Review

A Review of Fengshui Forests: Ecological Functions, Humanistic Values, and Potential Applications to Enhance Biodiversity in Urban Green Landscapes and Achieve Sustainable Development Goals

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A Review of *Fengshui* Forests: Ecological Functions, Humanistic Values, and Potential Applications to Enhance Biodiversity in Urban Green Landscapes and Achieve Sustainable Development Goals

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Abstract: Sustainable urban development increasingly aligns with the Sustainable Development Goals (SDGs), highlighting the importance of integrating local cultural landscapes into city planning. One compelling example is the concept of *fengshui* forests in China, which are deeply rooted in traditional beliefs associated with prosperity for local communities. This study explores how *fengshui* forests can inform urban landscape design, particularly in the context of biodiversity conservation. A comprehensive literature review was conducted, examining studies on the ecological functions and cultural significance of *fengshui* forests. This analysis included research articles, case studies, and ecological assessments, revealing that *fengshui* forests provide essential ecosystem services—such as preserving biodiversity, regulating microclimates, and sequestering carbon—while also offering unique cultural insights, economic resources, and tourism potential. Recognizing the critical role of plant selection and combination in urban landscape design, we compiled a database of 1,196 recorded plant species from *fengshui* forests, detailing their physiological traits, geographical distribution, and social values. By employing diverse plant pairing principles, urban landscape designers can select suitable species to create green spaces that support a well-functioning food web and ecosystem, ultimately fostering biodiversity conservation. By harnessing both the ecological functions and cultural values of *fengshui* forests, this research highlights their potential to enhance urban eco-landscape design, promote eco-tourism, and aid in the preservation of local species. These forests, with their traditional roots and ecological significance, hold promise for advancing ecological civilization through effective biodiversity conservation and sustainable urban planning.

Keywords: *Fengshui* forests; Ecological function; Humanistic value; Urban biodiversity

1. Introduction

Urban green ecological environments face significant challenges, including landscape and habitat fragmentation, human interference, and declining habitat quality [1,2]. In pursuit of the United Nations Sustainable Development Goals (SDGs) and the promotion of sustainable cities, it is essential to enhance urban green space ecosystems and biodiversity. A promising approach is to leverage local cultural landscapes in urban design [3–5]. One notable example is *fengshui* forests, which integrate traditional beliefs with ecological principles. Incorporating *fengshui* forests into urban green landscape design not only improves ecological functions but also enhances community well-being, ultimately supporting sustainable urban development [6,7].

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Fengshui forests represent a unique aspect of human settlement landscapes in China, with various theories regarding their origins. The prevailing belief is that *fengshui* forests stem from classical *fengshui* ideas, reflecting a distinct cultural phenomenon that highlights the harmony between humans and nature [8–10]. This traditional concept emphasizes the selection or modification of natural environments to promote good fortune and mitigate disaster [9–12]. Ancient Chinese thought posited that a suitable environment should be surrounded by water, forests, hills, and mountains to harness beneficial "qi" or energy [10,12]. Thus, *fengshui* forests are integral to *fengshui* theory.

Another explanation for the genesis of *fengshui* forests is their development for the worship of gods and ancestors, particularly the earth deities [10,13,14]. Villagers believed that planting trees around settlements provided protection from these gods and that such forests came to symbolize regional worship and cultural identity [15].

Fengshui forests can be defined as natural or artificial plant communities with strict protection and significant historical value [10]. More specifically, they represent stable vegetation communities shaped by years of natural succession from human-initiated forestation [16]. These forests can be found in villages, gardens, parks, or natural reserves, where the layout and selection of flora balance aesthetic appeal with *fengshui* principles [8,10,17] (Figure 1). In China, *fengshui* forests are prevalent in southern and central regions, including Hong Kong, Guangdong, Guangxi, and Jiangxi [17–19].

Figure 1. A *fengshui* forest, a *fengshui* pond, and surrounding environment in Huitong Village, Zhuhai City, Guangdong Province, China.

Before the 1970s, only two books—Flora of Hong Kong by George Bentham (1861) and Flora of Kwangtung and Hong Kong by Stephan T. Dunn and William J. Tutcher (1912)—mentioned the concept of *fengshui* forests in Hong Kong [8,16]. This lack of scholarly attention highlights how *fengshui* forests were historically underappreciated despite their cultural significance. However, systematic research on *fengshui* forests began in the 1970s [8]. During this time, Stella L. Thrower studied the floristics and plant communities of *fengshui* forests in Hong Kong, proposing that these forests were the original remnant forests preserved by human settlement [8,20,21]. This foundational work sparked interest in the ecological and cultural dimensions of *fengshui* forests, paving the way

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for subsequent studies. Since the 1980s, research on *fengshui* forests as a folk culture began in Hong Kong [8], further contributing to the understanding of their role in local identity and ecology.

In mainland China, research on *fengshui* forests also started in the 1980s, primarily focusing on ecological and landscape aspects. Early studies concentrated on rural ecology, landscape design, and management, as well as the definition, development, and conservation of *fengshui* forests [22]. Chen et al. [23] conducted a meticulous study of the vegetation communities in the Pearl River Delta region's *fengshui* forests, documenting over 600 plant species and organizing various vegetation community structures suitable for ecological afforestation projects. Furthermore, Chen et al. [17] systematically investigated the geographical distribution of *fengshui* forests in the southern and central regions of China. Influenced by Chinese culture, *fengshui* forests have also been found in Japan, Korea, Thailand, and other East and Southeast Asian countries within the Han Culture Circle [24,25], often referred to as "cultural forests" or "cultural protection forests" according to local history and culture.

Given the rapid urban development leading to increased fragmentation of green spaces detrimental to urban biodiversity conservation efforts [2], there is an urgent need to explore new designs for urban landscapes that promote biodiversity protection. As a unique Chinese human settlement landscape concept utilizing forested areas to create harmonious living environments with nature while offering diverse ecological and cultural values, *fengshui* forests hold great potential for enhancing urban landscape construction practices. However, current research primarily focuses on internal landscapes and conservation aspects without adequately addressing urban ecology [10,26].

This study aims to review and discuss the application of *fengshui* forest configurations in the design of urban parks and landscapes, focusing on biodiversity conservation and economic development, particularly within the framework of sustainable urban ecological development as outlined by the Sustainable Development Goals (SDGs). By examining existing research and practical examples, this work seeks to highlight how integrating *fengshui* forest principles can create multifunctional green spaces that benefit both people and nature. To further enhance the integration of *fengshui* forest principles in urban biodiversity conservation, a plant species database specific to *fengshui* forests has been developed. This database aims to support effective urban landscape design, promote the conservation of urban biodiversity, and serve as a valuable resource for urban planners and ecologists working towards sustainable urban environments.

2. Ecological Functions and Values

Fengshui forests have demonstrated a variety of ecological functions and values, including biodiversity conservation, microclimate regulation, carbon fixation, air quality improvement, and soil and water conservation. These functions play a crucial role in supporting both local ecosystems and broader environmental health.

2.1. Biodiversity Conservation

Fengshui forests can be considered essential landscapes for biodiversity [27] (Table 1). They support a rich diversity of plant species [21,28,29] as well as various animal species, including ants [30], birds [31,32] and mammals [33]. The heterogeneous habitats within *fengshui* forests play a vital role in regional biodiversity conservation [28,34].

Table 1. Summary of Biodiversity Studies in *Fengshui* Forests.

Indexes	Explanation or Examples	Citations
Plant diversity	**Comparison of biodiversity indexes (SWI, and SI [1]):** ***Fengshui* Forest Community in Huizhou:** Contains 37 species, which is more diverse than the 31 species	[35]

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Indexes	Explanation or Examples	Citations
	found in the nearby golf course and the 2 species in the Masson pine forest.	[28]
	***Fengshui* Forests in the Pearl River Delta:** Analyzed across 32 sites, these forests have a SWI of 4.04 and an SI of 0.90. Their biodiversity is comparable to well-developed evergreen broadleaved forests (SWI: 4.17; SI: 0.90) and greater than that of coniferous-broadleaved mixed forests (SWI: 3.28; SI: 0.86) and coniferous forests (SWI: 3.29; SI: 0.77).	[36]
	***Fengshui* Forest in Liantang County, Guangzhou:** Features 74 species with an SWI of 4.68 and a SI of 0.93, making it significantly more diverse than pure forests, which have only 14 species.	
Birds	**Zhongshan City, China:** *Fengshui* forests host 56.41% of the bird species in Zhongshan, highlighting their significance for forest bird conservation.	[31]
	Zhuhai City, China: In Huitong village, the SWI for the *fengshui* forest is 1.98, which is greater than that of the lychee orchard, which has an SWI of 1.64.	Jiang, Zhong and Tsim, *personal communication*
Ants	**Relative Species Richness:** **All or Native Ant Species:** The richness is highest in *fengshui* forests, followed by secondary forests, and then shrublands. **Tramp Ants:** The richness is greatest in secondary forests, followed by Shrublands, and lastly *fengshui* forests.	[30]
Seed bank & Seeding density	***Fengshui* Forests as Seed Providers:** Frugivorous birds play a crucial role in dispersing seeds from *fengshui* forests into the surrounding environment.	[37]
	Seedling Density Stability: *Fengshui* forests maintain a more stable seedling density compared to artificial secondary forests.	[34]
Genetic diversity	*Fengshui* forests exhibit lower biodiversity compared to natural forests due to smaller populations and human interference, which significantly impacts pollination and seed dispersal behaviors.	[38]

[1] SI: Simpson index; SWI: Shannon-Wiener index.

In terms of plant diversity, *fengshui* forests are particularly abundant. In Guangdong Province's Pearl River Delta, 698 plant species were recorded in 30 *fengshui* forests [29]. Similarly, Hong Kong hosts 567 plant species across 118 *fengshui* forests [8]. A study in Wuyuan County, Jiangxi Province [32], further illustrated that *fengshui* forests contribute significantly to plant species diversity in their surrounding regions. Compared to artificial landscapes and secondary natural landscapes, *fengshui* forests exhibit higher plant species richness and biodiversity indices [28,35,36]. Several studies [35,36,39–41] have documented that *fengshui* forests show superior Shannon-Wiener Index (SWI) and Simpson Index (SI) values across three vertical structural levels: tree layer (SWI: 1.5 to 4.2, SI: 0.50 to

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0.97), shrub layer (SWI: 3.0 to 4.7, SI: 0.60 to 0.90), and grass layer (SWI: 1.5 to 3.5, SI: 0.6 to 0.7). These findings indicate that *fengshui* forests possess a complex and stable structure of plant communities, suggesting their potential as vital habitats for diverse animal species [33].

Fengshui forests also support a wide range of wildlife. For instance, a bird survey in Zhongshan, Guangdong Province, revealed that 56.41% of the region's bird species inhabit *fengshui* forests [31]. Another study in Zhuhai showed that *fengshui* forests had higher bird species richness compared to orchards (Jiang, Zhong and Tsim, personal communication). In terms of insects, over 200 butterfly species were found in the *fengshui* forest of Fung Yuen Village, accounting for approximately 90% of Hong Kong's total butterfly species [42]. Additionally, Nooten et al. [30] found that native ant species richness was higher in *fengshui* forests than in secondary forests and shrublands in Hong Kong. However, the richness of tramp ant species was lower in *fengshui* forests, highlighting their significance as refuges for native species [30]. Overall, *fengshui* forests play a critical role in maintaining regional biodiversity.

With their abundant species resources, *fengshui* forests can also be considered important sources of seeds and genetic materials. Due to seed dispersal by frugivorous birds, *fengshui* forests serve as seed suppliers to surrounding areas, aiding the regeneration of rare plant species and forests [37]. As less human-influenced environments, *fengshui* forests maintain a more stable seedling density compared to artificial secondary forests, indicating a greater capacity for regeneration [34]. Furthermore, the relatively higher species diversity in *fengshui* forests provides a substantial primary pool for gene conservation, as these forests conserve genetic diversity with minimal human interference [38]. Most *fengshui* forests exhibit species heterogeneity higher than 2 [35,36,39–41,43], indicating that they not only harbor high species richness but also significant genetic diversity [43].

Fengshui forests contribute to the protection of rare animal and plant species. For example, the Blue-crowned Laughingthrush (*Garrulax courtoisi*), a critically endangered bird listed on the IUCN Red List [44] and an endemic species in China, is found exclusively in the *fengshui* forests of Wuyuan County, Jiangxi Province [32,45]. Additionally, the Pied Falconet (*Microhierax melanoleucos*), White-eared Night-heron (*Gorsachius magnificus*), and Japanese Night-heron (*G. goisagi*) are among other rare bird species identified in the *fengshui* forests of Wuyuan County [32]. Rare or nationally protected plant species such as *Pseudolarix amabilis*, *Erythrophleum fordii*, *Aquilaria sinensis*, and *Ormosia henryi* have also been documented in these forests [46]. Moreover, some trees over a hundred years old are well-protected in *fengshui* forests, thanks to both conscious protection efforts and the forests' long-standing history. Studies have indicated that the abundance of old tree resources in rural areas often exceeds that found in urban settings, attributed to local awareness regarding the conservation of *fengshui* forests [47,48].

The conscious protection and reduced human interference in *fengshui* forests lead to higher species richness and genetic diversity, as well as enhanced functions in biodiversity and rare species conservation. By safeguarding these unique ecosystems, we not only preserve biodiversity but also strengthen the resilience of the surrounding environment.

2.2. Microclimate Regulation

Fengshui forests play a crucial role in regulating local environmental conditions (Table 2). Research indicates that the canopy cover of *fengshui* forests can exceed 80%, providing substantial shade beneath the trees [49,50]. Due to the positive relationship between radiation and environmental temperature [51], this extensive canopy helps to attenuate sunlight, effectively cooling the surrounding area. For instance, a study in Zhuhai found that solar radiation levels beneath the *fengshui* trees were lower compared to both the surrounding open areas and the edges of the forests (Xie and Tsim, *personal communication*) Additionally, processes such as plant transpiration [8] and photosynthesis [10] further contribute to temperature reduction within these forests.

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Table 2. Summary of *Fengshui* forest functions in microclimate regulation.

Functions	Explanation or Examples	Citations
Temperature regulation	**Provide Shade:** *Fengshui* trees effectively block sunlight, creating a cool, shaded environment.	[8]
	Reduce Solar Radiation: The intensity of sun exposure is lower under *fengshui* trees compared to areas just beyond their reach, which in turn is less intense than open areas. Specifically, sun exposure intensity is as follows: under *fengshui* trees < peripheral area of *fengshui* trees < open areas.	Xie and Tsim, *personal communication*
Wind regulation	**Typhoon Mitigation:** The *fengshui* forests help mitigate the impact of typhoons and block the cold, dry winds from the north.	[8]
	Reduced Wind Intensity: Wind intensity is reduced by 28.8% to 33.4% due to the forests' direct regulation of wind flow.	Rong and Tsim, *personal communication*
	Sandstorm Protection: The presence of *fengshui* forests has led to less dust in the villages of Houtian, Nanchang City, effectively blocking sandstorms.	[52]

In addition to temperature control, *fengshui* forests also regulate wind patterns. Research conducted in Huitong Village demonstrated that these forests could reduce wind intensity by 28.8% to 33.4% (Xie and Tsim, *personal communication*). They effectively block dry and chilly northern winds and can mitigate the impact of typhoons [8]. Furthermore, a study in Nanchang City found that *fengshui* forests play a role in reducing dust storms [52], further highlighting their environmental benefits.

Through effective temperature and wind regulation, *fengshui* forests significantly improve the local microclimate, thereby creating a more favorable environment for wildlife.

2.3. Carbon Fixation

Fengshui forests play a crucial role as significant carbon sinks (Table 3), demonstrating greater carbon storage capacity compared to various other habitats, including barren hills, artificial forests, and evergreen broad-leaf forests found in nature reserves [53,54]. A study revealed that the carbon storage in *fengshui* forests in Guangzhou averaged 259.17 ± 69.67 t/hm², surpassing that of evergreen broad-leaf forests in the Dinghushan Nature Reserve (244.998 t/hm²) and exceeding the average carbon storage of forests in Guangzhou (178.03 t/hm²) and across China (163.70 t/hm²) [54]. Additionally, some of these *fengshui* forests have reported average carbon storage levels exceeding 300 t/hm² [54]. The primary contributors to the total carbon pool in these forests are the tree and soil layers [53–55]. Moreover, the carbon storage potential in each *fengshui* forest is influenced by factors such as patch size and edge effects [56–60]. Due to conscious conservation efforts and reduced human interference, the capacity for carbon storage in *fengshui* forests is on the rise [17,55,61]. Furthermore, the carbon storage capabilities of *fengshui* forests can yield substantial carbon assets, valued at up to RMB 186,400/hm² [55].

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Table 3. Summary of *Fengshui* forest functions in carbon storage.

Functions	Explanation or Examples	Citations
Carbon storage	**Comparison of Carbon Storage Capacity:**	
	***Fengshui* Forest in Huizhou:** Carbon storage is 137.06 t/hm², which is higher than that of the barren hill at 93.73 t/hm².	[53]
	***Fengshui* Forests in Guangzhou:** Average carbon storage is 259.17 ± 69.67 t/hm², exceeding that of the evergreen broadleaf forest in Dinghushan Nature Reserve (244.998 t/hm²) and the general forest carbon storage in Guangzhou (178.03 t/hm²). This is also higher than the national average for forest carbon storage in China, which is 163.70 t/hm².	[54]
	Economic Value of Carbon Assets: The high carbon storage in *fengshui* forests represents significant economic value, estimated at up to RMB 186,400/hm².	[55]
Ecological carbon density	*Fengshui* forests exhibit lower ecosystem carbon density, indicating a greater potential for biomass accumulation over time.	[57]

2.4. Other Functions

Fengshui forests play a significant role in enhancing air quality by effectively adsorbing dust, suspended particles, and toxic substances such as hydrogen fluoride and sulfur dioxide [10]. In addition to these benefits, certain plant species within these forests, especially traditional Chinese herbs, secrete aromatic hydrocarbons and other volatile compounds. These substances not only repel mosquitoes but also combat pathogens, contributing to air purification and improving the overall living environment [10,62,63].

Moreover, *fengshui* forests are vital for soil and water conservation, helping to prevent erosion. Due to minimal human interference, these forests maintain intact soil structures and demonstrate superior soil chemical properties, which enhance soil quality [64]. They also support a sustainable hydrological system, thereby benefiting local ecosystems [19]. Historically, rural communities in China have recognized the importance of *fengshui* forests for soil and water conservation, a belief that has persisted since ancient times [65,66]. The strategic placement of *fengshui* forests is crucial for protecting villages from erosion and ensuring a reliable supply of groundwater and surface water, as illustrated by the *fengshui* forests located behind Houlongshan village [26].

In addition to these primary functions, *fengshui* forests also provide various ecological services, including noise reduction, serving as natural fire barriers, and mitigating the impacts of natural disasters [67–70].

In summary, *fengshui* forests contribute a wide array of ecological functions that enhance air and soil quality, promote water conservation, and provide critical services that support the health and sustainability of local environments.

3. Humanistic Values of *Fengshui* Forests

With a long history and rich regional culture, *fengshui* forests in China generate a variety of humanistic values, encompassing social, economic, and cultural dimensions. The social values include historical and cultural research, while economic values focus on the cultivation of economic crops, medicinal plants, and tourism development.

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3.1. Social Values

Fengshui forests hold significant social values, particularly in terms of historical and cultural significance. These forests are steeped in heritage, often featuring ancient structures accompanied by a wealth of poetry and historical accounts. Additionally, *fengshui* forests are intricately linked to human settlements, fostering diverse folk cultures.

3.1.1. Historical Research Values

Fengshui forests, with histories spanning hundreds of years, are invaluable for historical research. As a specific type of forest landscape, they are closely associated with human settlement buildings, reflecting the principles of *fengshui* theory. Notable examples include the Ming dynasty cypress forest in Beijing's Temple of Heaven and the *fengshui* forest in Confucius Forest, Shandong Province, both of which serve as crucial resources for studying heritage structures [10].

Moreover, many *fengshui* forests are connected to significant historical events, such as the Great Emigrations. For instance, the ancient pagoda forest in Guangji Temple, Shanxi Province, is considered the starting point of the Great Emigration in Northern China during the early Ming dynasty [10]. Similarly, *fengshui* forests in northern Guangxi Province were formed alongside the migration of Han people, integrating Han cultural elements during the Ming and Qing Dynasties [71]. In Southeast China, *fengshui* forests established by the Hakka people are vital to Hakka villages [72]. Furthermore, certain trees, such as Osmanthus fragrans in Lushan White Deer Academy, are believed to have been planted by renowned figures like Zhu Xi, a famous Neo-Confucian philosopher [10].

In addition to their historical significance, *fengshui* forests are rich in mythology, ancient texts, and poetry. For instance, folklore surrounding the Confucius Forest includes the belief that “crows would never stay in the Confucius Forest” [10]. Various poems from the Han and Tang dynasties and articles from the Qing dynasty and the Republic of China specifically mention the landscapes of *fengshui* forests, providing essential insights for historical research, particularly in ancient literature.

Overall, *fengshui* forests serve as vital historical resources that enhance our understanding of heritage structures and significant cultural events throughout Chinese history.

3.1.2. Cultural Values

Fengshui forests are deeply intertwined with human communities, giving rise to various folk and regional cultures, thus possessing considerable cultural value. A core belief surrounding *fengshui* forests is the harmony between humans and nature, aligning with fundamental Taoist thought [72,73]. This ecological model reflects a virtuous cycle in which villagers sustainably utilize and protect the *fengshui* forests, which in turn provide benefits to the community. Furthermore, Taoism posits that forests are connected to wonderlands inhabited by deities, making *fengshui* forests surrounding Taoist temples unique environments for spiritual practices [15]. Similarly, Buddhism emphasizes the planting of *fengshui* forests around temples to create tranquil spaces for meditation and spiritual activities [10,15].

Moreover, *fengshui* forests are closely linked to regional cultures. In Hakka areas, folk practices associated with *fengshui* have become integral to Hakka identity. The Hakka believe that planting and protecting *fengshui* forests fosters a beneficial environment for families and the community [72,74]. Specific trees within these forests may be revered as village deities or symbols of family lineage, prompting Hakka communities to organize worship activities [75]. Similar tree divinity worship practices also exist among ethnic minorities in Guangxi, Guizhou, and Yunnan Provinces, blending Han *fengshui* theory with local traditions [71,76].

In summary, *fengshui* forests embody cultural values that promote community harmony and spiritual connections, reflecting a deep-seated belief in the interrelationship between nature and human life.

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3.2. Economic Values

Fengshui forests predominantly consist of protected woodlands where carefully selected economic crops and medicinal herbs are cultivated. Additionally, their unique historical and cultural significance, coupled with distinctive landscapes, provides a foundation for tourism development, contributing substantial economic value.

3.2.1. Economic Crops and Medicines

Fengshui forests are cultivated not only for village protection but also for economic development. During the planting process, villagers intentionally select economically valuable plant species, including crops, medicinal plants, and timber trees [10,19]. For example, the camphor tree (*Cinnamomum camphora*) is prevalent in *fengshui* forests, accounting for 24% to 44% of all surveyed trees in Hong Kong's *fengshui* forests [50]. This economically important species serves as both a traditional Chinese herb and timber for construction and shipbuilding. Moreover, it provides raw materials for producing camphor and camphor oil used in various industries and modern medicine [77].

In addition to timber, certain fruit trees, such as apricot, jujube, pear, plum, longan, and litchi, are commonly found in *fengshui* forests, serving as significant economic sources for local villagers [10,16,21,39]. *Fengshui* forests also contain traditional Chinese herbs like *Aspidistra lurida*, *Polygonatum sibiricum*, *Capparis acutifolia*, *Psychotria asiatica*, and *Camellia drupifera*, which are valuable for medicinal use and health food products [21,39,41,78,79].

Ultimately, *fengshui* forests represent a vital source of economic crops and medicinal plants, contributing significantly to local economies while supporting traditional practices.

3.2.2. Tourism

As distinctive landscapes, *fengshui* forests offer aesthetic values, encompassing color, form, sound, and fragrance, which create enchanting environments within villages [10]. Many *fengshui* forests, particularly in Southern China, have existed for over a century and are deeply rooted in local cultures, thereby promoting special tourism and related industries [80]. In Guizhou, minority villages have become essential tourist destinations, featuring unique village landscapes and the surrounding *fengshui* forests [81]. The distinct cultures and villages of these minorities have fueled the growth of rural tourism, making it a vital industry in Guizhou. In 2020, revenue from special rural tourism in Guizhou reached RMB 12.04 billion, benefiting 225,000 rural households [82].

In conclusion, *fengshui* forests play a crucial role in tourism development, enhancing local economies and preserving cultural heritage through their unique landscapes and historical significance.

4. Database of Plants in *Fengshui* Forests

As discussed in previous sections, *fengshui* forests have the potential to enhance urban biodiversity by fulfilling various ecological functions typical of forest ecosystems. With their unique historical, cultural, and economic value as distinctive landscapes in Chinese village settlements, *fengshui* forests are particularly suitable for urban ecological construction in cities across China. However, the primary challenge lies in effectively integrating the concept of *fengshui* forests into urban development and ecological initiatives to achieve the Sustainable Development Goals (SDGs). One direct application involves recreating *fengshui* forests, or wooded areas that embody some of their characteristics, in urban communities, or incorporating *fengshui* forest design concepts into urban park and landscape planning. A key aspect of this process is selecting and establishing appropriate plant combinations and community structures.

Numerous studies have analyzed the plant species and community structures within *fengshui* forests, which predominantly consist of native species alongside some that have been introduced over the centuries [46]. The observed community structure patterns typically feature economically

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valuable plants as dominant species, exhibiting complex hierarchical structures along with infiltration and mosaic distribution phenomena [36,83]. Notably, fruit trees and culturally significant trees dominate the tree layer, while Chinese herbal plants prevail in the shrub layer [29,83]. Therefore, when selecting and planting vegetation for urban landscapes, designers can draw directly from the characteristics of plant communities found in *fengshui* forests. However, current research lacks a comprehensive database documenting the plant species found in *fengshui* forests, which would aid urban landscape designers in their vegetation selection.

In preparation for this review paper, a total of 1,196 plant species recorded in Chinese *fengshui* forests were collected and summarized [21,23,29,36,46,83,84]. This has resulted in the creation of the **Database of Plants in *Fengshui* Forests**, which includes basic information, ecological values, and humanistic values associated with each plant species (**Table 4**).

Table 4. Summary of Database of Flora in Fengshui Forests**.**

Phylum	Number of species								Host Plants	
					Protection Degrees					
	Order	Family	Species	Life Form		China National Protection Class		IUCN Red List		
Angiospermae	45	135	1110	Grass Shrub Tree Liana Bamboo	274 327 41 7 71 21	Class II	12	CR EN VU NT	2 1 0 2 5 9	- For butterfly - For moths - For beetles and other insects - For other organisms (slugs, mice, etc.)	157 166 356 15
Pteridophyta	4	17	58	Grass Tree	57 1	Class II	2	NT	1	- For beetles and other insects - For other organisms (slugs, mice, etc.)	164
Gymnosperma e	7	9	25	Shrub Tree Liana	1 22 2	Class I Class II	5 3	CR EN VU	3 3 2 1	- For butterfly - For moths - For beetles	5 10 20 1

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								NT		and other insects - For other organisms (slugs, mice, etc.)	
Lycopodiophyta	2	2	3	Grass	3					- For beetles and other insects	1
Sum	58	163	1196	Grass Shrub Tree Liana Bamboo	334 328 440 73 21	Class I Class II	5 17	CR EN VU NT	5 13 27 11	- For butterfly - For moths - For beetles and other insects - For other organisms (slugs, mice, etc.)	162 176 393 20

4.1. Overview of the Database

The Database of Plants in *Fengshui* Forests serves as a comprehensive resource, detailing the diverse plant species that thrive within these unique ecosystems and highlighting their ecological and cultural significance.

Most species in the database are native to China, with only 4.8% being introduced species, some of which have been present for hundreds of years, such as *Epiphyllum oxypetalum*, *Hylocereus undatus*, and *Opuntia dillenii* [46,77]. According to the distribution of seed plants by genera in China as developed by Wu [85], the spermatophytes in *fengshui* forests mainly belong to Pantropic, Tropical Asia, and Old World Tropics [40,78,83,86–93]. Furthermore, based on the *Flora of China* [77] and *Catalogue of Life China* [94], most recorded plant species are distributed in Southern, Eastern, Central, and Southwestern China, with fewer species found in Northwestern and Northern regions, reflecting the geographic distribution patterns of *fengshui* forests in China.

The database indicates that 36.8% (440 species) of the recorded plant species are trees, 27.4% (328 species) are shrubs, 27.9% (334 species) are grasses, 6.1% (73 species) are lianas, and 1.8% (21 species) are bamboos. Additionally, it documents the presence of protected and endangered plant species, including 21 key protected species in China and 56 species classified above the Near Threatened (NT) level according to the IUCN Red List. Among the total of 534 host plant species recorded, 30.3% (162 species) support butterflies, 33.0% (176 species) support moths, 73.6% (393 species) support other arthropods, and 3.7% (20 species) support other animals, such as slugs and mice.

Moreover, the database organizes information about the flowering and fruiting seasons of the plants. Over 100 plant species exhibit blooming or fruit-bearing characteristics each month, with more than 300 flowering species from April to July and over 300 fruit-bearing species from July to November (Figure 2).

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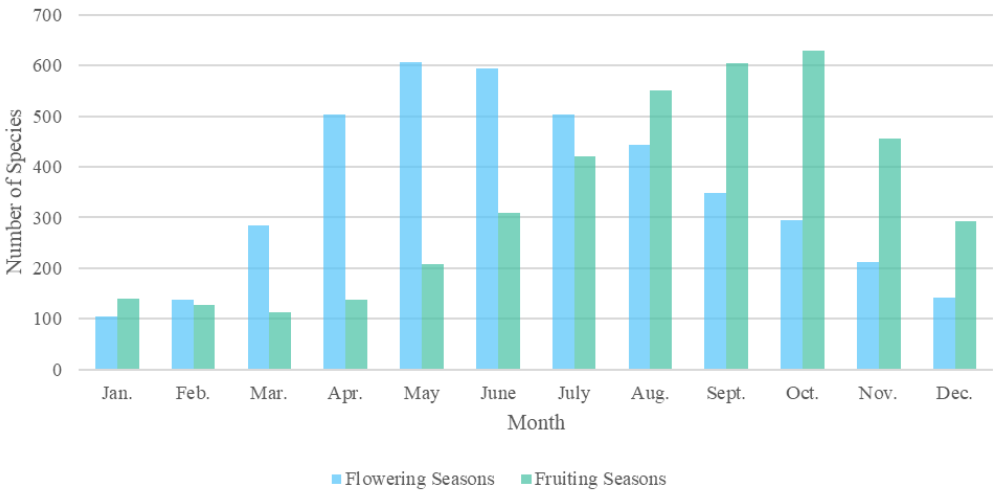

Figure 2. Flowering seasons and fruiting seasons of recorded plant species in *fengshui* forests.

This database not only records basic botanical information and protection grades of plant species within *fengshui* forests, but also includes humanistic values such as economic, medicinal, landscape, tourism, and historical/cultural values (Table 5). Specifically, 704 plant species have economic value for industrial production related to building materials, commodity processing, food processing, and other agricultural and livestock industries, while 895 plant species possess medicinal value for traditional Chinese medicine processing, extracting medicinal ingredients, and producing healthcare products. Additionally, 528 species have commercial value for developing ornamental plants for landscaping, and 161 species are valuable for eco-tourism development. Furthermore, 152 species carry historical, religious, and folk cultural research value.

Table 5. Summary of plant species with specific values in Database of Flora in Fengshui Forests.

Values		Number of Plant Species
Ecological Functions 	Flowering plants, Fruit plants, Host plants	1119
Conservation Values 	China National Protected Species; IUCN Red List	78
Economic Values 	Building material	127
	Product processing	477
	Edible, food processing	351
	Other industries	221
Medicinal materials	Traditional Chinese medicinal materials	834
	Extraction of medicinal ingredients	311

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Values		Number of Plant Species
	Health food	43
Landscape & Tourism Values 	Commercial landscape greening	528
	Eco-tourism	161
Historical and Cultural Values 	Historical research	128
	Religious studies	25
	Folk culture research	48

4.2. Specific Values and SDGs

The Database of Plants in *Fengshui* Forests not only catalogs the diverse plant species within *fengshui* forests but also highlights their specific ecological and humanistic values, linking these attributes to relevant United Nations Sustainable Development Goals (SDGs) (Table 5).

The database encompasses extensive information regarding the host plants and their flowering and fruiting periods. In the context of urban green landscape design, strategically combining and applying these plant species can enhance wildlife attraction, thereby enriching the urban food web and ecosystem. By arranging these plants to emulate the patterns found in *fengshui* forests, ecological functions such as microclimate improvement, noise reduction [67], and dust storm mitigation [52] can be realized within urban environments. These initiatives align with several objectives outlined in SDG 13, “Climate Action”, and SDG 15, “Life on Land”.

Additionally, the database catalogs a diverse range of rare plant species capable of adapting to human habitats, facilitating the ex-situ conservation of these plants in urban environments [95], which aligns with relevant objectives outlined in SDG 15.

By exploiting the economic, medicinal, landscape, and tourism values of the plants within the database, new green industries such as eco-tourism [65,96], Chinese herbal gardens [97], and native plant nurseries [98] can be established. This would create economic value and employment opportunities, facilitate local economic development, and drive sustainable consumption and production patterns, all of which are associated with the goals of SDG 12, “Responsible Consumption and Production”. Furthermore, promoting the medicinal worth of these plants can advance traditional Chinese medicine culture [97,99], fostering a more scientific and healthful lifestyle, which relates to certain goals of SDG 3, “Good Health and Well-being”. Additionally, by integrating the historical and cultural values of these plants, ancient tree parks, poetry and culture parks, and other theme parks [48,67] can be constructed, developing new historical and cultural outdoor education bases and providing high-quality educational resources relevant to some goals of SDG 4, “Quality Education”.

Ultimately, by leveraging the ecological functions of *fengshui* forests, these plants can improve urban ecosystems and enhance cultural values, promoting the construction of safer and more sustainable urban living environments, closely aligned with the goal of SDG 11, "Sustainable Cities and Communities".

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In summary, the plants documented in the Database of Plants in *Fengshui* Forests contribute significantly to the realization of the UN's Sustainable Development Goals across multiple dimensions, encompassing ecological, economic, and social aspects.

5. Applications

5.1. Applications in Native Species Conservation and Eco-tourism

Fengshui forests serve as vital reservoirs for native species, particularly native plant species. Research on plant communities in *fengshui* forests across Guangdong Province, Guangxi Province, Hong Kong, and other areas in Southern China has demonstrated their robustness, characterized by intricate structures and heightened biodiversity [21,29,79]. The flora in *fengshui* forests predominantly includes typical subtropical zonal plants, featuring a wealth of native species with territorial characteristics and cultural significance [21,29].

Fengshui forests harbor numerous native plant species and function as vital seed banks and gene pools for indigenous species, supporting the development and conservation of native ornamental plants. Compared to artificial secondary forests, *fengshui* forests possess more complex and stable community structures, which are favorable for protecting and facilitating the growth of local species [35]. Additionally, *fengshui* forests are significant venues for the conservation of rare native plants, which face challenges such as habitat fragmentation and small population sizes that lead to reduced fertility and vitality [100]. In-situ conservation, which involves establishing nature reserves to safeguard the native habitats of rare plants, should be prioritized [100,101]. However, due to habitat destruction, *ex-situ* conservation—preserving and maintaining living samples of rare plants outside nature reserves—becomes an efficient alternative [102,103]. As a source of rare native plants, *fengshui* forests can support both *in-situ* protection and provide seeds for cultivating rare plant seedlings [95], enabling effective *ex-situ* conservation in urban green spaces. The Database of Plants in *Fengshui* Forests includes several protected species, further demonstrating the role of *fengshui* forests in conservation efforts. By incorporating the design principles of *fengshui* forests into urban landscapes, we can create habitats that facilitate both in-situ and ex-situ conservation of endangered plant species, thereby contributing to SDG 15, which focuses on life on land and biodiversity conservation.

Fengshui forests with high species richness also play a crucial role in promoting ecotourism development. The International Ecotourism Society (TIES) defines ecotourism as “responsible travel to natural areas that conserves the environment, sustains the wellbeing of the local people, and involves interpretation and education” [104]. This trend is particularly important in developing countries [105]. Samal and Dash [105] also highlight the coexistence model of ecotourism and community-based ecotourism (CBET) as a way to maximize biodiversity conservation benefits. Biodiversity and the presence of rare wildlife contribute significantly to the growth of ecotourism and local economies. Since the introduction of ecotourism to China in the 1980s, many tourist destinations have been established in nature reserves [106]. Recently, birdwatching tourism has gained popularity in China, driven by the rich biodiversity in *fengshui* forests and old trees surrounding villages [107]. This has prompted local villagers to develop birdwatching-related businesses, such as guided tours and homestays, significantly benefiting their economies. For instance, a villager in Yunnan Province can earn between RMB 200 and 500 per day as a birdwatching guide, substantially more than the RMB 2,000 per year typically earned from farming [108]. In Mingxi, Fujian Province, birdwatching has led to an average income increase of RMB 60,000 for villagers [109]. In Guangxi Province, government investments of RMB 7 million have fostered the rural birding economy, benefiting over ten villages [110]. Moreover, the financial gains from birdwatching have shifted local attitudes from capturing birds to protecting them [108,110], raising awareness of nature conservation and benefiting local biodiversity. Therefore, protecting *fengshui* forests is vital not only for conserving native species but also for promoting ecotourism, which significantly contributes to local rural economies, aligning with SDG 8 on decent work and economic growth.

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5.2. Improve on Urban Landscape Design

Over centuries, *fengshui* forests have developed into sophisticated systems, particularly in the interplay between natural surroundings and human habitation. Incorporating *fengshui* forests into urban landscape design is a viable option for ecological urban development, a growing trend in urban management. This development emphasizes environmental protection, economic growth, and social progress, while honoring the city's cultural heritage, including *fengshui* forests [111]. By integrating urban park designs based on the landscapes and plant species of *fengshui* forests, we can establish eco-city systems that promote ecological conservation and sustainable economic development, thereby contributing to SDG 11, which aims to make cities inclusive, safe, resilient, and sustainable.

Urban green spaces are crucial for ecological urban development and urban biodiversity, serving multiple ecological functions and holding significant humanistic value [112,113]. The urban green coverage rate is a key indicator of urban ecological environment quality [112]. However, urbanization has led to encroachment and fragmentation of these spaces [112,114,115], resulting in decreased biodiversity and exacerbating urban ecological issues like the heat island effect [112]. Urban parks and green landscapes are essential resources in this context. Incorporating biological and sustainable designs into urban landscape planning is imperative to enhance urban biodiversity, mitigate heat island risks, address ecological challenges, and foster sustainable development. *Fengshui* forests, which provide various ecological functions such as improving microclimates, conserving soil and water, fixing carbon, enhancing air quality, and reducing noise, can be integrated into urban parks to create livable environments. Therefore, principles and concepts derived from *fengshui* forests can serve as valuable models for designing ecologically sensitive urban parks, ultimately supporting SDG 13 on climate action.

The conservation of urban biodiversity is a pivotal concern in urban ecological construction, with city parks and green landscapes being essential for fostering biodiversity. A common challenge in urban landscapes is the introduction of numerous ornamental plants, which can lead to biological invasions that negatively impact the stability and growth of indigenous plants [116,117]. Thus, utilizing native plants in landscape design is a crucial strategy for promoting urban biodiversity conservation, a practice supported by policy initiatives. The upcoming "Regulations on Urban Greening of Guangdong Province," effective from 2024, will prioritize the use of endemic species for greening efforts while preventing the invasion of alien species [118]. *Fengshui* forests, as mature human-inhabited landscapes, comprise plant species well-suited for urban habitats. The Database of Plants in *Fengshui* Forests indicates that 95% of the recorded plants are native species, providing appropriate local choices for constructing urban green landscapes. This approach reduces the risk of biological invasions from exotic ornamental plants while promoting urban green ecosystems and biodiversity conservation, which directly supports SDG 15.

When designing urban green landscapes, it is essential not only to select native plants but also to consider how to combine and arrange them to create a balanced food web and ecosystem. This strategy supports urban ecological construction, the protection of biodiversity, and sustainable urban development, thereby contributing to the attainment of the Sustainable Development Goals (SDGs).

The Database of Plants in *Fengshui* Forests offers fundamental taxonomic information, life forms, and flowering and fruiting periods for 1,196 plant species recorded in *fengshui* forests. By integrating diverse matching principles, complex plant community structures can be configured to facilitate the establishment of comprehensive food webs and green space ecosystems.

The first matching principle is to integrate various life forms, constructing a complex, interpenetrating, and stable forest layer structure akin to that of a *fengshui* forest in urban landscapes. This approach enhances the robustness of urban green ecosystems and aids in the protection of urban biodiversity.

The second principle is to cultivate host plants that attract a diverse array of butterflies, moths, beetles, and other insects. This not only facilitates the establishment of urban parks with distinctive features, such as butterfly habitats, but also promotes urban ecotourism and enriches food webs, advancing conservation efforts for urban biodiversity.

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The third principle is to combine plants with diverse flowering and fruiting periods to ensure a continuous supply of blooms and fruits throughout the year. This approach enhances landscape diversity and aesthetic appeal while providing essential food sources, such as nectar and fruits, for insects and wildlife, thus fostering a complete food web.

To achieve SDG 11, which aims to build sustainable cities, it is crucial to consider not only the green and sustainable development of urban areas but also the sustainable development of regional cultures. The database also provides various humanistic values associated with the plants. Thus, the fourth principle for plant selection in urban green spaces is to choose species with special values for designing thematic landscapes, facilitating cultural education and awareness, and promoting the protection and sustainable development of regional cultures, aligning with SDG 4 on quality education.

By harmonizing the principles of *fengshui* forests with urban landscape design, we can create resilient, biodiverse urban ecosystems that not only enhance the quality of life for residents but also contribute to the achievement of multiple Sustainable Development Goals, ensuring a sustainable future for both people and nature.

6. Conclusions

This study highlights the significance of *fengshui* forests as exemplars for designing urban green landscapes that contribute to the construction of sustainable cities and the realization of the Sustainable Development Goals (SDGs). Through an extensive review of literature, it is evident that *fengshui* forests provide unique ecological functions and humanistic values. As a distinctive type of secondary forest in China, these forests play vital roles in conserving biodiversity (SDG 15), improving microclimates, sequestering carbon, enhancing air quality, protecting soil and water resources, reducing noise and dust, and serving as natural fire barriers to mitigate disaster risks (SDG 13).

In addition to their ecological benefits, *fengshui* forests are rich in historical, cultural, and economic values, contributing to crop and medicinal material production as well as tourism development (SDG 8). By incorporating the design principles inherent to *fengshui* forests, urban planners can create green landscapes that promote sustainable urban development (SDG 11).

The key to effective urban green landscape design lies in the careful selection and combination of plant species. The **Database of Plants in *Fengshui* Forests** includes 1,196 plant species recorded in *fengshui* forests, detailing their classification, protection statuses, and significant economic and cultural values. By applying four strategic principles for plant selection and arrangement, urban landscapes can be designed to foster robust ecosystems and complete food webs, thus enhancing biodiversity conservation (SDG 15) and improving overall urban resilience.

Moreover, *fengshui* forests can play a crucial role in the protection of native plants and the promotion of eco-tourism (SDG 8), offering local communities' economic opportunities while fostering cultural heritage (SDG 4). As cities increasingly prioritize ecological development, the integration of *fengshui* forest principles into urban landscape design emerges as a powerful approach to creating livable environments that align with the broader objectives of sustainability, health, and well-being (SDG 3, SDG 12).

In summary, the application of *fengshui* forests in urban design not only addresses pressing ecological challenges but also enhances the cultural and economic vitality of urban areas, making significant strides toward the achievement of multiple SDGs.

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