the safety and security of people visiting those places. A few specific attributes of the design of an urban built-up environment significantly influence the safety and security of people (Newman, 1972). Other investigations have highlighted that urban design and environment influence people's perceived safety in different localities and public places (Geason & Wilson, 1989). A public place can take numerous shapes and forms; it can be a bus stop, railway station, market, or park (Jeffres et al., 2009). One of the common characteristics of all types of public places is that they are open to all, and numerous people visit those places at a time (Badiora et al., 2020; Singh & Gupta, 2023). Most individuals visiting public spaces are ordinary citizens who dedicate time to utilize various facilities and engage in activities such as walking, waiting, shopping, eating, halting, parking their vehicles, etc.

Rapid urbanization in India, particularly the expansion of megacities, has made people conscious of their safety in public places as the rate of crimes has increased due to overcrowding and disparities in economic development (Gupta, 2021a; Gupta, 2020). However, not all public places are equally vulnerable to public safety as it depends on the micro-physical and ecological design of an urban built-up environment, which provides people the opportunity to commit crime (Glaeser, & Sacerdote, 1996). Certain aspects of the urban environment determine the safety of people in public places, such as population size and density (Singh & Gupta, 2023, Gupta, 2020), the various land use and land cover of the Urban places (Kinney et al., 2008; Twinam, 2017; Sypion-Dutkowska & Leitner, 2017; Stucky & Ottensmann, 2009), presence of Alcohol Outlets (Block & Block,1995; Speer et al., 1998; Snowdena et al., 2016; Bromley & Nelson, 2002), the Urban Green Spaces (Maruthaveeran & van den Bosh, 2015; Han et al., 2018; Taylor et al., 2019; Shepley et al., 2019; Groff & McCord, 2011), the Road Networks and Building

Footprints (Silva & Li, 2020), Appropriate Lighting (Painter, 1996), Layout Design (Gupta, 2021b), Transit Nodes (Poister, 2008; Phillips & Sandler, 2015), etc. The possibility of crime in crowded urban areas is higher than in sparsely populated areas as it provides an easy escape for criminals (Gerban, 2007; Gupta, 2020).

This research aims to identify the safety of people in public places located in different parts of Delhi and the aspects of the urban built-up environment influencing and improving people's perceived safety in public places of Delhi. We have also developed safety indices for different localities of Delhi so that the authorities can take suitable measures to improve the safety of people in public places within areas prone to safety and security concerns.

Research Background and Theory

Safety and security are essential mental preferences of an individual while visiting a public place. As per the cognitive theory, fear of visiting a place arises when people perceive real or imagined individuals or objects and associated characteristics as causing a threat to their safety or well-being. (Smith & Pain, 2009). The same objects or environmental cues may provoke different intensities of fear across individuals (Ratnayake, 2017). People usually have fear and apprehensions about individuals, urban built environments, and buildings, which may lead to psychological and physical problems for themselves or individuals and possessions close to them. (Smith & Pain, 2009). Perceived safety may influence people's behaviour towards visiting public places despite becoming a victim of criminal activity, which is usually lesser and could potentially instil fear in specific individuals and lead them to reduce their visits to public places (Blobaum, & Hunecke, 2005). Generally, people feel safe in the company of similar people occupying the public space with less experience of victimization, and the availability of police and security guards may influence perceived safety (Shaftoe, 2008).

The characteristics of the Urban environment can impact individuals' emotions of fear and their perceptions of safety. Researchers have investigated crime and safety within the community or "meso-structural" levels, emphasizing incivilities or physical disorder characteristics. The connection between social and physical disorder and the perception level of threat to safety has been explored through the "Broken Window Theory" (Wilson & Kelling, 1982). This theory posits that if a building has a broken window and is not promptly repaired, individuals are expected to break other windows, believing the site is neglected and uncared for (Doran & Lees, 2005). The theory postulates that if disorderly behaviour goes unnoticed, it can escalate into more significant disorder and more serious criminal activities. Inadequately maintained urban built environments and physical incivilities prevent individuals from withdrawing from their roles of mutual support with fellow residents, eroding informal social control. This ultimately results in a breakdown of the social fabric and an increased vulnerability to crime (Doran & Lees, 2005).

Symbolic interactionism, as a social theory paradigm, elucidates how

individuals inhabit symbolic environments that consist of both social attributes and physical elements. People assign meaning to objects, buildings, and places like pleasure, safety, or fear. In turn, the meanings attached to the built environment offer individuals shared symbols that influence their actions (Bugni & Smith, 2002). The inherent character of all objects, be they social or physical, holds significance for the individual perceiving them (Bugni & Smith, 2002). Material objects in the environment convey expressive meaning through symbolic or visual representations (Blumer, 1969). When individuals similarly view symbols, a shared symbolic meaning of the object(s) emerges. For example, if individuals collectively associate a wall adorned with graffiti with feelings of fear, then the same symbolic meaning is attributed to this physical object. Scholars have employed these fundamental concepts of symbolic interactionism to comprehend criminal activities and perceived well-being in public spaces.

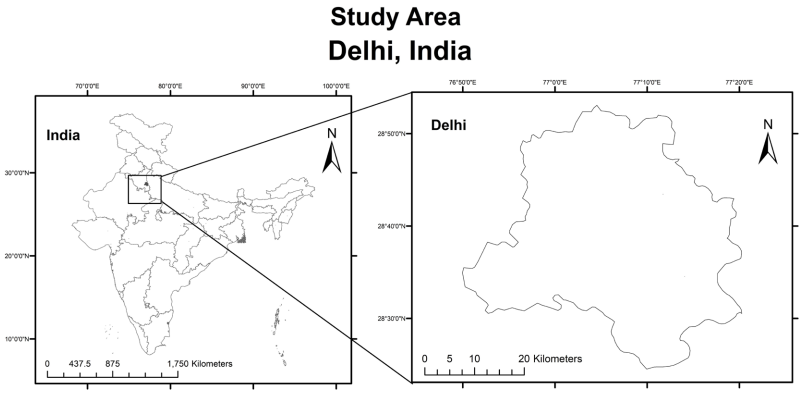
Appleton's (1975) prospect-refuge theory is an example of such a theory, aiming to conceptualize environmental cues based on their symbolic functions. It emphasizes explicitly two environmental features—refuge and prospect—that influence people's preferences in their surroundings. Environments are thought to offer humans a particular degree of prospect and refuge. Nasar and Fisher (1993) extended and refined Appleton's theory, investigating the influence of specific features in the Urban environment on the feeling of being safe. They researched on-campus students at Ohio University in the US, utilizing prospect for the victim and refuge for the offender as a conceptual framework. This approach aimed to elucidate how various exterior design features influence the perception of safety. Fisher and Nasar (1992) opined that areas marked by ample amounts of refuge and limited prospects would elicit the most significant level of distress among individuals. They hypothesized that if the environment provides victims with high visibility and permeability while offering a limited place for criminals to conceal themselves, they could assess the specific areas and proactively avoid engaging in criminal activities.

Appleton's prospect-refuge theory and Fisher and Nasar's safety model have significantly influenced environmental design strategies to address concerns about crime and safety perceptions. Appleton (1975) initially defined *refuge* as hiding features within urban built environments. Over time, the notion of refuge has expanded to include permanent elements in urban infrastructure, with humans now recognized as a refuge, while the previous studies on fear of crime and environmental features often overlooked the role of human presence. Human presence was identified in connection with prospects, hiding areas, and its role as either a refuge or a potential threat (Nasar & Jones, 1997). However, limited research has sought to validate this hypothesis. Additionally, studies exploring the association between crime distress and prospect-refuge theory have been more prevalent on university campuses than in other areas (Blobaum & Hunecke, 2005). Considering the diverse encounters with fear and apprehensions of crime and safety concerns in various settings like city centres, parks, and neighbourhoods, it is essential to research these different environments' unique challenges.

2. Materials and Methods

2.1. Study Area

The study was carried out in Delhi, the National Capital Territory of India, which spreads over an area of 1483 sq. km. between 28˚23'17" N and 28˚53'00" N latitudes and between 76˚50'24" E and 77˚20'37" E longitudes (Figure 1).



Source: Prepared by author

Figure 1. Map of the study area.

Towards the late twentieth century, Delhi saw rapid demographic transformation, which initiated several contemporary problems, including socio-economic challenges, environmental issues, traffic congestion, psychological concerns, and safety and security issues. We have collected information on safety in public places and factors influencing and improving the perceived in two stages.

2.2. Data Collection

First, we identified the frequency and type of crime in different localities of Delhi from secondary sources, including published data from the National Crime Research Bureau (NCRB), the website of the Delhi Police, magazines, and daily newspapers. Subsequently, we visited different localities and interacted with local people, municipal bodies, local police, government and private officials, shopkeepers, and vendors to learn about the reasons behind the prevalence of those crimes in the respective areas. Upon interrogating them, we understood that most crimes occurred at public amenities like bus stops, railway stations, metro stations, subways, and markets. After this pilot study, we were able to mark the hotspot locations of criminal activities in various localities in Delhi. After identifying hotspots, a structured survey was conducted to collect primary data. Fifty individuals were randomly selected from various public places within these identified hotspots. The sample size was determined based on feasibility and the exploratory nature of the study, allowing for a balance between statistical validity and resource availability. Given the diversity of the locations and the goal of capturing varied perceptions of safety, a sample of fifty respondents per location was deemed

sufficient to provide meaningful information while facilitating data collection and analysis. A stratified random sampling approach was used for each hotspot, categorizing them based on the type of public space and demographic characteristics such as age, gender, and occupation. At each location, individuals—including commuters and residents—were approached randomly to gather diverse perspectives on safety in public areas. Random selection involved choosing every nth individual encountered in the public space, which helped prevent the overrepresentation of any particular subgroup. This methodology minimized selection bias and ensured that the sample accurately reflected the broader population using these public spaces. Respondents were asked about the types of criminal activity that occurred in each location, their perceived level of safety in public areas, and the factors that could help improve safety in these environments. The assessment of perceived safety levels was conducted using a five-point Likert scale, ranging from one (very safe) to five (very fearful). Additionally, another five-point Likert scale was used to identify factors contributing to improved perceived safety in public spaces, with values ranging from one (not essential) to five (very important).

2.3. Data Analysis

The data analysis used frequency distribution, percentage analysis, RIDIT test, and ordinary least squares (OLS) regression. RIDIT analysis, short for *Relative to an Identified Distribution*, is a statistical technique that can compare multiple groups or treatments based on ranked data. In other words, credits are based on the observed distribution of a response variable for a specified set of individuals (Bross, 1958). RIDIT analysis is distribution-free in that it does not assume the distribution of the population under study (Ayranci et al., 2015; Pradhan, 2008). The technique allocates a continuous value to ordinally scaled data and to the variables rated using a scale ranging from zero to one to identify the ranks of attributes (Rashid & Pandit, 2017). The computation process for RIDIT scores is mentioned and elaborated on in **Appendix** I.

Accordingly, after calculating the RIDIT Values, we prepared a safety index for public places in different parts of Delhi by classifying the RIDIT score into five groups (0 – 0.2 = very safe and 0.8 – 1.0 = very fearful) based on the measurement scale. We applied the same technique to prioritize the factors improving the perceived safety in public places. Finally, we identified the influence of selected factors on perceived safety in public places using the Ordinary Least Squares (OLS) regression technique. The OLS technique calculates the coefficients of the linear equation by minimizing the sum of the squared residuals (the differences between observed and predicted values).

While this study provides valuable insights into the perceived safety of public spaces in Delhi, several limitations must be acknowledged to contextualize the findings. Perceptions of safety are influenced not only by environmental and physical design factors but also by cultural and social norms. For example,

individuals from marginalized communities or those with specific societal experiences may feel inherently unsafe in public spaces due to broader societal biases or past experiences. These factors can overshadow the impact of environmental conditions, introducing a level of subjectivity into the responses. Additionally, the sample may be affected by respondent bias, as it largely includes individuals who frequently use public spaces. This subset of the population may possess a heightened awareness or sensitivity to safety concerns compared to those who do not often visit these areas, potentially skewing the findings. Temporal variability is another significant limitation. Perceptions of safety are not static; they can vary considerably depending on the time of day, day of the week, or season. For instance, a public space may be perceived as safe during daylight hours but feel unsafe at night due to reduced visibility or a lack of activity. Since this study adopts a cross-sectional design, it may not fully capture these dynamic variations. While the analysis emphasizes environmental and design-related factors, it may understate the broader influence of societal conditions, such as systemic inequalities, governance quality, and laws, which often interact with local conditions to shape perceptions of safety. Furthermore, since the study was conducted in specific localities of Delhi, its findings may not be directly generalizable to other cities or regions characterized by different urban designs, cultural contexts, or socio-political dynamics.

3. Results and Discussion

3.1. Crime and Threat to Safety in Public Places

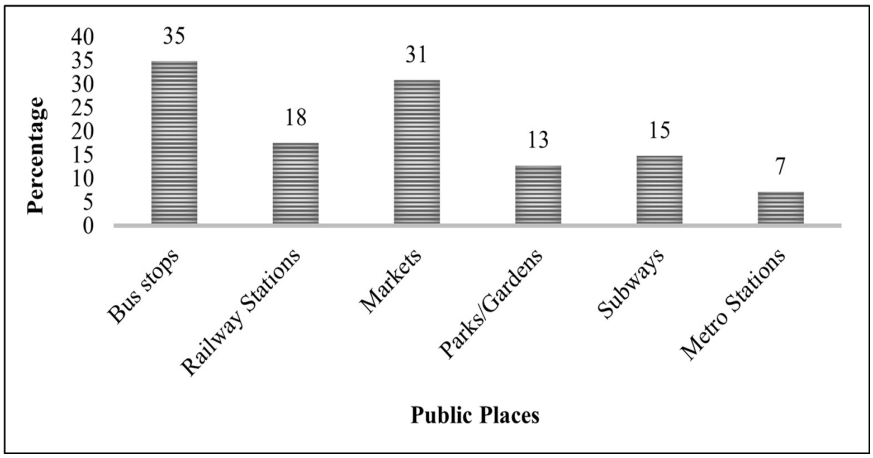
We asked the respondents about the types of crime they fear facing in public places that threaten their safety and security. The majority (26 per cent) considered snatching the most prevalent crime they perceived to face in public places. A considerable proportion of people (24 per cent) also fear the occurrence of heinous crimes, including assault, murder, and sexual abuse, as depicted in Table 1. The least number of people feared burglary (8 per cent) in public places, followed by vehicle theft (9 per cent) and robbery (12 per cent). Hence, the authorities should adopt measures to check on snatching, pickpocketing, and heinous crimes in public places. The factors that can help decrease the occurrence of these crimes in public places and increase the safety and security of commuters should be identified.

Table 1. Types of crime people fear to face in public places.

Types of crimes	Frequency	Percentage
Burglary	128	8
Snatching	447	26
Robbery	202	12
Pickpocketing	370	22
Vehicle theft	146	9
Heinous crimes	413	24

Source: Primary field survey

The study also helps identify the safest and most fearful public places based on people's perceptions, as shown in Figure 2. The bus stops were considered the most fearful, which may result from a lack of appropriate surveillance in and around the Bus Stops. In contrast, metro stations were perceived as the safest public places due to constant surveillance and Intervention of Police and Armed personnel. Markets and railway stations followed bus stops in the list of Most Fearful Areas. Further, regarding safety and security, metro stations were followed by parks/gardens and subways. The findings of this aspect also highlight the need to improve the perceived safety at bus stops, markets, and railway stations and identify the factors playing a crucial role in improving the perceived safety in these places.



Source: Primary field survey

Figure 2. Percentage of people fearing threat to their safety in different public places.

3.2. Perceived Safety in Public Places in Different Locations of Delhi

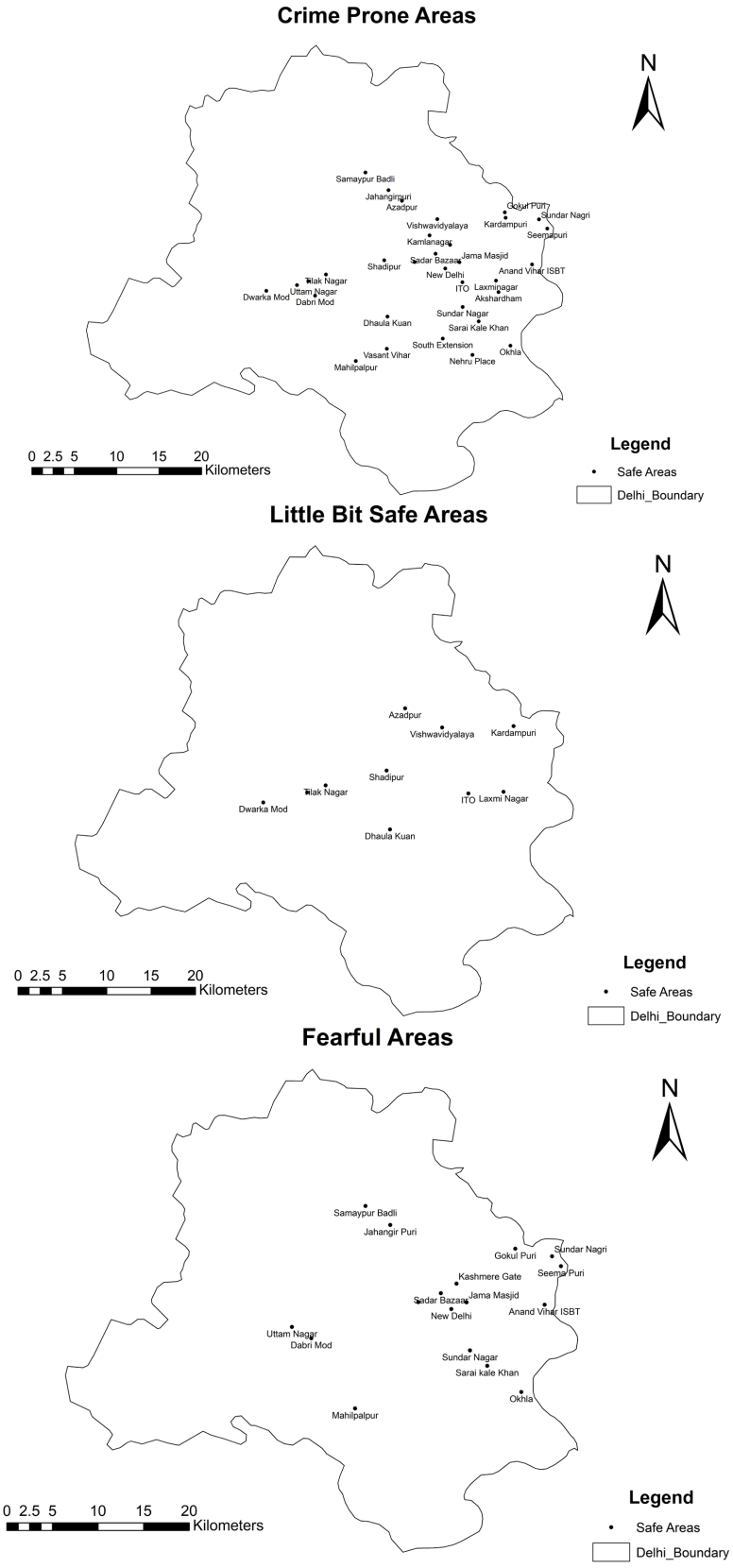
The public places in different locations in Delhi influence the people's perceived safety differently (Table 2). The perceived safety in public places situated in different parts of Delhi was found to vary significantly among the respondents, as confirmed by the Kruskal-Wallis (W) statistic of 3910.18, which was found to be higher than the critical chi-square value of 30.14 at 30 (31 - 1) degree of freedom at the 5 per cent level of significance. The findings suggest that public places in various localities of Delhi can be categorized into three groups: safe, safe, and fearful. None of the public places were perceived as very safe and very fearful. Public places in most of the localities of Delhi were considered fearful and safe. This can be possibly due to the location of bus stops and railway stations in these areas and lower visibility due to higher levels of crowding and population. Public places in a few Delhi localities, including Vasant Vihar, Nehru Place/Govind Puri, South Extension, Akshardham, and Kamlanagar, were considered safe. Most of these areas are devoid of bus stops and railway stations and are characterized by a higher level of visibility due to comparatively lower population density.

Table 2. Perceived level of safety at public places located in different parts of Delhi.

Localities	RIDIT	RANK	Safety index
Vasant Vihar	0.210	1	Safe
Nehru place/Govind puri	0.220	2	Safe
South extension	0.226	3	Safe
Akshardham	0.235	4	Safe
Kamlanagar	0.240	5	Safe
Azadpur	0.369	6	Little bit safe
Shadipur	0.370	7	Little bit safe
Tilak Nagar	0.382	8	Little bit safe
Dhaula Kuan	0.387	9	Little bit safe
Vishvavidyalaya	0.391	10	Little bit safe
Laxmi Nagar	0.392	11	Little bit safe
Dwarka mor	0.397	12	Little bit safe
Gokulpuri and Kardampuri	0.404	13	Little bit safe
ITO	0.416	14	Little bit safe
Janakpuri West	0.416	14	Little bit safe
Dabri mor	0.602	16	Fearful
Sundarnagar	0.604	17	Fearful
Mahipalpur	0.604	17	Fearful
Gokulpuri	0.606	19	Fearful
Okhla	0.607	20	Fearful
Kashmiri Gate	0.608	21	Fearful
Jahangirpuri	0.609	22	Fearful
Gaffar Market	0.610	23	Fearful
Sarai kale khan	0.612	24	Fearful
Anand V T	0.615	25	Fearful
Jama Masjid	0.615	25	Fearful
Seemapuri	0.622	27	Fearful
Samaypur Badli	0.623	28	Fearful
New Delhi	0.623	28	Fearful
Sunder Nagri	0.630	30	Fearful
Uttam Nagar	0.639	31	Fearful
Sadar Bazar	0.639	31	Fearful

Kruskal-Wallis Statistics (W) = 156.03, Chi Square = 32.67, Degree of freedom df (31 − 1) = 30, Level of significance = 0.05*; Source: Primary Field Survey*

Upon identifying the areas that had perceptions of safety for crime in Delhi, the areas were mapped using GIS tools to get a better picture of the distribution of the places that had safe, little bit safe, and fearful perceptions (Figure 3).



Source: Prepared by author

Figure 3. Mapping of perceived level of safety in Delhi.

3.3. Factors Influencing Perceived Safety in Public Places in Different Parts of Delhi

The respondents have specified the factors influencing their perceived safety in public places, as shown in Table 3. The degree of importance of factors improving perceived safety in public places was found to vary significantly among the respondents, as confirmed by the Kruskal-Wallis (W) statistic of 3910.18, which was found to be higher than the critical chi-square value of 30.14 at 11 (12 - 1) degree of freedom with a level of significance of 5 per cent. Eight out of twelve identified factors exert a more pronounced influence on improving the perceived safety of individuals in public spaces, given that their RIDIT score is 0.5 or higher. However, it does not signify that the other factors are unimportant. Instead, their role in improving perceived safety is less important than the respondents. A companion's presence was considered the most important, followed by increased visibility and the presence of private security guards in public spaces. This shows that when an individual visits a public place with a friend, relative, or family member, they feel more secure. The study also highlights that people prefer to visit a public place with higher visibility and security guards. Police patrolling on foot has a low influence on the safety perception of visitors as patrolling is never a constant phenomenon and is done at specific times and places. The location of public places near the main road and knowledge about the locality also has a lesser impact on people's safety.

Table 3. Factors improving perceived safety in public places.

Variables	RIDIT	RANK
Accompanied by someone	0.616	1
Higher visibility	0.575	2
Private security guards	0.573	3
Closed vacant plot	0.534	4
Lack of vegetation/bushes	0.529	5
Police patrolling in car	0.528	6
Being in well populated area	0.514	7
Better lighting	0.504	8
CCTV Cameras	0.450	9
Information about area	0.437	10
Close to main road	0.373	11
Police patrolling on foot	0.367	12

Kruskal-Wallis Statistics (W) = 156.03, Chi Square = 32.67, Degree of freedom df (12 – 1) = 11, Level of significance = 0.05; Source: Primary Field Survey

We have employed multiple OLS regression models to identify the factors influencing the perceived safety in public places, as shown in Table 4. Before finalizing the model, several OLS models were used, and insignificant factors with a value of more than 0.1 were removed from the final model. Out of twelve, six factors significantly determine the perceived safety in public places. The OLS regression model was significant at $p \leq 0.05$, with *an F-value* of 10.07. We can

explain a 15 per cent variation in the perceived safety of people visiting public places, as indicated by R2 of the model. Although the factors in the model explain the slight variance, it gives us a glimpse of the attributes that play an essential role in improving people's perceived safety in public places. The findings suggest that all the factors incorporated in the final OLS model have a significant positive effect on the perceived safety except the availability of vegetation and bushes in and around public places, which negatively influences people's perceived safety. However, it does not signify that all vegetation should be removed from public places; it should be appropriately maintained.

The findings indicate that patrolling of police in cars in and around public places has the highest positive effect on the perceived safety of people (**Table 4**). The perceived safety of people in public places can also be improved by installing CCTV cameras, locating public places near the main roads, increasing people's information about the area, and increasing visibility in public places. Government and firms can improve the utility of public places and commercial outlets by changing the identified factors, as they significantly influence people's perceived safety in public places.

Table 4. Unstandardized and standardized OLS regression coefficients with perceived safety as a dependent variable.

Variables	B	Beta
Higher visibility	0.050	0.058**
Police patrolling in car	0.178	0.210*
CCTV cameras	0.109	0.126*
Close to main road	0.098	0.123*
Information about area	0.075	0.100*
Availability of vegetation and bushes	-0.046	-0.056**
Constant	1.670*	
F-value	10.069*	
R^2	0.146	
Adjusted R^2	0.140	

*p value ≤ 0.05; **p value ≥ 0.05; Source: Primary Field Survey

The findings of this study align with existing research on urban safety, underscoring the significance of environmental design and surveillance in shaping perceptions of safety. For example, studies conducted in cities such as New York and London reveal that adequate lighting, CCTV cameras, and regular police patrolling notably enhance public safety (Cozens et al., 2005; Newman, 1972). Similarly, this research supports findings from Mumbai and São Paulo, where issues like crowding and poor visibility were identified as key contributors to increased feelings of insecurity (Davis, 2006; UN-Habitat, 2019). Additionally, the study reinforces Jane Jacobs' concept of "eyes on the street", which emphasizes the importance of community engagement and natural surveillance in fostering safer public spaces (Jacobs, 1961). Such strategies have been effective in Scandinavian countries, where participatory urban design has contributed to the creation of

safer environments (Gehl, 2010). Observations regarding temporal variations in safety perceptions—such as diminished feelings of safety at night—are similar to findings from Tokyo and Singapore, where well-lit and vibrant public spaces were associated with improved safety perceptions during evening hours (Masuda & Yamamoto, 2012; Yuen, 2014). Interestingly, the study notes that vegetation can elicit fear in certain public spaces, diverging from findings in cities like Melbourne and Vancouver, where green spaces are viewed as enhancing safety and community well-being (Browning et al., 2014). This contrast underscores the necessity of considering cultural and contextual factors in the design of urban spaces.

4. Conclusion

This study explores the perceived safety of public places in various areas of Delhi and identifies key factors that influence and enhance safety perceptions. The findings indicate that crimes such as snatching, pickpocketing, threats to life, and sexual abuse significantly impact individuals' feelings of security in public spaces, especially at bus stops, railway stations, and markets. The developed safety index shows that areas perceived as safe generally have fewer crime-related facilities, suggesting that infrastructure and urban design critically shape safety perceptions. Improving urban environments through better design, enhanced surveillance systems—such as increased police patrolling, the deployment of security guards, and the installation of CCTV cameras—emerges as a vital strategy for reducing opportunities for crime and fostering a greater sense of safety. Additionally, awareness campaigns that provide information about specific areas can empower individuals and positively influence their perceptions of safety.

Measures such as maintaining vegetation near public spaces can help eliminate hiding spots for criminals, while installing surveillance cameras in green areas can enhance safety. Additionally, placing SOS systems at regular intervals allows for quick reporting of criminal activities, further improving security. Encouraging natural surveillance—where residents and businesses design their spaces to maintain visibility of the outside—coupled with proper lighting and clear sightlines in public areas, can increase overall visibility and deter criminal behavior. Long-term strategies like integrating drone surveillance, utilizing digital tools, and implementing real-time monitoring systems can make urban areas less susceptible to crime. These efforts should be supported by micro-planning and inclusive urban policies that address socio-economic disparities and promote community engagement. Short-term actions, such as enhancing coordination among residents, neighbors, and law enforcement through neighborhood watch programs and regular police patrols, should also be encouraged. Ultimately, a combination of community-driven vigilance, thoughtful urban design, and technological advancements can create safer public spaces and alleviate feelings of insecurity. While these measures may not entirely eliminate crime, they represent significant strides toward fostering more secure, inclusive, and resilient urban environments.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix I

Suppose that there are m items and n ordered categories listed from the most favoured to the least favoured in the scale (Wu, 2007), then RIDIT analysis goes as follows:

1. Computation of RIDITS for reference data set

(a) Select a population to serve as a reference data set. For a Likert scale survey, the reference data set can be the total responses of the survey, if the population cannot be easily identified.

(b) Calculate the frequency f_j for each category of responses, where j = 1, 2, n.

(c) Calculate mid-point accumulated frequency F_j for each category of responses.

$$F_1 = \frac{1}{2} f_1 \tag{1}$$

$$F_j = \frac{1}{2} f_j + \sum_{k=1}^{j-1} f_k \text{, where, j = 2….., n} \tag{2}$$

(d) Calculate RIDIT value R_j for every category of responses in the reference data set.

$$R_j = \frac{F_j}{N} \text{, where, j = 1, 2……, n} \tag{3}$$

N represents the total number of responses obtained from the Likert scale survey under consideration. As per definition, the expected value of R for the reference dataset is consistently 0.5.

2. Compute RIDITS and mean RIDITS for comparison data sets.

Please observe that a comparison dataset consists of the frequencies of responses for each category within a Likert scale item. Given that there are m Likert scale items in this example, there will be m comparison datasets.

(a) Compute RIDIT value rij for each category of scale items.

$$r_{ij} = \frac{R_j \times \pi_{ij}}{\pi_i} \text{, where i = 1……, m.} \tag{4}$$

π_{ij} is the frequency of category j for the i^{th} scale item, and π_i is a short form for the summation of frequencies for scale item i across all categories, i.e.

$$\pi_i = \sum_{k=1}^{n} \pi_{ik} \tag{5}$$

(b) Compute mean RIDIT ρ_i for each Likert scale item.

$$\rho_i = \sum_{k=1}^{n} r_{ik} \tag{6}$$

(c) Compute confidence interval for ρ_i. When the size of the reference data set is very large relative to that of any comparison data set, the 95 per cent confidence interval of any ρ_i is:

$$\rho_i \pm \frac{1}{\sqrt{3\pi_i}} \tag{7}$$

(d) Test the following hypothesis using Kruskal—Wallis statistics

$$\begin{cases} H_0 : \forall i, \rho_i = 0.5 \\ H_a : \exists i, \rho_i \neq 0.5 \end{cases} \tag{8}$$

$$W = 12\sum_{i=1}^{m} \pi_i \left(\rho_i - 0.5\right)^2 \tag{9}$$

W follows a χ^2 distribution with (m − 1) degree of freedom. If H_0 cannot be accepted, examine the relationships among confidence intervals of ρ. The general rules for interpreting the values of ρ are shown below.

1. A scale item with its ρ_i value statistically deviate from 0.5 implies a significant difference in the response patterns between the reference data set and the comparison data set for the particular scale item. If the confidence interval of ρ_i contains 0.5, then it is accepted that the ρ_i value is not significantly deviate from 0.5.

2. A low value of ρ_i is preferred over a high value of ρ_i because a low value of ρ_i indicates a low probability of being in a negative propensity.

3. The response patterns of scale items with overlapped confidence intervals of ρ are considered, among the respondents, to be statistically indifferent from each other.