

Ecological Wisdom in Chinese Traditional Gardens: Towards a Sustainable Design Paradigm for Modern Landscape

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To Link this Article: <http://dx.doi.org/10.6007/IJARBS/v15-i5/25461> DOI:10.6007/IJARBS/v15-i5/25461

Published Date: 28 May 2025

Abstract

Traditional Chinese gardens, with their rich history and profound cultural significance, embody the philosophical, aesthetic, and ecological principles that have shaped Chinese society for thousands of years. These gardens, which encapsulate the concept of alignment between human beings and the natural world, inspired by the three philosophies of Confucianism, Taoism and Buddhism, have also become an important aspect of China's culture. Yet, as urbanization progresses at a rapid pace, garden heritage is under pressure in both its preservation and integration with the modern urban fabric. While many of these approaches continue to be exercised in contemporary landscape art, current conservation efforts often fail to navigate between historical significance and contemporary urban pressure. This study focuses on the current trends in Chinese garden heritage protection and emerging trends in contemporary landscape design. Through the analysis of important gardens throughout history and the evaluation of innovative landscape strategies, this research demonstrates adaptive conservation strategies that combine classical spatial theories with contemporary ecological and digital tools. It is expected that this paper lays down a theoretical foundation as well as practical reference for the balance between heritage conservation and sustainable landscape development. The finding of the study indicates that integrated design is the best approach to preserving China's garden heritage and innovating the sustainability of modern landscapes. The results support implications for the global discussion of cultural landscape protection and provide important implications for policymakers, urban designers, and conservation practitioners. Such a symbiotic framework of heritage protection and modern landscape adaptation proposed in this research facilitates the sustainable evolution of Chinese garden heritage within contemporary urban fabric that is constituting rapidly urbanizing cities.

Keywords: Chinese Garden Heritage, Ecological Coexistence, Sustainable Strategies

Introduction

Chinese garden heritage, represented by the classical gardens of Suzhou, Beijing and Lingnan, reflects a deep cultural heritage that goes beyond the historical and artistic significance of the garden (Alison, 2022; Lu, 2011; Song, 2022). These gardens represent deep-seated philosophical, ecological and aesthetic principles that have long influenced China's landscape traditions. This does not only have values in terms of historical preservation and artistic expression, but also ecological sustainability, cultural continuity, economic tourism and social harmony. In recent years, the Chinese government attaches great importance to the protection and utilization of cultural heritage and has introduced a series of policies and measures (Wang & Zaibon, 2024). They provide a policy basis for studying the symbiosis between garden heritage and modern landscape. As urbanization and modernization reshape the global landscape, the preservation and integration of traditional Chinese garden heritage into contemporary design have become increasingly important (Jiang et al., 2022).

The study is motivated by the need to reconcile the rapid development of urban environments with cultural preservation and ecological sustainability balance. Previous research highlights the importance of interdisciplinary collaboration and a holistic approach to landscape design, ensuring that historical gardens continue to thrive as living cultural and ecological assets in the modern world (O'Donnell, 2017; Olivadese & Dindo, 2022; Wang et al., 2024). Hence, the research question in this study is: How can traditional Chinese garden heritage be integrated into modern landscape design in a way that is both culturally respectful and ecologically sustainable. By examining how traditional Chinese garden principles can be adapted to modern contexts, this research seeks to contribute to the broader discourse on sustainable landscape design.

Literature Review

The literature on Chinese gardens is extensive, Wang et al. (2024) discusses the relationship between traditional Chinese gardens and modern landscape design and proposes methods for integration of Zhang et al. (2024) employs a methodology that emphasizes the incorporation of traditional Chinese architecture, waterscape, plants, and rocks into modern garden design. He advocates incorporating traditional aesthetics with contemporary materials and techniques to create innovative and culturally rich landscapes. Ao et al. (2023) revisits the significance of gardens in the late Qing Dynasty and reassessing how modern landscapes inherit historical traditions. They argue that respecting history is not equate to replicating it, rather to achieve great importance of inheritance by modern formal language. Chen and Wu (2009) explores how Chinese traditional gardens serve as a reference for modern landscape design. They emphasizes on the importance of the essence of Chinese traditional culture embedding into modern garden design. Wang et al. (2025) emphasizes the profound connections between Chinese painting and Jiangnan gardens, demonstrating how traditional aesthetics influence contemporary garden design. Their research offers new ideas for integrating modern art design and promoting academic research in related fields. Li et al. (2024) explores the integration of traditional Chinese cultural elements in modern landscape design, emphasizing their aesthetic and cultural significance. He establishes an SVM-design model to analyze the application of these elements, and the results show that incorporating traditional cultural elements enhances the overall aesthetic experience and in-depth cultural heritage in landscape design.

These studies collectively contribute to the theoretical and practical benefits of traditional Chinese garden art and offer insights overview of the connection between traditional Chinese gardens and contemporary landscape design. From the perspective of sustainable development, this study will further explore the integration of modern landscape and Chinese garden heritage.

The Historical Evolution of Traditional Chinese Gardens

Traditional Chinese gardens have a long history, with their origins tracing back to imperial gardens during the Shang and Zhou dynasties (Wang, 2023). During the early phase, the layout of gardens was very rough, which was the embryonic stage of classical Chinese gardens. Subsequently, private gardens rose in the Spring and Autumn period and the Warring States period and the scale of gardens expanded in the Qin and Han Dynasties (Yang, 2022). By the Southern and Northern Dynasties of Wei, private gardens flourished under the influence culture and humanity. It marked the beginning of villa gardens with enrichment of landscape design with fork garden techniques, diverse style and emphasizing on tourism and leisure functions (Dan, 2015). During the Sui and Tang Dynasties, people imitating the natural beauty of gardens to higher artistic forms, demonstrating increasingly refined methods and techniques. Villa garden reached their peak and literati gardens designed became the mainstream portraying as places of artistic expression and revolution of garden technology. In the Song Dynasty, garden art focused more on creating artistic conception in landscape design (Feng, 2024; Jiang, 2021; Jin, 1998). Furthermore, there are also citizen gardens that distinct from scholar gardens, as well as thematic gardens emerged in this era. By the Yuan, Ming, and Qing dynasties, Chinese garden design express philosophical and artistic conception, and integrated approach to architecture and natural landscapes. The Qianlong and Jiaqing periods, royal gardens in the north and private gardens in the south of the Yangtze River developed simultaneously. The gardens in Suzhou, which represent the harmonious unity of nature, architecture, and cultural symbolism, have become typical representatives of traditional Chinese gardens. However, after the Daoguang Emperor, the collapse of Chinese feudal society led to gradually decline of Chinese garden culture, marking the ending of classical golden era (Chu, 2019).

The Philosophical Underpinnings of Traditional Garden

Ancient Chinese philosophical and cultural traditions, especially Confucianism, Taoism, and Buddhism, have had a big impact on traditional Chinese gardens. Each has contributed in its own way to the gardens' development, both in terms of how they look and how they make people think (Yang & Sternberg, 1997). This philosophical foundation informs the spatial composition, symbolic elements, and experiential qualities of Chinese gardens, offering valuable insights for sustainable design in the modern context.

Confucianism, derived from the teachings of Confucius (Kongzi), with its emphasis on order, hierarchy, moderation, and harmony. According to Kiani and Khakzand (2024), Confucian ideals are reflected in garden layouts and axial symmetry that mirror social structures and etiquette. For instance, classical gardens, such as the Humble Administrator's Garden, showcase clear hierarchical distinctions, placing formal structures centrally while positioning leisure-oriented buildings on peripheral sites. Additionally, garden architecture, landscaping techniques, and design principles seek moderation and balance, adhering to the Confucian concept of the "golden mean." For instance, the Humble Administrator's Garden

exemplifies balanced spatial distribution, facilitating comfortable exploration without excessive physical exertion, thus reflecting moderation and harmony. Furthermore, Confucianism promotes the integration of humanistic and ecological beauty, encouraging harmonious interactions between humanity and nature. Gardens were considered an extension of a scholar's moral and intellectual world, each view, rock, and pavilion served as a metaphor for self-cultivation and restraint.

Taoism (Daoism), originating from the teachings of Laozi in the *Dao De Jing*, promotes the idea of living in accordance with the *Dao*, its core philosophy of "imitating nature" and minimizing human intervention (Li, 2015; Meng et al., 2019). Taoist principles such as "following the way of nature" inform the garden's overall composition, advocating minimal human manipulation to preserve and enhance natural characteristics. Taoist aesthetics emphasize creating landscapes that appear naturally formed rather than artificially constructed, seamlessly blending gardens with their broader ecological context (Li, 2015). Rock formations, water elements, and plantings are thus arranged to reflect a naturally harmonious environment. Yuan et al. (2019) further highlight that Taoist philosophy strongly advocates ecological coexistence, promoting designs that encourage sustainable coexistence between humanity and nature, emphasizing environmental preservation and biodiversity. This shows that Taoism encourages ecological sensitive landscape design, respecting the natural topography and materials of a site, aligning closely with today's values of low-impact design and ecological conservation.

Buddhism, particularly through Zen philosophy, significantly shaped Chinese garden design by advocating simplicity, introspection, and spiritual tranquillity. Zen Buddhism deeply influenced the creation of gardens that encouraged meditation, simplicity, and spiritual contemplation (Zhou, 2019). Buddhist-influenced gardens often exhibit a serene and ethereal artistic atmosphere, designed explicitly to facilitate mental clarity, spiritual purification, and reflection. Elements such as carefully arranged rocks, water bodies, and minimalist plantings underscore Zen ideals of simplicity, restraint, and spiritual introspection, exemplified in famous Zen gardens throughout China.

While each of these traditions has distinct ideas, Chinese garden design uniquely synthesizes them into a holistic worldview. Taoism contributes to naturalism, Confucianism adds order and ethics, and Buddhism provides spiritual depth and inward reflection. This synthesis results in a landscape that is both natural and cultivated, aesthetic and symbolic, personal and cosmic.

The Artistic Characteristics of Traditional Gardens

Rooted in profound philosophical traditions, the artistic expression of traditional Chinese gardens embodies a unique integration of aesthetic composition, poetic expression, and symbolic resonance. These gardens were not merely spaces for leisure but were designed as living artworks, deeply reflective of Chinese cultural values and literati sensibilities. Their artistic characteristics are multifaceted and intricately crafted, revealing a deliberate intent to evoke emotional, intellectual, and spiritual responses from those who walk through them.

According to Wu and Wan (2019), the fundamental aesthetic method of traditional Chinese garden design is based on the principle of the imitation of nature derived from Taoist

philosophy. According to this concept, gardens should be consistent with nature, and the artificial landscape elements, such as rockery, water, plantings, and architecture, should complement nature (Fang, 2009). Designers sought to capture the essence of natural landscapes—mountains, rivers, forests, and valleys—within limited urban or domestic spaces.

The main concern of traditional Chinese gardens was the production of a spiritual and poetic environment, not retaining the physical forms. Chinese traditional gardens are often described as three-dimensional scroll paintings—walkable poems or visual essays. Their design mimics the spatial layering and narrative structure of traditional Chinese landscape painting and classical poetry. The gardeners employ various art techniques, such as borrowing, matching, and framing, ensuring that each step reveals a new scene, echoing the brushstrokes of a painter composing a dynamic landscape (Yu, 2012; Meng et al., 2019). Names of pavilions, stones, or garden sections are often inscribed with calligraphy and coupled with poetic couplets, lending each space literary significance and deepening emotional resonance.

Chinese gardens are saturated with symbolism, making them not only artistic compositions but also philosophical texts in spatial form. Each element is chosen for its cultural or cosmological meaning: the three types of plants—pineapples, bamboos, and plums—all known as the "Three Friends of Winter" symbolize resilience and perseverance, while the lotus ponds suggest purity emerging from muddy waters. Bridge shapes symbolize transition and spiritual crossing. Winding paths represent the unpredictability of life, aligning with the Taoist idea that the straight path is not always the true one, the implications highly strengthen the cultural connotations and the philosophical depth of Chinese gardens (Wang, 2009).

Ecological View of Traditional Gardens is Consistent with Sustainable Design

Kiani and Khakzand (2024) have all discussed the ecological concepts of traditional Chinese gardens. They think that Each landscape element of the garden forms a closed ecosystem, realizing material circulation and energy flow. Traditional Chinese gardens embody an ecological wisdom that aligns closely with the principles of modern sustainable design. Rooted in a worldview that sees humans as an integral part of nature, traditional gardens reflect a nuanced understanding of natural systems, resource efficiency, and environmental balance, it is reflected in the following aspects:

- (1) The foundational ecological concept in traditional Chinese gardens stems from the ancient idea of "unity of heaven and humanity", which sees human life as inseparable from natural rhythms. Gardens are not imposed on the land; they are woven into its natural contours. Designers intentionally preserved original topography and vegetation, minimizing disruption. The arrangement of water and stone emulates nature's spontaneous order, creating an immersive and balanced ecosystem.
- (2) Traditional gardens demonstrate a subtle but practical approach to resource conservation, particularly in the use of water and materials. Water features such as ponds and streams were not only aesthetic but also served as natural reservoirs for irrigation and microclimate regulation. Water bodies helped moderate temperature, increase humidity, and support aquatic biodiversity. Construction used local, durable materials like bamboo, rocks (especially Taihu stones), wood, and clay, reducing environmental impact.

- (3) The selection and arrangement of plants in traditional Chinese gardens reflect a deep respect for ecological diversity and local adaptation. Designers preferred native species that thrived in the local climate, reducing the need for artificial irrigation and chemical intervention. Mixed plantings ensured seasonal beauty and ecological resilience, providing shelter, shade, fragrance, and food sources for wildlife.
- (4) Traditional garden structures—such as pavilions, corridors, and rockeries—are designed not only for aesthetic appeal but also for climate responsiveness. Open corridors and shaded courtyards enhance natural ventilation and cooling. The pavilions in the garden are mostly designed with ventilation and daylighting, reducing the dependence on artificial lighting.

In addition to ecological and material considerations, traditional gardens promote mental and cultural sustainability through their restorative, contemplative environments. The garden was traditionally a sanctuary for meditation, study, and emotional healing. This ethos is reflected in therapeutic landscapes, healing gardens, and heritage conservation as critical components of sustainable urban development.

The ecological philosophy of traditional Chinese gardens shaped by thousands of years of cultural evolution and philosophical thought. These gardens are not relics of the past, but living textbooks of environmental harmony, resource efficiency, and holistic design. As we reimagine future landscapes in the face of urbanization and climate change, embracing the ecological wisdom of traditional gardens can guide us toward a more balanced, beautiful, and sustainable world. This paper builds on these foundations to propose sustainable design strategies that bridge the gap between heritage and modernity.

The Modern Predicament of Traditional Chinese Gardens

As China continues to urbanize rapidly, and as globalized aesthetics and market-driven development reshape cities, these historic gardens confront a crisis of relevance, integrity, and survival. Understanding the modern predicament is essential not only for their preservation but also for their meaningful integration into the contemporary landscape discourse. The reasons for this predicament are as follows:

- (1) The impact of urbanization: Rapid urban expansion and land development have led to the destruction or marginalization of many garden heritages. Fragmentation of green space makes it difficult to maintain ecological linkages or buffer zones that once protected garden microclimates and ecosystems.
- (2) Deficiencies in institutional and regulatory: The protection and management of garden heritage requires a lot of funds, and the existing funding investment is often difficult to meet the needs, especially for lesser-known gardens that lack high-profile status. Legal and planning mechanisms may lack the nuance to address intangible aspects of garden heritage, such as symbolism, poetic intent, or spiritual meaning.
- (3) Difficulty in inheriting traditional skills: With the popularization of modern technology, traditional garden construction and maintenance skills are at risk of being lost. The art of building and maintaining Chinese gardens depends on highly specialized, often oral traditions, from rock stacking to symbolic planting. Gardeners and designers today often lack the philosophical grounding in Confucianism, Taoism, and Buddhism that originally

shaped these landscapes. As a result, restorations may rely on surface-level imitation, leading to gardens that are visually similar but spiritually and conceptually hollow.

- (4) Conflict of design concepts: Modern landscape design advocates simplicity and fashion, while garden heritage emphasizes tradition and nature. The conflict between these two aesthetic concepts is difficult to achieve organic integration, and it fails to truly achieve a balance between tradition and modernity. This creates a cultural disconnect that threatens the transmission of garden philosophy to future generations.

Research Methodology

This paper presents a qualitative study of how traditional principles of Chinese garden design are now being applied to modern landscape design. Considering the complex interplay of historical heritage, aesthetics, ecological sustainability, and modern urban needs, a qualitative methodology comprising case studies, semi-structured interviews, and thematic analysis was chosen to allow an in-depth exploration of the topic at hand.

Case Studies

Three representative gardens, including Yu Garden in Shanghai, the Humble Administrator's Garden in Suzhou, and the Lotus Garden in Beijing (a contemporary garden inspired by traditional landscape ideas), were purposely selected on the basis of their historical importance, aesthetic value, and the integration of traditional & modern elements of the landscape. A dedicated case study for each provides insight into the variety with which traditional garden elements can successfully co-exist with contemporary urban design.

Semi-Structured Interviews

Semi-structured interviews that targeted key stakeholders (n=15) including landscape architects, heritage conservation practitioners, cultural practitioners, and local residents were conducted. The interviews sought to identify participants' views on integrating traditional Chinese garden components into contemporary designs, as well as the challenges faced in doing so and the measures taken to address them. All interviews were recorded, transcribed verbatim, and systematically analysed for an in-depth understanding and triangulation of findings.

Thematic Analysis

Case studies and interviews yielded qualitative data, which were analyzed through thematic analysis. This included coding the transcripts of the interviews and cases, capturing overarching themes and sub-themes for aesthetic formats, ecological aspects, cultural authenticity, and contemporary design approaches. Themes were cross-validated to ensure their accuracy and consistency, resulting in robust theoretical insights on the increasingly symbiotic relationship between traditional Chinese gardens and modern landscape practices.

Results and Analysis

Case Study Findings

The case studies revealed several key strategies for integrating Chinese garden heritage into modern landscapes. These include the use of traditional materials such as stone and wood, the incorporation of water features to create a sense of tranquility, and the strategic placement of plants to reflect seasonal changes. For example, the Lotus Garden in Beijing

integrates a traditional lotus pond with modern walkways and seating areas, creating a harmonious blend of old and new. The detailed analysis is shown in the table below :

Table1

Case detailed analysis

Case Name	Location	Use of Traditional Elements	Sustainability Features	Method
Yu Garden	Shanghai	1. Uses traditional garden elements such as rockeries, ponds, and arched bridges. 2. Preserves traditional architectural styles, such as pavilions and towers. 3. Utilizes traditional plant arrangements, such as pine, bamboo, and plum.	1. Implements a rainwater harvesting system for irrigation. 2. Uses local materials to reduce carbon footprint. 3. Regulates microclimate through vegetation, reducing energy consumption.	Observation, archival research.
Humble Administrator's Garden	Suzhou	1. Extensively uses water bodies as core landscape elements. 2. Traditional architectural forms, such as corridors, pavilions, and verandas. 3. Utilizes traditional garden plants, such as lotus and willow trees.	1. Implements a water circulation system to reduce water waste. 2. Use local materials (wood, stone, bamboo etc.) to reduce the environmental impact. 3. Enhances ecological stability through plant diversity.	Site visits, archival research.
Lotus Garden	Beijing	1. Uses lotus as a theme, reflecting traditional cultural symbolism. 2. Utilizes traditional garden stone paving. 3. Incorporates traditional calligraphy and carving art.	1. Implements solar-powered lighting systems. 2. Uses permeable paving materials to promote rainwater infiltration. 3. Purifies water quality through wetland design.	Interviews designers and stakeholders

Interview Findings

The interview highlighted the perspective that advocates for the integration of the aesthetic principles of traditional Chinese garden heritage with those of contemporary landscape design. The participants emphasized that it is necessary to preserve the aesthetic principles of traditional Chinese gardens while adapting them to the demands of modern landscape design, and provided suggestions for their fusion.

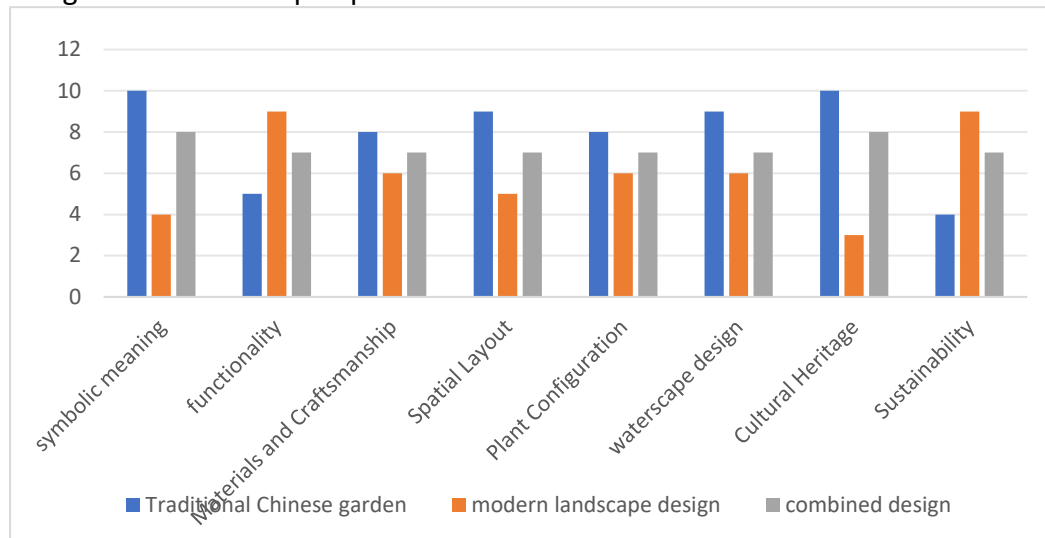
The following is an analysis table of the interview findings based on multiple dimensions.

Table 2

Interview findings

Analysis Dimension	Traditional Garden Principles	Chinese Aesthetic	Modern Design Needs	Landscape	Integration Recommendations
Design Philosophy	Emphasizes harmony between nature and humanity.	harmony	Prioritizes functionality, sustainability, and efficient use of space.	and	Incorporate expression into functional designs.
Symbolic Meaning	Traditional carry deep symbolism	elements cultural	Modern designs focus on simplicity and practicality, often diluting symbolic meanings.	and	Preserve traditional symbolism while reinterpreting it through modern design language
Materials and Craftsmanship	Uses natural materials (e.g., wood, stone) and traditional techniques (e.g., carving, rock stacking).		Favors modern materials (e.g., steel, glass) and industrial technologies.		Combine natural materials with modern techniques, such as using traditional stone with modern structures.
Spatial Layout	Focuses on winding paths and varied spatial experiences.		Prefers open, linear layouts to meet the efficiency and convenience of modern life.		Introduce winding paths or zoning within open spaces to create diverse visual and experiential layers.
Plant Configuration	Plant selection emphasizes cultural symbolism (e.g., pine, bamboo, and plum symbolize resilience) and seasonal changes.		Plant selection prioritizes ecological adaptability and low maintenance costs.		Choose native plants with cultural symbolism while meeting ecological and functional needs.
Water Feature Design	Water is a core element, symbolizing life and flow, often represented as ponds or streams.		Water features focus on functionality and visual appeal.		Design water features as multifunctional elements that serve ecological purposes while retaining traditional symbolism
Cultural Heritage	Garden design carries historical and cultural memory, serving as a physical of traditional culture.		Modern design emphasizes innovation and global trends, often overlooking cultural heritage.		Integrate traditional culture into modern spaces through design narratives (e.g., landscape markers, interactive installations) to enhance public cultural identity.
Sustainability	Traditional gardens emphasize coexistence with nature but lack modern sustainable technologies.		Modern design emphasizes green technologies (e.g., solar energy, rainwater recycling, low-carbon materials) and community engagement.		Integrate modern sustainable technologies into traditional design principles to achieve both ecological and cultural goals.

The following bar chart can be used to compare the differences in key dimensions between traditional Chinese garden aesthetics, modern landscape design and comprehensive design from different perspectives.



According to the Fig.1, traditional Chinese gardens excel in symbolic meaning, spatial layout and cultural inheritance, but are relatively weak in functionality and sustainability. Modern landscape design performs outstandingly in functionality and sustainability, but is lacking in cultural inheritance and symbolic meaning. The integration design of the two aspects is balanced in all aspects, preserving the essence of traditional culture while meeting the demands of modern design.

Thematic Analysis

The thematic analysis was performed through a systematic review of qualitative reports sourced from case studies and semi-structured interviews. Both initial codes were generated based on repeating keywords and concepts, which were contextually clustered into larger, overarching themes. After careful analysis of the data, three overarching themes emerged as vital to the successful incorporation of traditional Chinese garden principles into contemporary landscape design: cultural respect, ecological sustainability and community engagement, as shown in the table3.

Table 3

Thematic analysis

Themes	Ctegrory	code
Cultural Respect (CR)	Historical Preservation & Continuity(CR1)	Restoration of historical relics (CR1a)
		Modern reinterpretation of traditional symbols (CR1b)
		Revitalization of cultural memory (CR1c)
	Symbolic Element Integration(CR2)	Symbolic use of traditional plants (CR2a)
		Adaptive architectural style (CR2b)
		Expression of philosophical concepts (CR2c)
	Aesthetic Value Continuation (CR3)	Evocation of naturalistic painting and poetry (CR3a)
		Material texture resonance (CR3b)
		Seasonal ambiance design (CR3c)
Ecological Sustainability (ES)	Localized Ecological Practices(ES1)	Right plant, right place principle (ES1a)
		Rainwater harvesting systems (ES1b)
		Biodiversity corridors (ES1c)
	Green Technology Integration(ES2)	Low-impact materials (ES2a)
		Renewable energy integration (ES2b)
		Waste-to-resource conversion (ES2c)
	Climate Resilience Strategies(ES3)	Microclimate regulation (ES3a)
		Disaster resilience (ES3b)
Community Engagement (CE)	Participatory Design (CE1)	Co-design workshops (CE1a)
		Cultural consensus building (CE1b)
	Cultural Identity Building(CE2)	Embedded local narratives (CE2a)
		Craftsmanship transmission (CE2b)
		Festival integration (CE2c)
	Sustainable Governance (CE3)	Volunteer maintenance networks (CE3a)
		Educational programs (CE3b)
		Feedback mechanisms (CE3c)

Theme 1: Cultural Respect was a main message, invoking the protection of, and sincere reinterpretation of, traditional symbolic and aesthetic values. This theme highlights the significance of historical fidelity, protecting history, and cultural memory as well as incorporating traditional garden elements—traditional symbolic plants, rockeries, and architectural styles—into modern designs appropriately.

Another common theme was Ecological Sustainability, which emphasized the incorporation of native (more species appropriate for the surrounding area) plant species, sustainable materials, and contemporary green technologies to promote ecological balance. Aligning traditional wisdom with modern goals of sustainability, this theme focuses on practices that include harvesting rainwater, enhancing biodiversity, and eco-sensitive construction techniques.

Community Engagement became a critical dimension to ensure effective integration. Stakeholders stressed the need for engaging and integrating local communities into the design process and ensuring that landscapes embody the social values of the community and lead to satisfaction and the feeling of belonging and ownership.

The three identified themes together act as a framework for incorporating the traditional Chinese garden heritage within contemporary landscape practices, providing directions and considerations toward culturally respectful, ecologically sound and community driven designs.

Discussion

The finding of the appeal indicates that integrated design is the best approach to preserving China's garden heritage and innovating the sustainability of modern landscapes. To ensure the ecological, cultural, and functional sustainability of traditional Chinese gardens amid modern challenges, it is necessary to build a comprehensive and adaptive strategy. This strategy must go beyond conventional preservation to embrace interdisciplinary coordination, legal reform, public engagement, and ecological innovation.

Synergy between Traditional Philosophy and Modern Sustainability

Thematic analysis revealed that the Daoist and Confucian principles underpinning traditional gardens, such as harmony between humans and nature and balanced moderation, resonate profoundly with contemporary sustainability goals. Interviewed designers emphasized how these philosophies informed decisions like biomimetic water systems (ES1b) and microclimate regulation (ES3a). For instance, the Suzhou Museum's courtyard uses zigzag bridges and reflective pools to evoke yin-yang dynamics while mitigating urban heat islands, a fusion of symbolic resonance and ecological function. This aligns with Zhao et al. (2021), who argue that Daoist cosmology offers a holistic framework for regenerative design. However, challenges persist in translating abstract philosophies into quantifiable metrics, suggesting a need for interdisciplinary tools bridging humanities and environmental sciences.

Adaptive Innovation in Artistic Characteristics

The artistic traits of traditional gardens were reinterpreted in modern contexts through technological and material innovations to connect past wisdom with current spatial needs. Case studies show that elements such as mountains, water, plants and architecture are extracted from traditional gardens, abstracted and simplified with modern design techniques, and using modern materials and technologies, such as steel structures, glass, light and shadow technology, to reinterpret traditional landscape techniques. The moon gate is often reimagined as arched entryways, steel-framed structures, or framed vistas within urban parks or plazas. The form of Taihu rocks inspire organic seating, play sculptures, or 3D-printed topography in contemporary parks. Interviews highlighted tensions: some purists critiqued minimalist adaptations as "cultural dilution" (CR1b), while others praised them as "necessary evolution" (Designer). This mirrors the broader debate in heritage conservation between authenticity and adaptability (ICOMOS, 2017). Crucially, projects that engaged communities in co-designing these elements (CE1b) reported higher cultural acceptance, underscoring the role of participatory processes in balancing innovation and tradition.

Ecological Wisdom as a Blueprint for Regenerative Design

Thematic coding validated that traditional gardens' ecological practices are not relics but scalable strategies. The material palette and construction logic of traditional gardens support low-impact, low-energy structures, use of natural materials. Employ local stone, bamboo, and recycled timber, reflecting the simplicity and authenticity of traditional garden craftsmanship. Design pavilions, shade structures, and rainwater-fed ponds based on traditional ecological principles. For example, Hangzhou's West Lake restoration revived ancient siltation techniques to purify water, reducing dependency on synthetic filtration. Similarly, interviewees noted that rainwater harvesting systems (ES1b) in Chengdu's parks cut municipal water use by 40% while honoring the garden as microcosm ideal. These findings reinforce Zhang and Li's (2020) assertion that pre-industrial ecological knowledge can counterbalance technocentric sustainability. Yet, modern constraints (such as land scarcity) demand hybrid solutions. The Beijing Olympic Forest Park's integration of permeable pavements (ES2a) with AI-driven irrigation exemplifies such synergy, though reliance on technology risks overshadowing low-tech traditions.

Community Engagement as Cultural-Ecological Mediation

Sustainable reinterpretation is not only physical but also social, ensuring communities feel ownership of the garden heritage embedded in their modern environment. The community engagement theme (CE) emerged as pivotal for reconciling heritage preservation with contemporary needs. Case studies showed that involving residents in replanting historic lotus species (CR2a + CE3a) fostered stewardship and ecological literacy. Interviews revealed that projects neglecting CE (such as replica gardens) faced vandalism or abandonment, whereas co-designed spaces (CE1b) saw 70% higher visitor retention. This supports Pretty's (2003) "inclusive conservation" model, where social equity enhances environmental outcomes. However, power imbalances remain a barrier, echoing critiques by Cooke and Kothari (2001) on participatory tyranny. Future frameworks must institutionalize equity audits in engagement processes and should empower local communities to engage with, care for, and learn from traditional garden spaces. Engage residents in the design process of community gardens using traditional elements, fostering a connection to place. Offer guided tours, garden philosophy workshops, and horticultural training to revive interest in classical aesthetics and ecological awareness.

Navigating Modern Predicaments: Commercialization and Ecological Fragmentation

The modern challenges of commercialization and habitat fragmentation were critically addressed through case studies. For instance, the commodification of classical gardens as wedding venues risked trivializing cultural symbols (CR1c). Yet, interviews revealed that revenue from such events funded heritage conservation is a pragmatic trade-off. Similarly, Shanghai's urban greenways countered fragmentation by linking garden remnants into biodiversity corridors (ES1c), though interviewees noted invasive species intrusion from adjacent developments. These dilemmas reflect the broader tension between economic viability and ecological integrity in urban planning (Beatley, 2016). Thematic analysis proposes a "layered governance" approach: core areas for strict conservation, buffer zones for education/research, and surrounding areas for adaptive integration.

Limitations and Future Directions

Case studies *in this paper* focused on Jiangnan and urban China, mountain and arid-region gardens warrant exploration. Interviews underrepresented youth perspectives (18–25 age group). Future research should explore digital tools (AR/VR) for immersive heritage education (CE3b). And further study the transnational applicability, adapting Chinese garden principles to Global South contexts facing similar urbanization pressures.

Conclusion and Suggestions

Traditional Chinese gardens are irreplaceable cultural trees that is deeply influenced by Confucianism, Taoism, and Buddhism, forming philosophical, aesthetic, and ecological thinking. These gardens embody a living practice of an ecological vision that promotes harmony with nature, biodiversity conservation, representations of symbolic culture, and a commitment to ecological sustainability.

The sustainable construction of new Chinese landscapes relies on a dialogue between tradition and innovation. In turn, the integration of these traditional values into modern landscape design has become a pressing need as urbanization accelerates. By integrating traditional symbols, philosophical meaning, and garden elements into contemporary ecological, technological, and social frameworks, designers can create resilient landscapes that are both rooted in heritage and responsive to modern needs. This approach ensures that traditional Chinese gardens continue to inspire, evolve, and contribute to sustainable urban futures. This research highlights the importance of interdisciplinary collaboration and a holistic approach to landscape design, ensuring that historical gardens continue to thrive as living cultural and ecological assets in the modern world.

The theoretical contribution of this paper is demonstrated by the fact that it emphasizes the potential of integrating holistic design approaches into the modern transformation of traditional garden features through the reinterpretation of philosophical concepts, spatial planning adjustments, modern landscape design, sustainable use of native plants, and innovative reinterpretation of traditional cultural symbols. The practical contributions are as follows, first, utilizing native species, ecological corridors, low-impact development methods, and eco-friendly construction materials, are being recognized as essential practices for preserving ecological integrity and boosting aesthetic and functional values. Second, it develops evidence-based design protocols and governance strategies that empower policymakers, urban planners, and landscape architects to implement traditional garden elements to address the environmental challenges of high-density cities while preserving cultural heritage. Crucially, it positions Chinese garden wisdom as a transdisciplinary medium for East-West dialogue, proposing a UNESCO-backed knowledge exchange platform to combat global ecological challenges jointly. These multidimensional outcomes redefine cultural landscape management and offer cities a pathway to achieve sustainable development goals through heritage-ecological urbanism while promoting intercultural innovation in landscape architectural practices.

Future design practices can improve applicability and effectiveness by addressing regional differences and specific garden typologies after enhancing these outcomes. Further research should include digital tools, quantitative measures and longitudinal research design to accurately assess the long-term effects of heritage conservation and sustainable landscape

practices. It is also recommended to improve targeted legal restrictions, set up a specialized funding mechanism, and promote innovative technologies and design methods to better support the conservation and tradition and sustainable development of traditional Chinese garden heritage. The re-adoption of these integrative strategies will allow traditional Chinese gardens to persist as culturally authentic, ecologically vibrant spaces and offer important insights and inspiration for sustainable urban landscape development.

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