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Correlation Analysis Between Everyday Public Space and Urban Built Environment and a Study of Its Evaluation Framework: Taking Tianjin as an Example

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Abstract

As global urbanization accelerates, many regions—including Chinese cities—are continuously advancing their urban development. Urban renewal, as a component of urbanization, has increasingly become a focal point of attention in recent years. Achieving high-quality urban renewal requires an in-depth study of the interaction between the built environment and public space. Everyday public space, a subset of public space, represents residents' everyday practices in the urban environment based on their own needs and is a recurring challenge in contemporary urban renewal and management. This study takes three distinct urban zones in Tianjin as case examples and employs quantitative analysis. From the perspectives of land-use patterns, residential indicators, urban design, and transportation systems, we compare the relationships between built-environment elements (both at the sub-regional and city-wide levels) and the distribution of everyday public spaces. In addition, we construct an evaluation model by integrating Structural Equation Modeling (SEM) with the Analytic Hierarchy Process (AHP) to assess everyday public spaces. The results show that the spatial distribution of everyday public spaces is significantly correlated with various urban elements, and these relationships differ across regions. Overall, the strongest correlations are found with large markets, residential area, population density, building density, and the 160 m integration index. Regarding evaluation, users and designers differ markedly in their focal points: users prioritize concrete elements such as the presence of specific facilities, whereas designers emphasize aspects that can be directly addressed through design interventions. In summary, we propose a complete research pathway—identification and evaluation based on the built environment—that can provide systematic, actionable, technical support for formulating and implementing urban-renewal policies, offering substantial practical value.

Keywords: everyday public space; built environment; correlation; urban renewal; evaluation system

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1. Introduction

The acceleration of global urbanization—especially the pronounced scale and speed in developing countries—highlights both the economic vitality and opportunities generated by urbanization and the myriad of severe challenges it entails [1]. After decades of rapid

expansion, urban renewal has become a pivotal urban policy in nations worldwide, and its effectiveness is receiving increasing scholarly attention [2]. As China's urban development enters the "new era of urbanization," the renewal of existing built-up areas has become a central focus of urban renewal [3]. Urban public spaces, as vital components of the physical urban fabric and cultural life, have emerged as key sites in this renewal process [4]. In recent years, while the quality of some public spaces in built-up areas has improved through multi-stakeholder collaboration, across China such spaces continue to be informally and dynamically appropriated: residents perform music and dance beneath elevated bridges, street vendors gather in alleyways to sell goods, children ride bicycles at high speed in community parking lots, teenagers clandestinely film videos in abandoned buildings, and elderly individuals play chess and cards at street corners. There, spontaneously used spaces are the everyday public spaces; they not only compensate for deficiencies in formally planned public infrastructure and contribute to urban vitality but also pose challenges for urban governance due to their unregulated nature.

Not only in China, but also internationally, this type of space has also attracted widespread attention, and there has been a certain amount of research on everyday public space [5–8]. As early as the last century, Margaret Crawford drew on her observations in Los Angeles and integrated the everyday life theories of thinkers such as Henri Lefebvre and Michel de Certeau [9]. She uncovered everyday practices that re-inhabit and re-create well-designed urban spaces in new ways. From this work, she introduced the concept of "everyday space" and articulated the urban-design values of everyday urbanism [10–12]. Everyday urbanism is often listed alongside new urbanism and post-urbanism as three major urban research paradigms [13]. Unlike new urbanism or pattern language [14–16], which emphasize defining space through physical form and design norms, everyday urbanism emphasizes the ordinariness and concreteness of everyday life, focusing on grassroots, open-ended practices, and unintentionally becoming a non-canonical bottom-up mechanism of urban development that stands in stark contrast to the conventional bottom-up development model [9,13]. Everyday urbanism is also frequently criticized; as American architectural scholar Michael Speaks puts it, it places too much emphasis on the voices of ordinary people while neglecting the power of decision-makers. In contrast, research specifically focusing on everyday public spaces in Chinese cities is relatively scarce [17]. Such studies are often intertwined with three strands of research: urban informality, everyday life, and spatial appropriation [18]. The majority of the literature examines the informal characteristics of mobile vendors or urban villages [19], while recent years have seen a few studies emerging that concentrate on the practice of public-space renewal and regeneration in the context of micro-renovation [20–24]. Critical questions concerning the relationship between the built environment and everyday urban public spaces, as well as the methodologies for evaluating such spaces, require more in-depth investigation.

In urban studies, space is not merely physical; it also carries social and cultural meanings, while behavior refers to the activities and interactions that people engage in within a given space [25–27]. Current research in architecture on the correlation between space and behavior can be categorized into 4 types: the relationship between human perception and space [28,29], the correlation between specific behaviors and space [30], the correlation between behaviors of specific groups and space [17,20], and the correlation between spaces generated by human activities and other types of spaces [25,31]. The research objectives primarily focus on specific behaviors or specific groups, while studies on the correlation between activity-generated spaces and other spaces are relatively limited. Everyday urban public spaces, as spaces formed by human activities, require the collection of extensive behavioral and spatial data to study their correlation with the built environment. In recent years, with advancements in technical methodologies—such as space syntax [32–36] and

point-of-interest (POI) data collection [37–39]—spatial quantification techniques have been increasingly applied to the study of spatial relationships [40].

Research on the evaluation of public space quality began in the 1980s. Harvey proposed that the quality of urban public spaces is directly linked to "urban opportunities" [41]. Building upon this foundation, scholars have developed a variety of methods to evaluate public spaces, such as constructing comprehensive spatial evaluation systems [42], applying novel methodologies to spatial assessment [43,44], and establishing a star-shaped model for the visual evaluation of public spaces [45]. In addition, the biometric and neuroscientific analysis of spatial concavity and the complexity of urban facades has also constructed an evaluation based on human perception [46]. Despite the development of diverse evaluation systems in contemporary public space research [47–49], most are constructed from a single perspective. Even though pattern language enables users to more easily assess and design public spaces, it fundamentally remains rooted in the designer's logic. Most evaluations rely on user data, yet they still fail to fundamentally address the differences between designers and users. Evaluation frameworks that integrate both user and designer viewpoints remain relatively limited. Moreover, current evaluation methods rarely employ the structural equation model, even though it is particularly well-suited for capturing the complex relationships between various spatial elements and users' overall assessment of space.

Because everyday public spaces are difficult to manage and control uniformly, research methods targeting them are relatively scarce. Although new approaches such as big-data analytics and machine learning can theoretically be applied to the study of everyday public spaces, this field requires long-term on-site observation, and our mastery of these techniques is still limited, which may introduce bias into the results. After preliminary exploration, this study adopts the easily quantifiable urban built environment as a starting point to examine its relationship with the hard-to-quantify everyday public spaces. By analyzing the correlation between the two, we both fill the methodological gap in everyday public-space research and provide a new quantitative perspective for the field. Everyday public spaces are spontaneously created by residents, with the users themselves as the primary actors. Therefore, the research should foreground the users' perspective and emphasize the spontaneous nature of these spaces. Structural Equation Modeling (SEM) can capture mutual influences while integrating subjective emotions and objective variables, and it is not confined to a single subjective assessment, making it highly suitable as the core of the evaluation model. To further enhance the comprehensiveness of the assessment, we incorporate the Analytic Hierarchy Process (AHP) into SEM and combine the designers' viewpoint, thereby delivering a more systematic and multidimensional evaluation of everyday public spaces.

Therefore, through a comparative analysis of relevant literature, this study summarizes the existing research gaps as follows:

- Qualitative approaches are frequently used to discuss everyday public spaces, but there is a lack of quantitative analyses.
- Research on the relationship between the urban built environment and everyday public spaces in cities is limited.
- Evaluation studies on everyday urban public spaces remain insufficiently thorough, lacking comprehensive consideration of both users and designers.

Therefore, in order to address the aforementioned research gaps, this paper makes the following primary contributions:

- It systematically elucidates the mechanisms by which urban built-environment elements influence everyday public spaces, quantitatively reveals the relationships between them, and identifies the spatial distribution patterns of everyday public

spaces. These findings provide empirical support for theoretical development in this field and fill the spatial-level gaps in existing studies.

- Furthermore, it develops a dual-perspective evaluation model that integrates user perception with designer intent, which overcomes the limitations of traditional single-perspective assessments. The model enables a comprehensive consideration of everyday public space functionality, user experience, and design suitability, thereby enhancing the comprehensiveness and scientific rigor of the evaluation.

Finally, we have addressed the long-standing criticism of everyday urbanism for overlooking decision-makers. Optimization strategies for urban space renewal and urban management strategies are proposed to address current challenges in the management of everyday urban public spaces.

2. Methodology

This study first analyzed the relationship between the built environment and everyday public spaces and summarized the distribution characteristics of everyday public spaces, achieving the goal of identifying everyday public spaces based solely on built environment data. On this basis, to further evaluate the quality of these identified spaces, this study constructed a dual-perspective spatial evaluation model. Finally, by integrating the prediction and evaluation results, the research was able to propose targeted optimization strategies for enhancing the quality of everyday public spaces. The research framework can be seen in Figure 1.

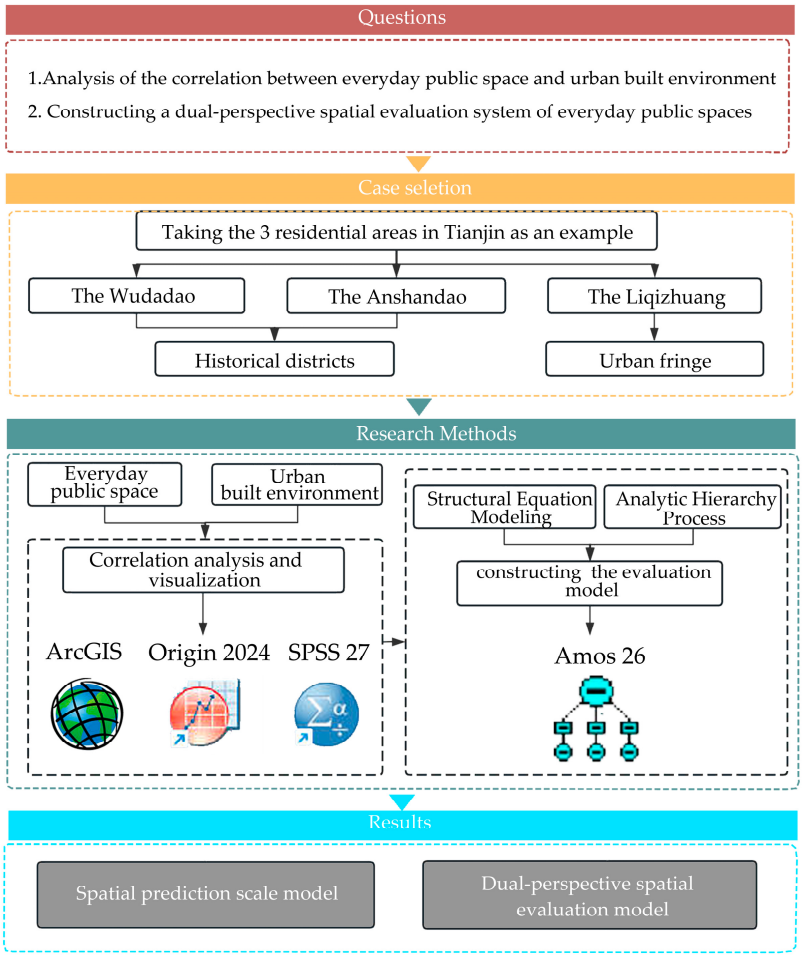
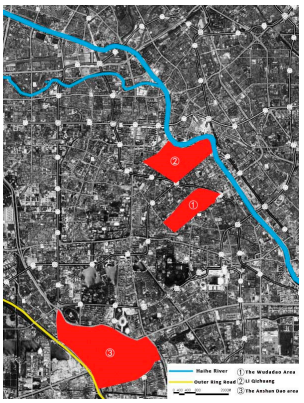


Figure 1. Research Framework.

2.1. Case Selection

We selected Tianjin as the study area because its dockside cultural development exhibits strong civic characteristics along with distinct cultural and regional features, which can reflect the diverse everyday behaviors across different built environments. Guided by Tianjin's overall master plan, the study selected research sites located in the city center area, the city core area, and the general urban area, thereby covering representative community types at the street level. The Wudadao area is located in the city center and is a historic and cultural block that shows the architectural features of celebrity residences. The Anshandao area is located in the city core and is a historic commercial and residential block. The Liqizhuang area is located in a general urban area, on the inner edge of the main urban area, with a certain industrial foundation and spatial plasticity, and it bears the responsibility of urban regional development. The characteristics of the selected area can be seen in Table 1. These three selected districts correspond precisely to the aforementioned spatial layers and reflect the city's spatial diversity. This spatial configuration aligns perfectly with the objectives of this study: on one hand, it enables the exploration of everyday public space characteristics by leveraging urban built elements at various scales; on the other hand, the rich interview data from users and designers provides strong empirical support for validating the dual-perspective evaluation model.

Table 1. The basic situation of the surveyed area.

District Name	Area	Population Size	Use Points	Average Construction Years	Research Units	Features	Location of the District
The Wudadao	140 ha	51,290	567	1977	137	Well-preserved; Monotonous form; Open block	
The Anshandao	230 ha	85,490	723	1993	90	Many updates; Diverse forms; Open block	
The Liqizhuang	598 ha	162,490	568	2004	149	Urban fringes; Monotonous form; Closed block	

In addition, according to the list of 14 historic and cultural districts announced by the Tianjin municipal government, this study treats the Wudadao and the Anshandao as components of the historic districts. Based on this, we first analyze the Wudadao and the AnshanDao separately, highlighting the differences between them; then we compare these historic districts as a whole with non-historic districts. The focus on historic districts stems from the fact that, in the current urban renewal process, historic districts have become a focal point. By concentrating research on historic districts, we can better align with real-world needs and more effectively address practical problems.

2.2. Data Collection

2.2.1. Data Collection for Correlation Analysis

From March 2023 to December 2024, field surveys were conducted in 3 districts to collect data on everyday urban public spaces and associated public activities. Based on an analysis of the characteristics of these spaces—particularly spatial stability—a screening

process was carried out [50], identifying a total of 2786 usage points and 548 everyday urban public spaces. In our study, usage points are points that record human behavior; a space is defined as the area formed by three or more long-duration activity points. In the quantification process of our study, the examined variables are the usage points and the environmental factors. Following established measurement methods [51] and adapted to the research scale, the grid method was applied to divide the study areas into 376 research units, with the division based on the median road segment length within each block. The scale and quantity of everyday urban public spaces were then quantified based on the number of usage points within each research unit.

The quantification of urban built environment characteristics varies depending on the research focus. However, these measurements generally fall within 4 core dimensions: land use patterns (diversity), residential indicators (density), urban design (design), and transportation systems (including destination accessibility and proximity to public transit) [52–54]. Drawing on research findings and existing literature, this study categorizes the characteristics of the urban built environment into 4 primary dimensions, comprising 17 specific indicators. Among them, the land-use pattern dimension includes the following indicators: Large market, School, hospital, government institutions, and Land use mix degree; the residential indicators dimension includes Residential land area and Permanent resident population density; the urban design dimension includes Building density, Average number of building floors, Morphological types, and Average construction year; and the transportation systems dimension includes Global integration degree, 160-m integration degree, Road density, Intersection density, The influence of bus stops, and one-way and two-way traffic. Using the ArcGIS 10.8 platform, research units were delineated through the grid method, and different quantification methods were applied according to the distinct characteristics of the built environment. For land use patterns, the functional distribution of large markets, schools, hospitals, and government institutions was analyzed by integrating Baidu Maps Points of Interest (POI) data with field surveys. Some of the formulas used were as follows:

$$LUM_i = -\sum_{j=1}^{n} \frac{P_{i,j}\log(P_{i,j})}{\log(n)} \quad (1)$$

$$PD_i = \sum_{j=1}^{n} \frac{A_j}{A_i} PD_j \quad (2)$$

$$Height_i = \frac{\sum_{j=1}^{n} Height_j}{n} \quad (3)$$

$$AV_i = \frac{\sum_{j=1}^{n} AV_j}{n} \quad (4)$$

In Equation (1), n represents the number of functional categories; $P_{i,j}$ represents the proportion of Type-j land use within the total land area of Study Area i. In Equations (2)–(4), n represents the number of buildings constructed within Plot i. In the above formula, LUM refers to Land Use Mix, representing the degree of mixed land use. PD stands for population density; Height indicates the number of building floors; AV represents the age value of the building's construction period.

Within the transportation system dimension, the space syntax software (sDNA 4.0.0) was employed to calculate the 160 m radius integration and the global integration degree for each research unit, which together characterized the accessibility of the road network in terms of topological configuration.

2.2.2. Data Collection for the Evaluation System

Through a comparative analysis of evaluation indicators from 62 public space evaluation systems, the indicators were initially categorized into five dimensions: spatial attributes, facility attributes, environmental attributes, management attributes, and cultural attributes, encompassing a total of 14 factors. Furthermore, based on the characteristics of everyday urban public spaces, 8 additional evaluation factors were incorporated, comprising 3 factors of publicness and 5 factors of everydayness, resulting in a final set of 22 evaluation factors.

The questionnaire was divided into three parts, namely, the basic information of the respondents, 22 evaluation items, and open-ended suggestions. The questionnaires were distributed in groups of multiple people simultaneously, and the survey data were collected in three districts over a period of two months. A total of 450 questionnaires were distributed, and 428 valid questionnaires were retrieved after eliminating the invalid ones (Table A1). Our inclusion criteria for the on-site questionnaire survey were that respondents must be permanent residents of Tianjin and be cognitively capable of completing the questionnaire independently and they must consent to the use of their questionnaire data. The exclusion criteria were professionals with a background in urban planning, public-space design, or related fields (to avoid professional bias) and questionnaires completed in an unreasonably short time or that displayed obvious random/invalid responses. Based on these criteria, we designed the sampling strategy so that the gender- and age-based proportional characteristics of the target population were matched as closely as possible. Additionally, several experts and teachers in the field of architectural planning and architectural design practitioners were invited, and 30 expert scoring questionnaires were distributed, with 28 valid questionnaires ultimately retrieved.

2.3. Data Analysis

2.3.1. Characteristics and Analysis of Everyday Urban Public Spaces

The spatial characteristics of everyday urban public spaces were analyzed by constructing a spatial database on the ArcGIS platform, integrating actual research and POI data, and using kernel density analysis to assess the intensity of human aggregation. Meanwhile, based on the characteristics of the measured data, the SPSS software (IBM SPSS Statistics 27) was used to conduct a correlation analysis between everyday urban public spaces and urban built environment elements by employing the Spearman rank correlation coefficient. Among them, due to the influence of various factors, the number of everyday urban public spaces in some research units was 0. To ensure the overall integrity of the research scope and the number of effective basic research units, the logic of "neighborhood analysis" with a rectangular window was adopted to assign values to these units, and a value of $0 < x < 1$ was ultimately assigned. The data of the Wuda Dao and Anshan Dao areas were combined to form the historic district data, and all the data of the three areas were taken as the total data to explore the correlation characteristics, similarities, and differences between the everyday public spaces of the city and different urban built environments. The comprehensive influence of urban environmental elements in four-dimensional space was clarified through ordinary least squares (OLS) regression. To ensure the normality of variables and meet the basic requirements of regression analysis, the Box-Cox transformation method [55] was used in statistical software (Minitab 17) to transform variables that did not conform to a normal distribution. For some variables with a majority of 0 values, the natural logarithm (In) was applied for normal distribution transformation. Finally, a prediction model for the location of everyday urban public spaces was obtained.

2.3.2. Evaluation System Construction

The reliability and validity of the user questionnaire were assessed using SPSS. After the data were successfully validated, all indicators were retained. The 22 initial factors were aggregated into five key dimensions: spatial comfort, spatial inclusiveness, spatial plasticity, spatial completeness, and spatial friendliness. Based on the existing literature on everyday urban public spaces, 34 hypothetical pathways were formulated to construct an initial conceptual model. Subsequently, Amos 26 software was employed to perform model fitting and refinement, resulting in the final structural equation model. Figure 2 shows the flow diagram of the structural equation model. Following data normalization, the corresponding weights representing the user perspective were derived. Concurrently, based on the objective evaluation indicators within the evaluation factor set, the Analytic Hierarchy Process (AHP) was applied, with the Yaanp v10.3 software assisting in the computation of evaluation factor weights. This process yielded the designer perspective evaluation model along with its associated weights.

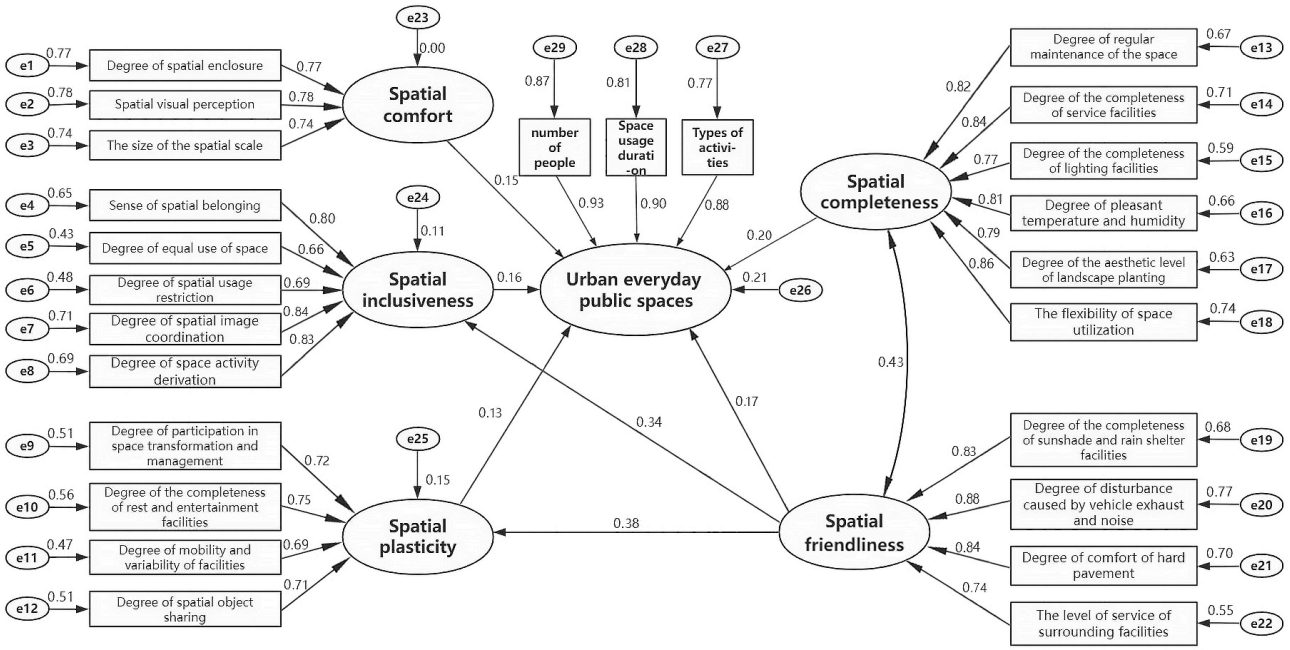


Figure 2. The final structural equation model. Note: the large ovals represent latent variables, the rectangles connected to them by arrows denote observed variables, the small circles indicate residuals, and the single-headed arrows signify unidirectional effects. The larger the number, the greater its influence.

By comparing the weights from the two perspectives, factors with a difference greater than 0.1 were averaged and then compared again. Factors with differences between 0.05 and 0.1 were adjusted and, for factors with differences less than 0.05, the user evaluation weights were retained. This process produced the final revised weights. This essentially completed the establishment of the dual-perspective evaluation system. To verify the applicability of the system, one everyday public space was randomly selected from each of the three study areas for empirical testing. The error rate between the designers' scores (from the final model) and the users' scores was within 10%, indicating a balanced alignment between user and designer evaluations. This outcome enables designers to derive evaluation results that consider both perspectives through objective indicator scoring.

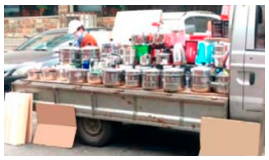
3. Results

3.1. Distribution of Everyday Urban Public Spaces and Correlation with the Built Environment

3.1.1. The Spatial Characteristics of Everyday Urban Public Spaces

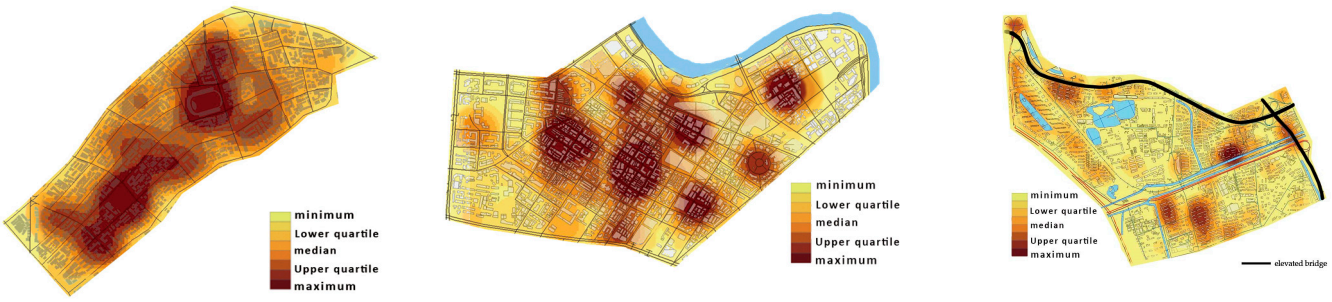
After analyzing the three case areas, we found that although the older districts exhibit a higher density of everyday urban public spaces, the specific ways in which activities are carried out may vary when examined in finer detail, but, overall, the differences among the activities are minimal. Board games, street vending, and social activities are the three main types, collectively accounting for over 70% of all activities in each district. However, their order of prevalence differs slightly among the three (Table 2). In the Wudadao area, street vending is strictly controlled. The old residential buildings and the aging population have led to a lot of living space extending out from the buildings, forming everyday urban activity spaces mainly for everyday living and residential activities. The Anshandao area includes the largest commercial pedestrian street in Tianjin, Peace Road, and some plots that have been updated into closed communities. The high population density and highly formal management have, on the one hand, led to an increase in the number of mid-to-low-end vendors, and, on the other hand, limited the overall number of everyday urban public spaces. The Liqizhuang area has a relatively younger population. Although the internal functions of the closed communities are relatively complete, they still show obvious deficiencies in meeting diverse social needs. More than half of the activities are related to life and socializing. Meanwhile, the large vacant spaces under the elevated bridges have become ideal spots for night market vending and square dancing.

Table 2. The three types of activity spaces in the three case study areas.

		Social Activities	Board Game Activities	Street Vendor Sales Activities
The Wudadao area	Proportion	35.1%	21.7%	18.4%
	On-site photos			
The Anshandao area	Proportion	20.4%	27.3%	25.6%
	On-site photos			
The Liqizhaung area	Proportion	55.8%	11.3%	8.26%
	On-site photos			

Through Kernel Density Estimation (KDE), it was found that in the overall spatial distribution, although the everyday public spaces in the three regions are relatively evenly distributed, there is a significant difference between the open block area and the closed community area. The distribution of urban everyday public spaces is shown in Figure 3. The Wudadao and Anshandao areas contain historic blocks that preserve the dense road network pattern of small blocks. The city's everyday public spaces are mainly distributed in the regional centers, showing an overall feature of "even distribution in the center". In

contrast, the spatial distribution in the Liqizhuang district exhibits a characteristic "even distribution along the edge" pattern. While everyday public spaces are evenly distributed across each closed community, they tend to concentrate near surrounding urban arterial roads, with significant aggregation observed beneath two elevated bridges.

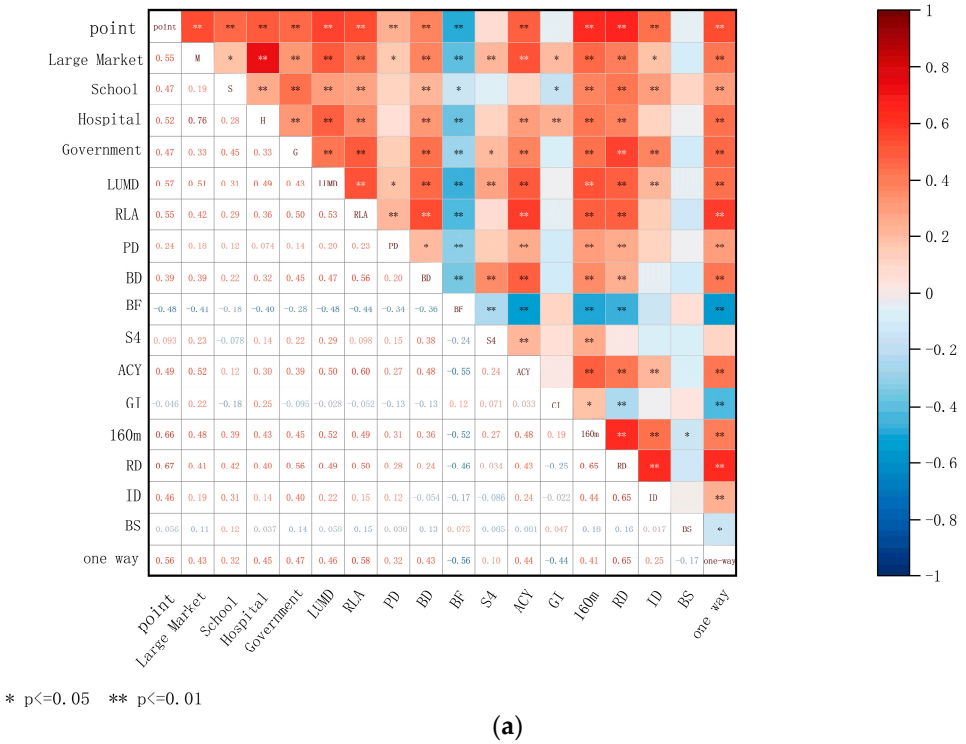


(**a**) (**b**) (**c**)

Figure 3. The distribution of urban everyday public spaces: (**a**) The Wudadao; (**b**) The Anshandao; (**c**) The Liqizhuang.

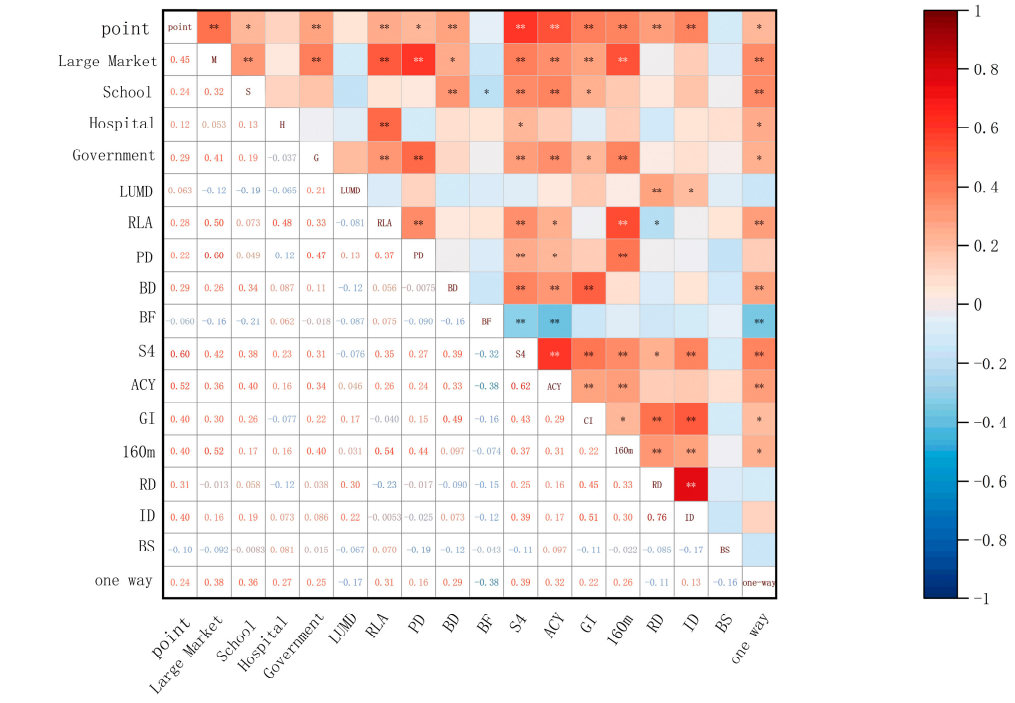
3.1.2. The Correlation Between Everyday Urban Public Spaces and the Built Environment of Cities

Based on the analysis of statistical data, there are significant differences in the correlations between everyday urban public spaces and the built environment among the three districts. The correlation heat maps of each district can be seen in Figure 4. Figure 4 contains three sub-figures that show the correlation heat maps for the three areas—the Wudadao, the Anshandao, and the Liqizhuang. In each heat map, the deeper the red hue, the stronger the positive correlation; conversely, the deeper the blue hue, the stronger the negative correlation, while lighter colors indicate weaker correlations.



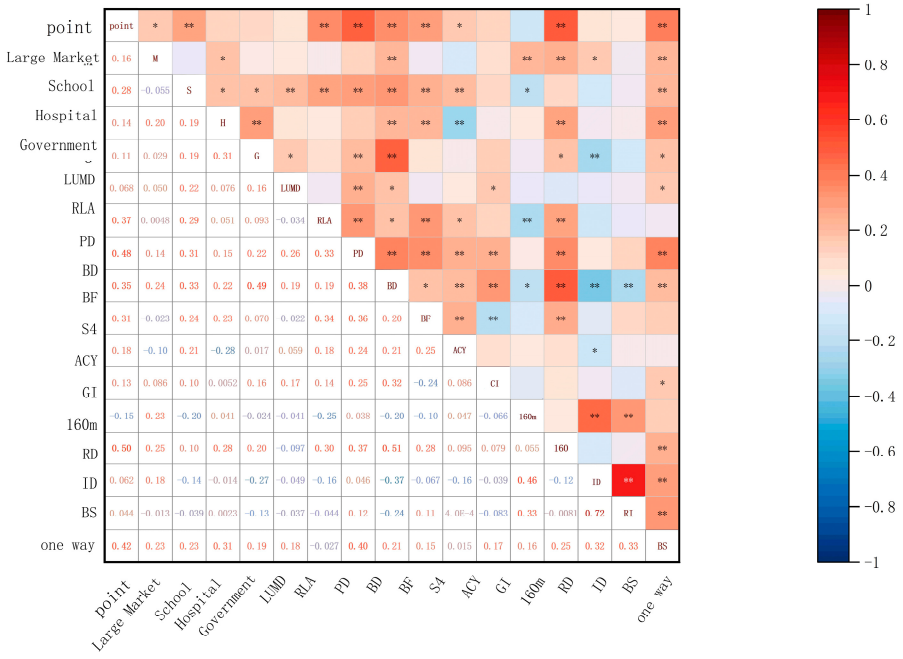
(**a**)

Figure 4. *Cont.*



* p<=0.05 ** p<=0.01

(**b**)



* p<=0.05 ** p<=0.01

(**c**)

Figure 4. Correlation heatmap: (**a**) the Wudadao; (**b**) the Anshandao; (**c**) the Liqizhuang.

As can be seen from Table 3, the number of significantly correlated elements decreases as the construction year of the district increases. However, there are also some common features.

Table 3. Spearman Correlation Analysis.

			The Wudadao (W) (N = 137)	The Anshandao (A) (N = 90)	The Liqizhuang (L) (N = 149)	Historical Districts (W + A) (N = 227)	Total (W + A + L) (N = 376)
Land use pattern	Distribution of large public buildings	Large market	0.554 **	0.446 **	0.164 *	0.447 **	0.262 **
		School	0.474 **	0.238 *	0.281 **	0.310 **	0.276 **
		Hospital	0.516 **	0.122	0.139	0.135 **	0.121 **
		Government institutions	0.465 **	0.287 **	0.114	0.401 **	0.307 **
	Land use mix degree		0.577 **	0.063	0.068	0.299 **	0.307 **
Residential indicators	Residential land area		0.548 **	0.278 **	0.372 **	0.429 **	0.258 **
	Permanent resident population density		0.242 **	0.221 **	0.481 **	−0.071	0.357 **
Urban design	Building density		0.388**	0.292 **	0.346 **	0.310**	0.498 **
	Average number of building floors		−0.481**	−0.060	0.307 **	−0.384 **	−0.218 **
	Morphological types	S4 (Hybrid)	0.093	0.602**	0.176 *	0.336 **	0.321 **
	Average construction year		0.490 **	0.524 **	0.129	0.642 **	0.562 **
Transportation system	Topological morphology indicator	Global integration degree	0.101	0.402 **	−0.148	0.175 **	−0.282**
		160 m integration degree	0.657 **	0.400 **	0.501 **	0.490 **	0.563 **
	Geometric form indicator	Road density	0.668 **	0.311 **	0.062	0.669 **	0.555 **
		Intersection density	0.459 **	0.395 **	0.044	0.324 **	0.244 **
	Traffic service level indicators	The influence of bus stops	−0.069	−0.104	0.416 **	−0.293 **	0.064
		One-way and two-way traffic regulations	0.558 **	0.238 *	0.000	0.118	0.415 *

Note: ** Correlation is significant at the 0.01 level (two-tailed). * Correlation is significant at the 0.05 level (two-tailed).

Within the dimension of land use patterns, large markets, schools, hospitals, and government institutions show varying degrees of positive correlation with the distribution of everyday urban public spaces. However, the correlation with markets is relatively high, indicating that visiting markets remains the most essential and necessary activity in people's everyday lives [56]. The overall degree of land use mix demonstrates a moderate positive correlation. However, the data shows significant discrepancies due to a certain number of land use designations in the Anshandao and Liqizhuang areas that do not match the actual conditions.

The residential indicator dimension exhibits an overall positive correlation, indicating that a higher proportion of residential land use and increased population density contribute to the vitality and utilization of everyday urban public spaces. The correlation coefficient of residential land use in the two historic district (the Wudadao and the Anshandao area) areas is greater than the density of permanent residents, while the situation in the Liqizhuang area is just the opposite. This indicates that there may be a certain number of population flows in the old urban area, and these people often contribute to the formation of everyday urban public spaces.

The urban design indicator dimension shows a positive correlation in overall building density, indicating that everyday urban public spaces are more likely to emerge in areas with higher building density. There is a significant difference in the correlation coefficient between the average number of building floors and the average construction year. Among them, due to the fact that residents living in buildings over five stories have difficulty interacting with the street space [57], the Liqizhuang area, with an average building height of seven stories, mainly benefits from the population dividend.

In terms of the transportation system dimension, the 160 m integration degree shows a significant positive correlation overall. The road network density and intersection density also exhibit similar positive correlations, indicating that everyday urban public spaces are more likely to be located in areas with higher local accessibility. These positive correlations are more pronounced in areas characterized by small blocks and dense road networks.

The regression results derived using the ordinary least squares method reveal that the predictive power of all regression models is moderate ($0.2 < adR^2 < 0.6$). This implies that the distribution of everyday urban public spaces is primarily shaped by urban construction elements, while also potentially influenced by additional factors such as demographic composition, income levels, urban furniture, and spatial management practices. The adR^2 value for the historic district is 0.454, while that of the Liqizhuang area is 0.319, indicating that the regression model for the historic district has significantly higher explanatory power than that for the urban fringe area. This suggests that the built environment elements in historic districts exert a more substantial influence on everyday public spaces. In terms of specific equation elements, the commonalities across the equations are limited. However, the overall model reveals that large markets, S4, 160 m integration degree, and road intersection density all exert influence, and their coefficients are quite similar. This once again proves that the everyday urban public space is formed under the joint influence of multiple dimensions of urban built elements. It is more likely to exist in the space adjacent to large markets, with complex and mixed spatial forms and high accessibility in small areas.

3.2. Analysis of Evaluation Model Results

The weight data of the user perspective model are presented in Table A2. Through the analysis of the structural equation model of user evaluations, it was found that spatial completeness has the highest direct effect on the quality of everyday urban public spaces. However, due to the mutual influence between spatial friendliness and spatial completeness, and their indirect influence on everyday urban public spaces through spatial inclusiveness and spatial plasticity, the total effect of spatial friendliness on the quality of everyday urban public spaces is the highest. This finding indicates that users' evaluations of everyday urban public spaces are based on relatively complex overall perceptions. Analysis of the third-level factors reveals that spatial friendliness and spatial completeness are primarily composed of concrete evaluation indicators, such as various facilities, landscapes, and functions. However, the third-level factors of spatial plasticity, inclusiveness, and comfort, which have lower weights, are relatively abstract, such as management participation, sense of belonging, and enclosure degree. It indicates that from the user perspective, tangible material elements that are perceptible in everyday urban public spaces exert a more significant influence on spatial quality, and these elements should be the focus of attention in the space design process. The weights of the third-level factors are generally relatively uniform, with more significant differences appearing in the degree of equal use of space and the degree of spatial usage restriction in spatial inclusiveness, which are relatively lower than the other three items. This suggests that in everyday urban public spaces, their quality is less affected by factors related to spatial control, and the overall

degree of freedom in space use is relatively high. Spontaneous use and management of space do not require excessive design. This is also reflected in the spatial completeness, where the weight of the flexible use of space is slightly higher.

The weight data of the designer perspective model are presented in Table A3. Analysis of designers' evaluation data reveals substantial variations in the weights of the third-level indicators across the dimensions of spatial inclusiveness, spatial completeness, and spatial friendliness. Specifically, the indicators of equal use of space and spatial usage restrictions exhibit significantly higher weights compared to spatial image coordination. The degree of completeness of service facilities demonstrates greater importance than the degree of pleasant temperature and humidity, and the disturbance caused by vehicle exhaust and noise outweighs the comfort of hard pavement. Furthermore, notable discrepancies appear among certain fourth-level indicators within the third-level categories of spatial usage restriction and the level of service of surrounding facilities. For instance, setting up access control measures carries higher weight than other factors, and "the roads are unobstructed and pedestrians and vehicles are separated" is prioritized over periphery functional configuration and demand adaptation. These findings suggest that designers perceive elements such as spatial management and service facilities as having a greater impact on the quality of everyday urban public spaces, while sensory-related factors are regarded as less impactful. Among the various factors involving sensations, the designers consider auditory and visual elements to be more important for the quality of the space, while paying relatively less attention to touch and smell.

The comparison and correction results of the weights between the designer and user perspective models are presented in Table 4. Comparative analysis of the third-level factor weights in the evaluation models of users and designers reveals that most differences are minimal, with only five differences exceeding 0.1. At the level of spatial inclusiveness, the weight distribution shows the greatest disparity between the two groups. Designers are concerned about whether the space is used equally and whether its use is restricted, while users are more concerned about the degree of spatial image coordination and the degree of spatial activity derivation. This suggests that users do not explicitly recognize the publicness-related indicators that designers consider critical for everyday urban public spaces. Instead, users tend to address issues of spatial inequality and restrictions through spontaneous use and informal modifications. Regarding spatial completeness, designers emphasize the completeness of service facilities, while users show greater concern for spatial flexibility. In terms of spatial friendliness, although the weights of vehicle exhaust and noise disturbance are significantly different between the two groups, these factors remain the most influential within their category for both. Overall, the distribution of weights assigned to the third-level factors by designers is less uniform than that of users, reflecting a more explicit inclination. Designers place greater emphasis on elements that can be directly shaped through design intervention, such as the completeness of service facilities. Finally, after revising the model weights for both, we randomly selected one space from each set of three districts for validation; the validation error was within 10%, demonstrating that a balance had been achieved between the two.

Table 4. Revised Results of Weight Comparison.

Second-Level Factors	Third-Level Factors	Weight of Space Users	Weight of Space Designers	Difference	Corrected Coefficient
A Spatial comfort	Degree of spatial enclosure	0.34	0.33	0.01	0.34
	Spatial visual perception	0.34	0.34	0	0.34
	The size of the spatial scale	0.32	0.33	0.01	0.32

Table 4. *Cont.*

Second-Level Factors	Third-Level Factors	Weight of Space Users	Weight of Space Designers	Difference	Corrected Coefficient
B Spatial inclusiveness	Sense of spatial belonging	0.21	0.18	0.03	0.21
	Degree of equal use of space	0.17	0.32	0.15	0.25
	Degree of limited space usage	0.18	0.26	0.08	0.18
	Degree of spatial image coordination	0.22	0.10	0.12	0.16
	Degree of space activity derivation	0.22	0.14	0.08	0.20
C Spatial plasticity	Participation in space transformation and management	0.25	0.25	0	0.25
	The completeness of rest and entertainment facilities	0.26	0.25	0.01	0.26
	Degree of mobility and variability of facilities	0.24	0.25	0.01	0.24
	Degree of spatial object sharing	0.25	0.25	0	0.25
D Spatial completeness	Degree of regular maintenance of the space	0.17	0.17	0	0.17
	Degree of completeness of service facilities	0.17	0.31	0.14	0.24
	Degree of completeness of lighting facilities	0.15	0.17	0.02	0.15
	Degree of pleasant temperature and humidity	0.16	0.09	0.07	0.13
	The aesthetic degree of landscape planting	0.17	0.17	0	0.17
	The flexibility of space utilization	0.18	0.09	0.09	0.14
E Spatial friendliness	Degree of completeness of sunshade and rain shelter facilities	0.25	0.23	0.02	0.25
	Degree of interference from vehicle exhaust and noise	0.27	0.42	0.15	0.34
	Degree of comfort of hard pavement	0.26	0.12	0.14	0.19
	The service level of the surrounding facilities	0.22	0.23	0.01	0.22

4. Discussions

4.1. Findings

Research findings indicate the following:

1. Board game activities, street vendor sales, and social activities constitute the three primary categories of activities observed in everyday urban public spaces. The distribution emphasis of these three activity types also varies across the three districts. Notable differences exist between districts dominated by open-block layouts and those characterized by closed communities. Closed communities are often surrounded by high-grade arterial roads, which restrict spatial accessibility and reachability and also lower safety levels [58,59]. In contrast, the characteristic dense micro-street network of open blocks provides higher network permeability and connectivity, thereby offering superior accessibility, reachability, and safety, which is more conducive to the formation of everyday public spaces [60,61]. The Wudadao and the Anshandao districts generally exhibit an "even distribution in the center" pattern, whereas the areas surrounding Liqizhuang primarily display even distribution within individual closed communities, reflecting an "even distribution along the edge" characteristic.

2. While there are common patterns in the correlations between everyday public spaces in urban areas and built environment elements across cities, notable variations also exist. Specifically, large markets, schools, hospitals, and government institutions exert positive influences on everyday urban public spaces. Because markets often serve as venues for residents' leisure and consumption activities [62], they have the most pronounced impact. This is due to differences in the accessibility of public transportation—such as buses and subways—between regions, which in turn leads to varying levels of vitality across those areas [63]. Therefore, the impact of road network density, bus stop density, and intersection density on everyday urban public spaces varies significantly across different districts. Historic districts have existed for a long time, featuring high building density and narrow spacing [64] and the overcrowded residential conditions of the old buildings cause everyday

life to spill out beyond the structures [65]. Thus, most elements in historic districts exhibit a higher degree of correlation compared to those in non-historic districts, suggesting that everyday public spaces are more likely to emerge in historic districts.

3. For users, relatively concrete evaluation factors—such as the presence of various facilities—carry greater weight than more abstract factors like the degree of enclosure, and users generally exhibit a preference for relatively open and flexible spaces. For designers, factors with a substantial influence on spatial quality hold greater importance than those pertaining to specific sensory experiences, and their assessment of space reflects an explicit inclination toward elements that can be directly shaped through design interventions. The emergence of such outcomes may stem from a divergence in focus between designers and users: professionals tend to prioritize normative considerations, whereas the public is more concerned with emotional experience [66]. Designers place greater emphasis on management, while users adopt a comparatively more informal approach [67,68].

The findings of this study are broadly consistent with the conclusions of existing literature, namely, that the built environment exerts markedly different influences on human activities across spatial scales. Specifically, prior research has largely focused on inter-city comparisons or on assessing the overall spatial vitality of entire cities [69–71]. Building on this, we refined our analytical lens to the intra-city level, selecting three districts within Tianjin for the investigation of everyday public spaces. Moreover, in the body of literature concerning dual-perspective evaluation frameworks, there is consensus regarding the cognitive gap between users and designers [72]; while other studies have reported that the needs of older users are often unmet, our results indicate that the everyday needs of ordinary residents are likewise frequently overlooked. In our study, the final model validation yielded an error of no more than 10%. The error was not reduced further because, during comparison and adjustment, we assumed an inherent margin of error and only corrected weight coefficients with relatively large deviations (greater than 0.1). The primary reason for this limitation remains the insufficient sample size.

4.2. Strategies

Through the correlation analysis of everyday urban public spaces and built environment elements, we found that certain environmental elements can significantly influence the formation of everyday public spaces, particularly in historic districts. In the evaluation results analysis, we also identified substantial discrepancies between users and designers in certain aspects. In response to the above findings, Figure 5 illustrates the process of strategy formulation, and we have summarized and analyzed it as follows:

1. Planning Dimension: Correlation and regression analyses reveal significant associations between everyday urban public spaces and built environment elements. Regulating urban elements at the planning level can effectively manage the everyday public spaces in cities. It is advisable to specifically regulate key elements such as the layout of residential land, large markets, road network density, and public transportation stations to optimize the configuration of the built environment. Meanwhile, the research has found that the correlations between the distribution of everyday public spaces in different urban areas and the elements of the built environment vary significantly. Therefore, in the process of urban renewal, differentiated spatial intervention strategies should be adopted, focusing on the elements with high correlations for urban renewal.

2. Historic dimension: According to the correlation and regression analysis results, the influence of urban built elements on everyday public spaces is more pronounced in historic districts compared to the Liqizhuang area. This suggests that everyday public spaces are more likely to develop within historic districts. The presence of such spaces contributes significantly to the vibrant and distinctive character of these areas. Therefore, during the

renovation and transformation of historic districts, everyday urban public spaces should be given particular emphasis to serve as key focal points of the renewal process.

3. Management Dimension: The evaluation model analysis reveals that users perceive everyday urban public spaces as having an inherent management logic, leading to significantly higher expectations for spatial flexibility compared to designers. The core objective of space management is to address human needs, and, as primary users, residents' experiences and demands should serve as a foundational basis for management decision-making. Therefore, during the urban renewal process, it is advisable to delegate certain decision-making powers to residents in order to foster public participation, thereby better aligning spatial management with actual user requirements.

4. Spatial dimension: The evaluation model analysis demonstrates that both users and designers agree that clearly identifiable and perceptible elements—such as the completeness of facilities and the service quality of surrounding functions—play a critical role in determining the overall quality of everyday urban public spaces. These aspects warrant particular attention during the spatial design process. Additionally, the plasticity of space and its functional flexibility are also recognized as influential factors. Therefore, incorporating design strategies such as elastic boundaries is recommended to enhance spatial adaptability and ultimately improve space quality.

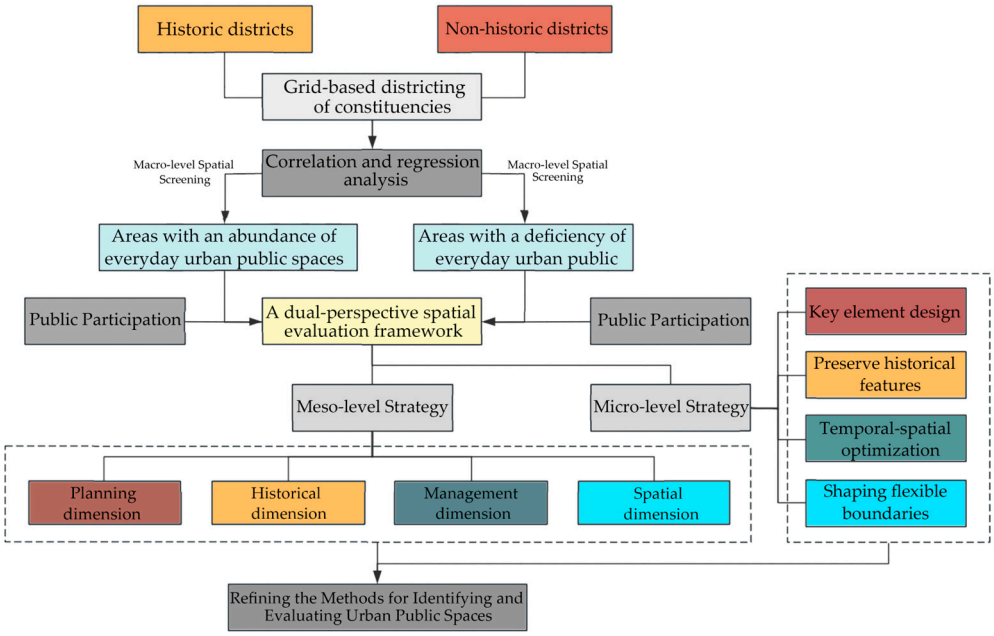


Figure 5. Flowchart for deriving strategies.

4.3. Limitations and Future Research Directions

Our study quantifies urban built-environment elements, thereby enabling the measurement of complex everyday public spaces. This advances the methodology for identifying such spaces and substantially enriches the existing literature on everyday public spaces. In addition, the evaluation model we constructed based on structural equation modeling effectively meets the assessment needs for everyday public spaces. Nevertheless, the approach has several limitations. First, during data collection, measurement errors, respondents' subjective biases, and insufficient sample size may arise. These issues constrain the comprehensiveness of the findings, limiting the research to three districts of Tianjin and reducing its broader applicability. Second, although we have integrated user and designer evaluations to make spatial assessment more convenient and accurate, the fusion of the user and designer models within the evaluation framework remains relatively rigid; this

may lead to larger evaluation errors when the model is applied to other regions. Alternative approaches could better capture the interaction between these two perspectives. Finally, although we have drawn some conclusions and conducted relevant discussions based on correlation analysis and evaluation results, the strategies could be further enriched by incorporating more practical considerations, thereby enabling the development of more targeted approaches.

In future research we will broaden the scope of the study and explore new approaches such as big-data analytics and machine-learning techniques to further refine our work. By increasing the sample size or employing other strategies to minimize evaluation errors, we aim to enhance the completeness and reliability of our findings.

5. Conclusions

Based on the findings of this study, the distribution of everyday public spaces in cities is shaped by regional differences, with factors such as large markets, residential floor area, population density, and a 160 m integration index showing particularly strong correlations. In terms of evaluation, designers and users exhibit certain cognitive differences that lead them to prioritize different aspects: users tend to focus on concrete elements such as the completeness of various facilities, whereas designers concentrate on elements that can be directly intervened through design.

In the final stage of our research, we established a comprehensive workflow—grounded in the built elements of the city—to locate, evaluate, and analyze everyday public spaces. This approach resolves the long-standing criticism that everyday urbanism neglects decision-makers, turning previously uncontrollable everyday public spaces into manageable ones. Consequently, the method provides a solid foundation for targeted urban renewal, facilitates policy implementation, and advances the modernization of urban development.

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Institutional Review Board Statement: The study only involves a minimal-risk, general questionnaire survey. It does not involve any experimental procedures, sensitive personal information, or interventions with participants. Therefore, ethical approval from an Institutional Review Board was not required for this research.

Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

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Abbreviations

The following abbreviations are used in this manuscript:

LUMD	Land Use Mix Degree
RLA	Residential Land Area
PD	Population Density
BD	Building Density
BF	Building Floors
ACY	Average Construction Year
GI	Global Integration
RD	Road Density
ID	Intersection Density
BS	Bus Stops

Appendix A

Table A1. Space Usage Evaluation Survey Form.

I. Personal characteristics of the respondent

1. Your gender ( )
   A. Male B. Female

2. Your age is ( )
   A. 10–20 years old B. 21–30 years old C. 31–50 years old D. 51–60 years old E. 61 years old or above

3. Your occupation is ()
   A. Student B. Professional (teacher, doctor, finance, law, art, etc.) C. Government personnel D. Freelancer E. Retired person F. Other

4. Your mode of transportation here
   A. Walking B. Bicycle C. Bus D. Private car E. Taxi

5. The time it takes for you to get here
   A. 5–10 min B. 10–15 min C. 15–20 min D. Over 20 min

6. The number of times you come here
   A. Daily B. Weekly C. Monthly D. Annual

II. Please select your true feelings about the city's everyday public spaces in the rating criteria in the table below, and mark √ in the serial number column.

spatial attribute	Rating level				
	5 points	4 points	3 points	2 points	1 point
The degree of spatial enclosure	open□	relatively open□	generally open□	less open□	not open□
The spatial visual perception	transparent□	relatively transparent□	generally transparent□	relatively opaque□	opaque□
Space scale	spacious□	relatively spacious□	generally spacious□	less spacious□	not spacious□
Flexible use of space	flexible□	relatively flexible□	generally flexible□	less flexible□	not flexible□
The service level of peripheral functions	convenient□	relatively convenient□	generally convenient□	relatively inconvenient□	inconvenient□
manage property	Rating level				
	5points	4points	3points	2points	1point
The sense of belonging in the space	good□	moderate□	slightly□	lacking□	No□
Equal use of space	equality□	relatively equal□	general equality□	relatively unequal□	unequal□
The degree of restricted space usage	not limited□	relatively unrestricted□	generally restricted□	relatively restricted□	restricted□
Participation level in space renovation and management	Have a sense of participation□	More sense of participation□	Average sense of participation□	Less sense of participation□	No sense of participation□
Regular maintenance level of space	Regular maintenance□	Moderate maintenance□	Sometimes maintenance□	Very little maintenance□	No maintenance□

Table A1. *Cont.*

Facility supply attributes	Rating level				
	5points	4points	3points	2points	1point
Degree of completeness of service facilities	Very complete□	relatively complete□	generally complete□	relatively incomplete□	incomplete□
The completeness of rest and entertainment facilities	Very complete□	relatively complete□	generally complete□	relatively incomplete□	incomplete□
Complete sun and rain protection facilities	Very complete□	relatively complete□	generally complete□	relatively incomplete□	incomplete□
Practical level of lighting facilities	Practical□	More practical□	Generally practical□	Less practical□	Not practical□
Facilities are movable or variable	Mobile□	Most of them are movable□	Some are movable□	Very rarely movable□	Non movable□
Environmental condition attributes	Rating level				
	5points	4points	3points	2points	1point
The degree of pleasant temperature and humidity	Pleasant□	relatively pleasant□	generally pleasant□	less suitable for people□	not suitable for people□
Automobile exhaust and noise interference	Non interference□	Less interference□	General interference□	Less interference□	Interference□
Aesthetic level of landscape planting	Beautiful□	relatively beautiful□	generally beautiful□	less beautiful□	not beautiful□
Hard pavement comfor	Comfortable□	relatively comfortable□	generally comfortable□	relatively uncomfortable□	uncomfortable□
Social and humanistic attributes	Rating level				
	5points	4points	3points	2points	1point
The degree of sharing of spatial objects	Can□	sometimes□	occasionally□	basically not□	not□
Coordination degree of spatial image	Coordination□	relatively coordinated□	generally coordinated□	relatively uncoordinated□	uncoordinated□
Degree of derivation from spatial activities	Can□	sometimes□	occasionally□	basically not□	not□

Appendix B

Table A2. The result of normalizing the user model weights.

Second-Level Factors	Weight	Third-Level Factors	Weight
Spatial comfort	0.14	Degree of spatial enclosure	0.34
		Spatial visual perception	0.34
		The size of the spatial scale	0.32
Spatial inclusiveness	0.15	Sense of spatial belonging	0.21
		Degree of equal use of space	0.17
		Degree of spatial usage restriction	0.18
		Degree of spatial image coordination	0.22
		Degree of space activity derivation	0.22
Spatial plasticity	0.13	Degree of participation in space transformation and management	0.25
		Degree of completeness of rest and entertainment facilities	0.26
		Degree of mobility and variability of facilities	0.24
		Degree of spatial object sharing	0.25

Table A2. *Cont.*

Second-Level Factors	Weight	Third-Level Factors	Weight
Spatial completeness	0.25	Degree of regular maintenance of the space	0.17
		Degree of completeness of service facilities	0.17
		Degree of completeness of lighting facilities	0.15
		Degree of pleasant temperature and humidity	0.16
		Degree of the aesthetic level of landscape planting	0.17
		The flexibility of space utilization	0.18
Spatial friendliness	0.33	Degree of completeness of sunshade and rain shelter facilities	0.25
		Degree of disturbance caused by vehicle exhaust and noise	0.27
		Degree of comfort of hard pavement	0.26
		The level of service of the surrounding facilities	0.22

Table A3. The result of normalizing the designer model weights.

Second-Level Factors	Third-Level Factors and Their Weights	Fourth-Level Factors	Weight
Spatial comfort	Degree of spatial enclosure 0.33	Open space	0.667
		Soft connection of spatial boundaries	0.333
	Spatial visual perception 0.34	The space is connected to the street	0.684
		The activities taking place at a venue are witnessed by others	0.316
	The size of the spatial scale 0.33	The high width ratio of the space can accommodate various activities	1.000
Spatial inclusiveness	Sense of spatial belonging 0.18	Space belongs to the people	1.000
	Degree of equal use of space 0.32	The subjects using it are extensive and equal	0.509
		The popularization of space consumption	0.491
	Degree of spatial usage restriction 0.26	Clearly stipulate space consumption	0.257
		Set up access control, surveillance, and security personnel	0.429
		Limit the usage time	0.088
		Lack of transparency in information disclosure	0.226
	Degree of spatial image coordination 0.10	Degree of integration with spatial functions and the environment	0.665
		Retain the texture and layout of the original space	0.335
	Degree of space activity derivation 0.14	The atmosphere of people's interaction is very familiar and comfortable	1.000
Spatial plasticity	Degree of participation in space transformation and management 0.25	Human-made alterations in space	1.000
	Degree of completeness of rest and entertainment facilities 0.25	Sufficient variety and quantity of seats and recreational facilities	0.332
		The utilization rate of seats and recreational facilities is high	0.668
	Degree of mobility and variability of facilities 0.25	Recreational and entertainment facilities are movable	0.572
		There are temporary street vendors	0.428
	Degree of spatial object sharing 0.25	Placement of personal furniture or second-hand items	1.000

Table A3. *Cont.*

Second-Level Factors	Third-Level Factors and Their Weights	Fourth-Level Factors	Weight
Spatial completeness	Degree of regular maintenance of the space 0.17	Environmental cleanliness	0.250
		Greening pruning	0.499
		Facility maintenance	0.251
	Degree of completeness of service facilities 0.31	Sufficient types and quantities of trash cans, toilets, lighting, and barrier-free facilities are available	1.000
	Degree of completeness of lighting facilities 0.17	The location and quantity of lighting facilities are reasonable	0.665
		Illumination facilities are practical at night	0.335
	Degree of pleasant temperature and humidity 0.09	Climate, sunlight, temperature, wind speed, and comfort level	1.000
	Degree of the aesthetic level of landscape planting 0.17	The seasonal changes of plants are rich and diverse	0.749
		Planting makes it convenient to approach and appreciate plants	0.251
	The flexibility of space utilization 0.09	The space transforms into different functions at different times	0.334
		Temporary construction and renovation activities in space	0.666
Spatial friendliness	Degree of completeness of sunshade and rain shelter facilities 0.23	Sufficient variety of sunshade and rain shelter facilities	1.000
	Degree of disturbance caused by vehicle exhaust and noise 0.42	Noise from motor vehicles	0.354
		Interference between different activities	0.646
	Degree of comfort of hard pavement 0.12	The ground is paved and level	1.000
	The level of service of the surrounding facilities 0.23	The roads are unobstructed and pedestrians and vehicles are separated	0.111
		Periphery functional configuration and demand adaptation	0.889

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