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Recognition of Street Landscape Patterns in Kunming City Based on Intelligent Decision Algorithm and Regional Cultural Expression

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Abstract: The integration of intelligent decision-making algorithms with urban cultural expression is becoming a hot topic in both academic and practical fields for exploring urban street landscapes. Exploring the application strategies of intelligent decision-making algorithms and regional cultural expression in street landscape pattern recognition and innovative design is a key step. The single layout of urban street construction, cultural deficiency, ecological imbalance, and low resident participation seriously constrain the overall quality improvement of the city. To address this dilemma, this study delved into Kunming City and selected the ten "most beautiful streets", such as Dianchi Road, for research. By using the Analytic Hierarchy Process, a comprehensive evaluation system covering multiple dimensions, such as the street layout, plant landscape, and historical culture, was constructed to analyze the street landscape of Kunming. The research results indicate that the top four roads in terms of weight evaluation scores are Cuihu Ring Road, Jiaochang Middle Road, Qingnian Road, and Beijing Road, with values of 0.2076, 0.1531, 0.1274, and 0.1173. The weight reveals that each street has its unique landscape factors, such as the profound cultural heritage of Cuihu Ring Road and the beautiful plant landscape of Jiaochang Middle Road. Further analysis also reveals the close relationship between various factors in the evaluation model, emphasizing the importance of supplementing material and cultural elements in street landscape design. The significance of this study goes beyond a single analysis of the street landscape in Kunming City. Drawing a regional street landscape pattern map sets an example for other cities to build distinctive, eco-friendly, culturally rich, and highly humanized street spaces, providing reference and inspiration. More importantly, this study promotes the application and development of intelligent decision-making algorithms in the field of urban landscapes. Future research will further optimize algorithms to improve their adaptability and accuracy in complex environments.

Keywords: intelligent algorithm; visual mode; landscape pattern recognition; regional cultural expression; multidimensional landscape; pattern recognition

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1. Introduction

The application of computational intelligence in urban planning and management is revolutionizing the design of urban landscapes with unprecedented strength [1–3]. Given the complex factors affecting the urban street landscape and the multitude of design variables, traditional design methods are difficult to achieve optimized design from a

quantitative perspective [4–6]. Therefore, combining computational intelligence with urban landscape design has become an innovative solution, opening up new paths for the optimization design of urban street landscapes. As the backbone and lifeline of urban spatial structure, urban streets are not only the main channels of urban traffic flow but also important carriers of urban images and culture. They carry the daily travel, commercial activities, and cultural exchanges of residents and are an indispensable part of urban life. They are also the inheritors of culture and the emotional sustenance of residents. With the acceleration of urbanization, the spatial landscape of urban streets has become a key indicator for measuring the quality and charm of cities. The landscape design and functional layout of streets are receiving increasing attention, and their design and management are of great significance for improving urban quality and promoting sustainable development [7–10].

However, in the process of constructing street landscapes in Kunming, despite some achievements, there are still a series of complex and multidimensional challenges. Firstly, with the rapid expansion and excessive commercialization of cities, the layout of street spaces often appears unreasonable, leading to increasingly serious problems such as traffic congestion and environmental degradation. In addition, there is a serious phenomenon of homogenization in street landscapes, lacking unique cultural charm and a sense of identity. This trend not only weakens the function of streets as windows for showcasing urban culture but also limits the expression of urban characteristics [11–13]. At present, although there are some studies on urban street landscapes, an evaluation system for the most beautiful street landscapes in Kunming has not been established, especially lacking in-depth research based on intelligent decision-making algorithms and regional cultural expression [14–17]. Therefore, this study aims to address this issue and provide a scientific basis for optimizing and enhancing the street landscape in Kunming City.

On the other hand, some current street designs neglect the inheritance of regional culture, the satisfaction of residents' needs, and the importance of ecological environments and humanistic care in landscape design [18–22]. This design method leads to a single function of street space, lacking vitality and characteristics, making it difficult to meet residents' expectations for a high-quality living environment and also restricting the comprehensive development of urban functions and the overall image improvement [23–25]. This study introduces intelligent decision-making algorithms and combines regional cultural expression to construct an evaluation system for the street landscape of Kunming City. This system not only considers the overall layout of the street, plant landscape features, and historical and cultural heritage but also focuses on key elements such as resident participation and identity, pedestrian friendliness, and accessibility. Through this evaluation system, we aim to find a balance point in the construction of urban streets, provide guidance for creating street spaces that are both characteristic of the times and rich in cultural heritage, meet transportation needs and residents' spiritual needs, and contribute to the sustainable development of the city.

The core focus of this study is to construct a "regional street spatial landscape model". Through in-depth exploration and analysis of several representative areas in Kunming City that have been rated as "the most beautiful streets", the aim is to reveal the regional characteristics, construction paradigms, and comprehensive benefits of these streets in terms of garden plant landscape. We have innovatively introduced an intelligent decision evaluation system that comprehensively and meticulously evaluates the landscape performance of these streets, taking into account key factors such as the overall layout of the streets, the uniqueness of the plant landscape, the integration of historical and cultural elements, resident participation and identity recognition, and pedestrian convenience and accessibility. Through precise quantitative analysis, we determined the impact weights of each landscape element on the overall landscape quality of the street, extracted key strategies for optimizing the street landscape, and established corresponding regional street landscape models. This series of research results aims to provide strong theoretical support and practical examples for street greening design and landscape design in Kunming and

other cities, promote the continuous optimization of urban street landscape, and assist the sustainable development process of the city.

Specifically, this study selected ten representative streets, such as Dianchi Road and Harmony Road, as research objects and conducted an in-depth analysis of the garden plant landscape of Kunming's "most beautiful streets". Revealing its regional characteristics, construction models, and comprehensive benefits can help enrich and improve the theoretical system of urban landscape design. As an important carrier of urban culture, street landscape design not only focuses on aesthetics and functionality but also carries the mission of cultural inheritance. By excavating and analyzing the historical and cultural elements in the landscape of Kunming streets, it is helpful to inherit and promote local culture and enhance residents' cultural identity and sense of belonging. Simultaneously shaping and strengthening Kunming's urban image and brand, enhancing its tourism appeal, promoting economic development and commercial prosperity. By quantitatively analyzing the influence weights of various landscape factors, the key factors affecting the quality of street landscapes are determined from the perspective of regional landscapes. Simultaneously drawing regional street landscape profiles to provide a scientific basis and practical guidance for street greening and landscape design in cities such as Kunming. More importantly, this study promotes the application and development of intelligent decision-making algorithms in the field of urban landscape. In the following chapters, we will provide a detailed introduction to the materials and methods used in this study, including the research object and current situation, selection of evaluation methods, construction of evaluation factors and models, and determination of indicator weights. Through empirical analysis and discussion, we will demonstrate the application effectiveness of the evaluation model and propose corresponding improvement suggestions. Finally, we will summarize the main conclusions of this study and look forward to future research directions.

2. Research Objects and Methods

The purpose of this research is to conduct an in-depth analysis of the spatial landscape patterns of streets in Kunming and to draw on the successful experience of building the most beautiful streets, providing a theoretical basis and practical guidance for the continuous optimization of urban street landscapes. The research framework is shown in Figure 1.

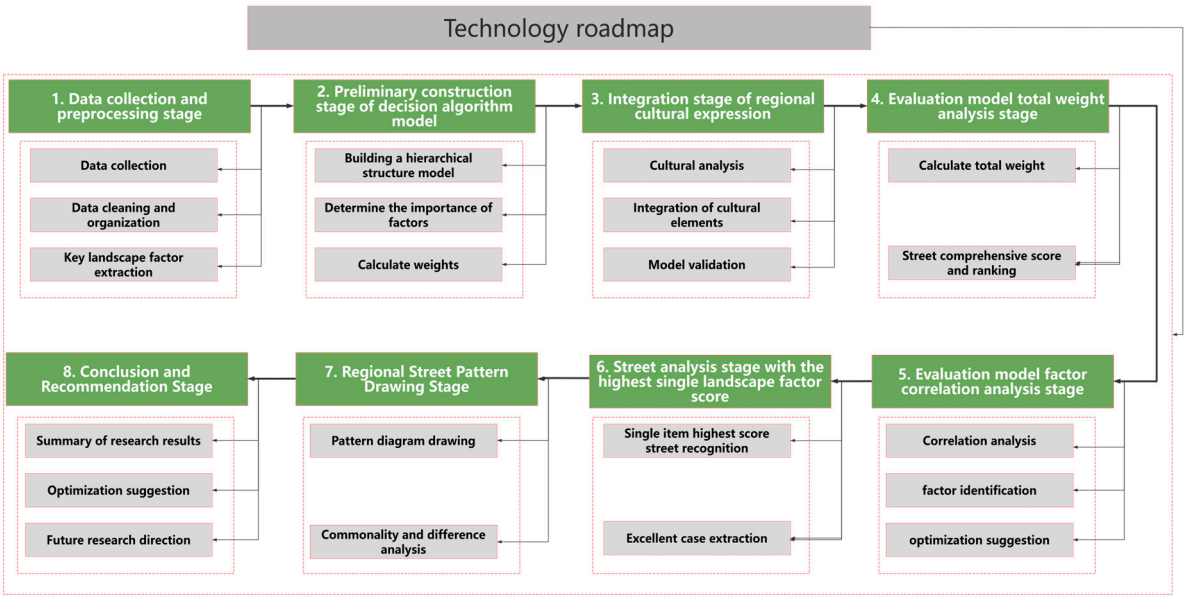

Figure 1. Research framework.

In this study, landscape-related data of the 10 most beautiful streets selected by Kunming City were collected, and factors that have a significant impact on the street

landscape pattern were extracted, such as the street section shape and building facade style. According to the purpose of this study, a hierarchical structure model is constructed, including the target layer, criterion layer, and factor layer. The weights of each factor are calculated based on their importance, forming a complete evaluation model. This implies integrating cultural elements into the evaluation model and conducting an in-depth analysis of the cultural background, historical heritage, and regional characteristics of each street. Afterward, we calculated the total weight of each criterion layer and factor layer, obtained the comprehensive score of each street based on the evaluation model, and ranked them. Next, we identified the key factors that have a significant impact on the street landscape pattern, analyzed their interrelationships, and identified the streets with the highest scores for each factor, analyzing their landscape characteristics and causes. Finally, based on the evaluation results, we drew a regional street landscape pattern map of Kunming City to showcase the street landscape characteristics of different regions. In addition, we summarized the research process, main findings, and conclusions and proposed specific suggestions for optimizing the landscape pattern of streets in Kunming, including the integration of cultural elements and the adjustment of landscape factors.

2.1. Research Object and Current Status

The selection of beautiful streets in Kunming has been carried out for many years since 2015, forming a long-term mechanism. The channels for the selection activity include paper ballots, online ballots, and on-site ballots. Among them, the 2016 activity received a total of 1,816,061 votes, and the selection activity covered the widest range. Subsequently, in 2021, taking the opportunity of the 15th Global Biodiversity Conference, the "China Kunming Stereoscopic Flower Bed Competition and Kunming City 2021 Beautiful Streets and Alleys" selection activity was launched. This selection activity has the greatest influence, is the most representative, and can best represent the highest level of street landscape construction in Kunming at present. Therefore, the ten beautiful streets selected in this selection are chosen as the research objects. This study selected ten representative streets in Kunming as research objects. These streets are not only an important part of the urban network but also a window to showcase the landscape of Kunming's regional gardens and plants. They are Dianchi Road, Harmony Road, Hongta East Road, Jiaochang Middle Road, Cuihu Ring Road, Rixin Middle Road, Qingnian Road, Beijing Road, Caiyun North Road, and Dongfeng East Road, as shown in Figure 2.

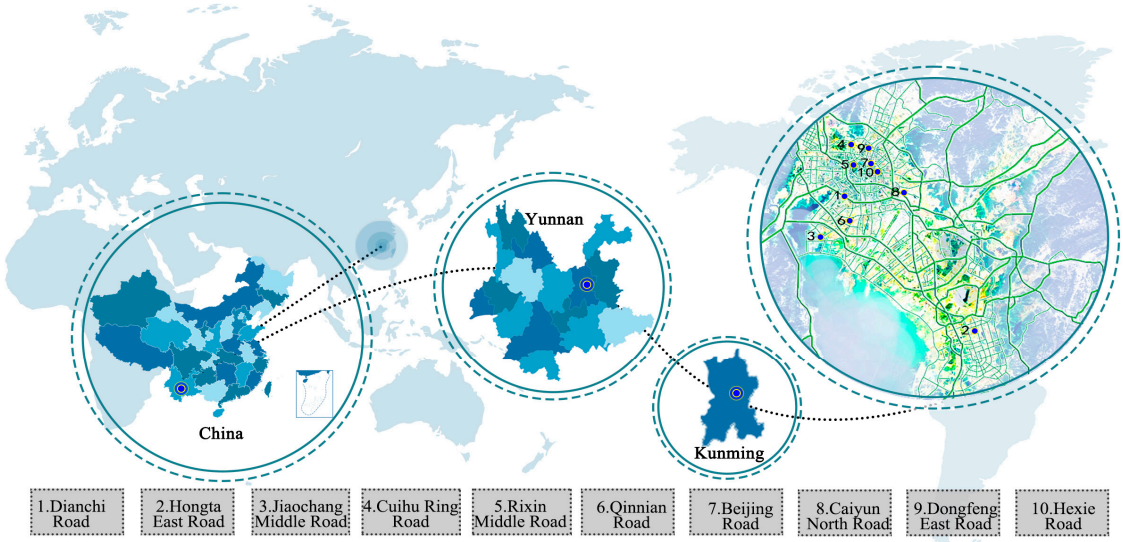

Figure 2. Display the position of the research object in different gradually enlarging forms.

These streets have been repeatedly rated as the "most beautiful streets" in Kunming City due to their unique landscapes, excellent greening effects, and profound cultural

heritage. This study selected the most typical road sections of the street for research, as shown in Figure 3, which is a satellite map and street view photo of the street.

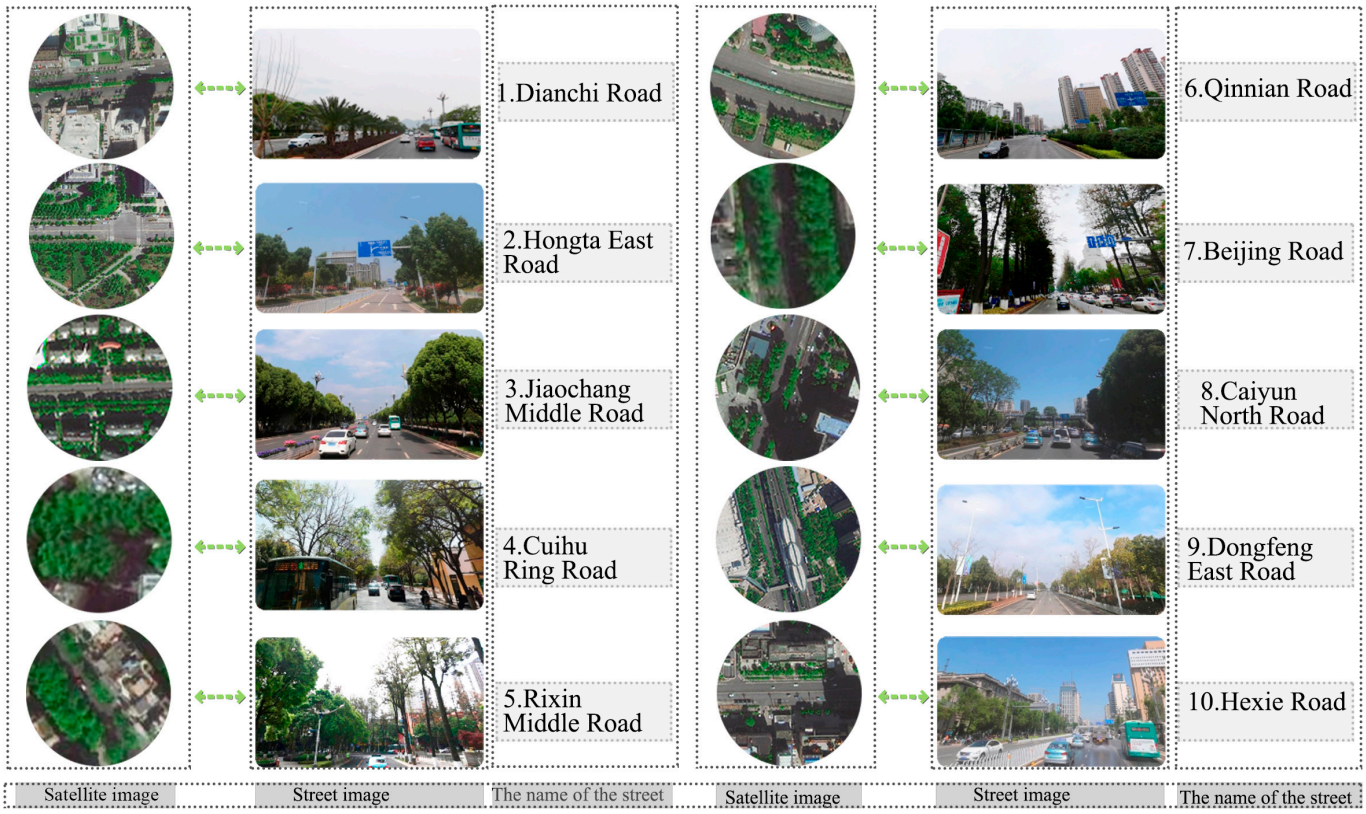

Figure 3. Satellite images and street views of the research object.

Dianchi Road is wide, with smooth and efficient traffic. The green belts on both sides of the road have a rich hierarchical structure. Hexie Road is located in the Chenggong District and is a newly planned road with a spacious, bright, and friendly atmosphere. Hongta East Road cleverly blends ethnic elements with modern aesthetics, featuring a red bus stop and unique streetlight design that exudes a strong regional style. Jiaochang Middle Road is famous for its spectacular jacaranda landscape, with jacaranda patterns on the walls and stone slabs engraved with them, creating a strong urban retro atmosphere. The Cuihu Ring Road surrounds Cuihu and is a great place for Kunming people to relax and exercise. The newly built Cuihu Slow Track not only integrates Kunming's major events and Cuihu elements but also showcases the rich historical and cultural heritage of this area.

Rixin Middle Road, an important urban artery in Kunming, has a flat and clean road surface with complete facilities. Qingnian Road is not only a north-south main road in Kunming but also lined with shops, pedestrians, and vehicles and has excellent lighting design. Beijing Road, as the central axis of Kunming's city, runs through the core areas of major CBDs, providing citizens with a new urban cultural center that integrates shopping, leisure, dining, and cultural entertainment. Caiyun North Road, a green landscape axis connecting the main city of Kunming and the Chenggong New District, is highly praised for its spacious roads and rich green landscapes. Dongfeng East Road, as an important east–west axis in Kunming, has a strong commercial atmosphere. Iconic buildings such as Tuodong Sports Center and Kunming Hotel have added infinite charm to this street. In addition, plant landscape, as an important element for showcasing the regional characteristics of modern streets, is a key part of the current research.

The main plants used on Dianchi Road are *Phoenix canariensis*, *Celtis tetrandra*, *Camphora officinarum*, *Loropetalum chinense* var. *Rubrum*, *Papaver rhoeas*, and *Euryops pectinatus*. The

main types of plants include trees, shrubs, and ground cover. The main plants used on Hongta East Road are *Camphora officinarum, Rosa chinensis, Fatsia japonica, Euryops pectinatus*, and *Begonia cucullata.* The main types of plants include trees, shrubs, and ground cover. The main plants used on Jiaochang Middle Road are *Jacaranda mimosifolia.* The plant types are mainly trees. The main plants used on Cuihui Road *Grevillea robusta*, *Camphora glandulifera*, *Salix babylonica*, and *Begonia cucullata.* The main types of plants include trees, shrubs, and ground cover. The main plants used on Rixin Middle Road are *Camphora officinarum*, *Celtis tetrandra*, and *Heptapleurum heptaphyllum.* The main types of plants include trees, shrubs, and ground cover. The main plants used on Qinnian Road are *Grevillea robusta* and *Platanus acerifolia.* The main types of plants include trees and shrubs. The main plants used on Beijing Road are *Camphora officinarum*, *Jacaranda mimosifolia*, and *Impatiens walleriana.* The main types of plants include trees, shrubs, and ground cover. The main plants used on Caiyun North Road are *Camphora officinarum*, *Celtis tetrandra*, and *Ligustrum* × *vicaryi.* The main types of plants include trees, shrubs, and ground cover. The main plant used on Dongfeng East Road is *Platanus acerifolia*. The plant types are mainly trees. The main plants used on Hexie Road are *Camphora officinarum*, *Liquidambar formosana*, *Platanus acerifolia*, *Ginkgo biloba*, *Rosa chinensis*, and *Viola tricolor.* The main types of plants include trees, shrubs, and ground cover.

2.2. Selection of Evaluation Methods

When selecting evaluation methods, we considered various potential assessment techniques, including other methods within a Multi-Criteria Decision Analysis (MCDA), such as the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), ViseKriterijumska Kompromisno Rangiranje (VIKOR), and the fuzzy comprehensive evaluation method. Each method has its unique strengths and limitations, and it is suitable for different research contexts and purposes.

TOPSIS method: This method ranks the evaluation objects by calculating their relative proximity to ideal and negative ideal solutions. Although TOPSIS can handle large amounts of data and multiple evaluation criteria, its effectiveness may not be as intuitive and clear as the Analytic Hierarchy Process when dealing with problems with complex hierarchical structures and fuzziness [26,27].

VIKOR method: The VIKOR method seeks compromise solutions by maximizing group utility and minimizing individual regret. It is suitable for handling complex decision-making problems with conflicting and non-commensurable criteria. However, compared with the Analytic Hierarchy Process, VIKOR may be more complex in weight allocation and handling of relationships between criteria, and it is difficult to intuitively reflect the hierarchical structure and internal logical relationships of the evaluation object [28–30].

Fuzzy comprehensive evaluation method: This method is suitable for handling evaluation problems with fuzziness and uncertainty. By introducing fuzzy mathematics theory, a more accurate and comprehensive evaluation of the evaluation object can be carried out. However, the fuzzy comprehensive evaluation method requires rich professional knowledge and experience support when constructing fuzzy relationship matrices and determining fuzzy weights, and the calculation process is relatively complex [31,32].

In contrast, the Analytic Hierarchy Process has unique advantages. In order to accurately study the spatial landscape pattern of streets in Kunming, the Analytic Hierarchy Process is used as the core evaluation method. In the field of intelligent decision-making, it can not only help decision-makers process large amounts of information but also transform subjective judgments into objective data through a combination of qualitative and quantitative methods, improving the transparency and repeatability of the decision-making process [33–35]. In addition, it also has flexibility and can be adjusted and optimized according to different decision-making needs and backgrounds to adapt to different decision-making scenarios [36,37]. It is a structured decision-support technology that exhibits high intelligence in handling complex decision factors, weight allocation, and comprehensive evaluation. By decomposing the complex evaluation system into several levels and factors

and combining qualitative and quantitative analysis, pairwise comparisons are made, and weights are assigned to each level of factors to achieve a quantitative evaluation of regional street landscapes. This decision-making method can not only effectively handle complex systems with multiple factors, levels, and difficulty in complete quantification but also ensure the scientific and systematic nature of the evaluation process. It is very suitable for in-depth analysis and evaluation of the comprehensive and diverse landscape system of Kunming street space.

The study of the street landscape in the Kunming area not only involves material elements such as plants but also cultural elements. By constructing a multi-level analysis structure, detailed analysis can be conducted on various aspects such as plant diversity, historical and cultural heritage, and resident participation in the street, ensuring the comprehensiveness and depth of the evaluation and meeting the needs of multidimensional analysis. The evaluation of street landscape often involves many factors that are difficult to quantify directly, such as residents' sense of identity and the inheritance of historical and cultural heritage. By using intelligent decision-making methods to score and convert these qualitative factors into quantitative data, the evaluation results become more objective and comparable, achieving a combination of qualitative and quantitative analysis.

Different streets emphasize the display of regional garden plant landscapes, some renowned for their plant diversity, while others are known for their rich historical and cultural heritage. The Analytic Hierarchy Process constructs a judgment matrix and uses mathematical methods to calculate the relative importance weights of elements at different levels, which can accurately reflect the advantages and disadvantages of each street in different evaluation dimensions. The regional plant landscape of Kunming street space is a complex system composed of multiple interrelated and influencing factors. This decision-making method decomposes complex systems into several levels and factors, analyzes and assigns weights to each level, and ultimately obtains an overall evaluation result that can better handle these systemic problems.

In the implementation process of the Analytic Hierarchy Process, we invite experts who are proficient in different professional fields to participate in the screening and adjustment of indicators. Experts' professional fields involve urban planning and design, landscape design, historical and cultural preservation, and many other areas, all of which have rich practical experience and profound academic backgrounds. By integrating expert opinions and suggestions, we have ensured the scientific and rational nature of the evaluation process and improved the accuracy and credibility of the evaluation results. To ensure transparency and objectivity in our research, we place special emphasis on the diversity and representativeness of our experts. The invited experts not only have significant achievements in their professional fields but also have a deep understanding of the street landscape in Kunming City. Their participation makes the evaluation model more in line with the actual situation and development needs of Kunming's street landscape and also provides strong support for subsequent landscape optimization and improvement.

2.3. Evaluation Factors and Evaluation Models

Based on the investigation of the current situation of the 10 most beautiful streets in Kunming City, a preliminary evaluation system for the regional street landscape in Kunming City was determined using a literature review, frequency analysis, and brainstorming methods. The Delphi method was used to solicit expert opinions to screen and adjust the indicators. Finally, an evaluation criteria layer was constructed based on the overall layout of the street, plant landscape features, historical and cultural heritage, resident participation and identity, pedestrian friendliness and accessibility. A total of 15 factor layers were constructed under 5 criteria layers, as well as 10 street scheme layers (as shown in Figure 4.

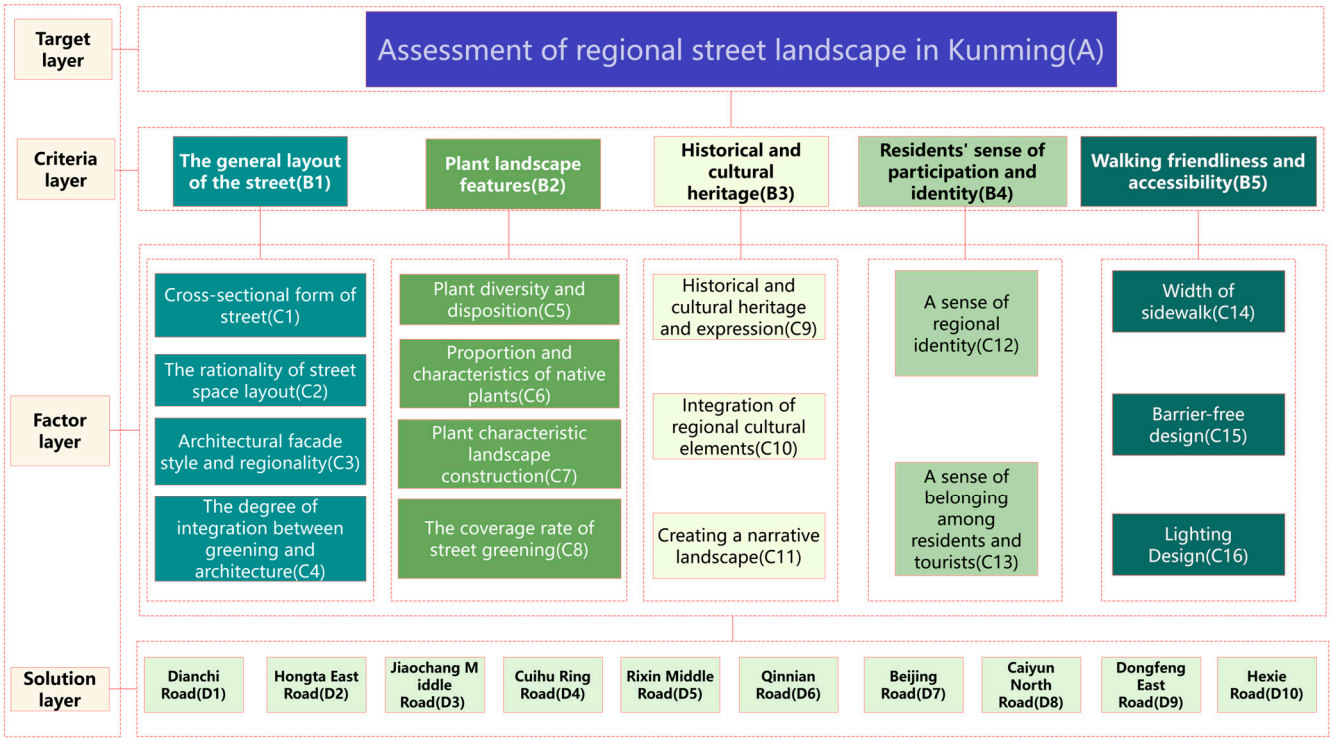

Figure 4. Landscape Evaluation Model for Regional Streets in Kunming City.

In order to comprehensively evaluate the spatial and regional landscape patterns of landscape plants in Kunming's streets, we constructed a weighted comprehensive scoring model. The comprehensive score of Street i is divided into S_i, which can be expressed as Equation (1).

$$S_i = \sum_{j=1}^{5} w_j \cdot f_{ij} \quad (1)$$

where, w_j is the weight of the j-th evaluation factor, determined by the Analytic Hierarchy Process; f_{ij} is the score of the i street on the j evaluation factor, usually obtained through expert scoring, questionnaire surveys, or field observations, and normalized to ensure that the scores of each factor are on the same dimension; j values range from 1 to 5, corresponding to five evaluation criteria.

2.4. Determination of Indicator Weights

We construct pairwise comparison judgment matrices, where the weight values can reflect the importance of each indicator, which reflects the position of each indicator in the rating system and its impact on the target layer [38–40]. In order to accurately determine the weights of various indicators, we need to compare each factor at the same level pairwise in order to eliminate the interference of other factors. We use the 9-scale Analytic Hierarchy Process for analysis. Next, we conduct consistency checks on the indicators. Finally, calculate the weights of each indicator.

In the process of constructing the 'Regional Street Landscape Evaluation System in Kunming City', we designed a specialized survey form to scientifically and reasonably determine the weights of various indicators. This survey aims to assign values to each indicator through expert scoring, in order to construct a judgment matrix. Subsequently, we utilized the Analytic Hierarchy Process mathematical model and combined it with the professional Yaahp10.3 software to calculate the weight values of each indicator. The specific calculation steps are as follows.

In the Analytic Hierarchy Process, for each level of factors, a judgment matrix needs to be constructed to represent the relative importance between these factors [41–44]. The

judgment matrix **A** is a square matrix, and its element a_{ij} represents the relative importance between factor i and factor j. It is usually assigned using the 1–9 scale method and can be expressed as Equation (2). In the 1–9 scale, Method 1 indicates that two factors are equally important; 3 indicates that one factor is slightly more important than another; 5 indicates that one factor is significantly more important than another; 7 indicates that one factor is more strongly important than another; 9 represents one factor being extremely more important than another; 2, 4, 6, and 8 are the median values of the adjacent judgments mentioned above, used to represent the median values of the judgments; The reciprocal represents inverse comparison.

$$\boldsymbol{A} = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \tag{2}$$

In Equation (2), n is the number of factors in the hierarchy, and the judgment matrix satisfies a_{ij}>0, $a_{ji} = \frac{1}{a_{ij}}(i \neq j)$, $a_{ii} = 1$.

For the judgment matrix **A**, it is necessary to calculate its maximum eigenvalue λ_{max} and corresponding eigenvector X. After normalization, the feature vector X can be used as the weight vector w for the hierarchical factors, which can be expressed as Equation (3).

$$\boldsymbol{A}X = \lambda_{max}X \tag{3}$$

The calculation of weight vector w can be expressed as Equation (4).

$$w = \left(\frac{x_1}{\sum_{i=1}^{n} x_i}, \frac{x_2}{\sum_{i=1}^{n} x_i}, \cdots, \frac{x_n}{\sum_{i=1}^{n} x_i} \right) \tag{4}$$

Due to the subjective construction of the judgment matrix, there may be inconsistencies; therefore, consistency testing is required. The consistency index CI, average random consistency index RI, and consistency ratio CR can be calculated and expressed as Equations (5) and (6).

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{5}$$

$$CR = \frac{CI}{RI} \tag{6}$$

The value of RI can be obtained by looking up a table, which depends on the order of the judgment matrix.

In the Analytic Hierarchy Process, in order to test the consistency of the judgment matrix, we introduce the indicator of the Random Consistency Ratio (RI). The RI value is obtained by searching the corresponding average random consistency table based on the order of the judgment matrix. Table 1 lists the corresponding RI values for judgment matrices of different orders.

Table 1. Random consistency index values corresponding to 9th-order judgment moments.

n	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

In this study, we constructed judgment matrices for each criterion layer and factor layer and searched for the corresponding RI values from the table based on the order of the matrices. Subsequently, we calculated the consistency ratio (CR), where CI is the consistency indicator obtained by calculating the eigenvalues of the judgment matrix. We consider the judgment matrix to have satisfactory consistency only when CR is less than

0.1. Through this method, we ensure the reliability and effectiveness of each judgment matrix, thereby ensuring the robustness of the entire evaluation model. The construction of the landscape evaluation matrix for regional streets in Kunming City and the consistency testing ratio are shown in Table 2.

Table 2. Evaluation matrix construction and consistency check ratio.

Hierarchical Model	Index	Matrix				Consistency Check	Hierarchical Model	Consistency Check
A-Bi	Bi	B1	B2	B3	B4		C1-Di	CR = 0.0833 < 0.1
	B1	1.0000	0.5000	0.5000	0.5000		C2-Di	CR = 0.0807 < 0.1
	B2	2.0000	1.0000	2.0000	3.0000	CR = 0.0750 < 0.1	C3-Di	CR = 0.0999 < 0.1
	B3	2.0000	0.5000	1.0000	2.0000		C4-Di	CR = 0.0952 < 0.1
	B4	2.0000	0.3333	0.5000	1.0000		C5-Di	CR = 0.0961 < 0.1
B1-Ci	Ci	C1	C2	C3	C4		C6-Di	CR = 0.0985 < 0.1
	C2	1.0000	2.0000	0.5000	2.0000		C7-Di	CR = 0.0984 < 0.1
	C3	0.5000	1.0000	0.5000	2.0000	CR = 0.0456 < 0.1	C8-Di	CR = 0.0994 < 0.1
	C4	2.0000	2.0000	1.0000	2.0000		C9-Di	CR = 0.0945 < 0.1
B2-Ci	Ci	C5	C6	C7	C8		C10-Di	CR = 0.0998 < 0.1
	C5	1.0000	1.0000	2.0000	2.0000		C11-Di	CR = 0.0969 < 0.1
	C6	1.0000	1.0000	0.5000	2.0000		C12-Di	CR = 0.0938 < 0.1
	C7	0.5000	2.0000	1.0000	2.0000	CR = 0.0695 < 0.1	C13-Di	CR = 0.0971 < 0.1
	C8	0.5000	0.5000	0.5000	1.0000		C14-Di	CR = 0.0966 < 0.1
B3-Ci	Ci	C9	C10	C11			C15-Di	CR = 0.0987 < 0.1
	C9	1.0000	2.0000	2.0000		CR = 0.0517 < 0.1	C16-Di	CR = 0.0932 < 0.1
	C10	0.5000	1.0000	0.5000				
	C11	0.5000	2.0000	1.0000				
B4-Ci	Ci	C12	C13					
	C12	1.0000	1.0000			CR = 0.0000 < 0.1		
	C13	1.0000	1.0000					
B5-Ci	Ci	C14	C15	C16				
	C14	1.0000	3.0000	2.0000				
	C15	0.3333	1.0000	1.0000		CR = 0.0176 < 0.1		
	C16	0.5000	1.0000	1.0000				

3. Research Results and Discussion

In this section, we will present and discuss in detail the results obtained from the evaluation model based on the Analytic Hierarchy Process. These results include the weight allocation of each evaluation factor and its sub-factors, as well as the rating of each research street on a single landscape factor. Through these results, we can gain a deeper understanding of the characteristics of regional street landscapes in Kunming, as well as the advantages and disadvantages of different streets in terms of landscape patterns. Next, we will gradually construct and discuss these results based on the hierarchical structure of the evaluation model, including total weight analysis, inter-factor correlation analysis, analysis of the street with the highest single landscape factor score, and regional street pattern drawing.

3.1. Evaluation Model Total Weight Analysis

We organize expert rating activities and conduct statistical analysis on the expert rating results. Based on the Analytic Hierarchy Process, I used Yaahp10.3 software to calculate the weight values of each indicator in the regional street landscape evaluation system of Kunming City. We chose the Analytic Hierarchy Process because it can effectively handle multi-level and multi-criteria relationships in complex decision-making problems, making it very suitable for the context of this study. Table 3 shows the weights of the regional street landscape evaluation system in Kunming City based on the Analytic Hierarchy Process.

Table 3. Weight of landscape evaluation system for regional streets in Kunming.

Target Layer	Criteria Layer	Total Weight	Factor Layer	Weight	Total Weight	Solution Layer	Total Weight of the Solution Layer
Assessment of regional street landscape in Kunming (A)	The general layout of the street (B1)	0.1591	Cross-sectional form of street (C1)	0.1981	0.0315	D1	0.0830
			The rationality of street space layout (C2)	0.3873	0.0616	D2	0.0825
			Architectural facade style and regionality (C3)	0.2748	0.0437	D3	0.1531
			The degree of integration between greening and architecture (C4)	0.1397	0.0222	D4	0.2076
	Plant landscape features (B2)	0.3397	Plant diversity and disposition (C5)	0.3353	0.1139	D5	0.0435
			Proportion and characteristics of native plants (C6)	0.2416	0.0821	D6	0.1274
			Plant characteristic landscape construction (C7)	0.2867	0.0974	D7	0.1173
			The coverage rate of street greening (C8)	0.1364	0.0463	D8	0.0505
	Historical and cultural heritage (B3)	0.2314	Historical and cultural heritage and expression (C9)	0.4905	0.1135	D9	0.0513
			Integration of regional cultural elements (C10)	0.1976	0.0457	D10	0.0837
			Creating a narrative landscape (C11)	0.3119	0.0722		
	Residents' sense of participation and identity (B4)	0.1689	A sense of regional identity (C12)	0.5000	0.0844		
			A sense of belonging among residents and tourists (C13)	0.5000	0.0844		
	Walking friendliness and accessibility (B5)	0.1009	Width of sidewalk (C14)	0.5485	0.0553		
			Barrier-free design (C15)	0.2106	0.0212		
			Lighting design (C16)	0.2409	0.0243		

The total weight of the overall layout of the street is 0.3397, with the highest weight, indicating that the overall layout of the street occupies a core position in the evaluation of regional street landscapes. Therefore, a reasonable street layout can not only enhance the overall beauty of the city but also promote smooth traffic and improve space utilization. The weights for the rationality of street section shape and street spatial layout are 0.1139 and 0.1135, respectively. A reasonable street section shape and spatial layout can optimize traffic flow, improve space utilization, and create a pleasant walking environment.

The weight of plant landscape features is 0.2314. As the focus of research, the weight of plant landscape features is the second highest, highlighting the key role of plants in creating regional street landscapes. The rich diversity of plants, unique plant configurations, and the application of native plants not only beautify the urban environment but also enhance the regional characteristics and cultural connotations of the landscape. The plant-related factors, such as plant diversity and configuration weight of 0.0844 and the proportion and characteristic weight of native plant application of 0.0821, have relatively high weights, reflecting the important position of plant landscape characteristics in regional street landscape evaluation. By reasonably configuring local plants and creating distinctive plant landscapes, the greening quality and regional characteristics of streets can be significantly improved.

The weights of historical and cultural inheritance and residents' sense of participation and identity are 0.1689 and 0.1591, respectively. These two factors have similar weights, reflecting the importance of urban culture and social factors in street landscape evaluation. The inheritance of historical and cultural heritage emphasizes the respect and continuation of the urban context, while the participation and sense of identity of residents emphasize that urban greening construction should be people-oriented, focusing on the actual needs and emotional identity of residents. The weight of historical and cultural inheritance and expression is 0.0553, and the weight of regional identity is 0.0437. Although these factors have relatively low weights, they cannot be ignored. They reflect the infiltration and integration of urban culture and social factors in street landscapes and are an important component of building urban street landscapes with cultural connotations and humanistic care.

The weight of pedestrian friendliness and accessibility is 0.1009, and although the weight of this criterion layer is relatively low, it is still an indispensable part. With the transformation of urban lifestyle, pedestrian friendliness has become an important indicator for measuring the quality of urban street space. Accessibility design, sidewalk width, and lighting design are directly related to the comfort and safety of pedestrians. The weight of the sidewalk width is 0.0315, and the weight of the barrier-free design is 0.0243. These factors have lower weights, but they are equally important. They are directly related to the comfort and safety of pedestrians and are key elements in improving the pedestrian friendliness of streets.

Under the comprehensive evaluation framework of regional street landscapes in Kunming City, we evaluated ten streets, including Dianchi Road, Harmony Road, Hongta East Road, Jiaochang Middle Road, Cuihu Ring Road, Rixin Middle Road, Qingnian Road, Beijing Road, Caiyun North Road, and Dongfeng East Road, and obtained their respective total weight values.

The total weight of Cuihu Ring Road is 0.2076, ranking first. Cuihu Ring Road, with its long history and cultural heritage, rich plant landscape configuration, and high sense of resident identity, has become a model of street landscape in Kunming City. The facade style of the surrounding buildings harmoniously coexists with the natural environment, with high green coverage and full integration of regional cultural elements, providing excellent leisure experiences for citizens and tourists.

The total weight of Jiaochang Middle Road is 0.1531, ranking second. Jiaochang Middle Road is known for its unique botanical landscape, especially during the spring season when Jacaranda mimosifolia D. Don is in full bloom, attracting a large number of tourists and citizens to stop and admire.

The total weight of Youth Road is 0.1274, ranking third. As one of the bustling commercial districts in Kunming, Qingnian Road's street landscape is particularly outstanding in terms of pedestrian friendliness and accessibility. The sidewalk is spacious, the barrier-free design is complete, and the lighting facilities are sufficient, providing a convenient and comfortable travel environment for citizens and tourists. At the same time, the street also emphasizes the creation of plant landscapes, which complement the commercial atmosphere.

Beijing Road has a total weight of 0.1173 and ranks fourth. Beijing Road, the north-south main road of Kunming City, has outstanding street landscapes in terms of overall layout and historical and cultural heritage. The layout of the street space is reasonable, and the architectural facade style is unified and has regional characteristics while incorporating rich historical and cultural elements, showcasing the historical changes and development of Kunming City.

He Xie Road and Dianchi Road have similar weights, with values of 0.0837 and 0.0830, respectively, ranking fifth and sixth. These two streets have their own unique features in terms of plant landscape, and Harmony Road emphasizes the integration of greening and architecture.

The total weight of Hongta East Road is 0.0825, ranking seventh. As the main road of Kunming's tourist resort, Hongta East Road has outstanding street landscapes in terms of plant diversity and configuration while emphasizing the creation of plant-characteristic landscapes, providing tourists with a rich visual experience.

The total weights of Dongfeng East Road, Caiyun North Road, and Rixin Middle Road are 0.0513, 0.0505, and 0.0435, respectively, ranking relatively low. Although they also have some highlights in certain aspects, such as street spatial layout and green coverage, overall, they are relatively inadequate compared to other streets in the comprehensive evaluation, and there is still significant room for improvement in the future.

In summary, each street has its own unique performance in the regional garden and plant landscape pattern of Kunming, which together constitute the unique style of Kunming's "most beautiful spring city". Through this evaluation analysis, we can have a clearer understanding of the strengths and weaknesses of each street, providing useful references and inspirations for future urban landscape construction.

3.2. Correlation Analysis Between Evaluation Model Factors

Correlation analysis was conducted on the evaluation factors in the regional street landscape evaluation model of Kunming City, as shown in Figure 5. According to the range of correlation coefficient values, when the absolute value of the correlation coefficient approaches one, it indicates a strong linear relationship between two variables. Values between 0 and 0.09 indicate no correlation, 0.3 indicates a weak correlation, 0.1–0.3 indicates a weak correlation, 0.3–0.5 indicates a moderate correlation, and 0.5–1.0 indicates a strong correlation.

As shown in Figure 5, we conducted a detailed correlation analysis on the five core factors of the evaluation model standard layer—overall street layout (B1), plant landscape features (B2), historical and cultural heritage (B3), resident participation and identity (B4), and pedestrian friendliness and accessibility (B5).

As shown in Figure 5a, there is a strong positive correlation between the overall street layout (B1) and the plant landscape features (B2), with a correlation coefficient of 0.71. This means that a good street layout not only provides superior conditions for the display and configuration of plant landscapes, but the richness of plant landscapes also enhances the overall effect of the street layout. Meanwhile, the correlation coefficient between the overall layout of the street and pedestrian friendliness and accessibility (B5) is 0.62, indicating that street layout has a significant impact on pedestrian comfort and convenience, thereby improving pedestrian friendliness and accessibility.

As shown in Figure 5b, further analysis of the four constituent factors of the overall street layout (B1) reveals a high correlation of 0.94 between the street section shape (C1) and the regional style of the building facade (C3), indicating a high degree of consistency between the two in shaping the overall street style. In addition, the cross-sectional shape of the street (C1) has a significant impact on the rationality of the street spatial layout (C2), with a correlation coefficient of 0.78. A reasonable cross-sectional shape helps create more comfortable and efficient street spaces. At the same time, the rationality of street spatial layout (C2) directly affects the integration of greening and architecture (C4), with a

correlation of 0.78. Reasonable spatial layout can promote the harmonious coexistence of greening and architecture, thereby enhancing the overall beauty of the street.

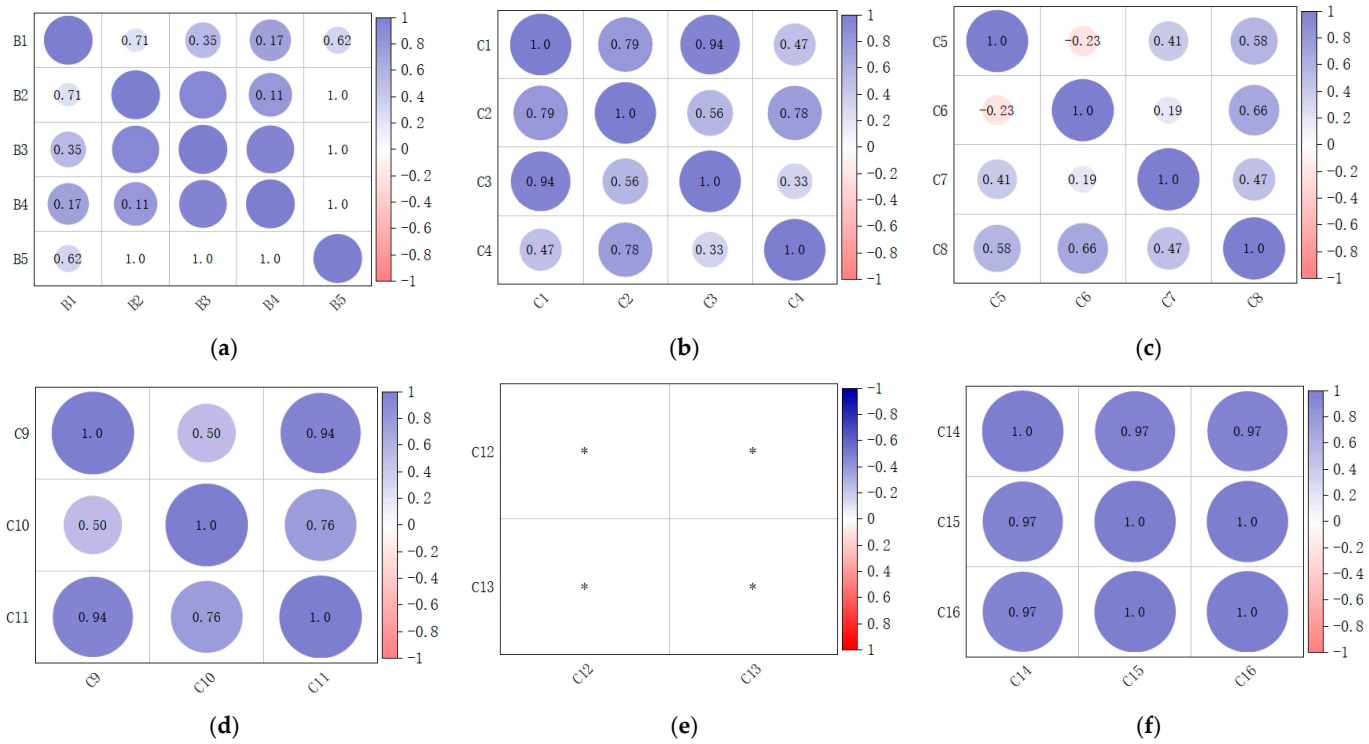

Figure 5. Correlation analysis of factors for evaluating the landscape of regional streets in Kunming. (**a**) Correlation analysis of criteria layer factors, (**b**) Correlation analysis of overall street layout factors, (**c**) Correlation analysis of plant landscape characteristics, (**d**) Historical and cultural heritage, (**e**) Resident participation and identity, (**f**) Pedestrian friendliness and accessibility. * There is no correlation between the influencing factors C12 and C13.

As shown in Figure 5c, we analyzed the correlation of four key factors in terms of plant landscape features (B2). The correlation coefficient between the proportion and characteristics of native plants (C6) and the green coverage rate of street plants (C8) is 0.66, indicating that the application of native plants has a significant impact on improving the green coverage rate of streets. At the same time, plant diversity and configuration (C5) also showed a positive correlation with street green coverage (C8), with a correlation coefficient of 0.58, indicating the positive role of plant diversity and rational configuration in improving street green coverage.

As shown in Figure 5d, for the three factors of historical and cultural inheritance (B3), we found that the correlation between the inheritance and expression of historical and cultural heritage (C9) and the creation of narrative landscapes (C11) is extremely high, reaching 0.94. This indicates that narrative landscapes often convey historical and cultural information through specific landscape elements, effectively enhancing the inheritance effect of historical culture.

As shown in Figure 5e, in terms of resident participation and identity (B4), we conducted a correlation analysis between regional identity (C12) and resident tourist belonging (C13), and the results showed no significant correlation between the two. Regional identity is more reflected in the recognition and pride of local culture, while the sense of belonging of residents and tourists may involve broader emotional factors such as community cohesion and security.

As shown in Figure 5f, finally, among the three factors of pedestrian friendliness and accessibility (B5), we found that the correlation coefficient between accessibility design (C15) and lighting design (C16) is one, indicating that the two are highly complementary

and complementary in terms of functionality and effectiveness. The barrier-free design ensures smooth movement of pedestrians in physical space, while the lighting design further enhances this function, providing pedestrians with a safer and more comfortable nighttime walking environment.

3.3. Analysis of the Street with the Highest Single Landscape Factor Score

The street with the highest score for each factor in the analysis factor layer can demonstrate the outstanding performance of each evaluation factor in the actual street landscape. By analyzing different streets, we can gain a more intuitive understanding of the practical significance and impact of different evaluation factors. At the same time, this also helps to uncover the successful experiences of excellent streets and provides a reference for the landscape improvement of other streets.

In terms of street section morphology (C1), Dianchi Road (D1) stands out with a high score of 0.2107, becoming the street with the highest score in this factor layer. Similarly, in the evaluation of the rationality of street spatial layout (C2), Dianchi Road (D1) once again ranked first with a score of 0.1601. For the evaluation of the regional architectural style (C3) of the building facade, Cuihu Ring Road received the highest rating with a score of 0.3039 for its unique regional architectural style. In addition, in the evaluation of the degree of integration between greenery and architecture (C4), Cuihu Ring Road also leads other streets with a score of 0.2428. In terms of plant landscape features, the performance of each street varies. Beijing Road received the highest score of 0.2206 in terms of plant diversity and configuration (C5). The Cuihu Ring Road leads with a score of 0.2324 in the proportion and characteristics of local plant application (C6) and also ranks first with a score of 0.2963 in the green coverage rate of street plants (C8). In addition, Jiaochang Middle Road has performed well in the creation of plant characteristic landscapes (C7), ranking first in this factor layer with a score of 0.2788. In terms of historical and cultural inheritance, the performance of Cuihu Ring Road is particularly outstanding. It received the highest evaluation in three factor layers: historical and cultural inheritance and expression (C9), integration of regional cultural elements (C10), and storytelling landscape creation (C11), with scores of 0.2712, 0.2699, and 0.3192, respectively. In terms of residents' participation and identity, Cuihu Ring Road's sense of regional identity (C12) leads with a score of 0.2389, while Jiaochang Middle Road scored the highest with a score of 0.2141 in terms of residents' and tourists' sense of belonging (C13). Finally, in terms of pedestrian friendliness and accessibility, Harmony Road leads with high scores in both pedestrian width (C14) and barrier-free design (C15) factor layers, receiving scores of 0.2011 and 0.1941, respectively. Beijing Road ranks first in this factor layer with a score of 0.1979 in lighting design (C16), as shown in Figure 6.

The Cuihu Ring Road achieved high scores in multiple factors, demonstrating its comprehensive excellence. The regional (C3) score of the architectural facade style is 0.3039, indicating that the architectural facade design of Cuihu Ring Road successfully integrates regional characteristics and harmoniously coexists with the surrounding environment. The C4 score for the integration of greenery and architecture is 0.2428, reflecting the high level of greenery design in Cuihu Ring Road, achieving a good integration of greenery and architecture and enhancing the overall beauty of the street. The proportion and characteristics of local plant application (C6) score is 0.2324, indicating that Cuihu Ring Road pays attention to the use of local plants in plant configuration, reflecting regional characteristics and ecological diversity. The street plant green coverage rate (C8) score is 0.2963, indicating that the green coverage rate of Cuihu Ring Road is high and provides a good ecological environment for citizens. The factors of historical and cultural inheritance and expression (C9), integration of regional cultural elements (C10), and storytelling landscape creation (C11) all received high scores (0.2712, 0.2699, 0.3192, respectively), demonstrating the outstanding performance of Cuihu Ring Road in cultural inheritance and expression, successfully integrating regional culture and historical stories into landscape design. The

score of regional identity (C12) is 0.2389, indicating that the design of Cuihu Ring Road has successfully stimulated the public's sense of identity with regional characteristics.

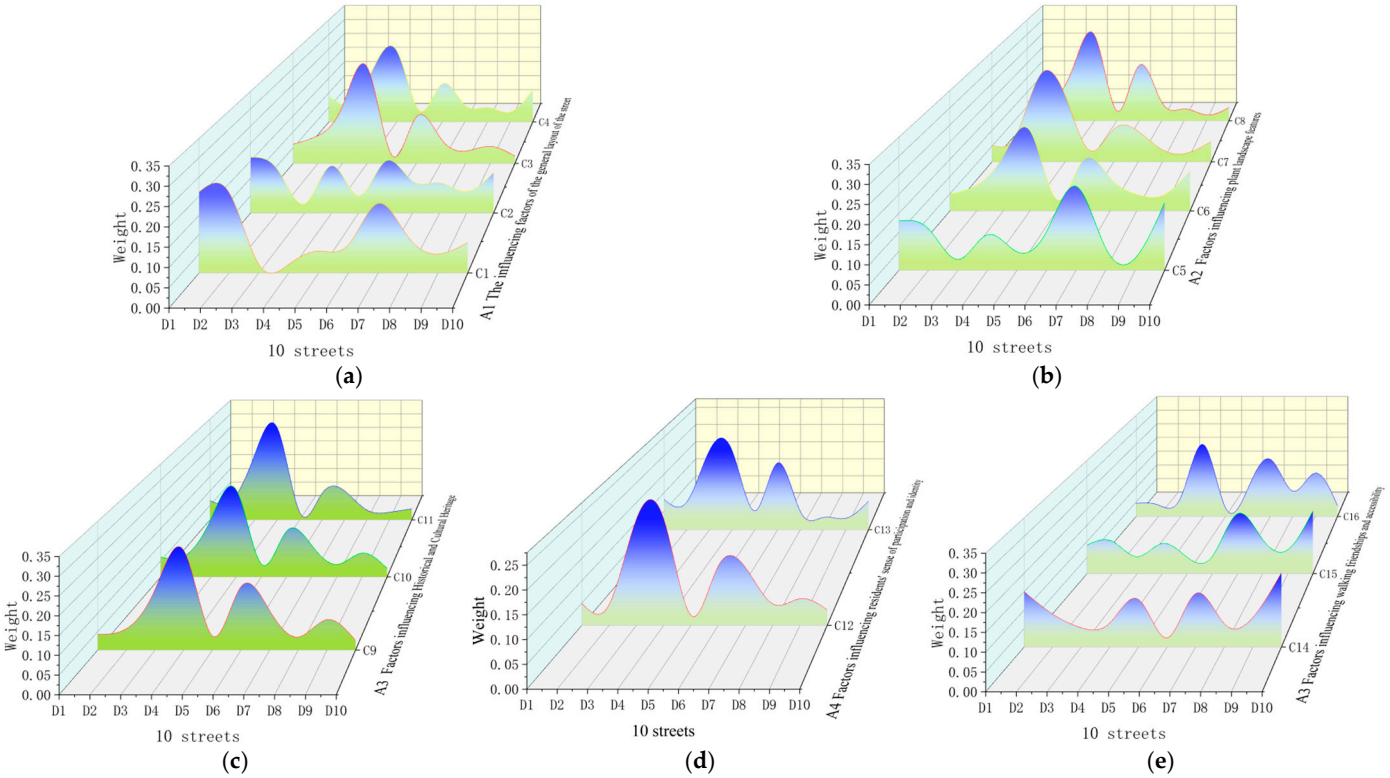

Figure 6. Analysis of street ratings at the factor level. (**a**) Overall street layout single factor rating, (**b**) Plant landscape feature single factor rating, (**c**) Historical and cultural heritage single factor rating, (**d**) Resident participation and identity single factor rating, (**e**) Pedestrian friendliness and accessibility single factor rating.

Dianchi Road performs outstandingly in terms of street section morphology (C1) and rational street spatial layout (C2). The street section morphology (C1) score is 0.2107, indicating that the road design of Dianchi Road is reasonable and meets various needs, such as transportation and landscape. The rationality of the street spatial layout (C2) score is 0.1601, reflecting the careful planning of Dianchi Road in terms of spatial layout, providing a safe and comfortable environment for pedestrians and vehicles.

Beijing Road scored the highest (0.2206) in terms of plant diversity and configuration (C5), indicating its richness and diversity in plant configuration. At the same time, Beijing Road also achieved a high score (0.1979) in lighting design (C16), indicating that its lighting facilities are well-designed, improving safety and aesthetics at night.

Jiaochang Middle Road scored the highest (0.2788) in the creation of plant characteristic landscapes (C7), demonstrating its uniqueness and innovation in plant landscape design. In addition, Jiaochang Middle Road also achieved a high score (0.2141) in terms of residents' and tourists' sense of belonging (C13), indicating that its design took into account the actual needs and feelings of residents. Hexie Road performs well in both pedestrian width (C14) and barrier-free design (C15), with scores of 0.2011 and 0.1941, respectively.

The Cuihu Ring Road performs well in multiple evaluation factors, especially those related to the integration of regional culture, ecological environment, and landscape, making it a leader in comprehensive evaluation. Dianchi Road demonstrates a high level of street design and spatial layout and is a model of combining transportation and landscape. Beijing Road and Jiaochang Middle Road have shown outstanding performance in specific areas such as plant configuration, lighting design, and residents' sense of belonging. Hexie Road has gained recognition in terms of pedestrian width and barrier-free design.

3.4. Analysis of Regional Street Patterns

In this section, we will provide a detailed description of the street cross-section patterns of the ten streets in Kunming that have been rated as the "most beautiful streets", namely Dianchi Road, Hexie Road, Hongta East Road, Jiaochang Middle Road, Cuihu Ring Road, Rixin Middle Road, Qingnian Road, Beijing Road, Caiyun North Road, and Dongfeng East Road. Each street is renowned for its unique landscape features and regional cultural elements.

Dianchi Road has a spacious layout with independent pedestrian and bicycle lanes, ensuring the safety of pedestrians and cyclists, which directly reflects its advantages in the overall street layout (C1). The green belt has a wide variety of plant species and reasonable color matching, which not only beautifies the environment but also reflects the characteristics of Kunming's "Spring City", which is highly consistent with the evaluation indicators of plant landscape features (C2). In addition, its two-way eight-lane design, friendly pedestrian width, and excellent understory space experience also make it outstanding in terms of sidewalk width (C14) and pedestrian friendliness and accessibility (C5), as shown in Figure 7.

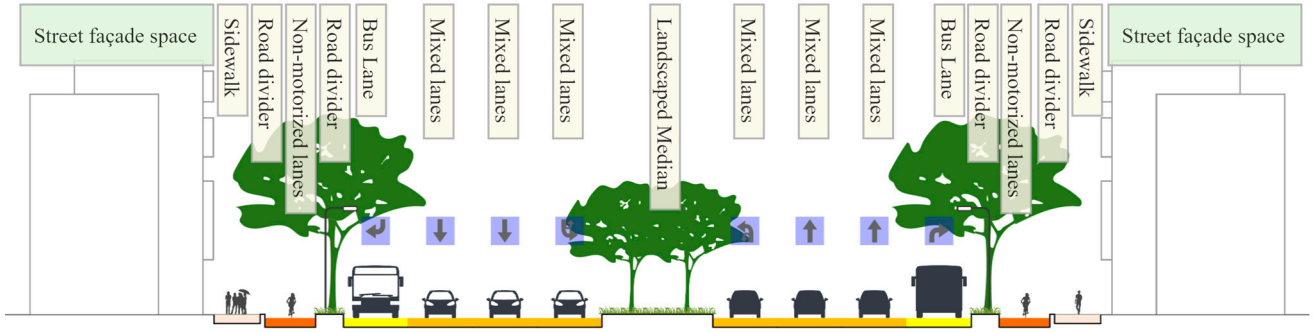

Figure 7. Typical street section pattern of Dianchi Road.

Hongta East Road is famous for its rich tropical plant landscape, which creates a strong tropical atmosphere that fully reflects its advantages in plant landscape characteristics (C2). At the same time, its two-way four-lane design, as well as the green belt between the motor vehicle lane and the non-motor-vehicle lane, provide safe walking space for pedestrians, which to some extent enhances its pedestrian friendliness and accessibility (C5), as shown in Figure 8.

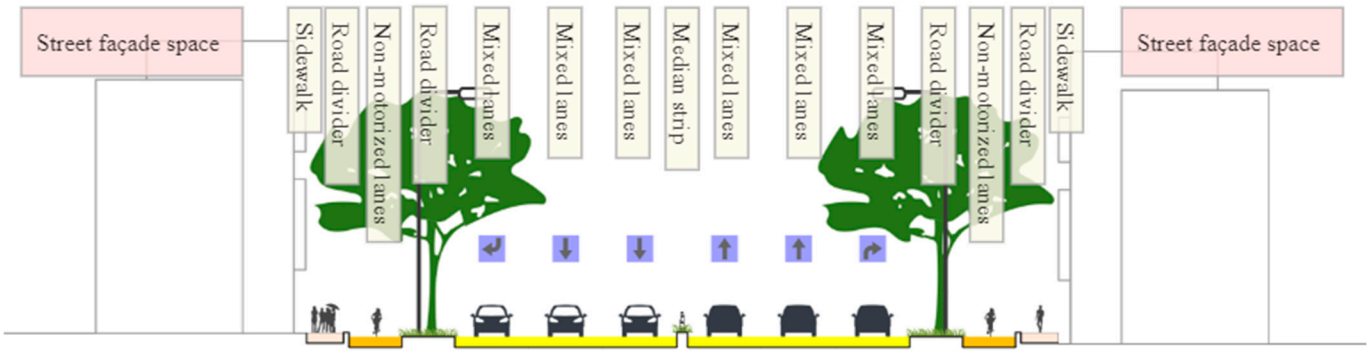

Figure 8. Typical street section mode of Hongta East Road.

The Cuihu Ring Road surrounds Cuihu Park, with green trees providing shade and complementing the landscape of Cuihu Park, forming a unique urban oasis. This not only reflects its outstanding performance in terms of plant landscape characteristics (C2) but also makes it outstanding in terms of regional architectural facade style (C3) and

integration of greenery and architecture (C4). As a one-way street, Cuihu Ring Road has significant advantages in terms of pedestrian width (C14) and pedestrian friendliness and accessibility (C5) due to its wide pedestrian and activity space, as well as its adjacent landscape environment, as shown in Figure 9.

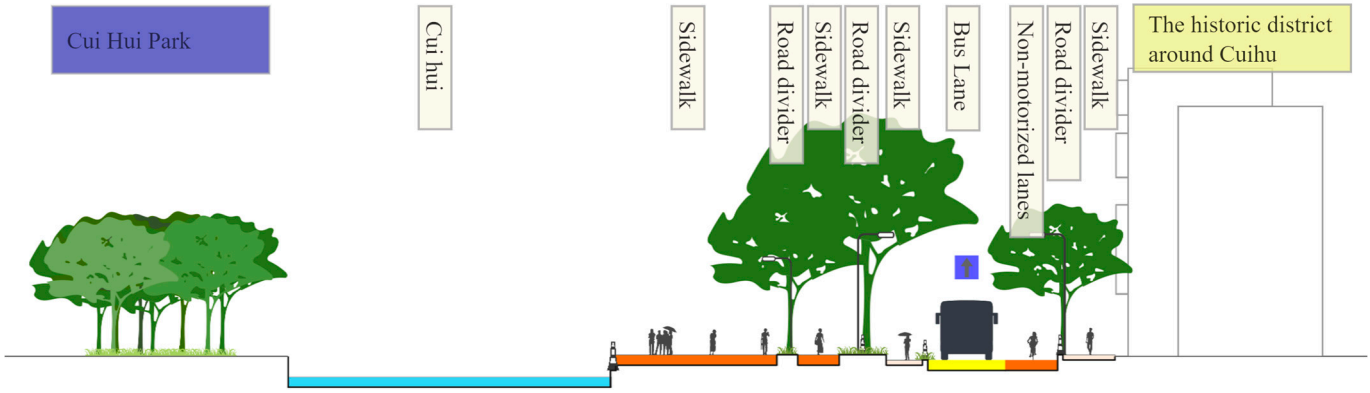

Figure 9. Typical street section sode of Cuihu Ring Road.

Jiaochang Middle Road is famous for Jacaranda mimosifolia D. Don, where purple and blue flowers cover the trees every spring, creating a beautiful and breathtaking landscape. This not only reflects its advantages in plant landscape features (C2) but also makes it outstanding in historical and cultural inheritance and expression (C9). At the same time, its narrow road width provides convenient conditions for roadside trees to form a wide understory space, which also enhances its pedestrian friendliness and accessibility to a certain extent (C5), as shown in Figure 10.

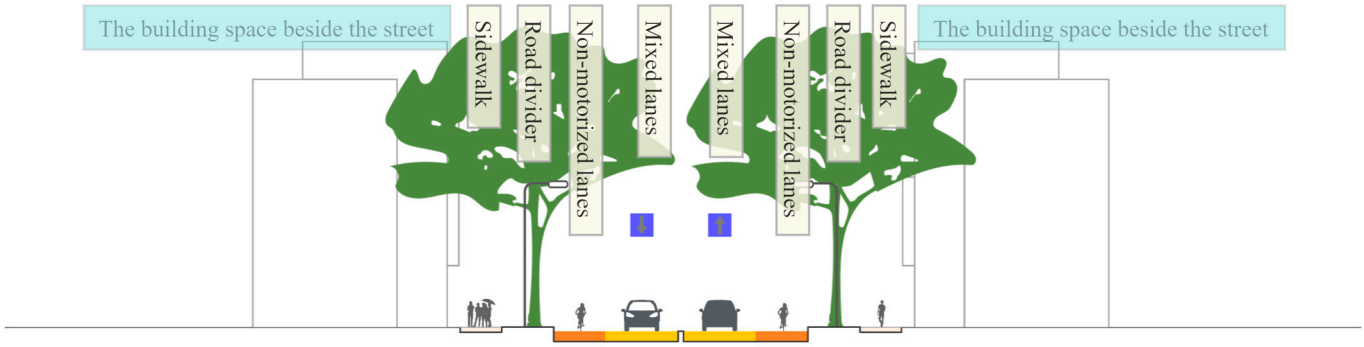

Figure 10. Typical street section pattern of Jiaochang Middle Road.

The landscape of Qingnian Road Street blends traditional and modern elements with a variety of architectural styles. This gives it a certain characteristic in terms of regional architectural facade style (C3). Meanwhile, its dual carriageway design with four lanes in both directions, as well as excellent lighting design, has resulted in an outstanding performance in terms of pedestrian width (C14) and lighting design (C16). However, the relatively narrow width of the sidewalk may, to some extent, affect its pedestrian friendliness and accessibility (C5), as shown in Figure 11.

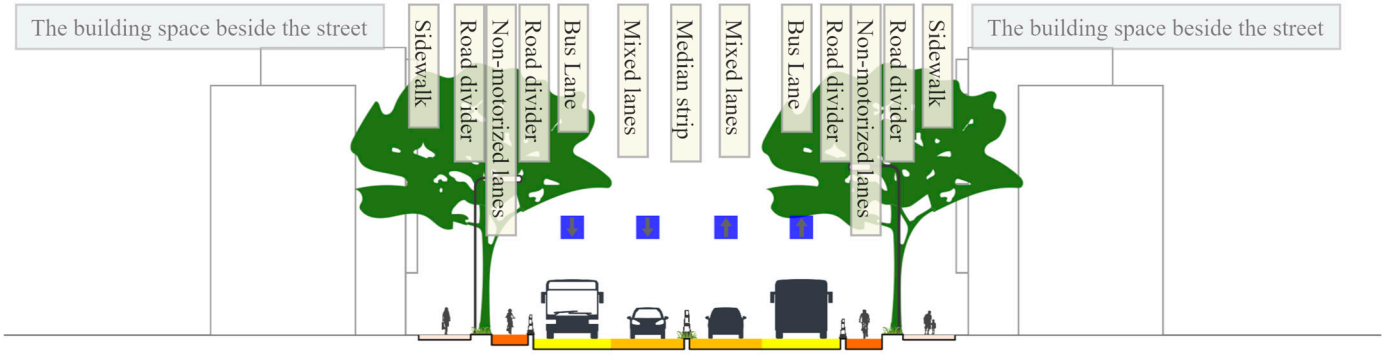

Figure 11. Typical street section mode of Qingnian Road.

Beijing Road has spacious roads, complete commercial formats, rich plant species in green belts, and distinct levels. This makes it outstanding in terms of overall street layout (C1) and plant landscape features (C2). Meanwhile, its bidirectional eight-lane design and superior lighting design give it significant advantages in pedestrian width (C14) and lighting design (C16), as shown in Figure 12.

Figure 12. Typical street section sode of Beijing Road.

The design of Rixin Middle Road emphasizes the combination of ecology and landscape, with rich plant species and bright colors in the green belt. This makes it outstanding in terms of plant landscape characteristics (C2). At the same time, its dual six-lane design and diverse vertical spatial forms give it certain characteristics in terms of regional architectural facade style (C3) and integration of greenery and architecture (C4), as shown in Figure 13.

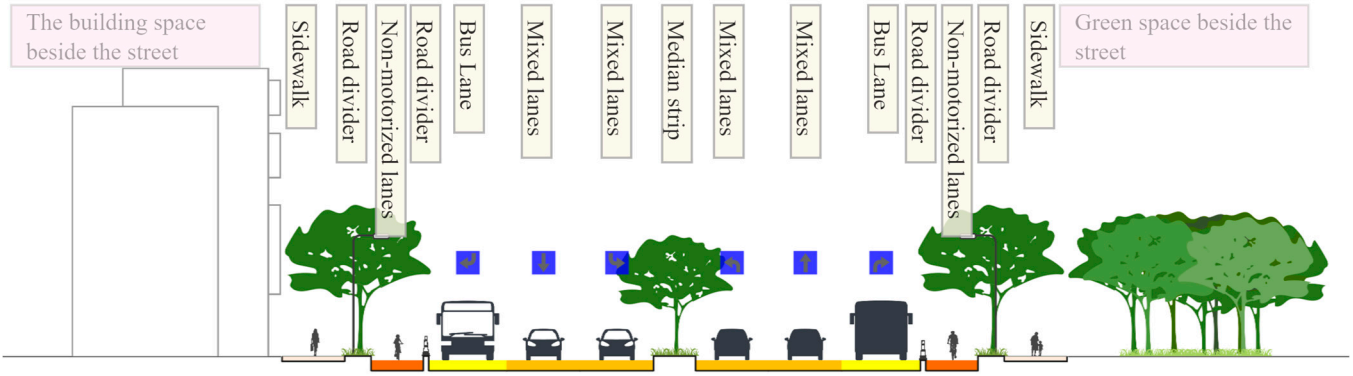

Figure 13. Typical street section sode of Rixin Middle Road.

Caiyun North Road connects Kunming City Center and the Chenggong New District and is an important axis for urban development. Its dual six-lane design and rich vertical

spatial forms make it outstanding in terms of regional architectural facade style (C3). At the same time, the isolation facilities of its green belts and roadside trees also provide safe walking space for pedestrians, as shown in Figure 14.

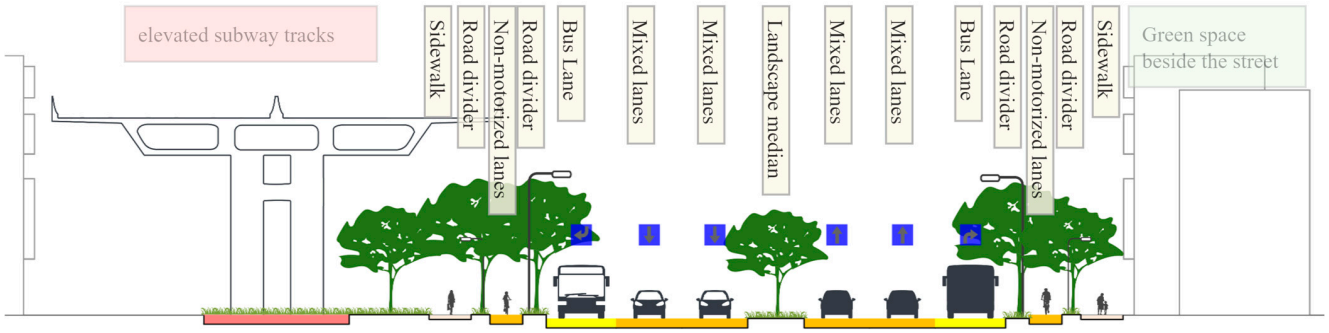

Figure 14. Typical street section sode of Caiyun North Road.

Dongfeng East Road focuses on improving pedestrian friendliness and accessibility, ensuring the safety of citizens' travel through comprehensive pedestrian and barrier-free design. This makes it excellent in terms of pedestrian friendliness and accessibility (C5). At the same time, its two-way six-lane design, as well as excellent lighting design and complete accessibility design, give it significant advantages in sidewalk width (C14), lighting design (C16), and accessibility design (C15), as shown in Figure 15.

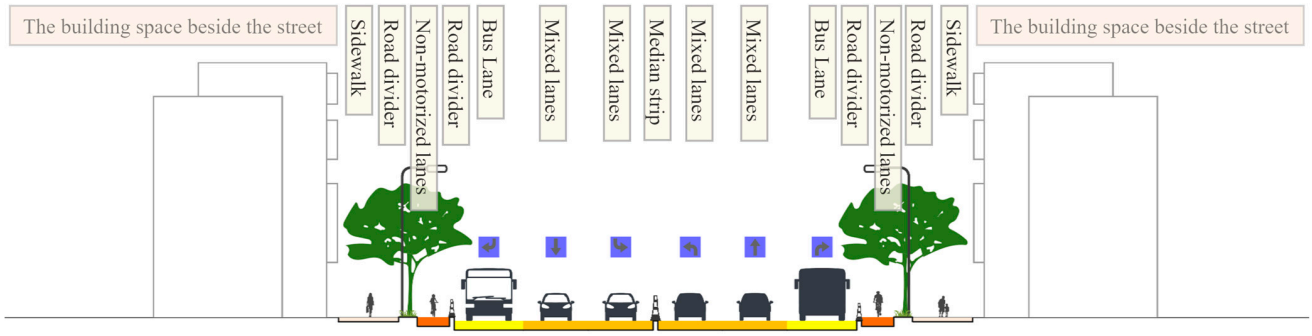

Figure 15. Typical street section sode of Dongfeng East Road.

Harmony Road is located in the Chenggong District, Kunming City, and is a key passage connecting multiple important nodes in the area. The street design fully considers the needs of modern urban life and demonstrates a unique overall street layout (C1) advantage. The streets are spacious with clearly defined pedestrian, bicycle, and motor vehicle lanes, ensuring smooth traffic and pedestrian safety. This design directly enhances pedestrian friendliness and accessibility (C5), as shown in Figure 16.

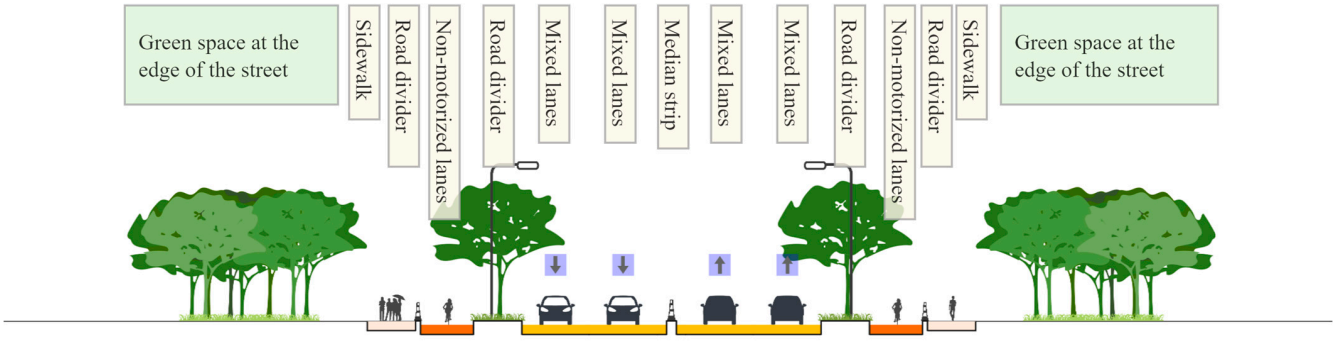

Figure 16. Typical street section mode of Hexie Road.

This study not only constructed a multidimensional and systematic intelligent decision-making framework for evaluating the regional characteristics of Kunming's street landscape, but more importantly, the framework and its evaluation results can provide scientific basis and decision-making support for urban planners, landscape designers, and relevant government departments. Based on the weight allocation of each factor in the evaluation model, urban planners can prioritize factors with higher weights when formulating street renewal plans, such as overall street layout (0.3397) and plant landscape features (0.2314), to ensure that the planning scheme can enhance the aesthetic value of the street while also considering functionality and cultural significance. When designing street landscapes, designers can refer to the street with the highest single landscape factor score (such as Cuihu Ring Road performing well in multiple factors), draw on its successful experience, such as the integration of greening and architecture and plant diversity configuration, to enhance the design level of new projects. The research results emphasize the importance of residents' participation and sense of identity (weight 0.1591). Therefore, in street renovation or new street design, public participation should be encouraged by collecting opinions through questionnaire surveys, community meetings, and other forms to ensure that the design scheme can reflect residents' needs and enhance regional identity.

4. Conclusions

4.1. Main Findings and Work Contributions

This study conducted an in-depth exploration of the street landscape pattern in Kunming City and constructed a multidimensional and systematic evaluation system using intelligent decision-making algorithms and regional cultural expression. This system covers multiple aspects, such as the overall street layout, plant landscape features, historical and cultural heritage, resident participation and identity, pedestrian friendliness, and accessibility, and achieves precise analysis and quantitative evaluation of street landscapes at all levels through refined factor layer indicators.

The research results indicate that the most beautiful streets in Kunming fully integrate regional cultural elements and showcase unique urban cultural charm. Especially in terms of plant landscape characteristics, it has shown outstanding performance, specifically in terms of plant diversity and configuration, the proportion and characteristics of local plant applications, and so on. The integration of these green elements not only enhances the aesthetic value of the streets but, more importantly, has a positive impact on the sustainable development of the city. For example, the application of native plants helps maintain ecological balance and reduces water resource consumption and pollution emissions; plant diversity enhances the stability and resistance of ecosystems, helping to address global challenges such as climate change. Therefore, integrating green elements is an indispensable part of identifying the street landscape pattern in Kunming and an important means of promoting sustainable urban development.

The evaluation system constructed in this study successfully integrates multiple dimensions such as street layout, plant landscape, historical and cultural heritage, resident participation and identity, pedestrian friendliness, and accessibility, forming a multidimensional and systematic intelligent decision-making framework. This system not only captures the complex ecological and diversity characteristics of Kunming street landscapes but also achieves precise evaluation of street landscapes at all levels through refined factor layer indicators.

Through evaluating the correlation analysis between model factors, this study reveals significant positive correlations between key factors such as overall street layout, plant landscape features, and pedestrian friendliness. For example, the high correlation between overall street layout and plant landscape features (correlation coefficient of 0.71) indicates that a good street layout is the foundation for fully displaying plant landscapes. These findings provide a scientific basis for coordinating the relationships between various elements in the process of street landscape renovation in Kunming City.

4.2. Research Significance and Future Prospects

This study revealed a significant positive correlation between key factors such as overall street layout, plant landscape features, and pedestrian friendliness through correlation analysis, providing a scientific basis for coordinating the relationships between various elements in the process of street landscape renovation in Kunming City. At the same time, the study also discovered the interdependence between material and cultural elements in street landscape design, providing important insights for future street landscape planning. These findings not only enrich the theoretical system of urban street landscape evaluation but also provide a reference for other cities on how to highlight their own characteristics in street landscape planning.

However, there are significant differences and particularities in street landscape planning and management among different cities, so the evaluation system constructed in this study may need to be appropriately adjusted and modified when applied to other cities. Based on the results of this study, future research can be further expanded to evaluate street landscapes in other cities to verify the universality and effectiveness of this evaluation system.

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