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Research on the Integration of Hainan Cultural Elements and Environment in Urban Landscape Design

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Abstract: Amid the dual challenges of urban homogenization and regional cultural preservation, landscape architecture has emerged as a vital medium for cultural expression, ecological integration, and lifestyle enhancement. Hainan boasts a rich cultural tapestry encompassing Li and Miao intangible heritage, maritime traditions, Nanyang overseas Chinese communities, Su Dongpo philosophy, tropical ecosystems, volcanic landscapes, and Danjia ethnic culture. Systematically incorporating these cultural elements into urban landscapes serves dual purposes: establishing a distinctive identity for the free trade port city while fostering synergy between cultural preservation and ecological sustainability. This study systematically categorizes representative cultural elements and their landscape translation logic, addresses prevalent issues in contemporary urban design, including fragmented cultural representation, inadequate ecological adaptation, and monotonous experiential approaches, and proposes integrated solutions through five dimensions: design principles, element selection, spatial configuration, material application, and business model revitalization. Empirical case analyses of Haikou, Sanya, Baoting, and Qionghai provide practical references, ultimately offering theoretical foundations and actionable strategies to advance Hainan's localized, distinctive, and high-quality urban landscape development.

Keywords: Landscape architecture; Landscape design; Hainan cultural elements; Regional culture; Ecological integration; Urban landscape

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1. Introduction

With the deepening development of Hainan Free Trade Port and the National Ecological Civilization Pilot Zone, urban construction has shifted from scale expansion to quality enhancement, with regional cultural identity and ecological livability becoming core value orientations. Traditional urban gardens commonly exhibit issues such as "uniform city appearances," excessive accumulation of cultural symbols, and disconnection from natural environments, making it difficult to preserve urban memories and the humanistic spirit. As China's only tropical island province, Hainan possesses unique cultural genes integrating indigenous traditions, maritime heritage, overseas Chinese culture, historical figures' legacy, and revolutionary culture. Landscape architecture, serving as the primary public open space in cities, fulfills multifunctional roles including ecological restoration, recreational activities, cultural dissemination, and urban identity

shaping. By organically integrating Hainan's cultural elements into landscape design, we achieve "perceptible culture, recyclable ecology, and participatory spaces," a strategy crucial for enhancing urban appeal, strengthening residents' sense of belonging, and promoting cultural-tourism integration [1].

From the perspective of "culture-environment-design synergy," this study defines the landscape expression system of Hainan's cultural elements and explores methods for transforming cultural symbols into landscape language. It emphasizes the deep integration of cultural elements with environmental factors such as tropical climate, topography, native vegetation, and sponge city concepts. The aim is to establish an urban landscape design paradigm that combines regional characteristics, ecological resilience, and humanistic warmth, thereby supporting Hainan's development into a livable, resilient, smart, culturally rich, and green city.

2. Types of core cultural elements in Hainan and their landscape compatibility

Hainan culture, a composite cultural system formed through the integration of multiple ethnic groups, geographical regions, and historical periods, can be categorized into six major types, all demonstrating clear potential for landscape translation and environmental adaptability.

2.1. Li and Miao intangible cultural heritage: Indigenous cultural roots of the island

The Li people, as Hainan's earliest indigenous inhabitants, coexist with the Miao people, who are the region's long-established ethnic group. Together, they have developed a distinctive intangible cultural heritage system centered around Li brocade, boat-shaped houses, bamboo and rattan construction techniques, bamboo and wood musical instruments, frog motifs and the Hercules totem, bamboo pole dances, and Shanlan culture. The geometric patterns and color scheme of Li brocade (dominated by black, red, and blue), the architectural wisdom embodied in boat-shaped houses featuring "three pillars and six rafters, thatched roofs, and nail-free mortise-and-tenon joints," and the ventilated, heat-dissipating design of bamboo and wood structures are the most distinctive local elements, making them suitable for parks, community green spaces, cultural tourism sites, and rural revitalization landscapes [2].

2.2. The ocean and Danjia culture: The identity of a coastal city

Surrounded by the sea on all sides, Hainan has given rise to visual symbols such as ocean waves, fishing boats, lighthouses, pearls, and the rhythm of the coconut breeze and maritime charm. The Danjia people, who "use boats as homes and regard water as land," have developed elements like saltwater songs, fishing and farming customs, sea worship rituals, Danjia hats, and fishing net textures [3]. These elements are well-suited for coastal parks, waterfront greenways, port landscapes, and wetland parks, and can be synergistically integrated with coastal forest systems and mangrove ecosystems.

2.3. Nanyang and overseas Chinese hometown culture: Open and inclusive characteristics

The architectural elements of homestead-style residences in Hainan, including arcade buildings, carved decorations, arched vaults, stained glass, pitched roofs, and gray plasterwork, embody a fusion of Eastern and Western aesthetics. These features are well-suited for historical districts, urban gateways, cultural squares, and pedestrian streets, while also meeting the environmental requirements for tropical shading, ventilation, and rain protection.

2.4. Su Dongpo and historical-humanistic culture: The sublime cultural heritage of the city

The poetry and verses left by Su Dongpo in Qiong, his iconic image of wearing a bamboo hat and wooden clogs, the symbolic concept of the Wine Transport Hall, and his advocacy for scholarly pursuits collectively form distinctive cultural landscape symbols. These elements are well-suited for integration into cultural parks, academy green spaces, campus landscapes, and riverside cultural belts, thereby enriching the humanistic depth of the gardens [4].

Classic verses like "Ask about your life's achievements, Huangzhou, Huizhou, Danzhou" can be integrated into

landscape spaces through wall engravings and ground carvings, allowing visitors to experience the literati's spirit while walking. The ethereal imagery of the "Lishu Figure" (a traditional Chinese scholar's depiction) may be transformed into sculptural installations or paving patterns, recreating Su Dongpo's carefree demeanor described as "lighter than a horse with bamboo cane and straw sandals." The Zaijiu Hall, symbolizing Su Dongpo's lecture site, could adopt its courtyard layout and architectural style to create cultural hubs combining exhibition and leisure functions, reviving the historic scene of "drinking wine and seeking wisdom." Educational initiatives could incorporate pavilions and covered walkways with scholarly couplets and plaques, fostering an atmosphere that values learning and culture. This approach transforms gardens into not just recreational spaces but spiritual vessels preserving historical heritage and cultivating refined cultural sensibilities [5].

2.5. Tropical ecology and indigenous material culture: Natural endowment advantages

Native plants such as coconut, areca nut, banyan tree, bougainvillea, and fox tail coconut; indigenous materials including volcanic rock, bamboo rebar, thatch, logs, and coconut shells; and ecological types like tropical rainforest, volcanic landforms, and mangrove wetlands constitute the natural backdrop of Hainan gardens, serving as the material foundation for cultural expression.

These natural elements not only preserve regional ecological memories but also carry unique cultural codes. Take the coconut tree as an example: its towering trunk and sprawling canopy vividly embody tropical charm, while derived materials like coconut shells and palm fronds can be artistically transformed into decorative landscape features or construction materials for rest facilities. This approach demonstrates resource recycling while enhancing regional identity. Volcanic rocks, with their rugged texture and ancient hues, serve as direct carriers of Hainan's volcanic culture. Their use in garden path paving, scenic wall construction, or rockery stacking not only showcases natural textures but also evokes associations with volcanic geological history. Tropical rainforest ecosystems provide layered visual richness and dynamic beauty through seasonal changes, while mangrove wetlands' "marine forest" landscapes, through ecological revetments and viewing platforms, allow visitors to experience the unique allure of intertidal ecosystems and their fragile ecological value. Strategic placement of native plants creates a "man-made yet naturally formed" aesthetic. The skillful use of local materials endows landscapes with rustic charm and cultural depth, ensuring Hainan gardens distinctly showcase tropical regional characteristics in both visual presentation and spiritual essence [6].

3. Practical challenges in integrating Hainan cultural elements with landscape environments

Cultural expression has become superficial, with excessive reliance on symbolic elements. Most designs merely incorporate Li brocade patterns, totems, and coconut trees as decorative accents on flooring, lighting fixtures, and seating, lacking a coherent spatial narrative or logical framework. The cultural content remains fragmented, failing to create an immersive experience. Culture is disconnected from the ecological environment; cultural structures are ill-suited to the tropical climate characterized by high temperatures, humidity, intense typhoons, and heavy rainfall, employing materials that are not corrosion-resistant and structures that lack wind resistance. Planting schemes involve haphazard introduction of exotic species while neglecting the synergy between native vegetation and cultural contexts, resulting in insufficient ecological resilience [7].

The regional characteristics exhibit homogenization with insufficient distinctiveness. There is a blind replication of popular domestic and international landscape designs, where elements such as arcaded buildings, boat-shaped houses, and coconut groves are overused, simplified, and distorted, resulting in a uniform urban landscape that fails to reflect the unique positioning of cities like Haikou, Sanya, Baoting, and Qionghai. A functional and cultural imbalance prevails, prioritizing visual aesthetics over recreational needs, while cultural landscapes lack accessibility, participatory engagement, and practical utility. Furthermore, the living preservation of intangible cultural heritage is inadequate, with landscapes

predominantly featuring static displays devoid of interactive experiences, folk performances, or hands-on craft activities.

The lack of traditional materials and construction techniques has led to extensive use of modern rigid materials, with insufficient application of indigenous materials (volcanic rock, bamboo, thatch, coconut shells). The loss of traditional construction techniques has resulted in cultural landscapes that are superficially similar but lack spiritual authenticity, exhibiting poor harmony with the environment.

4. Design principles for integrating Hainan's cultural elements with landscape architecture environments

With ecological preservation as the priority and tailored to local conditions, the design follows tropical climate and topographic features, leveraging native plants, sponge technology, and passive ventilation and shading systems to achieve synergy among cultural landscape, ecological restoration, stormwater management, and biodiversity conservation. Rooted in cultural heritage, it emphasizes living inheritance, shifting from symbolic replication to cultural interpretation by transforming intangible cultural heritage, folk customs, and lifestyles into spatial narratives, thereby creating dynamic cultural landscapes that are experiential, participatory, and shareable.

Regional distinctiveness and differentiation are emphasized. The urban planning is tailored according to each city's functional positioning: Haikou highlights its Nanyang and historical-cultural heritage; Sanya emphasizes its maritime and resort culture; Baoting focuses on the intangible cultural heritage of the Li and Miao ethnic groups; and Qionghai underscores its status as a hometown of overseas Chinese and its red cultural legacy, thereby avoiding homogenization.

People-oriented and multifunctional, it integrates leisure, fitness, social interaction, science education, performance venues, and emergency shelter capabilities, creating a cultural landscape that is "visually appealing, functional, and enjoyable to explore." The design adheres to low-carbon and circular principles with local construction techniques. Priority is given to low-carbon materials such as bamboo-reinforced steel, volcanic rock, recycled concrete, and thatch, while preserving traditional construction methods to reduce maintenance costs and enhance environmental compatibility [8].

5. Implementation pathways for integrating Hainan cultural elements with the landscape environment

5.1. Element extraction: From cultural genes to landscape language

Establish a transformation system integrating "cultural essence—visual symbols—landscape elements": Li brocade patterns are adapted into paving materials, decorative walls, lattice structures, and lighting designs; boat-shaped house outlines are transformed into covered walkways, post stations, public restrooms, and bus shelters; traditional Danjia fishing nets and ocean waves are repurposed as railings, sculptures, and water features; archways characteristic of overseas Chinese town arcades are converted into entrance gates and landscape frameworks; while Dongpo-inspired imagery is expressed through stone inscriptions, pavilions, and cultural-themed walls. The color palette predominantly features Li brocade black-red, ocean blue, coconut grove green, Nanyang gray, and volcanic rock brown, creating a cohesive visual identity.

5.2. Spatial design: Synergy between narrative scenes and environment

(1) Entrance Portal Space: Featuring boat-shaped veranda frames, arcade arches, and Li brocade totem landscape walls that enhance visual identity, combined with coconut tree arrays forming a welcoming sequence, this design complements urban gateways and park main entrances.

(2) Core Cultural Plaza: Constructed around totem pillars, intangible cultural heritage sculptures, ground carvings, and interactive water features, this narrative hub accommodates festival gatherings and folk performances while incorporating shaded trees and sponge pavements.

(3) Waterfront & Coastal Spaces: Integrating Danjia fishing traditions, ocean waves, and mangrove elements, the design creates ecological embankments, sea-view platforms, and fishing culture trails. Coastal defense forests and wetland vegetation harmonize ecological protection with cultural display.
(4) Leisure Recreation Areas: Bamboo pavilions, volcanic stone benches, coconut shell lamps, and thatched rest areas meet tropical sunshade and rain shelter needs, blending Li and Miao lifestyle elements to enhance comfort and sense of belonging.
(5) Planting Configuration: Establishing tropical ecosystems with "coconut palms + native trees + flowering shrubs + ground cover," examples like Betel Nut Valley and Li Flower Village utilize betel nut trees, banana plants, and mountain orchids to recreate Li-Miao settlement atmospheres, while mangroves and tung trees shape coastal wetland landscapes.

5.3. Materials and construction: Adaptation of local materials to tropical environments

(1) Bamboo and rattan materials: Utilized for pergolas, seating, grilles, and rest stations, these lightweight, low-carbon solutions combine aesthetic appeal with ventilation efficiency. Notable examples include the "Coconut Grove Settlement" in Boao's near-zero carbon demonstration zone and Baoshan Bamboo Houses in Wuzhishan, preserving traditional Li and Miao bamboo craftsmanship.
(2) Volcanic rock: Employed for paving, decorative walls, flower beds, and benches, this material offers slip resistance, corrosion resistance, and thermal insulation properties, perfectly complementing the volcanic landscape of Yangshan.
(3) Straw and straw-like materials: Applied to building roofs to recreate traditional boat-shaped houses while providing sunshade and rain protection, with modern, modified materials enhancing durability.
(4) Coconut shells, coconut wood, and logs: Used for decorative elements, lighting fixtures, and signage, these recycled local resources strengthen the island's unique identity.

5.4. Technological integration: Integration of ecological technology and cultural landscape

Sponge City technology employs permeable pavements featuring Li brocade patterns, volcanic rock grass swales, and rainforest-style rain gardens to integrate stormwater management with cultural aesthetics. The passive energy-saving design incorporates cultural pergolas and rest stations with overhanging eaves, transparent grilles, and natural ventilation systems, adapting to high-temperature and high-humidity climates while reducing energy consumption. Light and interaction technologies transform Li brocade and wave motifs into nighttime lighting displays, while the Lingshui Zhiyin Bridge enhances nighttime vitality through synchronized light effects that foster cultural engagement. Wind and earthquake-resistant technologies utilize lightweight, low-center-of-gravity, reinforced structures tailored to Hainan's typhoon-prone climate, ensuring safety and durability.

6. Empirical analysis of typical cases

The Baoting Betel Nut Valley Li and Miao Cultural Tourism Area centers on Li and Miao intangible cultural heritage, incorporating elements such as boat-shaped houses, Li brocade, bamboo and wooden musical instruments, and totem motifs. Using local materials like thatch, logs, and bamboo vines, it creates immersive cultural landscapes. Through sensory experiences, including listening to nasal flutes, observing brocade weaving, performing bamboo pole dances, and tasting mountain orchid wine, the area achieves seamless integration of cultural presentation with tropical rainforest environments, establishing itself as a benchmark for living cultural preservation.

The Haikou Arcade Historical and Cultural District landscape integrates architectural elements such as Nanyang-style arcade arches, intricate carvings, and vibrant colors. Through volcanic rock paving, coconut grove shade, and overseas Chinese-themed sculptures, the streetscape is revitalized with sponge city renovation techniques and smart ventilation systems, achieving harmonious integration of historical heritage, tropical ambiance, and commercial vitality. The Boao

Liuke Village Overseas Chinese Cultural Landscape, rooted in the Nanyang architectural style of Cai Family Residence, incorporates rice paddies, riverside waterfronts, and traditional overseas Chinese wharves. Utilizing local materials and low-impact development approaches, it recreates authentic overseas Chinese community life, realizing seamless integration of cultural preservation, rural revitalization, and eco-tourism.

The Lingshui Zhiyin Bridge landscape, inspired by the Li and Miao ethnic mountain ranges and flowing water imagery, integrates the cultural essence of high-altitude water systems. Through coordinated designs of bridge patterns, lighting effects, and fountain installations, it seamlessly blends Li ethnic traditions, ecological principles, and modern landscape technology, establishing itself as a cultural landmark in the city. Meanwhile, Haikou's Baishamen Park coastal area showcases marine culture and Danjia ethnic heritage through sea-view platforms, fishing culture trails, and mangrove conservation zones. Utilizing wind-resistant vegetation and ecological shorelines, this project achieves harmonious integration of coastal recreation, cultural immersion, and environmental protection.

7. Protection strategies

Top-level design guarantees are implemented through the formulation of Hainan Urban Landscape Regional Culture Design Guidelines. This specifies standards for element application, material selection, and architectural style control, while integrating cultural integration into planning approval and acceptance processes. Talent and skill development are ensured by cultivating interdisciplinary designers proficient in regional culture, ecological design, and intangible cultural heritage techniques. A local artisan database is established to preserve traditional crafts such as boat-shaped house construction, bamboo-wicker weaving, and volcanic stone masonry techniques.

Resource and material support involves establishing native plant nurseries and indigenous material supply chains, promoting low-carbon materials such as bamboo steel, modified thatch, and recycled volcanic rock to reduce costs and environmental impact. Operation and revitalization assurance entails creating sustainable maintenance mechanisms, engaging intangible cultural heritage inheritors and community organizations in landscape management, and regularly conducting folk activities and cultural experiences to maintain dynamic vitality [9].

8. Conclusion

The deep integration of Hainan's cultural elements with urban landscape design is essential for addressing homogenization, shaping the distinctive character of free trade port cities, preserving regional cultural heritage, and enhancing ecological livability. This study systematically examines six cultural systems: Li and Miao intangible cultural heritage, maritime traditions, Southeast Asian influences, Su Dongpo philosophy, tropical ecosystems, and revolutionary folk customs. It proposes five guiding principles: ecological priority, cultural foundation, regional identity, human-centric approach, and low-carbon circular economy. Five implementation pathways are developed: element extraction, spatial creation, material selection, technological integration, and dynamic revitalization, supported by case studies to validate feasibility. Research demonstrates that cultural integration transcends symbolic accumulation; it transforms cultural genes, lifestyles, and ecological wisdom into perceptible, participatory, and sustainable landscape spaces, achieving "culturally rooted, ecologically vibrant, and emotionally resonant environments."

Looking ahead, as Hainan Free Trade Port development and urban renewal advance, landscape architecture will increasingly embrace regional characteristics, ecological sustainability, digital integration, and dynamic vitality. Digital technologies will enable precise cultural element translation and interactive experiences, while carbon neutrality principles will emphasize the use of local materials and low-carbon construction practices. The fusion of culture and tourism will drive the living preservation of intangible cultural heritage, and distinctive urban landscapes will shape an island city system where "each city embodies its unique charm, and every scenic spot tells its own story." Through mutual empowerment of culture and environment, Hainan's urban landscapes will serve as a vital showcase for China's

outstanding traditional culture, tropical ecological civilization, and the free trade port's pioneering spirit, providing replicable and scalable Hainan models for regional urban landscape development nationwide.

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Disclosure statement

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