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Challenges and Stakeholder Perspectives on Implementing Ecological Designs in Green Public Spaces: A Case Study of Hue City, Vietnam

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Abstract: In recent years, ecological design has emerged as an innovative approach for landscape designs to address urban environmental issues such as biodiversity protection and the promotion of ecosystem services. However, in developing countries like Vietnam, an ecological approach is still in its early stages and requires more research and practical application. This study aims to explore stakeholder perspectives and identify suitable ecological landscape approaches through semi-structured interviews based on designed images. The findings reveal various challenges to implementing ecological designs in the public green spaces of Hue City, such as the prioritisation of short-term goals over ecosystem services, solely focusing on increasing green per capita, the lack of market interest, and the lack of motivation among different departments responsible for the design and management of public green spaces. In addition, the study also finds that stakeholders are willing to accept a hybrid ecological landscape approach in combination with 'cues to care' landscapes, such as buffer zones of well-managed vegetation or regularly cut lawns. Results highlight the necessity of prioritising ecosystem services in decision-making, policy, and planning development concerning urban green spaces in Vietnamese cities. In addition, education and awareness campaigns are needed for the public and stakeholders to increase acceptance of ecological design.

Keywords: urban green spaces; Hue City; Vietnam; ecological design; stakeholder's perceptions; ecosystem services

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1. Introduction

As urbanisation continues to increase globally, there is an emerging interest in ecological design thanks to its benefits for enhancing the living standards of residents as well as addressing environmental issues. Ecological design is an approach to mimicking the natural cycle that integrates natural processes and patterns into landscape designs to minimise the intervention of human activities [1,2]. Through this approach, ecosystem services (ES) of green spaces can be reinforced and enhanced, including temperature regulation, noise and pollution reduction, and air filtration [3–5]. Ecological design also contributes to preserving biodiversity and promoting public health and well-being [6,7]. This approach emphasises the importance of preserving and restoring existing ecological functions and services in urban areas [8,9]. Ecological design principles include prioritising the use of native species [10], emphasising the conservation of resources, regeneration, and resilience [11], and applying low-impact development and natural-based stormwater management [12].

Urban parks are essential types of green spaces that provide a variety of ecosystem services and offer recreational and cultural spaces for communities [13–16]. These ecosystem services rely on the quantity and quality of park vegetation, for example, characteristics such as plant size, form, canopy density, and the vegetation's ability to adapt to changes in the surrounding environment [17,18]. Relevant ecosystem services for climate adaptation

can also be influenced by the plant community's composition and diversity. For example, native plants can tolerate a shortage of water during dry seasons and can better withstand inundation or flooding events [19].

However, the current landscape approaches originated in Western landscape architecture (picturesque-gardenesque styles), leading to the extensive use of lawns or trimmed exotic plants [20]. This type of landscape requires intensive maintenance (mowing, irrigation, pruning, etc.) and significant resources and manpower, which also contribute to environmental issues, including water use, soil erosion, and the loss of biodiversity [20]. This tendency can lead to an imbalance in four types of ecosystem services, including supporting, provisioning, regulating, and cultural services [21]. Therefore, adopting a comprehensive landscape design approach for green public spaces is vital, as it maximises their potential to offer multiple functions and ecosystem services [22–24]. There is a growing consensus on the need to shift away from conventional practices and embrace more environmentally friendly approaches in landscape design and management [25,26]. Several countries, including the United Kingdom, France, Singapore, Malaysia, and Spain, have implemented various programmes and initiatives to incorporate ecological design principles into urban landscapes to promote ecosystem services. For example, various cities in Spain have been developing green infrastructure networks that connect parks, urban forests, and green corridors [27]. This change emphasises the self-adaptation and resilience of the landscape based on ecological principles, reducing reliance on chemicals and intensive maintenance [28–30].

Furthermore, shifting towards new landscape design and management practices can pose challenges for urban stakeholders due to the absence of adaptive management [31], a lack of priorities, guidelines, and collaboration among departments [32], or conflicts between landscape aesthetics and expectations for maintenance [33]. For example, Nassauer [34] found evidence supporting the notion that societies have a common expectation for landscapes to be well-maintained, managed, and cared for to a certain standard. This expectation is rooted in cultural and societal norms that prioritise highly manicured landscapes. It implies that if we can identify the minimum amount of 'cures' needed to make a landscape appear well-maintained and cared for, we can introduce more ecological structures into a landscape [35]. However, one person's definition of well-kept and aesthetically pleasing may not be the same as another's. Some stakeholders, for example, find a perfectly groomed lawn aesthetically pleasing, while others prefer more naturalistic and diverse plant life, such as a meadow. It may result in conflict among stakeholders. Nassauer [33] also implied that the general public can find it challenging to understand and appreciate the ecological value of such landscapes. It is especially acute in developing countries where there is limited awareness or education about environmental issues. This is because ecological landscapes often look messy, and their appearances do not exactly reflect their function or the benefits that they bring to the environment: *'what looks good may not be good, and what is good may not look good'* [33]. In other words, the perception and acceptance of these approaches by the public and stakeholders may vary depending on their backgrounds and preferences [23,36,37].

Thus, implementing ecological designs requires a comprehensive understanding of the challenges from the perspective of stakeholders [23,32,38] and a sufficient understanding of current ecosystem functions and services [39]. These insights will facilitate addressing potential challenges, provide the foundation for further research, and foster a new approach towards environmentally friendly public green spaces.

Urban Green Spaces in Vietnam

Vietnam's urban green spaces have evolved across centuries, bearing the imprints of its unique cultural heritage and the influences of various other societies. During the feudal era (7th century AD to 1858), the royal gardens were built to serve royal families and show their powers. These gardens were designed with a blend of Vietnamese and Chinese styles, featuring lotus ponds, rock formations, and delicate bridges. Then, the

19th century was characterised by French colonisation, which, among other influences on political and cultural life, introduced their formal (symmetrical) garden style to Vietnam. European architects and landscape architects were also responsible for designing the first public green spaces [40]. French formal gardens in Vietnam featured geometric shapes and were often located in public spaces such as parks and urban plazas. The most famous French-style garden in Vietnam is the Tuileries Garden, which was built in Hanoi during the early 20th century. In the post-colonial era, Vietnam adopted the Soviet Union's urban designs and planning, including the construction of multifunctional public parks [41]. More green spaces and gardens were created and often included a mix of natural and man-made features, such as forest groves, flowerbeds, fountains, sculptures, and pavilions. One example of a Soviet-style garden in Vietnam is Lenin Park in Hanoi.

After the economic reform in 1986, urban green spaces in Vietnam continued to grow and improve the quality of urban life. Global landscape design trends gradually replaced the Soviet style in public green spaces [41]. This new style is based on lawns, flowerbeds, and 'open' tree landscapes with high-intensity management and maintenance. Last decade, the government paid more attention to the role of public green spaces in providing ecosystem services and dealing with environmental problems such as floods and the urban heat island effect. Every year, Vietnam's cities face flooding issues, yet the idea of utilising parks as specific areas for flood regulation has not been given sufficient attention or consideration. Moreover, urban parks often face budget constraints and are susceptible to climate-related disasters, leading to a degradation of landscape quality over time. Thus, more environmentally friendly design and management of green spaces are needed to mitigate these problems.

This paper aims to explore the practical application of ecological approaches in landscape design and management of Vietnam's green public spaces, with a focus on addressing environmental challenges such as plant diversity loss and regulation of stormwater runoff. The first key aspect is to identify difficulties and challenges encountered by local stakeholders in implementing new approaches in the practice of landscape architecture. The second aim is to find a model for ecological designs that, on the one hand, requires less intensive maintenance and benefits the environment and, on the other hand, can be accepted by Vietnamese stakeholders. This study aims to fill the gap in existing research on urban green spaces in Vietnam and suggest a shift from conventional landscape practices to alternative landscapes that prioritise ecological principles, such as the increasing complexity of green spaces and their biodiversity.

2. Materials and Methods

2.1. Case Study

In 2016, Hue City (Figure 1) was recognised as the first national green city in Vietnam by the World Wide Fund for Nature [42]. Besides, Resolution No. 54-NQ/TW on Building and Development of Thua Thien Hue by 2030 aims to develop Hue City as an ecological hub that emphasises the conservation and value of heritage, tourism, smart technology, and environmentally friendly design [43]. Efforts are being made to develop and implement ecological principles in urban planning and design, aiming to create green and sustainable communities within the city. These factors make Hue City an ideal location as a case study for researching ecological design principles and their implementation in Vietnam.

In this research, we selected three public parks in Hue City as case study sites: Le Loi Park (P1), Tinh Tam Lake (P2), and Ton Duc Thang Park (P3) (Figures 1 and 2). These parks are not only the largest in the city but also the most common type of public green space. They encompass a diverse range of planting design features and offer various recreational opportunities. These parks serve as valuable examples for understanding existing management and maintenance practices. Additionally, we captured original photographs of these parks that were later used to create visual illustrations of ecological landscape design, which were subsequently incorporated into semi-structured interviews.

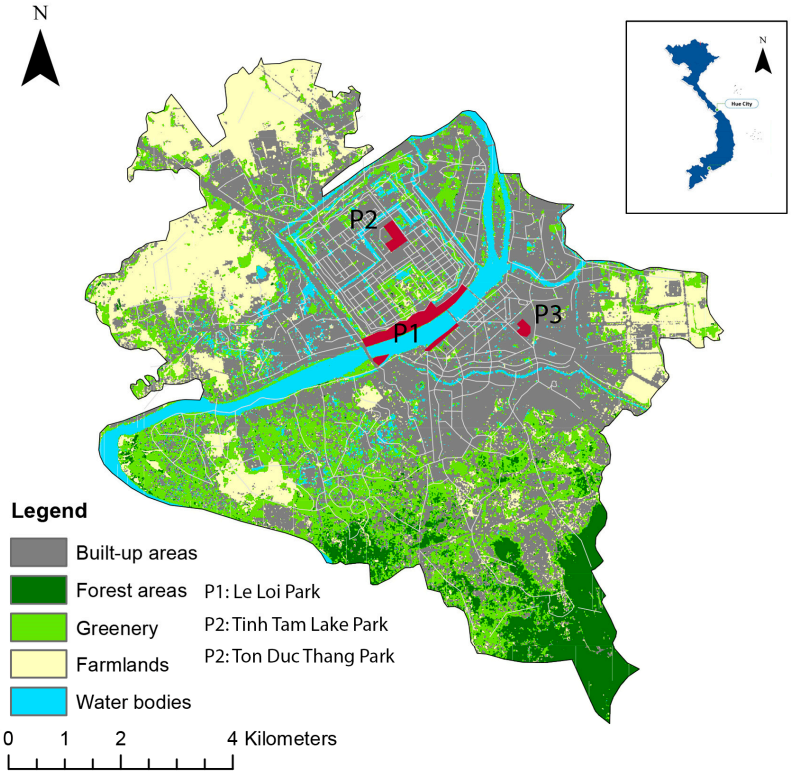


Figure 1. Land use map and the location of selected case study parks in Hue City. Source: Duy Khiem Tran.

Le Loi Park (P1)	Tinh Tam Lake Park (P2)	Ton Duc Thang Park (P3)
		
Area: 28 ha Founded in the early 20th century	Area: 4.3 ha Founded in the 18th–19th century	Area: 3.3 ha Founded in 2000

Figure 2. Three public parks for the case study.

2.2. Semi-Structured Interview with the Assistance of Designed Images

We conducted semi-structured interviews with stakeholders who are responsible for the planning, design, and management of green public spaces. A total of 15 participants from three parks agreed to be interviewed: the senior park manager (SPM), park site supervisor (PS), ground staff (GS), landscape architects (LA), and urban researcher (AS) (Table 1). Among these participants, there are two architects, three landscape architects, two university lecturers, and four agricultural and horticultural engineers. Each participant works in multiple parks. For example, park site supervisor PS1 works at both Le Loi Park and Tinh Tam Lake. The interviews took around 40 min–1 h. All interviews were recorded, transcribed, and translated from Vietnamese into English.

Table 1. List of participants and their expertise.

Participant		Expertise
Senior park manager	P1	Architect
Senior park manager	P2	Agricultural engineer
Senior park manager	P3	Agricultural and forestry engineer
Park site supervisor	P4	Agricultural engineer
Park site supervisor	P5	Architect
Park site supervisor	P6	Horticultural engineer
Park site supervisor	P7	Agricultural engineer
Ground staff	P8	Horticultural worker
Ground staff	P9	Horticultural worker
Ground staff	P10	Horticultural worker
Landscape architect	P11	Landscape design
Landscape architect	P12	Landscape design
Landscape architect	P13	Landscape design
Academic scholar	P14	Urban design and management
Academic scholar	P15	Urban design and management
Total		15

In this study, we used photo-based questions and the case study approach to collect and analyse the data. The case study approach was used to analyse the qualitative data collected from semi-structured interviews. This approach was often used to *'gain an in-depth appreciation of an issue, event or phenomenon of interest, in its natural real-life context'* [44] (p.2). Nvivo software was used to create codes for extracting and analysing directed content from the interviews.

The photo-based question method was used as an aid to semi-structured interviews as participants' knowledge of the ecological approach varies widely due to their different educational backgrounds. The interview process involved showing participants a series of photographs and asking them to respond to questions related to the images. This method helped generate more valuable data than discussing written arguments on complex topics. Photos also helped to generate more valuable data since they enabled participants to understand the interview questions and visualise ecological elements within an urban park, such as native plants, bioswales, wetlands, and rain gardens.

Nassauer [37,45], Jorgensen [46], and Harris et al. [47] showed that using images as a visual representation in interviews was very useful. For example, Nassauer et al. [37] developed six ecological design solutions for urban housing front yards in one of the USA cities to collect the thoughts of local people. Similarly, Jorgensen et al. [46] also used images to evaluate how visitors' preferences and feelings of safety were affected by wooded spaces and forest margins.

To evaluate the degree of acceptance of ecological landscapes by the public, we created specifically designed images. These images depict two degrees of ecological design implementation for each typology of green space (lawns, shrubs, semi-woodlands, water edges, and river/lake margins), allowing participants to visualise and compare the differences between the alternatives. These alternative designs were inspired by the natural landscapes in local areas (existing case study parks in Hue City), combined with ecological design solutions implemented in developed countries such as Singapore, Malaysia, and England. Figures 3 and 5 represent examples of original ecological design ideas (sketches) for various types of landscapes in the park. Then, we created digital images based on original sketches and Photoshop and used them during the interview. (Figures 4 and 6). There were

three groups of questions: about current park management, design, and maintenance; key factors and challenges to implementing ecological design in green public spaces; and about the potential of ecological landscape approaches and the perceptions of urban park managers. All interview questions can be found in the Appendix A.

The first alternative represents (Figures 3a, 4, 5a and 6, alternative 1) a medium level of implementation of ecological design. In this design, vegetation structures are incorporated into a landscape without being overwhelming; there are still cues of manicured landscapes such as mowed lawns or trimmed shrubs. In this alternative, the use of native ground covers and grasses is promoted, and plants are allowed to grow freely in certain areas of the landscape. However, they are kept at a reasonable height (which does not exceed knee level), aiming to maintain an overall neat appearance. For semi-woodland areas, the alternatives add more native shrubs and understory trees while maintaining the canopy trees. For water edges, a few groups of native species are added along the shoreline to reduce erosion and provide a habitat for aquatic wildlife. However, in order to maintain a manicured appearance, the vegetation can be planted in a controlled manner and trimmed to a reasonable height.

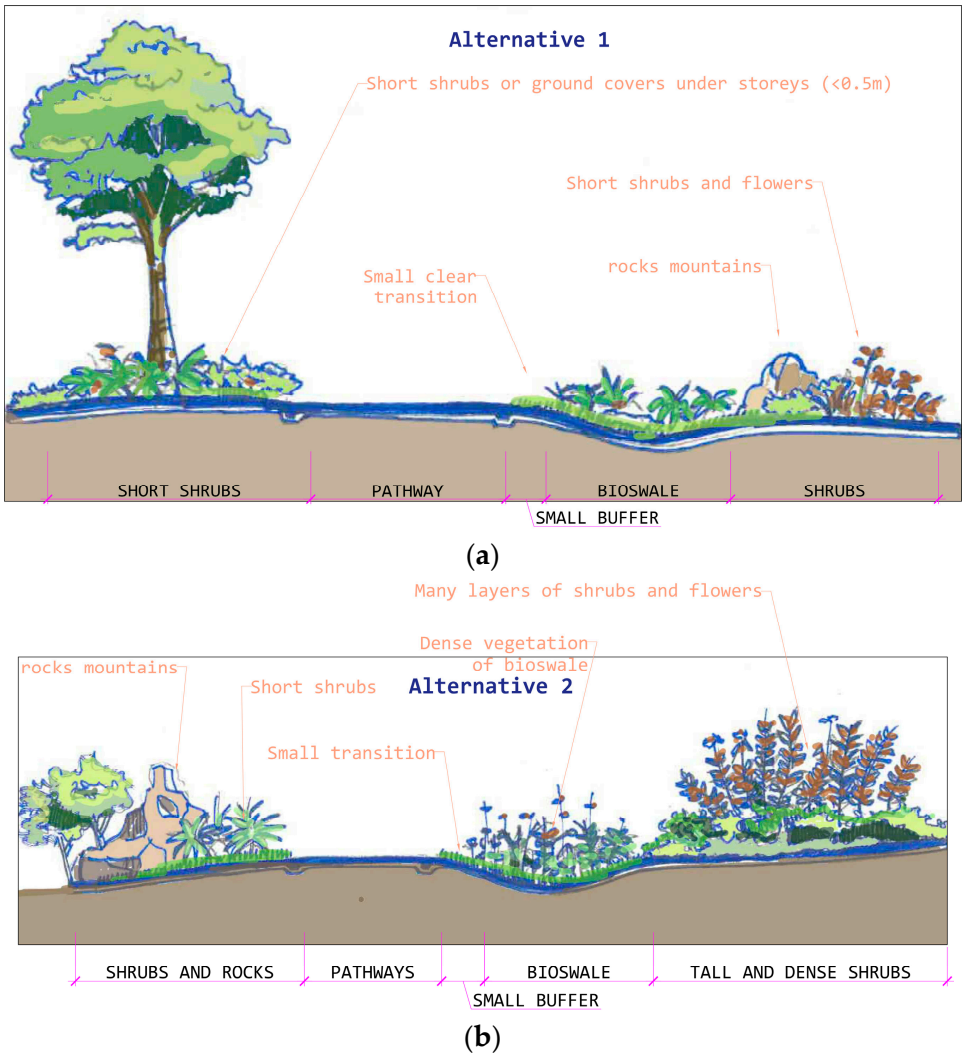
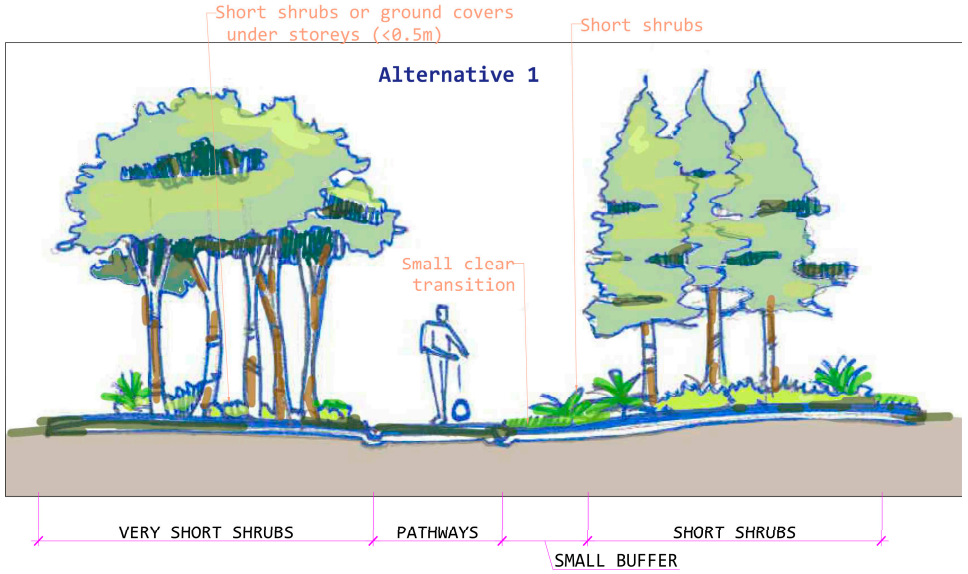
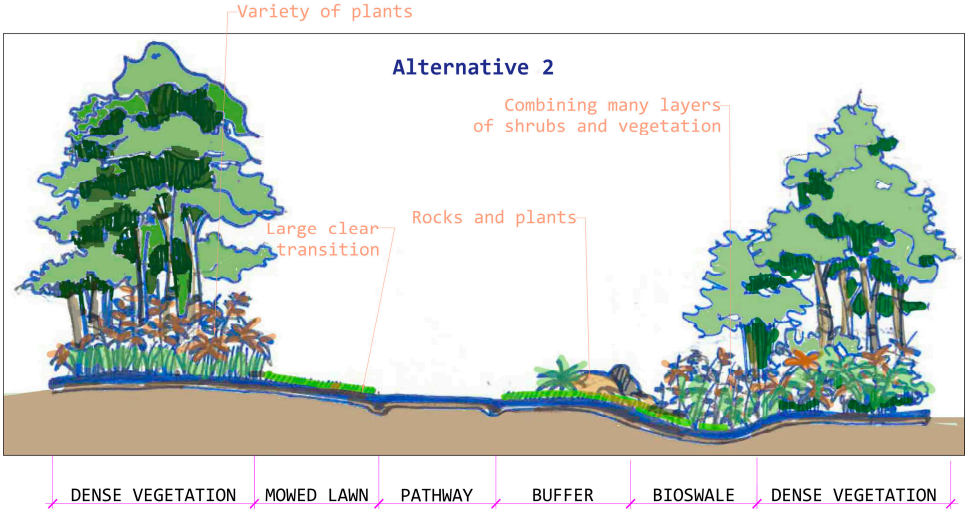


Figure 3. Example sketches of ecological design scenarios for shrub zones. (**a**) Alternative 1 and (**b**) alternative 2. Source: Duy Khiem Tran.

Figure 4. Alternative ecological designs for shrub zones. Alternatives 1 and 2. Images included in the stakeholder's interview. Source: Duy Khiem Tran.



(**a**)



(**b**)

Figure 5. Example sketches of ecological design scenarios for semi-woodland zones. (**a**) Alternative 1 and (**b**) alternative 2. Source: Duy Khiem Tran.

Figure 6. Ecological design scenarios for semi-woodland zones (understorey layer). Alternative 1 and Alternative 2. Images included in the stakeholder's interview. Source: Duy Khiem Tran.

In contrast, the second alternative (Figures 3b, 4, 5b and 6, alternative 2) is an intensive level of ecological design implementation that focuses on creating a wilder appearance compared to traditional manicured landscapes. In this type of design, lawns may be replaced with native ground cover or natural grasses that require less maintenance and provide habitat for insects and small animals. Shrubs may be allowed to grow more naturally, with less pruning and shaping. In semi-woodland, river margins, and water-edge areas, native plants are allowed to grow higher, larger in volume, and denser. Natural-based solutions for stormwater management, such as bioswales and rain gardens, are usually used to improve the hydrological function of the park. However, it requires regular maintenance to prevent overly aggressive plant growth that can irritate the public. To facilitate maintenance tasks, a small buffer zone (lawn) should remain between pathways and natural vegetation. Moreover, a few elements of traditional landscape designs were also added to assess stakeholders' opinions about supportive solutions. By using these photos, participants can imagine the appearance of ecological landscapes in green public spaces, thereby helping stakeholders give more in-depth responses.

3. Results

The analysis of surveys revealed two main themes emerging from stakeholders' responses about the challenges and potentials of the ecological approach to the implementation of green public spaces in Vietnam. The first theme is about the challenges and obstacles hindering the implementation of ecological designs from the stakeholder's perspective. The second theme is the stakeholders' evaluation of the potential impact of these designs in practice. This section clarifies these two issues in more detail.

3.1. Theme 1: Challenges of Implementing Ecological Design in Public Green Spaces

3.1.1. Insufficient Understanding and Priority Are Given to Ecosystem Services

The interview highlighted a key issue where park managers tend to overlook the ecosystem services offered by ecological approaches compared with temporary goals. This perspective was reflected in the statement from P1: *'Our park aims to create a beautiful, clean, tidy, and safe landscape for local people to come and relax and enjoy. Promoting ecosystem services, such as providing biodiversity or water runoff treatments are not part of our plans.'*

A respondent from Ton Duc Thang Park highlighted that the park's primary focus is on meeting the national standard of increasing overall greenery per capita (12m^2 per capita) to fulfil the city's development goal until 2030. The respondent stated, *'Our city is aiming to create as much green space as possible by planting more trees or expanding green spaces. Only after fulfilling the greenery requirement, we might consider improving the quality of our parks, but they are not a primary concern.'* (P2).

Evidence of a lack of knowledge about ecosystem services among stakeholders was apparent in the responses of some interviewees: *'. . .we have heard about ecosystem services before but we don't really understand. . .ecological designs just make the landscape more crowded and untidy. . .'* (P7).

Or: *'. . .I can't see the differences in benefits of conventional designs and ecological designs except for the appearances. . .'* (P8).

Moreover, interviewees P12, P14, and P15 pointed out the absence of legislation or policies to support the integration of ecosystem service concepts in the planning and design of public green spaces. P15 expressed, *'There are no any requirements or regulations to promote ecosystem services when it comes to landscape designs or urban green space planning.'*

Landscape architect P11 stated, *'We have no guidelines to guide us in designing and enhancing environmental quality, such as creating a rain garden. I thought it was a technical problem.'* This often leads to a lack of cohesion in the long-term planning and design of the landscapes, with some architects responsible solely for layout and green typologies, while others handle plant selection without close collaboration between designers and horticulturalists.

It is evident from the interviews that stakeholders did not properly recognise the value of ecological approaches for urban green public spaces. The ecosystem services provided by ecological landscapes were undervalued and given lower priority than conventional standards, such as increasing greenery per capita or maintaining clean and tidy landscapes. The emphasis on meeting quantitative targets (total areas of greenery and a high number of street trees) and aesthetic preferences overshadowed the potential benefits of ecological design, leading to a lack of appreciation for its ecological functions and long-term sustainability.

3.1.2. Concerning Responses from the Market Demands

Interviewees P1, P3, P6, P14, and P15 emphasised that popularising innovative approaches like ecological design requires greater market demand and support. However, they acknowledged the challenge of the public's responses, which directly influence market interest.

P6 highlighted this by stating, *'The stakeholders may not like native plants since they may not be vibrant or colourful, so suppliers wouldn't provide them, resulting in scarcity in the market.'*

P15 said: *'Investors may not favour ecological designs because they are afraid that wild appearance landscapes will not attract customers to their projects, especially in new area developments.'*

P3 argued that new landscape design trends often emerge in new urban neighbourhoods as investors utilise them as a form of advertising to attract customers: *'. . .if ecological designs are implemented successfully in new neighbourhoods, it can push the market. . .however, it still depends on customer's preferences.'*

Other respondents also showed the limited market demand for ecological design solutions: *'. . .The markets are not offering or developing bioswales, native plants, or pollinator gardens because they are not favoured by the public. Consequently, the implementation cost can be high as these solutions are not commonly adopted.'* (P12)

Similarly, P5 mentioned: *'We need experts to consult us, otherwise, we may have to rely on trial and error. Either way, it incurs costs.'* (P5)

These negative responses of the market, resulting from the public's reactions, presented obstacles to the widespread adoption of ecological designs. It also emphasised the need for support and intervention from governmental and local authorities to overcome these challenges.

3.1.3. Motivation and Collaboration among Departments

Regarding motivation and collaboration among departments, respondents (P3, P9, and P10) expressed that they were not motivated to seek new approaches to improve and preserve urban ecological services. P3 said: *'. . .We rarely receive advice or consultancy from other departments about new innovative approaches.'* Similarly, interviewees highlighted that the absence of institutional support, such as policies or guidelines, contributes to the siloed work among departments. They expressed sentiments such as, *'We feel it is better to focus on our own jobs; consulting with other departments takes lots of time.'* (P1)

Moreover, P2 stated that the constrained budget was also an obstacle to preventing them from searching for an innovative approach for landscape design and practice: *'. . .The annual budget is very limited, just enough to maintain the parks. . .'*

Some park staff claimed that as long as the public feels satisfied, they perceive their job as successful. For instance, one staff member (P10) expressed, *'Since the public may often complain about clean and tidy public green spaces rather than the environmental problems of landscape, we don't see the need for any changes to the design.'*

The interviewees also brought up a different issue with the bureaucratic structure that arises while designing formal parks and green spaces. Public green spaces are distributed proportionally according to the population size of the city, which is based on top-down quantity planning concepts [41]. However, this strategy unintentionally encouraged stakeholders to pay attention mainly to the quantity of green canopy over ecosystem service quality, as P1 stated: *'Many Vietnamese cities are striving to meet the national greenery standard, and we (Hue City) are aiming to achieve 15m2 per capita, which is close to the standard in developed countries.'*

3.2. Theme 2: Stakeholder Perspectives on the Implementation of Ecological Design Scenarios

3.2.1. Maintenance Tasks and Programs

The majority of stakeholders expressed a preference for the medium ecological approach (alternative 1) over the intensive (more wild appearance) ecological approach (alternative 2) for public green spaces (Figure 7). Respondents acknowledged the ecological benefits but also expressed concerns about the increased frequency and difficulty of maintenance tasks associated with the ecological approach.

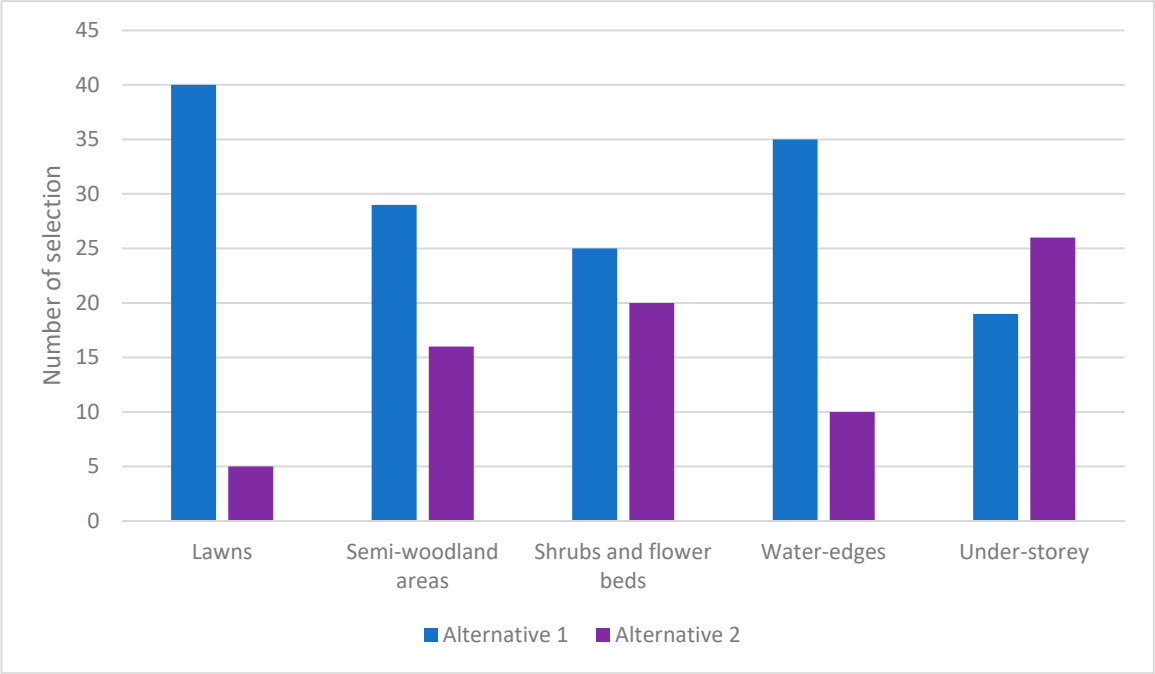


Figure 7. Favourite selections of respondents to different types of park landscapes. Each participant might have multiple points of view.

Some participants claimed that their daily tasks can increase significantly due to the complexity of a wild landscape (P1, P2, P5, P7, P8, P9, and P10), which is suggested in alternative 2. For example, *'The wild appearance of alternative 2 requires our workers to spend more time trimming and mowing the lawns, as they need to navigate around the plants and rocks carefully. In contrast, in conventional landscapes, we mow down all the grass without worrying about obstacles. Thus, we prefer to apply a medium ecological approach like alternative 1.'*

Another example mentioned by interviewees (P4, P6, and P8) is that alternative 2 may require a larger workforce for maintenance. They explained that using cow grass (*Axonopus compressus*) for the lawn, which often grows horizontally and close to the ground, only

requires mowing once per month. On the other hand, native ground covers could grow quickly and require more frequent control and management.

Moreover, park staff and landscape designers specifically highlighted the significant challenges; for example, it requires the trained skills and knowledge of the site worker to carry out the task properly (Figure 6, P8, P10, and P13):

'Alternative 2 is way more complicated to apply compared to alternative 1. Take the pruning of shrubs for instance, we need to figure out the right volume and height of vegetation to trim and also decide which area of lawns should be mowed or left to make the landscape look natural. This task requires experienced workers.' (P10)

Similarly, P1, P3, P9, P10, and P12 showed little confidence in their ability to know new technical components such as wetlands, rain gardens, and bioswales due to their limited knowledge (P1): *'We are not familiar with these types of landscapes. We have been told that these components can help to filter water runoff but how and where exactly these components should be implemented? It may require a specialist to manage water flow or vegetation to ensure efficiency.'*

Due to that, respondents expressed a desire for further research and to test pilot projects to see the results before implementing such practices: *'. . .Our knowledge of these natural-based solutions is still limited, we need to be trained. . .alternative 1 is better since they don't require many interventions, so we can have time to understand it.'* (P6)

On-site workers (P5, P7, and P10) also raised concerns about the dense vegetation in alternative 2 for riverbanks (Figures 8 and 9), which can easily trap rubbish and make cleaning more difficult. GS4 mentioned that *'the high density of vegetation in alternative 2 for the water-edge and shrubs will create traps for rubbish, which take plenty of time to clear. Currently, we have a small volume of aquatic plants on the riverbank, but every time rubbish gets trapped there, we struggle to remove it. We prefer to clear them all.'*

Figure 8. Alternative ecological designs for riverbanks. Source: Duy Khiem Tran.

Figure 9. Alternative ecological designs for lake margins. Source: Duy Khiem Tran.

3.2.2. Park Safety and Security

In terms of the park's safety, P1, P5, P11, P12, and P13 suggested that visitors may not like these landscape designs because their disorganised appearance does not give them a

safe feeling: *'Young visitors often gather near the lake (*Figures 8 and 9*) at night to relax so dense vegetation can make them feel uncomfortable, so intensive approach (alternative 2) is not suitable. It is better to mow all the lawn and keep the aquatic flowers on the water surfaces.'* (P5)

Some interviewees expressed concerns about the undesirable wildlife due to the character of the ecological approach. P5 said: *'Alternative 2 is too dense, it would provide an ideal breeding ground for rats, snakes or mosquitoes. Alternative 1 is sparser and poses fewer threads for us and visitors.'*

Although ecological landscapes can increase the likelihood of exposure to wildlife, they can pose some risks to visitors, especially children, if they are not supervised properly (P3 and P7): *'High density of vegetation near to water can prevent children from spotting out dangerous, consequences they can fall into water bodies. I think it should have a clear transition by lawns or pathways.'*

Meanwhile, senior staff members also highlighted the importance of considering park security. They expressed concerns that the wild and ecological appearance of the landscape could provide cover and hiding places for criminals and thieves. As one interviewee mentioned, *'Visitors may feel afraid to walk through the park at night due to concerns about criminals. Therefore, it is crucial to maintain a certain level of visibility in the landscape, as offered by alternative 1'* (P2).

3.2.3. Visual Appearance

Most of the respondents doubted the ability of ecological design to meet public preferences and expectations, particularly in terms of aesthetic appearance. P4, P11, P12, P13, and P15 emphasised that the public's reaction would heavily rely on the landscape's aesthetic appeal. GS5 stated: *'If the ecological landscape is kept orderly, beautiful and well-maintained, I think the public can accept it. . .The important thing is to create a visually pleasing view. Alternative 1 is a bit better, we can apply this design* (Figure 10, alternative 1).'

Figure 10. Alternative ecological designs for lawn areas. Source: Duy Khiem Tran.

Interviewees (P11 and P12) emphasised the importance of ensuring the public's comfort, taking into account the public's familiarity with conventional landscapes. According to P12, alternative 1 offers a tidier and less obstructive landscape while still providing a naturalistic experience. He stated, *'It may take time to convince the public to appreciate the wild aesthetics in parks. Alternative 2 is quite messy, some areas look like a forest or an informal green space, which the public may not favour. We prefer clean and clear.'*

Another potential concern regarding ecological design was the time it takes for the landscape to establish itself and mature. This initial period may result in a sparse or unfinished appearance, which could be disconcerting for those expecting immediate results or accustomed to traditional landscaping practices that prioritise instant gratification. P1 expressed, *'We typically install fully grown plants as residents prefer a beautifully mature landscape. Otherwise, there may be complaints that the green infrastructure does not fit to its promised standards.'*

The lack of understanding among the public regarding ecological landscapes also poses challenges for park managers. P1, P3, P4, and P14 mentioned that due to limited exposure to ecological design in Vietnam, the public may express dissatisfaction with such landscapes. PS3 highlighted this issue, stating, *'We introduced native plants in our neighbourhood park, but some local residents complained that the native plants are quite plain and not as vibrant and colourful as exotic plants.'*

It is noticed that there were many selections for alternative 2 in understorey zones (Figure 6), due to the areas being quite bald, as P6 stated: *'I think alternative 2 is better for spaces understorey, as it can help to create more themes to the park and help to fill up the empty spaces. . .'*

Similarly, P15 also agreed that intensive ecological implementation (alternative 2) can help recover river margins and resist erosion better: *'Some river margins or semi-woodland where people do not frequent, I think alternative 2 could be better, but it should have a clear zone to let people know.'*

However, P11 stated that it is a necessity to educate the public to appreciate the value and functions of ecological landscapes. Without proper education, people may not fully understand the purpose behind these designs, leading to potential misconceptions and negative perceptions. LA1 said: *'Maybe only stakeholders can understand and appreciate these designs, the public may mistakenly consider these landscapes as poor or ineffective designs.'*

4. Discussion

The interviews revealed some difficulties in implementing ecological design in public green spaces. We clarified the underlying reasons that have caused these challenges and explored recommendations to address them.

Firstly, in the urban development process, ecosystem services are not always a top priority for stakeholders, even in developed countries. For instance, Hagemann et al. [32] demonstrated that some cities in Sweden do not adequately prioritise urban ecosystem services in their municipal planning. In Hue City and other Vietnamese cities, this tendency is worse, as stakeholders almost lack knowledge and misunderstand the role of ES in addressing environmental issues. This is reflected in several policies, which focus on visual beautification such as planting more trees and pretty flowers without considering the importance of an integrated green network and the ecosystem service benefits [48]. Thus, most interviewees believed that green public spaces should be designed to mainly meet basic requirements such as social connections, recreation, or sight-seeing experiences, which primarily fall under cultural services. However, they completely disregarded the remaining ecosystem services, including supplying, supporting, and regulating them. For example, conventional landscapes featuring lawns, trimmed plants, exotic vegetation, impervious pavements, and concrete structures are prevalent in most urban landscape designs, whereas ecological principles such as using native plants or sustainable stormwater management are completely neglected. This trend could be alarming because Vietnam is one of the most vulnerable countries to climate change [49], and natural-based solutions are absolutely needed to address environmental challenges effectively.

Secondly, interviewees expressed that the public's perception and reaction play an important role in driving market demand, particularly concerning the trend of public landscape designs. They claimed that investors are not willing to introduce ecological approaches due to concerns about negative feedback from the public, which could result in reducing the value of their projects, especially in new development areas. However, we should acknowledge that the perception of stakeholders towards public opinions is subjective since, in Vietnam, the participation of the community in public landscape designs is still limited. There is also a lack of relevant research in this field.

Furthermore, the concerns about initial costs and time associated with ecological design, such as native plantings, soil improvement, and the training of specialists, also prevent investors from implementing such designs and practices. This pattern reveals a gap between the goals of sustainable green development in Hue City and the preferences

of stakeholders. While the city's long-term sustainable green development calls for a more natural approach, investors and the general public may place greater emphasis on immediate financial benefit or aesthetic improvement.

Lastly, the result pointed out the lack of motivation and participation among various departments regarding public green space designs and management. Most stakeholders perceive that existing green spaces are good enough (in terms of design and vegetation strategy) and may not see the need to adopt a more environmentally friendly approach. It also showed the passive attitude of stakeholders and related departments, where efforts were directed to meet the current needs of the public rather than addressing environmental issues for the long term. This is due to a lack of support, such as education, policies, or guidelines, and sustainable goals to encourage stakeholder study and value the benefits of ecological designs. This situation may lead to a cycle of continuously playing catch-up to meet current needs rather than adopting a long-term approach to promote ecosystem services.

4.1. Appropriate Ecological Landscape in the Eye of Stakeholders

When asked about their preferred level of implementation for ecological landscape design in public green spaces, respondents showed a preference for a medium approach (alternative 1) rather than an intensive approach (alternative 2). Respondents expressed a desire to incorporate some elements, such as native plants, rain gardens, and bioswales, to introduce a sense of wildlife without overwhelming conventional landscapes. According to these interviewees, a model of eco-landscape can be developed that strikes a balance between conventional and ecological features. This model includes a clear pathway buffer, layered planting with native species, controlled shrub heights, hierarchical vegetation arrangement, rain gardens and bioswales, and a focus on low-maintenance design principles. A key aspect is that most stakeholders favour varied flower designs of vegetation components such as bioswales and shrubs, so it can potentially gain more acceptance from the public, as demonstrated in the studies of Hoyle et al. [36] and Southon et al. [50]. However, a majority of stakeholders were not willing to make drastic changes to their parks and preferred to have a conventional landscape appearance with a few ecological elements. Their concerns were primarily related to maintenance schemes, aesthetics, and safety. This finding is consistent with previous research conducted in different countries, including Ibrahim et al. [38], which highlighted the influence of landscape appearances on stakeholders' preferences and decision-making processes.

Initially, Vietnamese philosophy embraced the notion of 'living harmoniously with nature'. However, over time, this philosophy has gradually been replaced by a philosophy of 'man conquers nature', which encourages a subjective approach where humans actively engage in the natural world [51]. During the colonial period, urban design and planning in Vietnam were heavily influenced by the French, including landscape architecture [52]. As a result, Vietnamese people became accustomed to the visual aesthetics of formal landscapes. They may favour an orderly and symmetrical design commonly associated with formal landscapes, while eco-design is perceived as a style with a wild and natural appeal. Thus, many interviewees believed that ecological landscapes would have a 'jungle' or 'messy' appearance, which is often perceived as untamed and unsuitable for urban aesthetics.

Another common misconception is that stakeholders frequently believe that intensive ecological design (alternative 2) is unsafe for park visitors, needs skilled personnel, and requires a lot of maintenance. This misconception stems from concerns about the untidy, crowded, and unfamiliar nature of naturalistic elements within the design. However, while ecological design can require expertise and knowledge, it does not require a high level of skills that are difficult to acquire. Ecological design is also cost-effective and low-maintenance in the long term [1,8,26]. For example, native plants often require less water and fertiliser once established [10]. In addition, ecological features are incorporated in a way to minimise risks to park visitors, such as buffer zones, signage, and clear pathways.

4.2. Recommendations to Address the Challenges in Implementing Ecological Designs

Addressing environmental issues and promoting ecosystem services should be prioritised when it comes to urban green space planning and design [32]. It is necessary to enact legislation or create policies that support the consideration and integration of ecosystem services in the very early stages of urban development and public green space design. Public parks in Vietnam should shift their focus from solely emphasising global visual beautification [53] or the quantity of green canopy to prioritising habitat diversity or self-adaptation and resilience. One example is the 'City in a Garden' in Singapore, which successfully enhances the quality of life by incorporating ecosystem services into urban green space development [54]. In this campaign, Singapore implemented policies, regulations, and guidelines for greenery provision in building and landscape developments. This includes using native plant species and ecological principles such as rain gardens and bioswales for effective stormwater management.

Moreover, educational programmes and awareness campaigns for stakeholders and the public are also needed to provide the necessary knowledge and skills, facilitate making informed decisions, and actively promote cross-collaboration among departments. These programmes can include teaching and training to enhance their understanding of ecological design principles and the benefits of ecosystem services. This is especially true for developing countries in tropical and subtropical climates that had no chance to fully develop the research on ecological design and offer models for its implementation in local conditions. Another aspect involves public engagement and participation, enabling stakeholders to contribute their opinions and concerns related to projects [31]. For example, community workshops and public forums can be organised to gather feedback and involve residents in the decision-making process.

Additionally, creating successful case studies of ecological design for public green spaces is a good way to convince the public and investors [31]. Stakeholders can see the positive outcomes of wild aesthetics and improved habitats. It can also be an opportunity to educate the public and the community.

5. Conclusions

This study confirms the need for several actions to overcome the challenges related to the implementation of ecological design in public green spaces in Vietnam. Stakeholders have shown a positive inclination towards this approach, with caution due to various concerns such as costs, safety, and obstacles to the maintenance of ecological designs in public parks. To overcome these challenges, it is necessary to showcase successful examples that demonstrate the benefits of environmental design. For instance, organising demonstration sites with information panels that can be exposed and explain ecological thinking in a visual and understandable way.

This research clearly shows that the 'cues to care' approach announced in the USA in the late 1990s [33] is one of the most effective ways to introduce ecological aesthetics to public spaces. All interviewers in the city of Hue agreed to consider a model that strikes a balance between ecological design and conventional landscape features (such as cut lawns and clear river margins) that can help address stakeholders' preferences while integrating sustainable elements. By prioritising public engagement, conducting educational programmes, and addressing misconceptions, we can foster understanding and support for ecological design in Vietnamese cities. This model offers a practical and achievable pathway towards creating sustainable and resilient green spaces that benefit both the environment and the community.

However, public opinions and attitudes towards ecological design play an important role in the success of future implementations of this innovative approach. Understanding how the public perceives aesthetics, safety, diversity of nature, and other aspects is crucial for effective green space design. Public attitudes could also be different from the perceptions of stakeholders. Due to COVID-19, we were not able to collect opinions from the public, resulting in some limitations in this study. Thus, we suggest conducting more

research on the public's attitudes towards green spaces in Vietnamese cities. In addition, while ecological designs offer the potential to enhance environmental conditions, it is also necessary to think about the maintenance costs that are associated with new approaches. For example, comparative research of the comprehensive benefits of ecological landscapes with conventional ones, which can also include costs and public reactions, would help to understand the potential of the implementation of ecological design in Vietnam. These further studies can provide more evidence that can effectively resonate with stakeholders and the wider public.

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Appendix A. Semistructured Interview Questions

I. Current park management, design, and maintenance

1. What are the primary management and maintenance operations in your park?

2. What are the changes in planning, design, and management policies of green spaces that have occurred during the time you have managed the parks?

3. What are the pros and cons of the current design, management, and maintenance of urban parks?

II. Key factors and challenges to implementing the ecological design in green public spaces

4. How do you consider implementing ecological design in your parks?

5. What are the key challenges/barriers to change to ecological landscape design?

6. What are ecosystem services available in your parks? How does your park preserve and promote these services?

7. Which guidelines, standards, or tools do you refer to design and manage the park? Do you consider promoting ecosystem service through the design?

8. Are you experiencing any particular lack of expertise or knowledge when seeking a new approach like ecological designs for your parks?

III. Potential of ecological landscape approaches and perceptions of urban park managers

9. What do you think of these landscape designs? What are the differences between alternative designs and the existing conventional landscape?

10. Which alternatives do you prefer? Why?

11. What are the benefits and problems if these alternatives are implemented in practice? Which alternative is better for each typology?

12. How can you incorporate these alternatives into the park's practice? Which parts of your park that these designs can be applied to?

13. What are your preferences for a park landscape that benefits your work and provides environmental benefits?

14. To what extent can you use these ecological designs to improve your park's aesthetics and environmental benefits?

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