

# Study on Practice Framework and Evaluation Indicator System of Landsense Design for the Enhancement of Cultural Ecosystem Services in Historical Blocks

Jiang LIU<sup>1,2</sup>, Haijuan HAN<sup>1,2</sup>, Zhu CHEN<sup>1,3,\*</sup>

**1** School of Architecture and Urban-Rural Planning, Fuzhou University, Fuzhou 350116, China

**2** Fujian Key Laboratory of Digital Technology for Territorial Space Analysis and Simulation, Fuzhou 350116, China

**3** Institute of Environmental Planning, Leibniz University Hannover, Hannover 30419, Germany

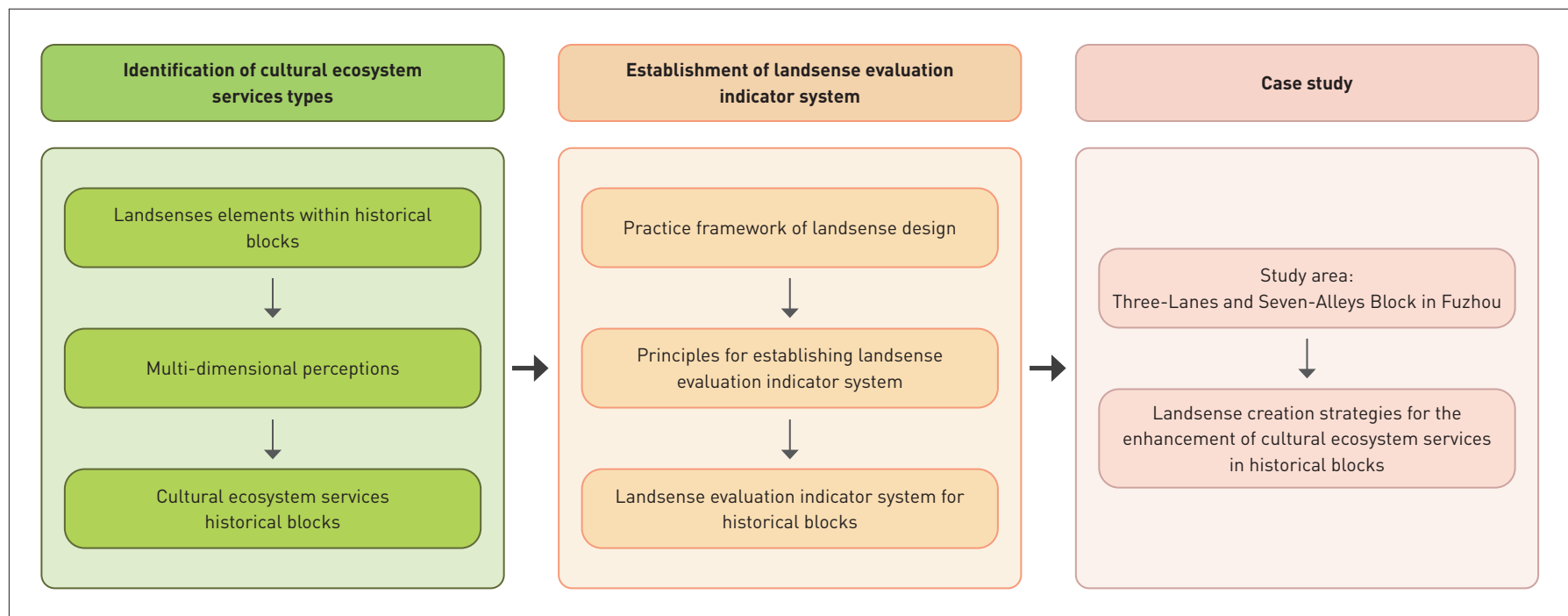
\*CORRESPONDING AUTHOR

**Address:** No. 2 North Wulong River Road, University

Town, Fuzhou 350116, Fujian Province, China

**Email:** chen@umwelt.uni-hannover.de

## GRAPHICAL ABSTRACT



## ABSTRACT

As important cultural service providers in urban ecosystems, historical blocks play a crucial role in ensuring the well-being of multiple stakeholders during the urban renewal process. Based on theories of Landsenses Ecology and literature review, this study systematically examined the landsense elements of historical blocks and their related cultural ecosystem services (CES) by proposing a landsense design practice framework for CES enhancement and further constructing a landsense evaluation indicator system. Using the Three-Lanes and Seven-Alleys Block in

Fuzhou, China as a case study, this research analyzed the status quo and existing problems of the block according to the evaluation indicator system, and then proposed suggestions for landsense creation to enhance, preserve, and improve CES of the block. Finally, it qualitatively elaborated the evaluation indicators upon the practice framework of landsense design. This study provides an essential theoretical foundation and evaluation basis for enhancing CES in historical blocks from a perspective of multi-dimensional perceptions.

## KEYWORDS

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Cultural Ecosystem Service; Historical Block; Landsenses Ecology; Landsense Design Practice Framework; Landsense Evaluation Indicator System; Landsense Creation; Three-Lanes and Seven-Alleys Block

## HIGHLIGHTS

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- Inventories landsense elements and cultural ecosystem service types of historical blocks and explores their interrelations
- Develops a landsense design practice framework and evaluation indicator system for cultural ecosystem service enhancement in historical blocks
- Elaborates on the contents of each evaluation indicator of landsense design by demonstrating the case study of Three-Lanes and Seven-Alleys Block in Fuzhou, and proposes landsense creation strategies according to the practice framework

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## 1 Introduction

Cultural ecosystem services (CES) are the non-material characteristics of ecosystems that impact the physical and mental states of humans<sup>[1]</sup>, directly or indirectly contributing to their health, welfare, and life quality enhancement<sup>[2]</sup>. Currently, research on CES primarily focuses on urban wetlands<sup>[3][4]</sup>, urban forests<sup>[5][6]</sup>, urban parks<sup>[7][8]</sup>, ecological parks<sup>[9]</sup>, and other types of natural green spaces in cities. In contrast, studies related to urban ecosystems are relatively scarce. Urban ecosystems, representing a unique amalgamation of all living organisms (including humans) and their

environments within urban areas<sup>[10]</sup>, have garnered relatively less attention. These ecosystems, adapted, shaped, and modified by human activities from the natural environment<sup>[11]</sup>, are human-dominated environments: humans change and ultimately benefit from ecosystem services (ES)<sup>[12][13]</sup>. CES is at the core of urban ecosystems' functionality, with leisure tourism, cultural education, and spiritual fulfillment closely related to human life<sup>[14][15]</sup>. Despite human perception of landscape elements in urban ecosystems offering significant opportunities and pathways for realizing CES value, existing research predominantly focuses on the direct measurement of CES valuation upon human perceptions, neglecting the multifaceted influence of public perception and interactive landscape experiences on CES utilization. For instance, studies by Haoran Li et al.<sup>[16]</sup> and Yi Zhang et al.<sup>[17]</sup> used social media data like online reviews to obtain a direct public perception level of CES on urban riverfront green space and urban lake park, as similarly observed in the works of Yuqing Zhao et al.<sup>[18]</sup> and Qianzi Jiang et al.<sup>[19]</sup>, despite they studied different user groups.

The “Landsenses Ecology,” proposed by ecologist Jingzhu Zhao, offers a holistic study approach that integrates landscape elements and ES. It is conceived with the objectives of fostering sustainable development and ecological principles. It undertakes a comprehensive examination of land use planning, construction, and management by considering natural elements, physical senses, psychological perceptions, socio-economic perspectives, process risk, and other factors<sup>[20]</sup>. In its application, people imbue or encapsulate their visions into certain carriers via appropriate forms of expression, enabling such visions to be comprehended and appreciated both personally and collectively through engagement with the carriers. Such carriers can be a spectrum of elements, from physical forms (e.g., blocks, buildings, plants) to cultural expressions (e.g., paintings, calligraphy, poetry, novels, songs, symbols). The carriers possessing these attributes are termed “landsense,” and the entirety of the releasing process of the landsense is referred to as “landsense creation”<sup>[21]</sup>. Thus, the pathways of representing landsense can be diverse, tangible, and abstract.

Since the proposal of Landsenses Ecology, Chinese scholars such as Lina Tang<sup>[22]</sup>, Rencai Dong<sup>[23]</sup>, and Xiaofang Liu<sup>[24]</sup> have advanced its theoretical underpinnings and practical applications. Concurrently, international scholars such as Işıl Kaymaz<sup>[25]</sup>, Elvira Tarsitano<sup>[26]</sup>, and Nir Becker<sup>[27]</sup> have delved into the realms of public perception, cognition, and preferences within urban public spaces, and evaluated people's willingness to pay for nature reserves maintenance through monetary

methods. Xiaofang Liu et al. refined the external manifestations of landsense as “landsense elements”<sup>[24]</sup>, encompassing both natural and artificial ecological and environmental components that embody human visions and affect perceptions. Compared with conventional landscape elements, landsense elements emphasize visitors’ perceptions and visionary expectations, as well as individuals’ initiative in creating, expressing or attributing meaning to the landscape. Moreover, visions also serve a directive or normative function, influencing people’s discourse and behaviors, and further promoting sustainable development. In this sense, landsense elements can integrate concerns for environment and social sustainability, beyond mere perceptual appreciation. Landsenses Ecology provides CES evaluation a new approach to enriching CES research paradigms<sup>[28]</sup>.

In Landsenses Ecology, exploratory research has focused on the interplay between the landsense and the hierarchy and supply-demand dynamics of ES<sup>[29][30]</sup>. However, practical or applied studies concentrate on urban green spaces, with little attention to historical blocks. Studies pertaining to landsense perception within historical blocks mostly explore visitors’ touring experiences via different perceptual approaches, along with related evaluation methods and enhancement strategies<sup>[31]~[34]</sup>. In the studies related to CES in historical blocks, scholars have investigated the values of various services provided by landscape elements (e.g., street trees)<sup>[35]</sup>, historically or culturally significant buildings (e.g., museums)<sup>[36][37]</sup>, and non-biological elements in historical areas (e.g., geographical environments)<sup>[38]</sup>. However, the concepts or terms used in these studies often revolve around “perceptual experience” or “resource value,” lacking a cohesive and systematic framework encompassing both. Furthermore, these studies have not merged the concepts of CES with Landsenses Ecology. As an essential component of urban ecosystems, historical blocks harbor valuable tangible and intangible cultural wealth. The elements within these blocks showcase regional identities and landscape characteristics, manifesting the historical and cultural assets of the city<sup>[39]</sup>, making the historical blocks crucial areas for the provisioning of CES within urban ecosystems. Therefore, this study categorizes the landsense elements and CES types within historical blocks and delineates their interrelations through the prism of landsense creation. Besides, this paper proposes a practice framework of landsense design and a landsense evaluation indicator system for CES improvement. Employing the Three-Lanes and Seven-Alleys Block in Fuzhou, China, as a case study, the paper elaborates the constituents of the framework and the evaluation indicator system,

and recommends the corresponding landsense creation strategies for CES enhancement of the study area.

## 2 Types and Interpretation of CES in Historical Blocks

The Millennium Ecosystem Assessment, published in 2005, defined CES as non-material benefits humans derive from ecosystems, including spiritual satisfaction, cognitive development, reflection, recreation enjoyment, and aesthetic experiences<sup>[40]</sup>. CES can be divided into various types with certain explanations according to specific studies<sup>[18][41]</sup>. Building upon this globally recognized framework, the study organized and synthesized the literature regarding different types of CES in terms of experience, perception, resources or values<sup>[31][32][35]~[38][40][42]~[44]</sup>, resulting in the articulation of specific interpretations of each CES type in the context of historical blocks (Table 1).

## 3 Practice Framework of Landsense Design in Historical Blocks

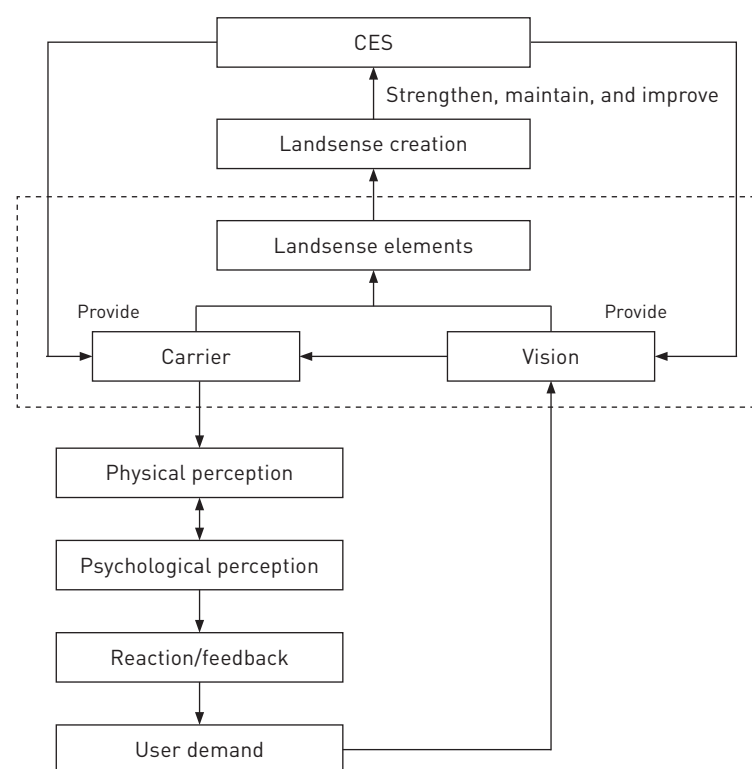
Landsense elements, as the manifestations of landsense, are classified and analyzed in practice according to different study objectives. In this study, landsense elements are defined as elements in natural or artificial environments that carry users’ demands and visions, and can affect their perceptions<sup>[24]</sup>. Drawing from the literature on perceptions of historical blocks<sup>[31]~[34]</sup> and overall-value assessments<sup>[42][45][46]</sup>, and aligning with the emphasis of Landsenses Ecology on physical and psychological perceptions<sup>[20][21]</sup>, this study categorizes landscape environment of historical blocks into natural and humanistic. Accordingly, five main types of landsense elements and several sub-types are identified: for the natural environment, landsense elements include climate conditions (e.g., temperature, humidity, wind speed) and environmental quality (e.g., atmospheric, visual, acoustic, olfactory, water and light environments); for the humanistic environment, landsense elements consist of path pattern (e.g., spatial fabric and structure, path interfaces), landscape elements (e.g., plant landscape, architectural landscape, waterscape), and cultural elements (e.g., cultural heritage, cultural facility, cultural economy).

Humans’ spiritual and non-material needs for ecosystems and the characteristics of landsense elements provided by ecosystems play pivotal roles in the dynamic process, by which the CES are transferred from ecosystems to human systems<sup>[47]</sup>. Fig. 1 outlines the structure and process of landscape perception under the theories of Landsenses Ecology<sup>[21][29]</sup>, elucidating the affecting

**Table 1: Classification and implication of CES in historical blocks**

CES type	Implication
Aesthetic value	The natural and cultural landscapes in historical blocks that have unique artistic characteristics and styles, embody historical, cultural, and aesthetic qualities and values, and can satisfy people's daily aesthetic needs
Inspirational value	Exploring and experiencing the natural and cultural landscapes in historical blocks can make visitors relaxed and inspire their artistic creativity
Sense of place identity	Historical blocks often accommodate rich and unique humanistic and cultural legacies, which can evoke visitors a sense of attachment and belonging
Spiritual value	As an integral part of urban spiritual and cultural life, historical blocks contain rich spiritual values, fulfilling the spiritual desires of urban residents and tourists
Educational value	The historical and cultural resources in historical blocks have significant social and educational values, providing platforms for educational activities and events such as cultural exhibitions
Cultural heritage value	Historical block, as one of the comprehensive cultural heritage forms with regional and contemporary characteristics, preserves important historical landscapes (natural and cultural) or objects with significant historical and cultural values
Recreational and ecotourism value	Historical block, as an important type of urban public spaces, often possesses high tourism value due to their rich historical and cultural heritage and satisfies people's recreational and entertainment needs combined with natural landscapes

mechanism of landscape perception on CES via landsense creation methods. Typically, individuals engage with landscape carriers in the environment through sensory perception, subsequently interpreting the carriers in light of their varying cultural backgrounds. This process engenders either similar or divergent psychological perception, eliciting ephemeral or enduring responses, through which visitors can articulate their needs and cultivate visions for landscape carriers, thereby forging specific landsense elements. Landsense creation unfolds through three ways: utilizing existing carriers, transforming existing carriers, and building new carriers integrated with visions. Adhering to the eight principles of landsense creation—the bi-direction principle of vision manifestation, the vein-compliance principle of orientation and bearing, the multiscale principle of spatiotemporal combination, the systematicness principle of physical senses, the integrity principle of psychological perceptions, the interactivity principle of physical senses and psychological perceptions, the dissimilarity principle of different cultures, and the progressivity principle of the process<sup>[21]</sup>—enables the deliberate design of landsense elements to augment, maintain, and improve CES in the environment.



1. Structure and process of landscape perception under the theories of Landsenses Ecology (adapted from Refs. [21][29]).

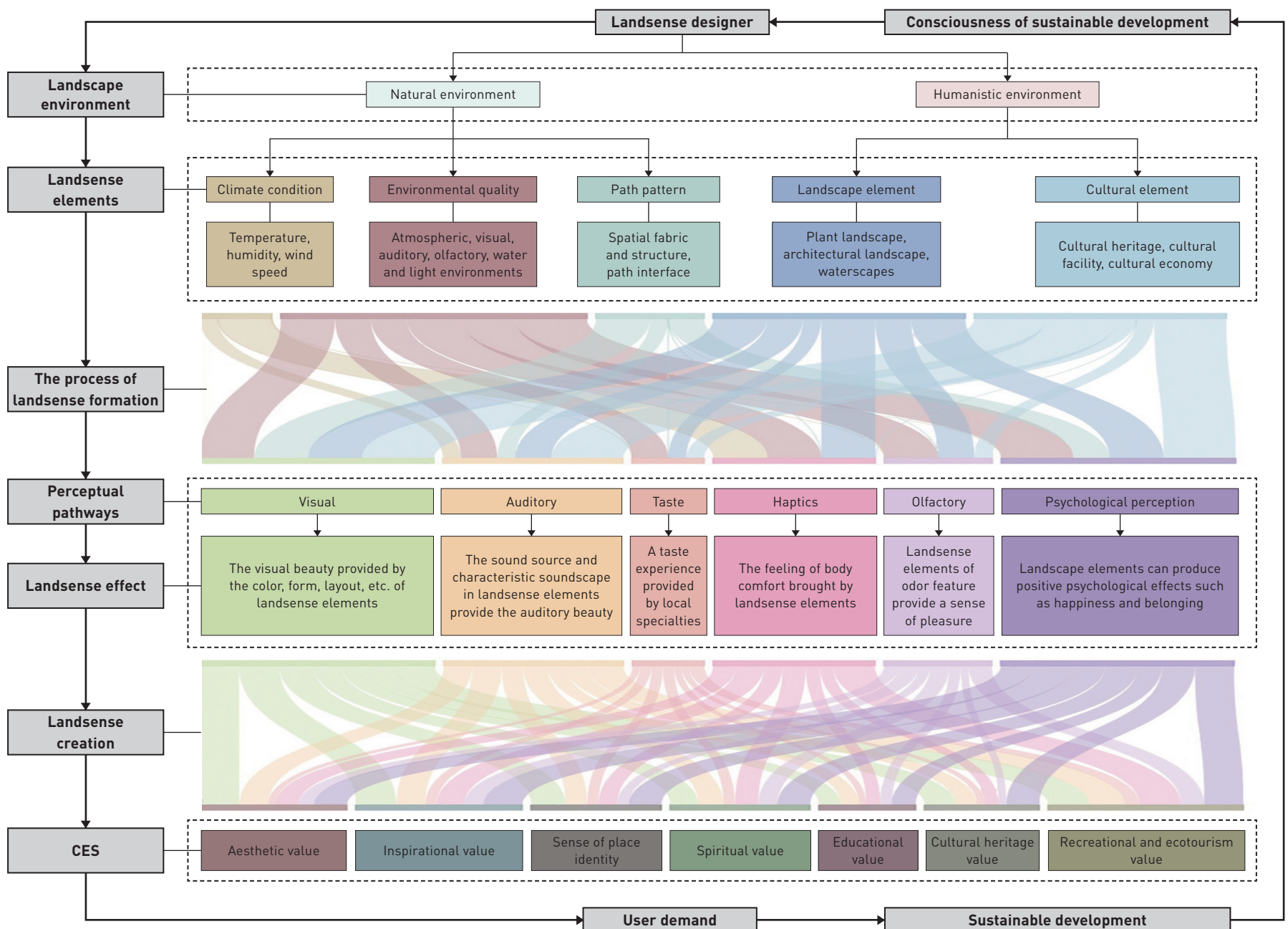
Following the structure and process of landscape perception under the theories of Landsenses Ecology and focusing on the application in historical blocks, a landsense design practice framework for CES enhancement is proposed (Fig. 2). This framework elaborates on the interconnections among various factors, including landsense designers and users, and extends the implications of CES to sustainable development and awareness, establishing a profound linkage between historical blocks' landsense elements with CES.

#### 4 Construction of Landsense Evaluation Indicator System for Historical Blocks

The landsense evaluation indicator system developed in this study for historical blocks not only takes the block's redevelopment into account<sup>[43]</sup>, but also fulfills the following international principles for constructing indicator systems<sup>[48][49]</sup>.

1) Principle of scientificity: the indicator system necessitates a foundation deeply rooted in the intrinsic characteristics and

2. The practice framework of landsense design for CES enhancement.



essence of landsense elements within the historical blocks by considering factors such as history, culture, and architecture and using scientific quantification and calculation methods to define and measure landsense elements.

2) Principle of guidance: the selection of indicators should appropriately reflect the landsense characteristics of the historical blocks, effectively guide and promote the protection, transformation, and management of the blocks; it should focus on the human-environment harmony in the blocks to better satisfy people’s feelings and needs.

3) Principle of operability: the indicators should be observable or measurable, and corresponding metrics should be selected for data collection through scientific methods and techniques; the data should be collected from multiple sources and preferable in

universality and statistics.

4) Principle of continuity: the data for each indicator should be temporally continuous (ideally collected annually) to monitor the dynamic changes of landsense elements in the historical blocks and provide a basis for establishing urban spatiotemporal data platforms.

5) Principle of applicability: the indicator system should serve as a tool for local governments to promote the improvement of landsense elements within historical blocks; therefore, indicator selection should align with local affairs and be integrated into spatial planning systems, such as urban spatial planning and historical block conservation planning.

The landsense evaluation indicator system for historical blocks proposed in this study, built upon the practice framework of landsense design, is shown in Table 2.

**Table 2: Landsense evaluation indicator system for historical blocks**

Category	Primary indicator	Secondary indicator	Interpretation	
Climate condition	Physical comfort	Temperature	Whether the ambient temperature is suitable for visitors to conduct activities and experiences	
		Humidity	Whether the ambient humidity affects the comfort of visitors	
		Wind speed	Whether the ambient wind speed affects visitors’ experience	
Environmental quality	Atmospheric environment	Air quality	Air composition and pollution levels	
		Visual environment	Diversity of visual landscape	The richness of visual landscape, measuring the variety of landscape elements and scenic spots
			Naturalness of visual landscape	The visual proportion of natural elements within the landscape, such as plants and water bodies
	Uniqueness of visual landscape		Whether the visual landscape can reflect the identity and characteristics of the block	
	Acoustic environment	Characteristics of sound source	Perceived frequency, intensity, harmony, and dominance of sound source	
		Overall quality of acoustic environmental	The overall sound environment of the block, mainly considering the pleasure and richness levels of soundscape	
	Olfactory environment	Characteristics of odor source	Odor intensity, purity, freshness, and cleanliness perceived by visitors	
		Overall quality of olfactory environment	The overall olfactory environment of the block, including the pleasantness, suitability, and naturalness of odor landscape features	
	Haptics environment	Tactile comfort of materials	Tactile comfort of the ground/floor and other construction materials used in the block	

(Continued)

**Table 2: Landsense evaluation indicator system for historical blocks** (Continued)

Category	Primary indicator	Secondary indicator	Interpretation
Environmental quality	Water environment	Water quality	Water composition (such as nutrient concentration, dissolved oxygen, pH), clarity, fluidity, etc., reflecting the quality of water bodies
		Hydrological environment	Hydrological cycle and stormwater management
		Aquatic biodiversity	The biodiversity of aquatic species, reflecting the ecological status and sustainability of water bodies
	Light environment	Artificial light features	The lighting landscape design and light effects of artificial light features
		Natural light evenness	The distribution evenness of natural lights in the block, reflecting the consistency and softness of natural lights
		Light pollution degree	Light pollution level in the block, affecting visitors' visual experience at night
Path pattern	Spatial pattern	Spatial fabric and structure	The physical pattern and spatial structure of the block, including the arrangement and organization of buildings, streets, and landscape elements
		Path density	The quantity and compactness of the paths in the block, reflecting the density of spatial distribution of the paths
	Path interface	Ratio of facade height to path width	The ratio of facade height to path width in the block, reflecting the quality and scale of the paths
		Enclosure degree of buildings and paths	The enclosure and blocking degree of buildings and paths, affecting visitors' spatial perception and experienced privacy
		Interface density of buildings and paths	The ratio of the projected width of buildings along the path to the length of the same section of the path
		Interface guidance	Orientation and guidance facilities in the interfaces, such as road signs and interpretation/navigation boards
Landscape elements	Plant landscape	Plant diversity	The diversity of plant species, reflecting the ecological and landscape values of vegetation
		Plant ornamental value	The aesthetics and attractiveness of the vegetation landscape, affecting visitors' visual experience
		Vegetation coverage	The coverage proportion of vegetation in the block, reflecting the greening level and natural landscape quality
	Architectural landscape	Architectural features	The appearance and style of the buildings in the block, affecting the visual perception and cultural context
		Uniqueness of architectural creation	The uniqueness of architectural construction techniques and materials, reflecting the cultural value and characteristics of the buildings
		Historical value of architecture	The historical and cultural value of the building themselves, reflecting cultural inheritance and educational functions

(Continued)

**Table 2: Landsense evaluation indicator system for historical blocks** (Continued)

Category	Primary indicator	Secondary indicator	Interpretation
Landscape elements	Waterscape	Area ratio of waterscape	The area proportion of water bodies to the overall landscape area of the block
		Diversity of waterscape types	The variety of waterscape types, such as ponds, streams, fountains, and lakes
		Richness of waterscape forms	The formal and structural diversity of waterscape features, e.g., curvilinear, geometric, irregular, etc.
Cultural elements	Cultural heritage	Richness of cultural heritage	The quantity and diversity of cultural heritage, reflecting the richness and inclusiveness of cultural heritage
		Historical and cultural inheritance	The degree of historical and cultural inheritance, such as the protection and display of historical and cultural elements, public participation and support to historical and cultural protection activities, and the venues for such activities
	Cultural facility	Availability of historical and cultural exhibition institutions	The availability and accessibility of historical and cultural exhibition institutions in the block
		Richness of historical, cultural, and educational resources	The diversity of historical, cultural, and educational resources and institutions
	Cultural economy	Diversity of cultural products	The variety of cultural products offered in the block, affecting visitors' cultural experience and shopping needs
		Diversity of cultural commercial forms	The diversity and innovation of commercial forms and types that reflect the cultural and historical traditions
		The integration of traditions with modern commerce	The integration suitability of traditions and modern commerce, reflecting the level of preserving traditional historical and cultural characteristics while fulfilling the needs of contemporary commerce

## 5 Case Study: Landsense Creation Strategies for CES Enhancement in the Three-Lanes and Seven-Alleys Block, Fuzhou

### 5.1 Study Area

The Three-Lanes and Seven-Alleys Block (literally, three “Fangs” and seven “Xiangs”), located in Fuzhou, Fujian Province, China, comprises a path system of three lanes, seven alleys, and one axial street (Fig. 3), representing a unique historical urban fabric of the region. Among its rich tangible and intangible assets, the lane-alley pattern alongside over 200 historic buildings witnesses the highest historical and cultural value—the block, as a legacy originated from the Jin Dynasty (the 3rd century) and perfectly

preserved through the later centuries to date, stands as a living fossil of the lane-alley system that is a rare example extant in Chinese cities<sup>[50][51]</sup>. Apart from being a cluster of classical private gardens, the block is renowned for being the historical residences of eminent figures such as Zexu Lin, Baozhen Shen, Fu Yan, and Xin Bing, who made outstanding contributions to the progress of modern Chinese history, thereby infusing the area with profound cultural significance.

### 5.2 Status Quo Analysis

According to the landsense evaluation indicator system proposed in the paper, five aspects of the study area—climate condition, environmental quality, path pattern, landscape



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3. Pattern of the Three-Lanes and Seven-Alleys Block. Typically, the term “Fang” refers to a relatively larger block or community shaped by lanes and houses, and “Xiang” refers to narrower paths connecting the houses within the block. In the Three-Lanes and Seven-Alleys Block, the paths in the Fang are generally wider than those in the Xiang, offering a varied walking experience due to the contrasting visual effect between the paths and the adjacent architectures.

elements, and cultural elements—were examined to scrutinize the prevailing problems within the Three-Lanes Seven-Alleys Block<sup>[44][52]~[54]</sup> (Table 3).

### 5.3 Landsense Creation Strategies

The study proposes a suite of landsense creation strategies for bolstering, maintaining, and improving different CES types within the block according to the primary and secondary indicators of the landsense evaluation indicator system. Notably, the evaluations, methods, and metric selection for the indicator system are designed to be adaptable, which ensure that the indicator system can be tailored to fit the uniqueness of different cases. Although this study does not make a customized alteration to the indicator system, further exploration will be expected in subsequent works.

#### 5.3.1 Aesthetic Value: Enriching Natural and Cultural Landscapes

Landsense creation should prioritize visual perception to enhance aesthetic values by enriching the natural and cultural landscapes within the study area. This involves careful consideration of the architectural styles and the path pattern of the block, as well as appropriate planting design to increase community biodiversity and layers. Additionally, there should

**Table 3: Analysis of the status quo and problems within the study area**

Landsense evaluation category	Status quo	Existing problem
Climate conditions	<ul style="list-style-type: none"> <li>· Fuzhou is characterized by its oceanic subtropical monsoon climate; it experiences a brief winter that is warm and humid, contrasted by a long, hot summer with notably strong solar radiation</li> <li>· Precipitation in the area is plentiful (the average annual relative humidity approximates 77%), lacking a pronounced dry season</li> </ul>	<ul style="list-style-type: none"> <li>· The ratio of the natural landscape in the study area is relatively low, with a prevalence of isolated-planted vegetation</li> <li>· From June to October, the weather conditions may become excessively hot or humid, affecting the visitors' comfort and experience (for example, high temperatures may reduce visitors' willingness to engage in outdoor activities)</li> </ul>
Environmental quality	<ul style="list-style-type: none"> <li>· The block is surrounded by urban roads</li> <li>· Within the block, the environment maintains a notable level of cleanliness; both the extension of roads and the visual sense of accessibility are commendable; and the block enjoys a high overall aesthetic appeal</li> <li>· The block is observed with crowded pedestrian flows, especially at nighttime hours</li> </ul>	<ul style="list-style-type: none"> <li>· The acoustic environment within the block is potentially susceptible to noise pollution from surrounding traffic, which would detract from visitors' experience, especially in narrow paths</li> <li>· Inadequate nighttime lighting in the paths may make visitors feel insecure</li> <li>· The absence of a distinctive olfactory environment that could imbue the block with local characteristics</li> </ul>

(Continued)

**Table 3: Analysis of the status quo and problems within the study area** (Continued)

Landscape evaluation category	Status quo	Existing problem
Path pattern	<ul style="list-style-type: none"> <li>· The path pattern adheres to a traditional style, including the historical fabric and texture, narrow paths, defined interfaces, and distinct signage</li> <li>· The overall path pattern exhibits a fishbone or checkerboard layout, and the pleasant ratio of facade height to path width instills visitors a sense of intimacy and security</li> <li>· The overall path pattern of Lane-Alley, coupled with the agreeable spatial proportions of the paths, fosters a sense of place and identity among visitors</li> </ul>	<ul style="list-style-type: none"> <li>· In some cases, due to the constrained width of the paths, traffic congestion and high pedestrian density may appear, especially during peak visiting hours</li> <li>· Some open spaces within the block lack recreational facilities and amenities</li> </ul>
Landscape elements	<ul style="list-style-type: none"> <li>· The traditional architecture in the block exhibits a harmonious integration with the path landscape, and the architectural style and carved decorations present the unique local characteristics and historical culture of the block</li> <li>· The vegetation within the block is lush, complementing the historical buildings and paths</li> </ul>	<ul style="list-style-type: none"> <li>· The signage of some stores disrupts the continuity of the facades of the original historical buildings</li> <li>· The chromatic palette of vegetation in some areas is depressing and monotonous</li> </ul>
Cultural elements	<ul style="list-style-type: none"> <li>· The block boasts a significant historical legacy, including the former residences of famous figures; there are also many classical private gardens</li> <li>· The block is distinguished by its rich opera culture, such as Fujian Opera, Chiyi, Pinghua, and Shifan</li> <li>· The block highlights diversified cultural handicraft traditions (e.g., bodiless lacquerware, Shoushan stone carving, softwood painting), folk activities (e.g., book market, lantern market, and flower market), and the Maritime Silk Road and other Fuzhou maritime cultures</li> <li>· Food culture of the block is also well-known, which includes dishes such as “Mojin meatball,” “Tongli Meat Swallow,” and “Yonghe Fish Ball”</li> </ul>	<ul style="list-style-type: none"> <li>· Certain aspects of the preservation, propagation, commercialization, and revitalization of cultural traditions within the block require enhancement</li> <li>· There is a discernible gap in tourist satisfaction concerning the interactive activities available for cultural experience in the block</li> </ul>

be a concerted effort to optimize the sightlines of the axial street and minimize obstructions to visitors' views<sup>[55]</sup>. Light also plays a significant role in defining the spatial experience within the paths, where natural light can be harnessed to accentuate the unique features and historical architectural forms of the block, allowing visitors to feel the trace of time over the textures of the surfaces and thereby reconnecting with historical memories. Also, artificial lighting can be employed to create artistic vibes and atmospheric effects. In the expression of architectural forms, lighting design should enhance the quaint charm of the historical buildings within the block<sup>[56]</sup>.

### 5.3.2 Inspirational Value: Providing Sources and Clues for Afflatus and Encouragement

In urban renewal planning, it is crucial to foreground the inheritance of history and cultures, especially by showcasing Fuzhou's unique folk cultures and traditional craftsmanship. This can not only celebrate the block's rich historical heritage but also encourage afflatus and inspiration. Enhancing inspirational value can be achieved through multi-dimensional approaches of landscape creation. For the auditory sense, the diversity of natural sound sources can be enriched by improving the plant configuration and the arrangement of insect and bird facilities; for

the boundary areas, soundscape design, such as introducing the calming sounds of water<sup>[57]</sup> can significantly mask traffic noise from adjacent roads, thereby improving the overall quality of the acoustic environment within the area. Also, integrating the unique sounds of folk activities and traditional craftsmanship within the area can foster an inspirational atmosphere that stimulates artistic creativity.

Additionally, plants are a primary source of natural fragrances<sup>[58]</sup>. Therefore, increasing the richness of native fragrant plants in Fuzhou, such as *Jasminum sambac* and *Osmanthus fragrans*, is an effective method to enhance visitors' olfactory experience. Selecting species with either no distinct odors or subtle scents odors but strong dust-retaining abilities in planting design can contribute to the improvement of air quality and the creation of a pleasant, inviting, and comfortable olfactory environment.

### 5.3.3 Sense of Place Identity: Exhibiting Regional Uniqueness and Features

The historical and cultural exhibition venues within the block, such as the Zhonghua Fuguan (Yan Chen's Former Residence) and the Maritime Silk Road Exhibition Hall (You's Residence), can present the regional historical and cultural uniqueness to residents and tourists, foster the sense of attachment and place identity within the historical block at a more profound dimension<sup>[59]</sup>. Additionally, the sense of place identity can be promoted through enriching multi-dimensional landsense experiences. For visual perceptions, it is beneficial to integrate unique symbols (such as the traditional doors of distinctive buildings within the block<sup>[60]</sup>) with local building materials and traditional construction techniques to construct a cohesive visual landscape system that stimulates curiosity and encourages exploration. Regarding the auditory sense, Fuzhou dialects and traditional operas telling the stories of notable figures from the historical block can be employed to enhance visitors' sense of place identity and deepen their appreciation for the humanistic resources of the study area. Moreover, the traditional cuisine of the block can also appeal to olfactory and gustatory perceptions.

### 5.3.4 Spiritual Value: Fulfilling Spiritual Needs

The spiritual essence of the historical block is manifested mainly in cultural activities, offerings, and products. Research indicates that the study area possesses a variety of unique cultural sounds, including reading aloud, poetry recitation, and folk activities<sup>[51]</sup>. Nonetheless, with the tourism growth

and increased human interference, human-generated noise has become a dominant sound source in the study area. Therefore, it is crucial to rediscover and amplify the distinctive historical and cultural sound sources within the block as a vital part of landsense creation through protection and management strategies. For instance, regular performances of local traditional theatrical arts (e.g., Fujian Opera, Chiyi) can be scheduled. Broadcasting promotional videos and recorded musical pieces can encourage visitors to explore different parts of the block and enhance its vitality<sup>[61]</sup>. Such characteristic sounds can contribute to shaping vibrant soundscapes, especially in the areas within the block that are relatively quiet. In addition, diversified cultural merchandise and products themed around the rich heritage of the study area can be created, such as T-shirts, figurines, postcards, and bookmarks, offering a tangible connection to the locale. Emphasizing folk and ethnic cultural activities and products can deepen people's sense of engagement and experience and thereby meet their spiritual needs of local attachment, cementing the spiritual repository of the block.

### 5.3.5 Educational Value: Promoting Educational Activities

The educational significance of the historical block is embodied through its various material and spiritual assets. Since the Three-Lanes Seven-Alleys Block gathers many historical residences of renowned figures and a number of classical private gardens, introducing an interpretive system at landscape nodes to display relevant historical narratives and cultural connotations, so as to promote visitors' engagement and interactions with historical landscapes. The performance of emblematic cultural activities can not only be perceived visually but also convey cultural essence through auditory perceptions, offering insights into the historical soundscape of the study area by introducing sounds from folk cultural activities, craftsmanship, etc. Furthermore, regularly launching cultural events, including exhibitions of various forms and themes (maritime culture, familial legacies, etc.) can forge local educational tourism brand, delivering historical knowledge and elevating the educational services of the block.

### 5.3.6 Cultural Heritage Value: Endowing Historical Importance

The cultural landscapes of the block, both the entirety and specifics, enjoy invaluable heritage. Landsense creation can be carried out through visual and tactile aspects. Visually, the authenticity of the block's cultural landscapes is presented with diverse landscape elements and materials within the block, covering primary building materials (e.g., wood, stone), wall materials (e.g., gray brick, paint), and pavement materials (e.g.,

bluestone slabs, granite slabs, concrete). The landsense creation should honor the original and authentic materials of historical architecture and combine interpretative facilities that harmonize the style and atmosphere of the block, to invite visitors to engage with and appreciate the historical qualities of the block through visual and tactile design interventions. Newly added landscape materials should fit the aesthetic style of the block, which ideally selects the ones with moderately hard, warm and smooth textures with appropriately added uneven surfaces. These tactile qualities could attract visitors to touch and feel, fulfilling the needs of human comfort<sup>[62]</sup>.

### 5.3.7 Recreational and Ecotourism Value: Meeting Leisure and Recreational Desires

The visual and auditory environments are critical in increasing visitors' motivation for recreational activities and touring experiences<sup>[63]</sup>. Visually, the preservation of the block should faithfully reflect the historical appearance, melding traditional and modern elements to portray the core historical culture of Fuzhou. Tactilely, creating a comfortable microclimate environment within the block can improve visitors' experience. Given Fuzhou's high summer temperatures, using landscape elements like plants and water bodies can regulate the humidity and improve the comfort of the study area. From a gustatory perspective, gourmet food events can be held regularly, during which popular local cuisines can be identified according to sales data, thereby developing potential food brands in the future. Such activities can attract more visitors to delve into the historical culture through brand marketing and promotion. Regarding the olfactory, some commercial projects (e.g., the Three-Lanes Seven-Alleys Fragrance Museum) can be introduced, exhibiting and retailing perfumes, aromatherapy products, or scented candles with the typical scents of the block, making it a multisensory destination—a new tourism identity.

## 6 Conclusions and Prospects

Leveraging theories of Landsenses Ecology, this study combines literature review and analyses to identify landsense elements and the types of CES in the block, and further explores their interconnections, constructing a landsense design framework for CES enhancement. This study proposes a landsense evaluation indicator system for historical blocks, providing an evaluation basis and criteria for relevant planning and design practices. With the case studying the Three-Lanes Seven-Alleys Block in Fuzhou, this research delineates landsense creation strategies to address the

current challenges of the study area and qualitatively interprets the content of the landsense evaluation indicator system according to the practice framework. Although the landsense evaluation indicator system in this study draws from existing literature on historical blocks, it is envisaged to be adaptable to other spatial types, certainly by further investigations in the future.

The landsense creation of historical blocks for CES enhancement is a process integrating theory and practice, entailing a variety of factors, such as climatic environment, socio-economic conditions, cultural background, and user characteristics. In practice, landsense designers should focus on collecting and identifying basic information about the places, as well as dissecting and interpreting the information regarding users' perceptions. This is to simultaneously facilitate sustainable development of the historical block and create public spaces that contribute to human health and well-being.

Future studies can summarize quantifiable metrics based on the evaluation indicator system and the interrelations between CES and landsense elements explored in this study, and determine the weights of each indicator through, for instance, methods of expert scoring or entropy weight for the application of the evaluation indicator system. Moreover, the weights of the indicators may differ due to the varied attributes of the study areas. In future studies and applications, the evaluation indicator system should be adjusted according to the actual conditions of different cases, which would enhance the efficacy of landsense creation strategies in bolstering ES, providing the theoretical basis and data support for the planning and design of historical blocks.

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**Competing interests** | The authors declare that they have no competing interests.

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# 历史街区生态系统文化服务提升的 景感设计实践框架与评价指标体系研究

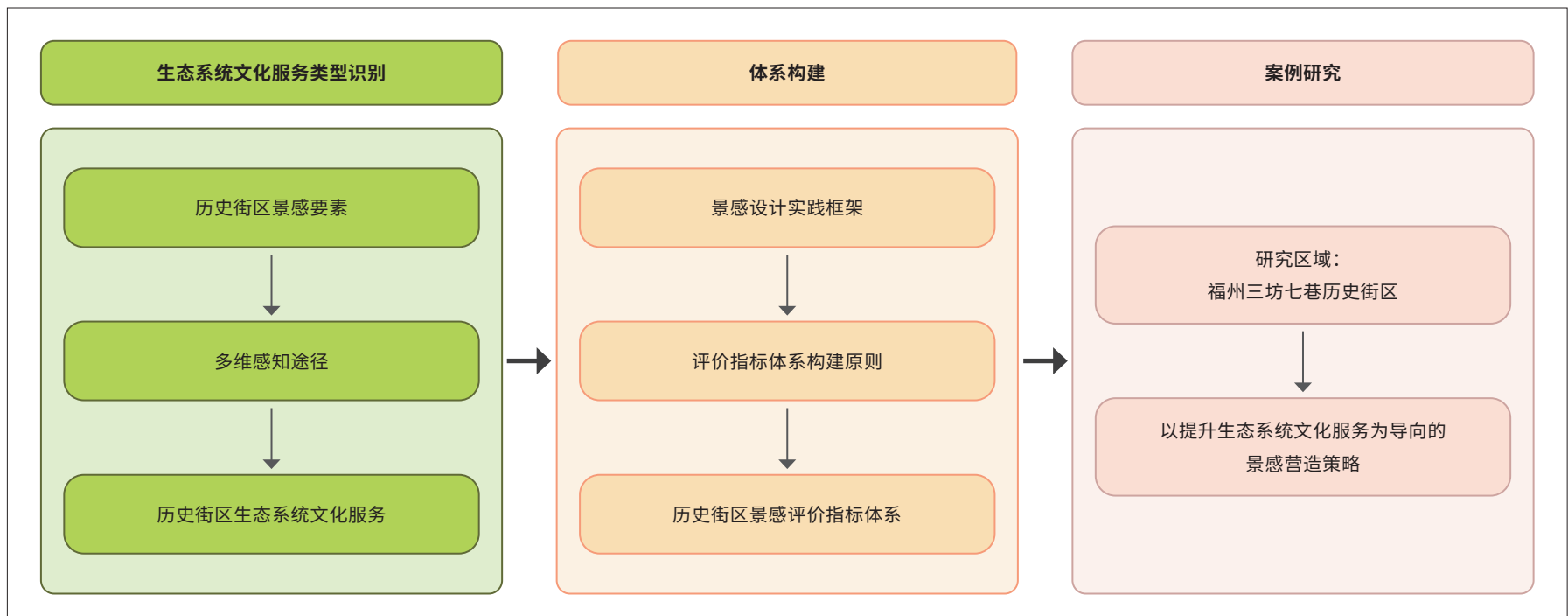
刘江<sup>1,2</sup>, 韩海娟<sup>1,2</sup>, 陈铸<sup>1,3,\*</sup>

- 1 福州大学建筑与城乡规划学院, 福州 350116
- 2 福建省国土空间分析与模拟数字技术重点实验室, 福州 350116
- 3 德国汉诺威莱布尼茨大学环境规划研究所, 汉诺威 30419

\*通讯作者

地址: 福建省福州市大学城龙江北大道2号建筑与城乡规划学院  
邮编: 350116  
邮箱: chen@umwelt.uni-hannover.de

## 图文摘要



## 摘要

历史街区作为城市生态系统中重要的文化服务供给侧, 如何在更新过程中保障其供给能力关系到多元利益相关者的福祉。本研究以景观生态学理论为基础, 结合文献综述, 对历史街区的景观要素及其相关的生态系统文化服务类型进行了梳理; 基于两者之间的内在联系, 提出了以生态系统文化服务提升为导向的景观感设计实践框架, 并对应构建了景观感评价指标体系作为框架的评价依据和标准。最后, 以福州三坊七巷街

区为例, 基于并围绕该评价指标体系, 同时结合研究区域在地特征分析现状及存在问题, 提出加强、保持和改善三坊七巷生态系统文化服务为导向的景观营造建议, 并基于景观感设计实践框架对评价指标进行定性解读。本研究为从多维感知角度提升历史街区生态系统文化服务提供了重要的理论基础和评价依据。

## 关键词

生态系统文化服务；历史街区；景感生态学；景感设计实践框架；景感评价指标体系；景感营造；三坊七巷街区

## 文章亮点

- 梳理了历史街区的景感要素和文化服务类型，并探索了两者之间的内在联系
- 构建了以提升生态系统文化服务为导向的历史街区景感设计实践框架和评价指标体系
- 遵循景感设计实践框架对福州三坊七巷街区案例中的景感评价指标体系进行内容解读，并对应提出景感营造策略

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编辑 田乐，周佳怡  
翻译 陈铸，田乐

## 1 引言

生态系统文化服务（CES）是生态系统影响人类身心状态的非物质产物<sup>[1]</sup>，对人们的健康、福祉和生活质量具有直接或间接的贡献<sup>[2]</sup>。现阶段，CES的研究多聚焦于城市湿地<sup>[3][4]</sup>、城市森林<sup>[5][6]</sup>、城市公园<sup>[7][8]</sup>和生态公园<sup>[9]</sup>等城市中的自然绿色空间。城市生态系统是城市区域内所有生物（包括人类）与其环境形成的统一整体<sup>[10]</sup>，也是人类对自然环境的适应、加工、改造而建设起来的特殊的人工生态系统<sup>[11]</sup>。城市生态系统以人为主导，即人在改变和影响生态系统服务的同时，也是生态系统服务的最终受益者<sup>[12][13]</sup>。CES是城市生态系统重要的组成部分，且其中的休

闲旅游、文化教育和精神需求与人类的生活密切相关<sup>[14][15]</sup>。尽管人类对城市生态系统中景观元素的感知为CES价值实现提供了重要的机会和途径，现有相关研究大多仅直接衡量人们对CES价值的感知，而忽略了多维公众感知和景观交互体验在CES使用中的重要作用。例如，李昊冉等人<sup>[16]</sup>、张怡等人<sup>[17]</sup>利用网络评论文本等社交媒体数据获取公众对城市滨河绿地、城市湖泊公园的CES直接感知水平；赵雨晴等人<sup>[18]</sup>、姜芊孜等人<sup>[19]</sup>虽然研究了不同的使用者群体，但也仅关注使用者对CES的直接感知情况。

生态学家赵景柱提出的“景感生态学”（Landscape Ecology）有效地将景观要素和生态系统服务联系在一起，即以可持续发展为目标，基于生态学的基本原理，从自然要素、物理感知、心理认知、社会经济、过程风险等相关方面，研究土地利用规划、建设与管理的科学。<sup>[20]</sup>在实践中，人们通过适当的表现形式将他们的愿景赋予或融入某种载体，令其他人和自己在观赏载体的同时能够领悟到其中的愿景。这些载体可以是街区、建筑、植物、绘画、书法、诗歌、小说、歌曲或标志等各种元素。蕴含这种属性的载体称为“景感”，而构思和构筑景感的整个过程则为“景感营造”<sup>[21]</sup>。由此可见景感的表现形式多种多样，可能是具象的，也可能是抽象的。

自景感生态学理论提出后，唐立娜<sup>[22]</sup>、董仁才<sup>[23]</sup>、刘晓芳<sup>[24]</sup>等国内学者进一步对其理论方法及应用进行研究，伊希尔·凯梅兹<sup>[25]</sup>、埃尔维拉·塔斯塔诺<sup>[26]</sup>、尼尔·贝克尔<sup>[27]</sup>等国外学者基于景感生态学理论，探究了城市公共空间中的公众感知、认知和偏好，或通过货币化价值评价公众对于自然保护区的经济投入意愿。其中，刘晓芳等人进一步将景感的外在表现形式定义为“景感要素”<sup>[24]</sup>，其是能够承载人类愿景、影响人类感知的各种自然和人工的生态与环境要素。与“景观”相比，“景感”强调更为广泛的概念，不仅包括自然景观元素，还包括各种形式的人造载体。传统的景观可能更专注于对自然或人造环境特定方面的描述和研究，而景感涵盖了形式更多样的景观和更深层次的人类参与和表达。因此，相比于景观要素，景感要素更加注重使用者的感知及需求愿景，同时强调了人类对景观进行的创造和表达或赋予意义的主动作用。并且，这些愿景具有一定的指导或规范人们言行的作用，从而可进一步推动可持续发展的实现，这表明景感要素可以不局限于感知本身，而包括了对环境和社会可持续性的关注。基于景感生态理念对CES进行评价，也是拓展CES研究深度的新思路<sup>[28]</sup>。

在景感生态学领域，目前已有探索性研究关注景感与生态系统服务层级及供需的关联性<sup>[29][30]</sup>，但相关的实践或应用型研究主要集中于城市绿地，较少关注历史街区。此外，现有的历史街区景感研究主要探索不同感知途径下的游览体验及相关的评价方法和提升策略<sup>[31]-[34]</sup>。在历史街区的CES相关研究中，部分学者探究了历史街区中景观要素（如行道树）<sup>[35]</sup>、历史文化用地内的历史建筑或文化功能建筑（如博物馆）<sup>[36][37]</sup>，以及历史

区域中非生物要素（如地理环境）<sup>[38]</sup>所提供的各类服务价值。然而，这些研究中使用的概念或措辞大都为“感知体验”或“资源价值”等，并未系统地将两者结合考虑。此外，相关研究也未综合考量将CES和景感生态学。历史街区作为城市生态系统中的一个重要组成部分，承载着宝贵的物质与精神文化财富。其内部的元素构成反映了地域特色和景观面貌，并体现了城市的历史文化价值<sup>[39]</sup>，是城市生态系统中CES重要的供给区域之一。因此，本研究首先梳理了历史街区内的景感要素和CES类型，基于景感营造探究了它们之间的相互关系，构建了以CES提升为目标的景感设计实践框架和评价指标体系；之后，以福建省福州市的三坊七巷街区为例，通过背景解读评价内容，并基于景感设计实践框架和评价指标体系，提出相应的景感营造策略。

## 2 历史街区中的CES类型与解读

2005年，千年生态系统评估将CES定义为人类通过精神满足、认知能力的发展、反思、娱乐及审美体验等从生态系统中所获取的非物质收益<sup>[40]</sup>。CES分为多种类型，并根据具体研究赋予各个类型具体释义<sup>[18][41]</sup>。在此国际框架下，本研究整理了与历史街区的体验、感知、资源或价值等相关的研究<sup>[31][32][35]-[38][40][42]-[44]</sup>，得到历史街区背景下各类CES的具体释义（表1）。

## 3 历史街区景感设计实践框架

景感要素作为景感的外在具体表现形式，需要在实践中根据不同的研究目标予以归类和分析。本文将景感要素定义为承载使用者的需求愿景，并能够影响使用者感知的自然或人工环境中的要素<sup>[24]</sup>。基于不同感知途径下的历史街区相关研究文献<sup>[31]-[34]</sup>及已有历史街区综合价值评价体系<sup>[42][45][46]</sup>，并结合景感生态学理论所强调的物理感知和心理认知<sup>[20][21]</sup>，本研究将历史街区的景观环境分为自然和人文两个类别，并从中总结出五个主要的景感要素类型及多个子类型：自然环境景感要素包括气候条件（温度、湿度、风速等）和环境质量（大气环境、视觉环境、声环境、嗅觉环境、水环境、光环境等），人文环境景感要素包括街巷格局（街区布局、街道空间界面等）、景观要素（植物景观、建筑景观、水体景观等）和文化要素（文化遗产、文化设施、文化经济等）。

人类对生态系统的非物质精神需求和生态系统提供的景感要素特征，是CES从生态系统流向人类社会系统的动态过程的两个主导元素<sup>[47]</sup>。图1简要展示了在景感生态学的背景下景观感知的结构和过程，厘清了景观感知通过景感营造方法影响CES的逻辑<sup>[21][29]</sup>。通常情况下，人们首先通过自身的物理感知来体验环境中的景观载体，而后基于不同使用者个人或群体的文化背景对景观载体做出特定的理解，产生差异化或相同的心理认知，由此生成短期或长期的反应结果。基于此，使用者能够明晰自身的需求并对景观载体产生对应的愿景，而结合载体和愿景便生成了特定的景感要素。随后，通过景感营造的三种方式——利用现有载体；改造现有载体；构建新的载体并融入愿景——并遵循景感营造的愿景呈现的双向性、方位的脉势顺应性、时空组合的多尺度性、物理感知的系统性、心理认知的整体性、物理感知与心理认知的交互性、不同文化之间的差异性、营造过程的渐进性八项原则<sup>[21]</sup>，对环境中的景感要素进行设计，从而对CES产生加强、保持和改善的影响作用。

本研究进一步基于景感生态学背景的景观感知结构和过程，从历史街区的项目设计实践角度，提出以CES提升为导向的景感设计实践框架（图2）。该框架对包括景感设计师和使用者在内的各个元素间的相互关系进行细化，并更深入地将CES的影响拓展至可持续发展及相关意识层面，将历史街区景感要素与CES相联系。

表 1: 历史街区中的 CES 类型及释义

CES 类型	释义
美学价值	历史街区中的自然和人文景观，具有独特的艺术个性和风格，蕴含历史文化特质，有较高的美学艺术价值，能够满足人们日常的审美需求
灵感价值	通过游览和体验历史街区内的自然和人文景观，达到放松心情的效果，并激发艺术创作灵感
地方认同感	历史街区留存了地方特有的人文内容，会带给体验者依恋感和归属感
精神价值	历史街区作为城市精神文化的有机组成部分，蕴含丰富的精神价值，具有满足城市居民和游客精神需求的重要功能
教育价值	历史街区的历史文化资源具有重要的社会教育功能，由此衍生的特定文化宣传展示场所能够为开展教育活动提供必要平台
文化遗产价值	历史街区是兼具地域性和时代性的综合文化遗产形态，包含具有重要历史价值的（自然或人文）景观和具有重要历史文化价值的物品
游憩与生态旅游价值	历史街区是一种重要的城市公共空间类型，由于其深厚的历史文化底蕴，结合街区内的自然景观，往往被认为具有较高的旅游价值，能够满足人们的休闲和娱乐需求

## 4 历史街区景感评价指标体系构建

除了结合历史街区再发展的具体情况<sup>[43]</sup>外,本研究提出的历史街区景感评价指标体系还遵循以下国际通行的指标体系构建原则<sup>[48][49]</sup>。

1) 科学性原则: 指标体系必须基于历史街区景感要素的特征和本质, 考虑到历史街区的历史、文化、建筑等方面的因素, 并采用科学的量化和计算方法来定义和评估景感要素。

2) 导向性原则: 指标的选取应能够准确反映历史街区的景感特征, 能够指导和促进历史街区的保护、改造和管理工作; 重点关注历史街区中人与环境的和谐关系, 以更好地提升和满足人们对于历史街区的感受和需求。

3) 操作性原则: 指标应该具备可观测性或可测量性, 能够通过科学的方法和技术手段选择对应的测量指数进行数据收集; 优先考虑具备普适性和统计意义的多源数据。

4) 连续性原则: 指标数据应当具备一定的时间连续性(如逐年获取), 以跟踪历史街区景感要素的动态变化, 同时也为建立城市时空数据平台提供基础。

5) 应用性原则: 指标体系应成为地方政府推动历史街区景感要素提升的工具, 因此指标的选取应与地方事务紧密对接, 与城市空间规划、历史街区保护规划等相关规划体系紧密联系。

综上, 本研究在景感设计实践框架的基础上提出的历史街区景感评价指标体系如表2所示。

## 5 案例研究: 福州市三坊七巷街区以提升CES为导向的景感营造策略

### 5.1 研究区域概况

“三坊七巷”坐落于福建省福州市, 由三个坊、七条巷和一条中轴街肆组成(图3), 在其保留的众多物质及非物质文物遗产中, 最具价值的是“起于晋, 完善于唐五代, 至明清鼎盛”并至今基本保留完整的坊巷格局和200余座古建筑, 可谓是中国都市仅存的一块“里坊制度活化石”<sup>[50][51]</sup>。另外, 三坊七巷不仅是古典私家园林集萃地, 也是林则徐、沈葆楨、严复、冰心等众多名人故居所在地, 这些先贤均对中国近现代史的进程做出过巨大贡献, 由此赋予了三坊七巷独特的人文价值。

表 2: 历史街区景感评价指标体系

类别	指标	次级指标	评价指标内容说明
气候条件	体感舒适度	温度	街区中的环境温度是否适合游客进行活动和体验
		湿度	街区中的环境湿度是否影响游客的舒适度
		风速	街区中的环境风速是否对游客的体验产生影响
环境质量	大气环境	空气质量	街区中的空气成分和污染水平
	视觉环境	视觉景观多样性	街区中视觉景观的多样性, 如景观元素、景点多样性等
		视觉景观自然性	街区中视觉景观中的自然元素(如绿植、水体等)的视觉占比
		视觉景观独特性	街区中的视觉景观是否能够反映街区的独有特征
声环境	声源特征	街区中的声源感知频率、强度、和谐度和优势度	
	总体声环境质量	街区整体声环境, 主要包括声景愉悦度和丰富度	

(续表见下页)

表 2: 历史街区景感评价指标体系 (接上表)

类别	指标	次级指标	评价指标内容说明
环境质量	嗅觉环境	气味源特征	街区中游客感受到的气味强度、纯度、新鲜度、清洁度
		总体嗅觉环境质量	街区的整体嗅觉环境, 主要包括香景愉悦度、适宜性、自然性等
	触觉环境	材质接触舒适度	街区中地面和建筑材料的触觉舒适性
	水环境	水体质量	街区中的水体成分(营养物质含量、溶解氧含量、pH 值等)、清澈度、流动性及其他水质特征
		水文环境	街区的水文循环和雨洪管理情况
		水体生物多样性	街区水体中的生物种类多样性, 反映水体的生态状况和可持续性
	光环境	人工光景特征	街区中的人工光景特征, 如照明景观设计、光线特征等
		自然光照均匀度	街区中自然光照分布的均匀性, 反映光线的均匀度和柔和度
		光污染程度	街区中的光污染水平, 对游客的夜间视觉体验产生影响
	街巷格局	街区布局	空间肌理结构
街道密度			街区中街道的数量和紧凑度, 反映街道空间分布的密度
街道空间界面		街巷高宽比	街区中街巷的立面高度和街道宽度比例, 反映街道环境的品质和尺度
		建筑街道围合度	街区中建筑和街道的封闭性和围合度, 影响空间感知和游览私密性
		建筑街道界面密度	街道一侧建筑物沿街道投影面宽与该段街道的长度之比
		界面引导性	街区界面中的导向和引导设施, 如路标、导览牌等
景观要素	植物景观	植物多样性	街区中植物种类的多样性, 反映植被的生态和景观价值
		植物观赏性	街区中植物景观的美观度和吸引力, 影响游客的视觉体验
		植被覆盖率	街区中的植被覆盖面积比例, 反映绿化水平和自然景观质量
	建筑景观	建筑风貌特征	街区中建筑的外观和风格特征, 影响视觉感知和文化氛围
		建筑营造独特性	街区中建筑营造手法和材料的独特性, 反映建筑的文化价值和特色
		建筑历史价值	街区中建筑本身的历史和文化价值, 影响文化传承和教育功能

(续表见下页)

表 2: 历史街区景感评价指标体系 (接上表)

类别	指标	次级指标	评价指标内容说明
景观要素	水体景观	水景面积占比	街区中水体面积占整体景观面积的比例
		水景类型多样性	街区中水景类型多样性, 如池塘、溪流、喷泉、湖泊等
		水景形态丰富度	街区中水景设计的形态和结构多样性, 如曲线型、直线型、不规则型等
文化要素	文化遗产	文化遗产丰富度	街区中文化遗产的数量和多样性, 反映文化遗产的丰富和多元程度
		历史文化遗产性	街区中历史文化遗产的程度, 如历史文化元素的保护和展示情况、人们对历史文化保护活动的参与度和支持度、街区内是否有传承和讲述地方故事的载体等
	文化设施	历史文化展览机构可用性	街区中历史文化展览机构的可用性和易达性
		历史文化教育资源丰富度	街区中历史文化教育资源和机构的多样性
	文化经济	文化产品商品多样性	街区中提供的文化产品和商品种类多样性, 影响游客的文化体验和购物需求
		文化商业形式多样性	街区中能够反映街区文化和历史传统的商业形式和类型的多样性和创新性
历史文化与现代商业融合度		街区中历史文化与现代商业的融合适宜度, 反映为在保留历史文化的传统特色的同时, 又能够适应当代商业需求	

## 5.2 现状分析

基于上述历史街区景感评价指标体系中的主要指标——气候条件、环境质量、街巷格局、景观要素和文化要素, 本研究对三坊七巷街区的现状进行了分析和问题识别<sup>[44][52]-[54]</sup> (表3)。

## 5.3 景感营造策略

研究进一步结合历史街区景感指标体系内的指标和次级指标提出景感营造策略, 旨在对三坊七巷内不同类型CES进行针对性的加强、保持和改善。基于指标体系的评价涉及方法和测量指数的选择, 会因研究区域、可获取数据和评价指标使用者的不同而产生差异。本研究不涉及这一范畴的内容, 但将在后续的研究中深入探究。

### 5.3.1 美学价值: 丰富自然和人文景观

致力于美学价值提升的景感营造主要可围绕视觉感知开展。营造应注重三坊七巷内的自然和人文景观, 根据街区内的建筑样式、街巷结构, 搭配合适的植物群落, 增加植物种类, 丰富种植层次。此外, 应充

分发掘主轴南后街这条核心的“视觉轴线”, 优化景观视线通廊, 避免过多的元素干扰人们的视线<sup>[55]</sup>。光线对街巷空间也具有明显的重塑作用, 可以利用光线凸显街巷空间的特色与古建筑形态: 通过引入自然光使历史建筑焕发活力, 让人清晰感受到建筑表面的肌理, 重拾历史记忆; 而人工照明设施的利用可以营造光影变换的艺术氛围。照明设计应注重对建筑外形结构的表现, 提升三坊七巷特色历史建筑的古朴韵味<sup>[56]</sup>。

### 5.3.2 灵感价值: 提供灵感源泉

在街区更新规划过程中应重视历史文化遗产性, 向游客展示福州独有的民俗文化和传统技艺, 充分体现街区的历史文化价值并提供灵感价值。灵感价值的提升可通过多维感知的途径进行景感营造。在听觉感知层面, 通过丰富三坊七巷的植物配置并布置引虫引鸟设施来提升自然声源多样性; 在街区靠近外部道路的区域通过声景设计 (如水景产生的流水声<sup>[57]</sup>) 来降低噪声, 从而提升街区内部整体声环境质量; 增加街区内独有的民俗活动声、手工制作声等, 激发参与者的艺术灵感。

植物是自然环境中气味的主要来源<sup>[58]</sup>, 因此在嗅觉感知层面, 可

表 3：三坊七巷历史街区现状分析及问题识别

景感评价主要指标	现状分析	存在问题
气候条件	<ul style="list-style-type: none"> <li>· 福州属海洋性亚热带季风气候，副热带季风现象明显，全年冬短夏长，冬季温暖湿润，夏季高温炎热，且太阳辐射较强</li> <li>· 雨量充沛，无明显的干季，年相对湿度约为 77%</li> </ul>	<ul style="list-style-type: none"> <li>· 街区内自然景观整体占比较小、单体型植被较多</li> <li>· 6~10 月可能存在气温过高或过于潮湿的情况，影响旅游舒适度和游览体验，如高温天气可能导致游客不愿意在户外游览</li> </ul>
环境质量	<ul style="list-style-type: none"> <li>· 街区整体被城市道路环绕</li> <li>· 街区内部环境相对整洁，道路延伸感较好，视觉感官层面的可达性较好，整体景观美感受度较高</li> <li>· 街区内部人流较为密集，尤其是在夜间</li> </ul>	<ul style="list-style-type: none"> <li>· 街区内部声环境易受外部交通噪音影响，干扰游览体验，特别是在狭窄的巷道中</li> <li>· 夜间巷坊内的光线较暗，可能使游客缺乏安全感</li> <li>· 街区内缺少具有当地特色的嗅觉环境</li> </ul>
街巷格局	<ul style="list-style-type: none"> <li>· 街巷格局遵循传统风格，表现为古老的街区肌理、狭窄的街道、清晰的界面和店铺招牌等</li> <li>· 坊和巷整体呈鱼骨式格局或棋盘状布局，适宜的街巷高宽比给予游客亲切感和安全感</li> <li>· 里坊制街巷整体格局及其中巷道空间尺度宜人，能让人们产生场所感和认同感</li> </ul>	<ul style="list-style-type: none"> <li>· 部分街巷道路较狭窄，可能存在交通拥堵和拥挤的问题，特别是在人流高峰时段</li> <li>· 街区内部分相对开阔的空间缺乏休憩基础设施和停留空间</li> </ul>
景观要素	<ul style="list-style-type: none"> <li>· 街区内的传统建筑与街道景观具有较好的整体协调性，建筑设计风格及雕刻装饰呈现出街区独有的地方特色和历史文脉</li> <li>· 街区内整体植被较为茂盛，与历史建筑和坊巷街道融合度较高</li> </ul>	<ul style="list-style-type: none"> <li>· 部分商业门店外部的标志设施一定程度上打破了原有历史建筑的连续界面</li> <li>· 部分区域的植被色彩过于压抑单调</li> </ul>
文化要素	<ul style="list-style-type: none"> <li>· 街区内名人故居众多，也是许多古典私家园林的聚集地</li> <li>· 戏曲文化丰富，包括闽剧、伢艺、评话、十番等</li> <li>· 具有多样的文化传承，如脱胎漆器、寿山石雕、软木画等手工技艺文化和书市、灯市、花市等民俗活动；以及海上丝绸之路等福州海上文化</li> <li>· 美食文化远近闻名，如“木金肉丸”“同利肉燕”“永和鱼丸”等</li> </ul>	<ul style="list-style-type: none"> <li>· 部分文化要素在保存和传播、文化与商业活动结合，及维持文化的传承与活力方面有待提升</li> <li>· 游客对街区内文化体验互动活动的满意度不高</li> </ul>

提升福州特有香花植物的丰富度，如茉莉 (*Jasminum sambac*)、桂花 (*Osmanthus fragrans*) 等。种植设计时还可考虑无特殊气味，或气味较弱、滞尘能力强的植物品种，以有效改善空气质量，营造宜人、舒适的嗅觉环境。

### 5.3.3 地方认同感价值：展现地域独特性

借助三坊七巷内中华福馆（陈衍故居）、海上丝绸之路展示馆（尤氏民居）等历史文化展览机构，展现三坊七巷历史文化的地域独特性，让居民和游客更好地领略传统文化，从而在心理认知层面增强对历史街区的地方依恋和认同感<sup>[59]</sup>。此外，地方认同感还可通过多维度感知的途径进行提升。在视觉感知层面，可基于三坊七巷原有特征，引入独特的标志符号（如特有的传统建筑之门<sup>[60]</sup>），并结合当地建筑材料和传统建

造技术构建完整的视觉景观体系，从而激发人们的好奇心。在听觉层面，可通过福州方言戏曲演绎三坊七巷的古厝“坊巷人物”故事，增强游客的地方认同感，以及对当地人文资源的深入理解。三坊七巷的地方传统特色美食则可以从嗅觉和味觉层面吸引游客。

### 5.3.4 精神价值：满足精神需求

三坊七巷的精神价值主要反映在文化活动和产品的呈现上。研究表明，三坊七巷中曾有多种特征文化声源，如读书声、吟诗声和民俗活动声等<sup>[51]</sup>。然而，随着旅游业的发展，人类活动声已成为街区内出现最多的声源。因此，在景感营造时可挖掘三坊七巷内特有的历史和文化声源，对其进行设计重现并加强保护管理。例如，专人定期定点演奏或表演闽剧、福州伢艺等当地特有的曲艺文化节目；还可通过播放宣传片和

真实录制的演奏片段供游客欣赏，引导人们探索街区内不同的区域，提升街区活力<sup>[61]</sup>。在相对安静的区域，特色文化声也可形成一种鲜活的“景观”。此外，还可创设更多以三坊七巷文化为主题的衍生品，例如T恤、手办、明信片、书签等，以丰富产品选择。相关的民俗、民族文化活动和产品可以提升人们的参与感和体验感，从而在一定程度上满足人们地方依恋层面的精神需求，以此提升街区的精神价值。

### 5.3.5 教育价值：开展教育活动

三坊七巷的教育价值可体现在街区内的各种物质和精神载体中。街区内坐落众多名人故居且是传统私家园林集萃地，可在景观节点增加解说系统来介绍相关历史背景和文化内涵，增强游客与实体历史景观的互动性；特色文化活动的表演可通过人们的视觉和听觉感知传递文化价值；人们可通过感知民俗文化活动声、手工制作声等对三坊七巷的历史声环境有所认知；另外，还可定期构筑文化走廊及专题展览，打造三坊七巷特色研学品牌，以海上文化、名人家风家训等为主题，通过有趣的形式向人们传达历史知识，提升三坊七巷的教育价值。

### 5.3.6 文化遗产价值：赋予历史意义

无论是三坊七巷整体，亦或是其内部各类文化景观，都承载着重要的文化遗产价值。景感营造可主要在视觉和触觉层面进行。视觉上，三坊七巷原有的文化景观主要通过不同的景观要素和材质进行呈现，包括木材和石材等主体建筑结构的材质，灰砖和涂料等墙体材质，以及青石板、花岗岩石板和混凝土等铺装材质。因此，景感营造应在尊重历史建筑原本材质的前提下，引入契合街区环境风格氛围的引导标志，吸引人们参与其中，从视觉或触觉感知中体验街区的历史痕迹。新增的景观材质应在契合街区古朴格调的基础上，选择硬度适中、较为温暖和光滑的材料，并且适当增加表面的纹理质感和凹凸程度，从而有利于吸引游客触碰体验，同时满足人体舒适度的需求<sup>[62]</sup>。

### 5.3.7 游憩与生态旅游价值：满足休闲、娱乐意愿

视听环境是提升游客游憩动机和游览体验的最重要因素之一<sup>[63]</sup>。在视觉上，三坊七巷整体风格应基于历史风貌，并在注重协调传统和现代元素的前提下，展现核心的福州历史文化。此外，还可从触觉角度出发，营造舒适的街区微气候环境。例如，由于福州夏季气温较高，营造清凉舒适的微气候环境有利于吸引居民和游客到访，可合理运用三坊七巷内植物和水体等景观要素来调控局地湿热环境的舒适度。在味觉方面，可定期举办美食鉴赏活动，活动期间可结合销量数据分析受欢迎程度较高的美食类型，从而在后期重点打造相关的美食品牌，通过品牌营销和宣传等形式吸引更多游客来此体验历史文化。在嗅觉层面，可引入

对应的商业项目，如“三坊七巷气味博物馆”，展览和售卖具有三坊七巷特色气味的香水、香薰或香烛等相关周边产品，从而丰富整个街区的旅游特色。

## 6 结语与展望

本研究以景感生态学为理论基础，结合文献综述和分析，识别历史街区中的景感要素和CES类型，并分析景感要素和CES之间的内在联系，从而构建了以CES提升为导向的景感设计实践框架。研究同时提出了历史街区景感评价指标体系，为相关规划与设计实践提供了一定的评价依据和准则。研究以福州市三坊七巷街区为例，针对其现状问题提出了以CES提升为导向的景感营造策略。由此基于景感设计实践框架，定性地对景感评价指标体系的内容进行更为具体的解读。虽然本研究构建的景感评价指标体系来源于现有的历史街区相关研究，但相信通过未来更深入的研究挖掘，该框架的适用性将拓展至历史街区以外的其他景观场所。

以CES提升为导向的历史街区景感营造是一个涉及气候环境、社会经济、文化背景、使用者特征等诸多因素的理论研究和实践相结合的过程。在实践中，景感设计师应注重对场地基础信息的采集与识别，以及对使用者感知信息的充分分析和解读，从而实现历史街区的可持续发展，营造有益于人类健康和福祉的公共空间。

未来研究可根据本研究提出的评价指标体系及所梳理的CES与景感要素的相互关系，归纳总结出具体可量化指数，后续进行评价指标体系应用时，还应通过专家打分、熵权法等方式确定各指标权重。尽管如此，各评价指标的权重值也可能因所评价的历史街区特征不同而有所差异。此外，在今后的研究和实践中也可根据实际情况进行调整和优化，从而更切实地通过景感营造策略提升生态系统服务，为历史街区规划设计提供必要的理论依据和数据支持。

图 1. 景感生态学背景下的景观感知结构和过程（改绘自参考文献 [21][29]）

图 2. 以 CES 提升为导向的景感设计实践框架

图 3. 三坊七巷街区的坊巷格局。“坊”通常指相对较大的城市街区或社区，包含若干街巷和房屋。“巷”则通常指较窄的街道，是具体的道路，连接着坊内的各个房屋。三坊七巷内，坊路的道路宽度普遍比巷路宽，这种道路与两侧建筑高宽比的差异变化也会给游客带来丰富的游赏体验。