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Urban Wilderness by Design

A Pattern-Based Framework Integrating Urban Nature and User Perception

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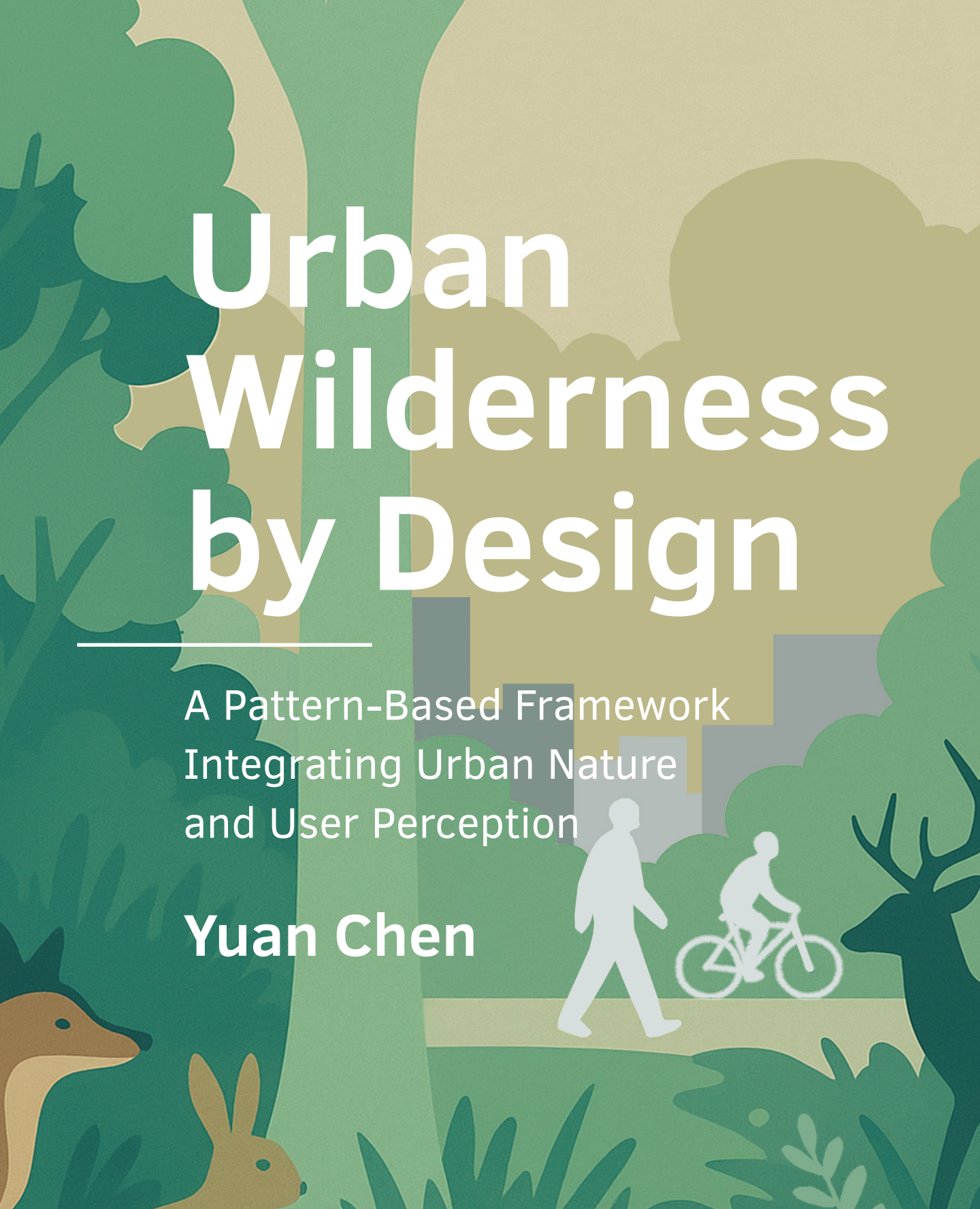

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Urban Wilderness by Design

A Pattern-Based Framework Integrating Urban Nature and User Perception

Dissertation

for the purpose of obtaining the degree of doctor
at Delft University of Technology
by the authority of the Rector Magnificus, prof.dr.ir. T.H.J.J. van der Hagen
chair of the Board for Doctorates
to be defended publicly on
5 January 2026 at 10:00 o'clock

by

Yuan CHEN
Master of Science in Landscape Architecture, Southeast University, China
Born in Anhui, China

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This dissertation has been approved by the promotors.

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Dr. M.C. Roos	Leiden University / Naturalis
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Acknowledgement

It has been a long journey. I was born and raised in Anhui Province in the middle of China. To reach Delft, the place where this thesis was completed, I had to first take a high-speed train to a nearby big city, then fly to Amsterdam for more than ten hours, transfer to an NS train for forty minutes, and finally walk ten minutes to my little studio. And yet, the longest journey has not been from Anhui to Delft. It has been the distance from my office in the BK City building to the defence hall in Aula, which actually stands only eight hundred meters away. It takes only three minutes to walk from my office to the printer room in the Urbanism lobby, but more than four years to finally publish this thesis.

Yet this voyage has been woven from countless small but delightful moments. On good-weather days, I often choose to walk slowly from my studio to the faculty building, which usually takes the length of four songs. The distance from the faculty to the library where I sometimes worked on weekends was roughly two songs. Coffee breaks with friends and colleagues usually lasted one cappuccino. Throughout this long and intricate journey, I have experienced a wide range of emotions and moments. Most of them were joyful, thanks to the wonderful people around me. Of course, there were also darker times. But now, standing so close to the end of my PhD and my life in the Netherlands, what I feel most profoundly is gratitude.

First and foremost, I owe my deepest thanks to my promoters, who are wise, knowledgeable, and kind. Professor Steffen Nijhuis guided me patiently at the early stage of my PhD, helping me shape my research direction, and offered generous encouragement whenever I struggled or hesitated. Professor Machiel van Dorst has always supported me with kindness and understanding. Together, they ensured that my research embraced both the perspectives of urban planning and landscape design, as well as environmental psychology and behavioral studies. Their insights and guidance have been the true compass of my academic path. During difficult times in my personal life, both of them supported me with care and trust. They believed in my ability to balance work and family, and their confidence gave me warmth and courage in a foreign land. When my physical and mental health faltered, they responded swiftly and compassionately. Their empathy helped me stay grounded and hopeful through the most challenging periods. I vividly remember a casual conversation after a meeting when Steffen and Machiel told me I was a brave and resilient person, and it meant a great deal to me. I know I still have a long way to go, but their encouragement became a strength that pushes me toward a better self.

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I would also like to expand my gratitude to all the scholars, teachers, and staff who have supported me throughout my academic journey. I would like to express my sincere appreciation to the secretaries and staff of our department and faculty for their warm and practical assistance, and to Véro Crickx, who provided valuable support with editing, layout, and publication of this thesis. My heartfelt thanks also go to the members of the defence committee, Eric Luiten, Yuning Cheng, Arjan van Timmeren, Marco Roos, and Sanda Lenzholzer, for dedicating their valuable time to reviewing my work and offering professional insights. It is an honor to have them witness this milestone in my academic life. I am also deeply grateful to the many scholars and practitioners who participated in my PhD research, including Caroline Newton, Xiangrong Wang, Fiona de Vos, Sjerp de Vries, Rik de Visser, Annet Kempenaar, Sjef Jansen, Ruwan Aluvihare, and Haoxiang Zhang. Your enthusiasm and generosity in sharing knowledge and perspectives have been a great source of inspiration.

To my colleagues from the Landscape Architecture section, thank you for your friendship, collaboration, and inspiration. Working, talking, and sharing experiences with you has been deeply meaningful to me. This includes Mei Liu, Shile Zhou, Yuyang Peng, Haoxiang Zhang, Yu Huan, Monica Veras Morais, Mustiafiz Al Mamun, Amna Riaz, Lei Xia, Jingsen Lian, Yifei Zhao, Pooja Boddupalli, Junkai Lan, Zaichen Wu, Rosa de Wolf, Yuka Yoshida, Jorrit Parmentier, Cristian Seguel Medina, and Zian Wang. I believe our paths will cross again in the professional world, and I look forward to future collaborations.

To my loving friends, thank you for standing by me so steadfastly. Whether in the joy of work, the warmth of daily life, or the quiet reflections and sorrows of existence, you shared it all with me. Shiyu Wang, Yu Huan, Haoxiang Zhang, Bayi Li, Mei Liu, Jiefang Ma, Yijia Zhang, Han Bao, Yue Wang, and Mingyu Wang, we have witnessed each other's growth, happiness, and triumphs, as well as our lows and sad. When I was struggling physically and emotionally, you stayed by my side, bringing comfort and light. You taught me to reach out for help and to trust friendship as a form of strength. To all the friends who shared my years in the Netherlands, including Yan Song, Yuyang Peng, Jun Wen, Zaichen Wu, Zhaoyifei Zhao, Jingsen Lian, Yuqing Hu, Lei Xia, Xiaoxia Zhang, Wei Wang, Ran Pan, Yinhua Tao, Yingwen Yu, Shenglan Du, Yu Li, Danielle Hellendoorn, Zhuoran Jia, Ziao Wang, Nan Bai, Yizhao Du, Shuyu Zhang, Gong Zhang, Enshan Chen, Diwen Tan, Sitong Luo, Yimin Zhu, Chi Jin, Bo Li, Cinco Yu, and Weixiao Gao. Thank you for filling my life with laughter, companionship, and countless beautiful memories. Friends are the family we choose for ourselves, and the memories we create together will continue to accompany and shape me in the years to come.

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Most importantly, I dedicate this thesis to my parents, who have always supported me with unconditional love and strength. It is through their upbringing that I became an independent and thoughtful woman capable of completing this research. I thank my father, Changfu Chen, who cared for and guided me throughout my thirty-one years. He was a gentle and kind man who, in the last three years of his life, faced illness with courage and dignity. Even during his struggle, he accompanied me on my fieldwork in Hangzhou. Although he passed away before this thesis was completed, his love, strength, and resilience will always remain with me, and they will continue to guide me until the day we meet again. I thank my mother, Fan Xu, who taught me strength and independence, and who cared for my father with unwavering devotion throughout my PhD years. Her sacrifice and love are beyond measure. My parents' love is the force that keeps me moving forward.

To continually explore and expand the boundaries of understanding, to strip away the false and the hollow, to seek authenticity and wholeness. These have always been the guiding principles of both my research and my life. In the acknowledgement of my master's thesis, I once wrote that I hoped to keep climbing through life's journey, challenging myself to reach new heights. The process of refinement has never ceased, and I believe that during my PhD years, I have lived up to that ideal. More importantly, I have come to know my body, my mind, and my resilience more deeply. I have learned to cherish both the hardship of the climb and the serenity of pausing midway, to walk through the forested slopes, to linger in the wilderness, and to find joy in the company of fellow travelers. As I continue forward, I will walk with greater confidence and calm, with courage and an open heart, toward the next horizon.

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Summary

In the context of rapid urbanization, ecological degradation, and increasing disconnection from nature, the notion of urban wilderness emerges as a timely and significant topic in spatial planning and design (Cao et al., 2019). Historically perceived as peripheral, neglected, or transitional spaces, urban wilderness areas are now recognized for their potential to integrate ecological integrity and meaningful human experience within urban settings (Bauer, 2005).

Unlike traditional, intensively managed green spaces, urban wilderness is characterized by spontaneity, minimal human intervention, and ecological unpredictability (Cronon, 1996). Evidence shows that urban wilderness can positively influence both ecological resilience and residents' quality of life (Lutz et al., 1999; Scoyen, 1969), reflecting the necessity of integrating these spaces into urban planning and design practices. Yet, their inherently ambiguous identity prompts critical questions: What constitutes wilderness in the urban realm? How do people perceive and value it? And, crucially, how can planners and designers engage with them without compromising their ecological essence?

Although scholarly attention to urban wilderness has grown, it remains limited in practice, especially related to user experience and perception. Consequently, this thesis clarifies the concept of urban wilderness in the spatial planning and design process, investigates users' perceptions and experiences, and develops practical design tools validated through scholarly and professional expertise. These tools should ensure the preservation of ecological value while enabling visitors to perceive and appreciate the aesthetics of urban wilderness.

The overarching aim is to explore how urban wilderness can be understood, perceived, and designed in ways that maintain ecological spontaneity while enhancing user engagement. Structured into four key parts, respectively, foundation, investigation, synthesis, and application, the thesis integrates literature review, practical case studies, empirical studies, pattern development, and validation. Together, these components form a transdisciplinary inquiry into a cohesive urban wilderness design paradigm.

Foundation Part:
Recognizing Urban Wilderness in Spatial Planning Process

Establishing a robust theoretical and practical foundation for integrating urban wilderness into spatial planning is essential. Through a systematic literature review incorporating scientometric and thematic analyses, this research identifies trends within the wilderness-planning discourse, recognizing a shift from philosophical discussions towards practical planning solutions in urban contexts. Recent literature emphasizes human-wildlife coexistence and anthropocentric perspectives. The existing literature was recategorized into three dimensions based on wilderness roles, respectively covering philosophy, ecology, and urbanism. Findings confirmed both the necessity and feasibility of incorporating urban wilderness into spatial planning and design frameworks.

There is a clear need for urban planning to embrace wilderness concepts as cities seek sustainable ways to reintroduce nature. This overview part provides a foundational knowledge base for this PhD thesis, and guides the subsequent phases of the research, which focus on developing practical urban wilderness design guidelines. It also affirms a critical gap: the insufficient studies explicitly address urban wilderness from a design perspective. Urban wilderness can and should be part of urban planning discourse

Investigation Part:
Learning from Practical Case Studies and Empirical Studies

It is necessary to investigate and understand the design focus, site conditions, and landscape characteristics of existing urban wilderness relevant practices in real life. Simultaneously, it is also important to understand the environmental perception and visiting experience of urban wilderness space users. These provide key references for guiding scholars and practitioners to create usable urban wilderness spaces that can be perceived and appreciated by visitors.

Building on the theoretical groundwork, the thesis explores practical insights through case studies and empirical user research. Three Dutch case studies were selected to represent diverse scales and management approaches, illustrating various interpretations and implementations of urban wilderness. Analyses focused on site characteristics, design strategies, and roles of wilderness in the sites, the practical cases studies examines how wilderness is interpreted, managed, and communicated in practice. Recurring themes emerged, including prioritizing ecological processes, fostering wildlife habitats, carefully managing human intervention, and integrating community involvement. These cases demonstrate urban wilderness as a flexible and negotiable construct shaped by designers' intentions, visitors' expectations, cultural contexts, and spatial policies.

Complementing these practical insights, empirical research conducted in Jiangyangfan Ecological Park in Hangzhou, China, investigated user perceptions and experiences of urban wilderness. Employing mixed-method research, including questionnaires, mental mapping, and behavioral observations, the study assessed visitors' attitudes toward ecological attributes, aesthetics, perceived safety, and emotional engagement.

Findings show that users comprehend and appreciate the untamed qualities of the urban wilderness park, such as high biodiversity, immersive vegetation, and perceived naturalness. Perceptions varied across diverse environmental attributes, visitors' on-site experience, and their intention to visit the site, revealing that ecological literacy, cultural background, and daily routines all shape how urban wilderness is recognized and interpreted. This part foregrounds the importance of perceptual recognition, i.e., how people mentally and physically experience and interpret the urban wilderness environments, and emphasizes the necessity of design approaches that balance ecological complexity with human intelligibility.

Synthesis Part:
Developing Urban Wilderness Design Patterns

Integrating theoretical insights, practical cases, and empirical findings, the thesis articulates a set of actionable design patterns to guide the integration of urban wilderness into planning and design practices. Drawing inspiration from Christopher Alexander's pattern language, these design patterns provide adaptable, context-sensitive strategies rather than rigid solutions.

In total, 24 urban wilderness patterns were developed and organized around three interconnected lenses: natural, cultural, and social lenses. The natural lens addresses ecological processes, biodiversity, and environmental integrity. The cultural lens considers human-nature interactions, cultural values, and the provision of supportive facilities. The social lens emphasizes inclusive design, social dynamics, perceived safety, and community engagement. These lenses are intentionally flexible and overlapping, acknowledging that many patterns will intersect and that their application in practice must be context-oriented. Each pattern clearly articulates its purpose, practical scenarios, supporting evidence, implications for implementation, and relationships with other patterns.

The proposed pattern language bridges theoretical aspirations with practical implementation, enabling designers and planners to integrate ecological complexity, experiential richness, and social inclusivity into urban wilderness projects.

Design Part:
Validating Urban Wilderness Design Patterns

To ensure practical applicability and robustness, the developed design patterns underwent validation through expert interviews and a participatory design workshop. Besides, the comments and suggestions proposed by the participants promote the potential of the developed patterns for application in future practices.

Design patterns from a variety of knowledge sources have broad evidence support as design guidelines to assist in guiding future urban wilderness spatial interventions, and as a communication tool to enhance the efficiency between diverse stakeholders. However, the application potential of these patterns needs to be further validated, as it may be limited by the professional experience and recognition of the designer, the environmental characteristics of the site, and the cultural or policy context. Hence, in this Part, participants from varied disciplines in different spatial stages were invited to the interviews, including landscape architects, ecologists, municipal planners, and researchers, to assess the readability and validity of the developed patterns and their applicability in future practices. Interviews confirmed the patterns' conceptual clarity and usefulness, recommending context-specific adjustments and emphasizing the importance of interdisciplinary collaboration.

Subsequently, a participatory design workshop engaged master students and PhD candidates from relevant disciplines. Participants applied the patterns in realistic design scenarios, highlighting their value as creative and communicative tools while also suggesting improvements for clarity and inclusiveness. The workshop demonstrated the patterns' dual function as both practical guidelines and as effective communication instruments between diverse stakeholders.

Feedback from both validation phases emphasized adaptability and the need for patterns to remain responsive to cultural, environmental, and policy contexts. Suggestions for future refinements included enhancing visual communication and incorporating diverse user perspectives to further strengthen their inclusive potential.

In summary, this thesis offers substantial contributions to the evolving discourse on urban wilderness within spatial planning and design, highlighting its conceptual, empirical, and practical dimensions. It begins with a theoretical clarification of the urban wilderness concept, highlighting its roles of varied dimensions and also the necessity of integrating it within spatial planning and design process through a systematic literature review. Building on this foundation, three Dutch case studies are analyzed to extract spatial strategies and understand the practical integration

of wilderness in diverse planning contexts. A mixed-method empirical study in Jiangyangfan Ecological Park in Hangzhou, China, reveals how visitors perceive and interact with urban wilderness areas, uncovering the relevant environmental attributes that contribute to their perceptions and experiences. Synthesizing theoretical, practical, and empirical insights, a series of patterns is developed to guide the design of urban wilderness areas. These design patterns serve both as a communication tool and as practical guidance for spatial interventions. A validation process through expert interviews and a participatory pattern language design workshop is then conducted, which demonstrates the applicability and validity of the developed design patterns. Also, the potential challenge, future research, and practice direction are discussed and addressed.

The research argues convincingly for urban wilderness to be reconceived as a dynamic, perceptually engaging, and ecologically valuable spatial entity. By challenging conventional planning paradigms, it encourages planners and designers to embrace ecological spontaneity and user experience simultaneously, recognizing wilderness as both a cultural construct and a tangible, designable urban reality. Ultimately, this thesis advocates for integrating urban wilderness as an intentional, meaningful element of sustainable urban development, enriching ecological resilience and human well-being. Its outcomes contribute both practically and theoretically, supporting planners, designers, and scholars in fostering urban environments where nature and humanity coexist harmoniously.

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Samenvatting

In een tijd van snelle verstedelijking, ecologische achteruitgang en een groeiende vervreemding van de natuur, vormt het concept van stedelijke wildernis een actueel en relevant onderwerp binnen de ruimtelijke planning en het ontwerp (Cao et al., 2019). Waar deze gebieden historisch werden gezien als perifere, verwaarloosde of tijdelijke ruimtes, worden ze tegenwoordig erkend vanwege hun potentieel om ecologische integriteit te combineren met betekenisvolle menselijke beleving in stedelijke omgevingen (Bauer, 2005).

In tegenstelling tot traditioneel beheerde groengebieden, wordt stedelijke wildernis gekenmerkt door spontaniteit, minimale menselijke interventie en ecologische onvoorspelbaarheid (Cronon, 1996). Uit onderzoek blijkt dat stedelijke wildernis zowel de ecologische veerkracht als de leefkwaliteit van bewoners positief kan beïnvloeden (Lutz et al., 1999; Scoyen, 1969), wat het belang onderstreept om deze ruimtes op te nemen in ruimtelijke planningspraktijken. Toch roept hun ambigue identiteit fundamentele vragen op: Wat is wildernis in een stedelijke context? Hoe ervaren en waarderen mensen deze ruimtes? En vooral: hoe kunnen ontwerpers en planners hiermee omgaan zonder de ecologische essentie aan te tasten?

Hoewel de academische aandacht voor stedelijke wildernis is toegenomen, blijft de toepassing ervan in de praktijk beperkt, met name wat betreft gebruikerservaring en -perceptie. Daarom verduidelijkt dit proefschrift het concept van stedelijke wildernis binnen het ruimtelijk ontwerpproces, onderzoekt het de waarnemingen en ervaringen van gebruikers, en ontwikkelt het praktische ontwerptools die gevalideerd zijn door academische en professionele expertise. Deze tools moeten bijdragen aan het behoud van ecologische waarden én het mogelijk maken dat bezoekers de esthetiek van stedelijke wildernis kunnen herkennen en waarderen.

Het overkoepelende doel is te verkennen hoe stedelijke wildernis begrepen, ervaren en ontworpen kan worden op een manier die ecologische spontaniteit behoudt en tegelijkertijd gebruikersbetrokkenheid versterkt. Het proefschrift is opgebouwd uit vier hoofdonderdelen: basisvorming, onderzoek, synthese en toepassing. Deze omvatten literatuuronderzoek, praktijkcases, empirisch onderzoek, patroonontwikkeling en validatie. Samen vormen deze onderdelen een transdisciplinaire verkenning van een samenhangend stedelijk wildernisontwerpparadigma.

Basisvorming:
Herkenning van stedelijke wildernis in het ruimtelijke planningsproces

Een solide theoretisch en praktisch fundament voor de integratie van stedelijke wildernis in ruimtelijke planning is essentieel. Door middel van een systematische literatuurstudie, inclusief scientometrische en thematische analyses, identificeert dit onderzoek trends binnen de wildernis-planningsdiscussie. Hierbij is een duidelijke verschuiving zichtbaar van filosofische beschouwingen naar praktische oplossingen binnen stedelijke contexten. De recente literatuur benadrukt de co-existentie van mens en dier en een meer antropocentrisch perspectief. De bestaande studies zijn opnieuw gecategoriseerd in drie dimensies op basis van de rol van wildernis: filosofisch, ecologisch en urbanistisch. De bevindingen bevestigen zowel de noodzaak als de haalbaarheid van het integreren van stedelijke wildernis in ruimtelijke planningskaders.

Er is een duidelijke behoefte aan stedelijke planning die ruimte biedt aan wildernis-concepten, nu steden op zoek zijn naar duurzame manieren om natuur te herintroduceren. Dit fundament biedt een kennisbasis voor het proefschrift en vormt het vertrekpunt voor de volgende fasen van het onderzoek, die gericht zijn op de ontwikkeling van praktische ontwerpprincipes. Tegelijkertijd toont het een belangrijke lacune aan: er is een tekort aan studies die stedelijke wildernis expliciet benaderen vanuit een ontwerpgericht perspectief. Stedelijke wildernis verdient een plaats in de planningsdiscussie.

Onderzoek:
Leren van praktijkvoorbeelden en empirisch onderzoek

Om stedelijke wildernis effectief te kunnen ontwerpen, is inzicht nodig in bestaande praktijken, zoals ontwerpdoelstellingen, locatiekenmerken en landschapsstructuren. Tegelijkertijd is kennis over hoe gebruikers deze ruimtes ervaren essentieel om stedelijke wildernissen toegankelijk en betekenisvol te maken.

Gebaseerd op het theoretisch fundament onderzoekt het proefschrift praktische inzichten via casestudy's en empirisch gebruikersonderzoek. Drie Nederlandse voorbeelden van uiteenlopende schaalniveaus en beheersvormen illustreren verschillende interpretaties van stedelijke wildernis. De analyses richten zich op ontwerpstrategieën, rol van wildernis, en het spanningsveld tussen ecologische processen en menselijke betrokkenheid. Terugkerende thema's zijn het bevorderen van biodiversiteit, zorgvuldig omgaan met menselijke invloed, en het stimuleren van gemeenschapsbetrokkenheid. Deze cases tonen stedelijke wildernis als een onderhandelbaar construct, gevormd door ontwerpintenties, bezoekersverwachtingen, culturele context en ruimtelijk beleid.

Aanvullend op deze praktijkinzichten is empirisch veldonderzoek verricht in Jiangyangfan Ecologisch Park in Hangzhou, China. Via een mix van vragenlijsten, mentale kaarten en gedragsobservaties zijn de percepties en belevingen van bezoekers onderzocht met betrekking tot ecologische kenmerken, esthetiek, veiligheid en emotionele betrokkenheid.

De resultaten tonen dat gebruikers de 'wilde' kwaliteiten van het park waarderen, zoals biodiversiteit, weelderige begroeiing en natuurlijke uitstraling. Percepties verschilden naar gelang omgevingskenmerken, ervaringen ter plaatse en bezoekmotieven. Ecologische geletterdheid, culturele achtergrond en dagelijkse routines beïnvloeden hoe stedelijke wildernis wordt geïnterpreteerd. Dit benadrukt het belang van zintuiglijke en mentale herkenning, en de noodzaak van ontwerpstrategieën die ecologische complexiteit verenigen met menselijke begrijpelijkheid.

Synthese:
Ontwikkeling van ontwerpprincipes voor stedelijke wildernis

Door theoretische inzichten, praktijkvoorbeelden en empirische bevindingen te combineren, ontwikkelt het proefschrift 24 concrete ontwerpprincipes geïnspireerd op Christopher Alexander's patroonbenadering. Deze patronen bieden contextgevoelige strategieën die kunnen worden aangepast aan diverse stedelijke situaties.

De patronen zijn gegroepeerd volgens drie overlappende lenzen: natuur, cultuur en samenleving. De natuurlijke lens omvat ecologische processen, biodiversiteit en milieu-integriteit. De culturele lens belicht mens-natuurrelaties, culturele waarden en ondersteunende voorzieningen. De sociale lens focust op inclusiviteit, sociale dynamiek, veiligheid en participatie. Elk patroon beschrijft het doel, toepassingsscenario's, wetenschappelijke onderbouwing, implementatie-implicaties en relaties met andere patronen.

Deze 'patroontaal' slaat een brug tussen theoretische ambities en praktische toepassing, en stelt ontwerpers en planners in staat om ecologische complexiteit, ruimtelijke ervaring en sociale inclusie te integreren in stedelijke wildernisontwerpen.

Toepassing:
Validatie van ontwerpprincipes

Om de praktische toepasbaarheid van de ontwerpprincipes te toetsen, zijn deze gevalideerd via expertinterviews en een participatieve ontwerpworkshop. De feedback van deelnemers onderstreepte het potentieel van de patronen voor toekomstige toepassingen.

De ontwerpprincipes zijn gebaseerd op uiteenlopende kennisbronnen en worden ondersteund door empirisch bewijs. Ze dienen zowel als ontwerprichtlijn voor stedelijke interventies als communicatiemiddel tussen verschillende belanghebbenden. Tegelijkertijd vereist hun praktische inzet verdere toetsing, gezien de mogelijke beperkingen door ontwerperservaring, locatiekenmerken en beleidscontexten.

Daarom werden experts uit verschillende disciplines – landschapsarchitectuur, ecologie, gemeentelijke planning en onderzoek – geïnterviewd over de leesbaarheid en bruikbaarheid van de patronen. Hun feedback bevestigde de helderheid van de concepten, en benadrukte het belang van contextuele aanpassing en interdisciplinaire samenwerking.

Vervolgens testten masterstudenten en promovendi de patronen in een participatieve ontwerpworkshop. Zij pasten de patronen toe in realistische scenario's, en waardeerden ze als creatieve en communicatieve hulpmiddelen. De workshop onderstreepte het dubbelrol van patronen: als praktische leidraad én als middel om samenwerking tussen belanghebbenden te verbeteren.

De terugkoppeling uit beide validatiefasen benadrukte het belang van flexibiliteit en cultureel-politieke gevoeligheid. Aanbevelingen betroffen onder meer verbeterde visuele communicatie en inclusie van diverse gebruikersperspectieven.

Dit proefschrift levert een betekenisvolle bijdrage aan het groeiende debat over stedelijke wildernis binnen de ruimtelijke planning en het ontwerp. Het begint met een theoretische verheldering van het concept, onderbouwd door systematisch literatuuronderzoek. Vervolgens worden drie Nederlandse cases geanalyseerd, gevolgd door een empirische studie in China die inzicht biedt in gebruikerservaringen. Deze inzichten worden samengebracht in een reeks ontwerpprincipes die zijn gevalideerd via deskundigen en participatieve sessies.

Het onderzoek pleit ervoor om stedelijke wildernis te herdenken als een dynamisch, ervaarbaar en ecologisch waardevol onderdeel van de stedelijke ruimte. Door bestaande planningsparadigma's te bevragen, nodigt het uit tot ontwerpen waarin ecologische spontaniteit en menselijke beleving hand in hand gaan. Uiteindelijk pleit dit proefschrift voor de bewuste integratie van stedelijke wildernis in duurzaam stedelijk beleid, ten gunste van zowel ecologische veerkracht als menselijk welzijn.

1 Introduction

Chapter One demonstrates this dissertation's background and problem field. The overall research objective is to develop urban wilderness as a concept for urban planning and design while identifying principles that align with user demands and preferences. To meet this objective, four research questions must be addressed: 1) To what extent is the urban wilderness as a concept part of the urban planning and design process? 2) What environmental features and metrics play a role in designing urban wilderness in ways recognized by designers and perceived by users? 3) What design patterns can be developed for urban wilderness? 4) How can the applicability of design patterns be tested through the RTD method, and what is their added value? To address these research questions and achieve the research goal, a mixed-methods methodology is set up in Section 1.3. The relevance and outline of this PhD thesis are also discussed respectively in sections 1.4 and 1.5.

1.1 Research Background

One of the biggest challenges of this century is urbanization. High-density urban environments often replace valuable ecosystems (Kowarik, 2011). At the same time, a growing body of literature emphasizes the multifaceted importance of urban green spaces (UGSs) in addressing the challenge. UGSs contribute significantly to urban biodiversity, public health, microclimate regulation, and recreational needs (e.g., Vargas-Hernández et al., 2018; Botzat et al., 2016; Wang et al., 2022). Global initiatives, such as The Economics of Ecosystems and Biodiversity (TEEB, 2010), further stress the importance of integrating green infrastructure and biodiversity into urban contexts, systematically articulating these values through the concept of ecosystem services (Reid et al., 2005).

Landscape architects and urban planners have historically contributed to creating livable and resilient cities through the design and implementation of green structures, for instance, parks, linear greenways, and metropolitan green networks, which primarily emphasize typological classifications or functional benefits (e.g., Tate & Eaton, 2002). These include improving urban biodiversity, mitigating heat islands, and offering restorative spaces for city dwellers (e.g., Vargas-Hernández et al., 2018). However, within the diverse taxonomy of UGSs, urban wilderness as a specific form remains underrepresented in both theoretical frameworks and practical applications (Kowarik & Körner, 2005; Martin, 2021).

Urban wilderness, characterized by minimal human intervention and spontaneous ecological succession, holds distinct and often underappreciated value (Jorgensen & Tylecote, 2007). It supports high levels of biodiversity by providing habitat for native and migratory species (Threlfall et al., 2016; Kowarik, 2013). Moreover, contributes to ecological features in regulated urban ecosystems. Additionally, it offers a suite of experiential and psychosocial benefits, such as healing effects for urban dwellers (Harper et al., 2019), opportunities for direct encounters with wildlife, and the sensory immersion that elicits a sense of remoteness or escape from urban pressures (Kendal et al., 2008; Botzat et al., 2016).

Despite its potential, urban wilderness is particularly vulnerable in the face of rapid urban development. Lacking formal recognition in planning frameworks, these areas are often viewed as vacant, residual, or transitional lands that are frequently targeted for redevelopment, infill, or infrastructural projects (Wang & Wang, 2017). As a result, wilderness spaces are often excluded from competition over remaining green areas and marginalized in spatial policy debates. Their undervaluation and absence in conventional planning discourse threaten not only their continued existence but also their capacity to deliver critical ecological and social functions.

1.1.1 The need for urban wilderness in spatial planning

The concept of urban wilderness emerged from the field of landscape architecture, first introduced during the international conference *Landscape, Wilderness and the Wild* held at the University of Sheffield in 2007. Defined as 'land in the city that is dominated by nature rather than people', it refers to areas characterized by the free growth of vegetation and natural succession processes, including woodlands, wetlands, unmanaged fields, river corridors, abandoned sites, and brownfields (Jorgensen & Keenan, 2012). The idea of urban wilderness is rooted in the broader and more established concept of wilderness, which has a long intellectual and cultural history. Wilderness was often viewed negatively, commonly described as barren and uninhabitable (Cronon, 1996). With increasing urbanization and environmental degradation, however, perceptions began to shift. The rise of environmentalism in the late 19th century marked a turning point, emphasizing wilderness not only for its ecological value but also for its philosophical and existential significance. Scoyen (1969) emphasized wilderness as both a physical reality and a mental construct, as a space of introspection and deep human-nature connection (Lutz et al., 1999). Holmes Rolston (1986) further argued that wilderness is foundational to human existence, describing it as a vital expression of nature's autonomy and our relational dependency on it.

As natural resources become increasingly constrained due to urban expansion and the intensification of human activities, interest in wilderness preservation has gained attention. Organizations such as World Urban Parks, IUCN, Urban Ecosystems Specialist Group, and Urban Nature Alliance advocate for conserving wild spaces in cities (Cao et al., 2019). Wilderness has long been central to the creation and management of protected areas and national parks (Lupp et al., 2011). The establishment of Yellowstone National Park is a landmark example of this tradition, with the U.S. National Park System embodying wilderness ideals (Nash, 1967). The Rewilding Europe, a non-profit organization, has been working to create rewilded landscapes in at least 10 different regions across Europe. Similar efforts are now emerging in China, where the creation of a national park system has become a new focus for scholars (Wang & Su, 2015; Zhang & Yang, 2016).

Scholars increasingly argue that wilderness should no longer be understood exclusively as remote and pristine. In an urban context, wilderness takes on new relevance. Increasingly, formerly remote natural areas are absorbed by expanding urban fabrics, giving rise to hybrid environments in which human and ecological systems coexist (Wang & Wang, 2017). From the perspective of planners and designers, such spaces can be conceptualized as wilderness landscapes, which are urban ecological systems that retain autonomy in structure, form, and function

(Jorgensen & Keenan, 2012; Wang & Wang, 2017). These landscapes are dynamic, resilient, and capable of fostering ecological processes even under conditions of marginal human oversight.

Urban wilderness areas offer tangible ecological benefits. Their value lies in internal ecosystem stability, enhanced species diversity, and their contribution to the broader urban ecological network (Cronon, 1996; Shao et al., 2021). Properly protected and managed, such spaces provide critical habitats for urban wildlife, including migratory birds and native fauna (Threlfall et al., 2016; Kowarik, 2013). Their capacity to support biodiversity without intensive management makes them ecologically effective and economically efficient (Navarro & Pereira, 2012). In addition, urban wilderness areas fulfil educational, recreational, aesthetic, economic, and healing functions (Diemer et al., 2003). Their low-maintenance and self-regulating ecosystems reduce costs associated with upkeep. At the same time, they enhance the excellent "green atmosphere" of urban areas, potentially attracting both residents and enterprises and contributing to local economic value (Martin, 2021). Unlike pristine wilderness areas, urban wilderness is accessible, enabling broader public interaction with natural environments. As Zahniser (1956) observed, such environments stimulate all human senses, including sight, hearing, smell, and touch, allowing individuals to experience an authentic and restorative connection with nature.

Visually, wilderness enhances urban landscape aesthetics, increasing visible greenery and visual comfort (Rupprecht & Byrne, 2014), contributing to landscape diversity (Shao et al., 2021). Empirical research supports the positive relationship between exposure to natural environments and psychological and physical health (Kaplan & Talbot, 1983; Hartig & Evans, 1993; Kowarik, 2018), and it could promote residents' well-being and living quality, especially when integrated into daily life (Ulrich, 1979; Hester, 1989; Kaplan & Kaplan, 1989; McNally, 1995). The field of ecological psychology treats people's psychological problems through the wilderness space, which is called "wilderness therapy" (Harper et al., 2019). Different types of urban wilderness offer different possibilities. Medium and small wilderness embedded in urban interstices encourage active commuting, informal recreation, and community interaction (Jorgensen & Tylecote, 2007). Larger sites at urban margins, such as forests and protected parks, support more immersive activities like hiking, cycling, and bird watching (Threlfall & Kendal, 2018). Across these scales, wilderness offers a model for enhancing urban sustainability and liveability.

In contemporary urban planning and design, a core challenge lies in preserving and integrating wilderness spaces while maintaining their ecological integrity and public accessibility (Xie, 2019). Although wilderness can offer unique benefits, it is often undervalued in both policy and practice, treated as marginal or transitional rather

than as a viable and intentional land-use strategy. This gap calls for the development of planning and design principles that acknowledge the full ecological, social, and symbolic potential of urban wilderness (Jorgensen, 2011; Martin, 2021).

Ultimately, urban wilderness represents more than a residual or forgotten landscape type, it is a living, evolving part of the urban ecological and cultural infrastructure. Recognizing and integrating wilderness in spatial planning may help cities cultivate more resilient environments, meaningful public spaces, and new paradigms for coexisting with nature.

1.1.2 The public's environmental preference in urban wilderness planning

Understanding public environmental preference is essential for advancing sustainable landscape development. As Mansvelt & Lubbe (1999) argue, meaningful landscape planning must reflect public attitudes and values. Kaplan & Kaplan (2005) further suggest that environmental perception and attitudes are shaped not only by physical attributes of the landscape but also by the ways people interact with their surroundings. A substantial body of research has examined how individuals perceive and respond to natural environments. Attributes such as cultural background, regional contexts, demographic profiles, and personal psychology all influence environmental preferences (Lutz *et al*., 1999). Tools developed by researchers, such as Kaplan and Kaplan's (1989) preference indicators, have helped identify which landscape characteristics are most impactful in shaping human responses. These theoretical foundations are now increasingly relevant to urban planning and ecological design.

In the context of urban wilderness, public perception becomes especially important. Unlike manicured green spaces, wilderness areas often lack formal structure, which can lead to varied interpretations and levels of acceptance. Bauer (2005) emphasized that public preferences and attitudes should be considered when designating wilderness areas, as discrepancies often exist between official classifications and public expectations. Aesthetic and symbolic elements of wilderness, such as wildness, disorder, or natural spontaneity, may not always be legible or appreciated without thoughtful design and communication (Lutz *et al*., 1999). These findings underscore the importance of public perceptions and preferences as a critical dimension in urban wilderness discourse.

Recent studies have begun to address these complexities. Jorgensen et al. (2007) investigated how people interpret wilderness in urban settings, while Watson et al. (2015) explored attitudes toward its management. In China, Li *et al.* (2019) investigated residents' perception of wilderness vegetation in city parks, revealing how ecological and aesthetic values interact. Other studies demonstrate that wilderness perception varies across populations, influenced by regional, cultural, and psychological factors (Lutz *et al.*, 1999). These findings suggest that public attitudes toward wilderness vary significantly across social and cultural contexts and are often mediated by personal experience, familiarity, and values (Kliskey & Kearsley, 1993; Fischer *et al.*, 2018).

For planners and designers, this means that integrating public perceptions into urban wilderness design is not optional but critical. Some landscape architects have this challenge by creating 'wilderness-like' urban landscapes that preserve wildness while allowing for human interaction (Wang, 2019). These designs aim to evoke atmospheric qualities of wilderness, such as openness, irregularity, and sensory richness, without relying solely on untouched ecological conditions (Cao *et al.*, 2019).

Despite this growing awareness, planning practice still lacks clear methods for incorporating public perception into the design and management of urban wilderness. There is a need for perception-based indicators and design strategies explicitly tailored to wilderness spaces within urban settings.

To summarize, the integration of public environmental perception is vital to the successful implementation of urban wilderness in spatial planning. By understanding how people value and experience wild urban spaces, planners and designers can better align ecological goals with human needs and thus create landscapes that are both sustainable and socially resonant.

1.1.3 Urban wilderness design principles and application

Spatial design is the integrated operation of conceptual and schematic design to provide solutions for preserving, renovating, or developing spaces and sites (Nijhuis & de Vries, 2020). Design principles could be one of the most well-known and reliable methods that guide the spatial planning and design process, usually derived from knowledge input or the planner and designer's experience. In some cases, a series of general patterns would be abstracted from multiple case studies, which can be applied in further research and projects (Nijhuis & de Vries, 2020).

Design principles can also be derived from tests or experiments to validate and supplement existing principles or variables, thus making them more applicable to the object of research or design (Nijhuis & Bobbink, 2012). Mainly, the development of design principles involves a combination of these approaches.

While exploring the principles of urban wilderness planning and design, existing knowledge must be incorporated. Design principles specifically for urban wilderness space must also be explored and developed through research, surveys, and experimentation, thus ensuring usability and validity.

Alexander *et al.* (1977) created a new language for architecture, urban design, and community vitality through the book A Pattern Language: Towns, Buildings, Construction, which intended to help professionals and also ordinary people design for their neighbours, towns, or buildings; patterns are the language used to describe the form of places consistent with activity. It seems like a series of experiences abstracted from multiple architectural and planning practices. In order to address the resulting multifaceted problems in the space (Table 1.1), the design strategies are proposed in different contexts, which are the 'patterns' (Rooij & van Dorst, 2020). For example, when designing accessible green space for people, Alexander believed that the distance between green space and users is important and that it would be better to have open, accessible green spaces that are not farther than 750 feet from each workplace, which means that green spaces should be evenly dispersed throughout the city at a certain spacing. Also, the diameter and area of green spaces should be above a certain value (Alexander *et al.*, 1977).

TABLE 1.1 Overview of modern difficulties of urban planning and proposed solutions of a pattern language methodology

Problem	Solution
Large and diverse body of knowledge	Patterns as building blocks of knowledge Pattern languages are a knowledge database
Lack of flexibility	Adjustability of individual patterns
Uncertainty, difficulty of predictions	Postponement of implementation of individual patterns and (future) complex system modeling
Understanding and communication	Patterns are an efficient communication medium
Holistic perspective and complexity	Understanding pattern relations
Urban planning versus self-organization	Increased understanding and communication enlarges stakeholder participation
Sustainability	Patterns for urban symbiosis; well-defined relationships which enable a system's approach
Resilience	Alternative patterns in a pattern network
Top-down approach by default in urban planning	It is very well possible to start with low-level patterns and work from there

(Source: Henriquez et al., 2013)

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Besides, pattern language has given new insights into many disciplines and provided detailed and practical guidance to the practice of architecture, urban planning, and landscape design. When developing urban wilderness design principles, pattern language could be considered to guide the design of different spaces in urban wilderness according to their nature, users' needs, and planning intention, which facilitates the communication between researchers and planners (Rooij and van Dorst, 2020).

Researches by scholars from the psychology discipline provide an idea to involve and analyze users' perceptions and preferences during the development of design principles (Kaplan, 1987; Kaplan *et al.*, 1999; Kaplan and Kaplan, 2005), which sets appropriate norms to fully consider people's attitudes when developing urban planning and landscape design principles. Kaplan *et al.* (1999) proposed corresponding principles for different patterns of situations. The research concluded that four factors influencing users' attitudes toward the natural environment provided a framework for examining the design patterns (Table 1.2). This pattern framework reveals the focus on different aspects of the principle. Detailed design patterns in different situations are proposed, which provide strategies for applying research knowledge to spatial planning and design. User behavior patterns when interacting with natural environment-related research provide insights for the validation of wilderness perception analysis (Unt & Bell, 2014; Kahn *et al.*, 2017; Lev *et al.*, 2020). These knowledge inputs contribute to the framework of the initial design principles and the design of the research process, thus providing clues for developing the final design principles.

The planning and design principles of urban wilderness will be a design-oriented guideline that can be directly used and applied to space by planners and designers, guiding how to design urban wilderness. The exact form and parameters of the principle will be determined in the research process. A critical issue will be finding a proper strategy to translate abstract knowledge from research and experiments into principles that could guide spatial planning and design.

TABLE 1.2 Designing and managing patterns of everyday nature

Factors	Principles	Patterns
Understanding	**Creating Regions and Providing Distinctive Elements**	COHERENT AREAS A small number of coherent areas makes a setting easier to understand.
		REGIONS Coherent regions are helpful in way-finding.
		GATEWAYS NEED PARTITIONS Partitions create opportunities for gateways.
		LANDMARKS Landmarks are most useful in way-finding when they are distinctive and not too many.
		THE TRAIL'S PATH Helping people stay oriented is an important function of a trail.
		ORIENTATION FOR THE NEW VISITOR Key decision points need to be easily identified.
	Providing Supplementary Cues and Information	UNDERSTANDABLE INFORMATION Meaningful participation requires information that is readily understood.
		WHY SHOULD I READ THIS? Brochures and pamphlets are more likely to be read if they are user friendly.
		LABELS AND SYMBOLS Maps are more helpful if the information is where one needs it.
		MAPPING FOR THE MIND'S EYE Avoiding the accuracy hang-up leads to a more easily remembered map.
		PATHS AND SIGNS Getting there and back can be aided by paths and signs.
		WHICH WAY IS NORTH? Align a posted map with the viewer's position.
	Compatibility with Human Biases	ENHANCING FAMILIARITY Familiarity helps people feel more comfortable.
		HUMAN SIGN Although indications of human presence can be a source of concern, human sign is often reassuring.
		WOOD, STONE, AND OLD The choice of materials can enhance restoration.
		A SENSE OF ENCLOSURE A sense of enclosure can make a place comforting and distinct.
		OPENINGS Openings in the woods are comforting both when one is in them and when one can look into them.
		THE TRAIL SURFACE Trail surfaces are important, both visually and functionally.
		SMOOTH GROUND Ground texture impacts preference.

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TABLE 1.2 Designing and managing patterns of everyday nature

Factors	Principles	Patterns
Exploration	**A Chance to See What's There**	ORIENTATION FOR THE NEW VISITOR Key decision points need to be easily identified.
		VISUAL ACCESS Visual access increases confidence.
		GATEWAYS AND ORIENTATION A gateway provides information about what lies ahead.
		VIEWS, LARGE AND SMALL What can be seen from the trail makes all the difference.
		GUIDING THE EYE A captivating view provides information about where to look.
		POINTS OF INTEREST Stopping points along the way can provide opportunities for resting and observing.
	Around the Bend	THE VIEW THROUGH THE GATEWAY A well-designed gateway can provide both information and mystery.
		MYSTERY Mystery encourages exploration.
		TRAILS, NARROW AND CURVING The promise of discovering what lies just beyond the bend in the road greatly increases preference.
		A SENSE OF DEPTH Layers and landmarks enhance the sense of depth.
	The Mind's View	MORE THAN MEETS THE EYE A vista engages the imagination.
		WANDERING IN SMALL SPACES Even a small space, if it has extent, can constitute a whole different world.
		ENOUGH TO LOOK AT A vista is more engrossing if it has extent.
		THINK VIEW Consider opportunities for providing views.

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TABLE 1.2 Designing and managing patterns of everyday nature

Factors	Principles	Patterns
Restful and Enjoyable		QUIET FASCINATION Natural settings can fill the mind and enhance restoration
		WANDERING IN SMALL SPACES Even a small space, if it has extent, can constitute a whole different world.
		SEPARATION FROM DISTRACTION The sense of being in a different world is easily undermined by intrusions and distractions.
		THE VIEW FROM THE WINDOW Even if one is not in a setting, it can have restorative benefits.
		TREES Trees help make special places.
		BIG SPACES Big areas become more interesting if divided.
		SMALL SPACES To be highly prized, places need not be large.
		THE WATER'S EDGE The treatment of the water's edge impacts how the water is perceived.
Meaningful participation		CHECK IT OUT Reactions from potential users can lead to surprising insights. OPPORTUNITIES
		FOR PARTICIPATION Permitting local involvement needs to be an ongoing part of management.
		START EARLY, INCLUDE MANY Genuine participation needs to start early and reach the diverse segments of the population.
		UNDERSTANDABLE INFORMATION Meaningful participation requires information that is readily understood.
		PROVIDING ALTERNATIVES People respond more usefully if provided reasonable choices.
		THE ART OF INVITING FEEDBACK The format for getting feedback has to be friendly and appropriate.

(Source: adapted from Kaplan et al., 1999)

1.1.4 Problem statement

Wilderness-relevant topics have been discussed for decades across a range of academic disciplines. Much of the existing literature focuses on primary wilderness areas through different theoretical lenses. For instance, natural writings and environmental philosophy have explored the human-nature relationship from a conceptual and ethical perspective (e.g., Rolston, 1986). In ecology, scholars have investigated the ecological values of wilderness areas and their role in biodiversity conservation (Van de Berg & Koole, 2006). Environmental psychology has examined how individuals interact with wilderness environments and perceive their psychological and restorative benefits (Kaplan, 1987). However, there is a noticeable lack of research and practical application from the perspectives of urban planning and landscape design. The potential role of the urban wilderness concept within spatial planning and design has not yet been comprehensively explored.

Although it is widely acknowledged that natural green spaces such as wilderness areas facilitate both urban biodiversity and human well-being (Hartig & Evans, 1993; Kowarik, 2018), relevant research on integrating the urban wilderness concept into spatial planning and design practice is still lacking. It also remains unclear whether urban wilderness can function as a design tool or conceptual language in the professional planning process. Beyond this theory-practice gap, existing design strategies for urban wilderness tend to be underdeveloped, with most frameworks emphasizing ecological or environmental objectives rather than spatial qualities and human engagement.

While scholars have increasingly investigated human-natural interactions (e.g., Brown et al., 2015) and public perceptions of landscape environments (Rupprecht, 2017; Kim, 2016), few studies have focused specifically on how user perceptions, attitudes, and demands can inform design strategies for urban wilderness. A significant research gap persists in the understanding of urban wilderness that supports ecological resilience while enhancing user experience relevance in urban life.

In summary, rapid urbanization significantly challenges urban planning and landscape design by threatening the availability of marginal or unregulated green spaces. Urban wilderness, as a distinct and increasingly rare type of green space, deserves more attention in both preservation and design contexts. This research responds to that need by employing pattern language to conceptualize and communicate design strategies tailored to urban wilderness contexts. While green space design traditionally focuses on facilitating human interaction with both space and others, existing research on urban wilderness continues to prioritize ecological

considerations at the expense of spatial design quality and public engagement. Therefore, it becomes crucial to explore how users perceive and interpret urban wilderness.

This PhD research aims to expand the role of urban wilderness in spatial planning by reviewing key themes across relevant disciplines and by developing context-specific design principles that incorporate user perceptions and preferences. In doing so, the research seeks to enhance the applicability of urban wilderness as a meaningful component in planning and design practices. The research also employs the RTD method to ensure that the developed principles are both empirically grounded and practically applicable across diverse stakeholder interests.

1.2 Research Objective and Questions

To address the previously proposed gaps, this exploratory research aims to develop urban wilderness as a concept for urban planning and design while identifying principles that align with user demands and preferences.

To meet this objective, there are four research questions that need to be addressed (Figure 1.1).

- **Question 1** To what extent is the urban wilderness as a concept part of the urban planning and design process?
- **Question 2** What environmental features and metrics play a role in designing urban wilderness in ways that are both recognized by designers and perceived by spatial users?
- **Question 3** What design patterns can be developed for urban wilderness?
- **Question 4** How can the applicability of design patterns be tested through the RTD method, and what is their added value?

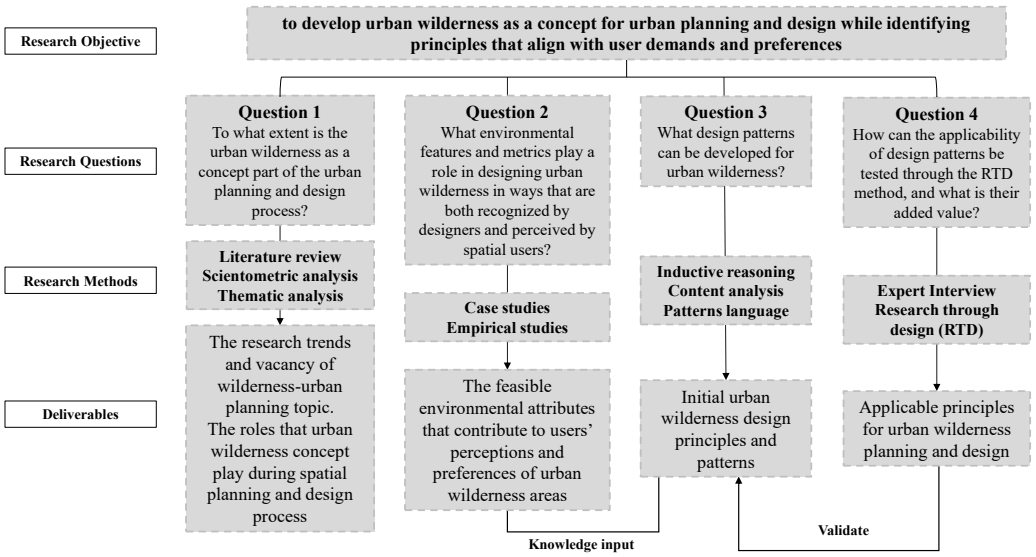

FIG. 1.1 Research objective and questions

1.3 Research Approaches

A seven-step methodological framework is constructed to achieve the research objective and answer the research questions (Figure 1.2). Step 1 answers question 1 by reviewing the current state of the art and trending topics of wilderness-urban planning relevant study fields, which provide theoretical knowledge for developing design patterns for urban wilderness. Steps 2 and 3 answer question 2, respectively, and provide practical and empirical knowledge foundations for the urban wilderness design patterns. Step 2 selects practical cases of urban wilderness areas to investigate their landscape characteristics and critical design ideas. Step 3 conducts empirical studies through a desk study, questionnaire, mental maps, and behavior observation to investigate how users experience and comprehend urban wilderness areas and the crucial environmental characteristics and metrics influencing their perceptions and preferences. Step 4 answers question 3, in which the previous design knowledge input contributed to formulating the design principles and patterns of urban wilderness. Steps 5 and 6 answer question 4, including evaluating and applying developed design patterns and reflections. During this stage, expert interviews were organized with diverse spatial

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planning and design practitioners, including planners, designers, researchers, and policymakers, to evaluate and comment on the developed urban wilderness design patterns. Master's students from relevant disciplines were invited to participate in a design workshop to apply the design patterns to practice and test their applicability and validity. The research team reflects the whole evaluation process and participants' feedback. Finally, step 7 concludes this PhD dissertation and provides an outlook for future studies and practices.

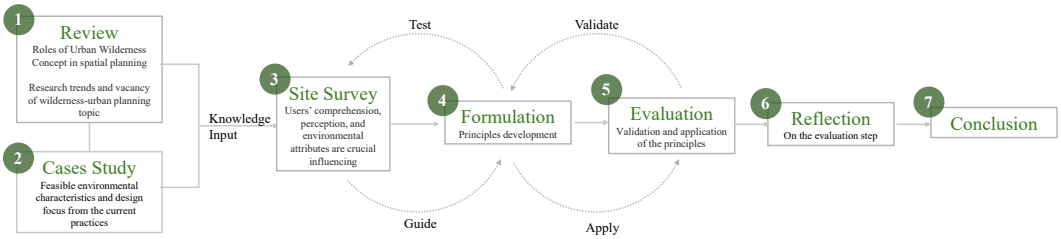

FIG. 1.2 Initial framework of research methodology

Given the complexity and transdisciplinary nature of the research objectives and questions, this thesis employs diverse research methods, utilizing an exploratory concurrent mixed-methods design that integrates quantitative and qualitative approaches, including literature review, precedent studies, case study, site survey, and RTD method, are conducted, providing holistic and varied data sources for the final results of this PhD research. Figure 1.3 illustrates the thesis structure, organized into four sections: Foundation, Investigation, Synthesis, and Application, each addressing specific research questions. The integration of these four sections will address the research questions holistically. The rationale for each method selection is discussed in detail below.

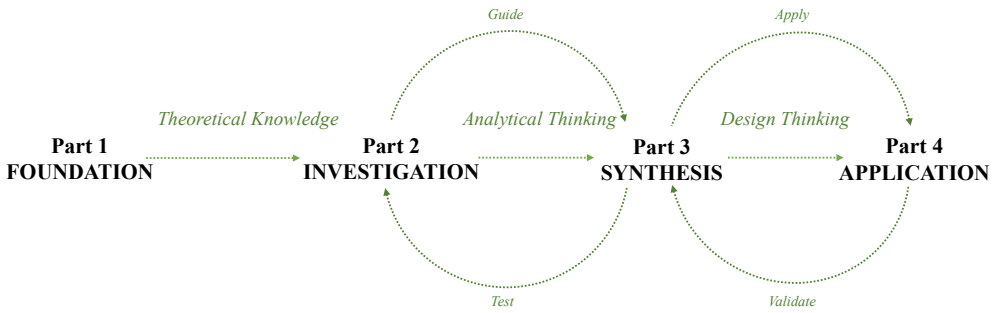

FIG. 1.3 The Four Parts of the Thesis

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1.3.1 Part 1: Foundation

The Foundation Part aims to define urban wilderness as a concept for urban planning and design and answer Research Question 1 in Chapter 2: To what extent is urban wilderness a concept in the urban planning and design process? Several sub-questions are addressed within this part, such as how to define wilderness and urban wilderness. How has the wilderness idea evolved with urban development? What role does urban wilderness play in spatial planning and design? What are the values of urban wilderness as a tool integrating spatial planning and design?

To address the sub-questions, this part begins with a systematic literature review of relevant literature in the wilderness-urban planning research field across recent decades, thus establishing a foundational definition and tracing the evolution of the urban wilderness concept. Meanwhile, scientometric analysis is conducted to visualize the state of the art at the intersection of wilderness and urban planning. The review further examines the significance of urban wilderness spaces for urban environments and residents. Additionally, an anatomizing of the urban wilderness concept for urban spatial planning is conducted by a thematic analysis according to the diverse roles urban wilderness plays in the spatial planning process. Through this process, the necessity and possibility of investigating principles for urban wilderness planning become evident, laying the groundwork and establishing a knowledge foundation for subsequent research steps (Figure 1.4).

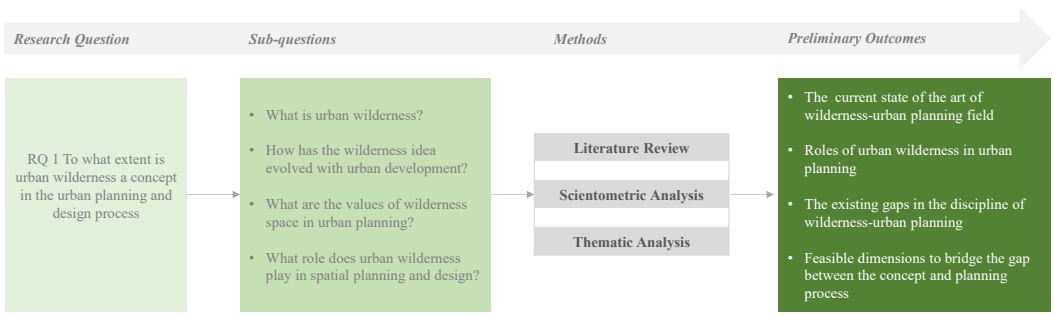

FIG. 1.4 Workflow of Part 1

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Literature review

This thesis uses a literature review to systematically identify and synthesize existing research on urban wilderness and urban planning. It aims to anatomize urban wilderness concepts, specifically within urban planning and design. The review establishes a systematic examination and investigation of the key concepts of wilderness and urban wilderness, identifying the current progress and highlights in the research field, recognizing the existing research gaps, and revealing the research hypotheses. The review aims to offer insights into the spatial qualities and diverse contributions to urban environments and residents of urban wilderness areas across various disciplines' perspectives, building a multi-dimensional understanding of urban wilderness as a planning and design concept and tool.

The literature review results, extracting insights from the precedent studies, provide a solid theoretical foundation for setting the stage for subsequent practical and empirical studies and further development of urban wilderness design principles and patterns.

Scientometric analysis

A literature review requires a wide range of knowledge input, synthesis, and interpretation of precedent studies. It is crucial to translate the knowledge from the review outcomes into an understandable format, thus effectively exploring the trends and implications. The scientometric analysis is extensively used to visualize scientific trends (Shiffrin & Borner, 2004), offering researchers precise, color-coded bibliographic data on diverse topics (H. Zhang et al., 2022). To examine the state of the art in wilderness-urban planning topics across recent decades, highlighting the necessity to explore urban wilderness from the perspective of spatial planners and designers, scientometric analysis is employed to identify relevant keywords and clusters, revealing the current state of relevant disciplines, the primary trends and existing gaps in the wilderness-urban planning research field, laying the theoretical support for subsequent studies steps.

Thematic analysis

Thematic analysis is conducted to re-categorize the outcome from the scientometric analysis, focusing on interpreting the relevant literature from diverse perspectives based on the roles of urban wilderness as a research subject. The study employed the three dimensions of wilderness concepts proposed by Cao and Yang (2017) as primary themes (Figure 1.5).

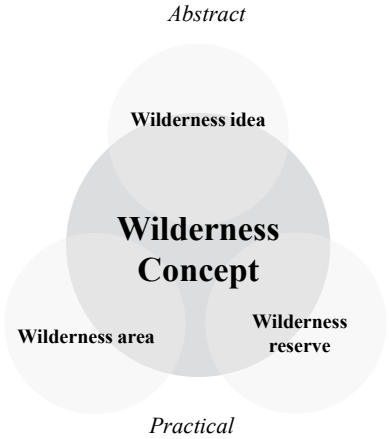

FIG. 1.5 The three dimensions of the wilderness concept in research
(Source: adapted from Cao and Yang, 2017)

This process identified diverse roles and values emphasized in urban wilderness-relevant disciplines, clarifying existing focus areas. Within each dimension, key trends and specific topics among scholars emerged. The results indicate current research tendencies in urban wilderness topics and suggest valuable future academic and practical exploration trends.

1.3.2 Part 2: Investigation

The Investigation Part consists of Chapters 3 and 4, which answer Research Question Two: What environmental features and metrics play a role in designing urban wilderness in ways recognized by designers and perceived by spatial users? These two chapters respectively investigate the primary design considerations of existing urban wilderness practices through case studies and the environmental indicators that influence the users' perceptions of urban wilderness areas by conducting empirical studies. Several sub-questions must be addressed in this part. For instance, what are the current design considerations of urban wilderness relevant practices? What is the current status of existing urban wilderness spaces? What implications could be extracted from the existing cases that guide future research and application? Which indicators will influence people's experience of the environment? What indicators should we consider when evaluating people's perception and preference of urban wilderness? What indicators will make wilderness perceived as 'wild'?

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To address the sub-questions, the Investigation part reviews existing measurable environmental metrics, landscape elements impacting perceptions of urban wilderness, and relevant theoretical frameworks. Existing urban wilderness practices are selected to assess their current status and design considerations. Following this, an exploratory matrix is developed to guide the evaluation of crucial environmental metrics influencing perceptions of urban wilderness through empirical studies, which employ a mixed-method approach, incorporating a questionnaire, mental maps, and behavioral observations to gain users' experience, perceptions, and attitudes, thus identifying essential environmental indicators that shape the users' perceptions and preferences. The deliverable from this part provides essential practical and empirical design knowledge for developing design principles and patterns for urban wilderness (Figure 1.6).

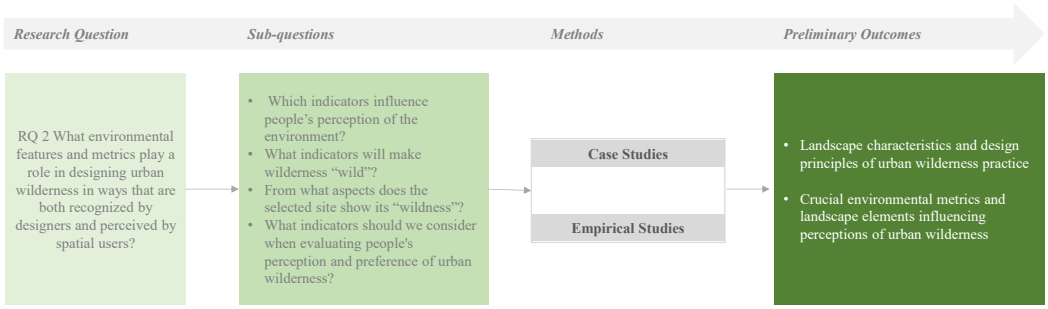

FIG. 1.6 Figure. 1.6 Workflow of Part 2

Case studies

Case studies are well-suited for exploratory research addressing "How" or "Why" questions regarding contemporary events (Yin, 1984), such as the development of design principles. In this PhD thesis, case studies of selected intentional urban wilderness projects were conducted to examine their spatial characteristics and planning principles, specifically investigating the project background, design considerations, and the role of urban wilderness within the site.

The findings highlight existing concerns, landscape characteristics, design strategies, and key environmental indicators relevant to intentional urban wilderness planning and design. These case studies are integral to developing universal planning and design strategies for urban wilderness applications, offering practical insights for contributing to the development of design principles of urban wilderness.

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Empirical study

This PhD research employs a multi-method survey to collect onsite data from users in an urban wilderness setting. A representative site is selected, where data collection includes a questionnaire, mental maps, and behavior observations.

The questionnaire assesses users' perceptions and preferences regarding wilderness areas, identifying environmental metrics and landscape elements that influence these perceptions. Mental maps capture the users' visiting experience through drawings, while behavior observation provides supplementary data to verify questionnaire results.

The collected data are analyzed through experimental methods, yielding key indicators for developing principles applicable to the planning and design process (Figure 1.7).

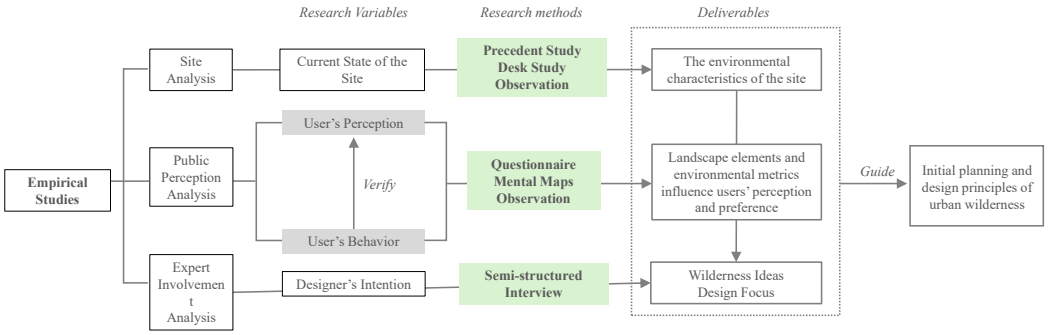

FIG. 1.7 Empirical studies outline

1.3.3 Part 3: Synthesis

The Synthesis Part includes Chapter 5 of this thesis, which addresses Research Question 3: What design principles can be developed for urban wilderness? Several sub-questions that are essential to this objective are tackled. For instance, what insights from previous design knowledge contribute to developing design principles recognized by designers and perceived by users? Can these design principles be universally applied to urban wilderness contexts? What insights could be incorporated beyond the existing knowledge based on the researcher's experience and expertise?

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Multiple research methods are applied to answer these sub-questions. First, prior knowledge and data are reviewed and evaluated to support the formation of design principles for urban wilderness, employing inductive reasoning throughout this process. The researchers' reflective practice allows for integrating expert experience and knowledge, which is crucial in assessing the applicability and solidity of existing materials. Finally, initial design patterns are extracted and concluded by thematic analysis from the design principles (Figure 1.8).

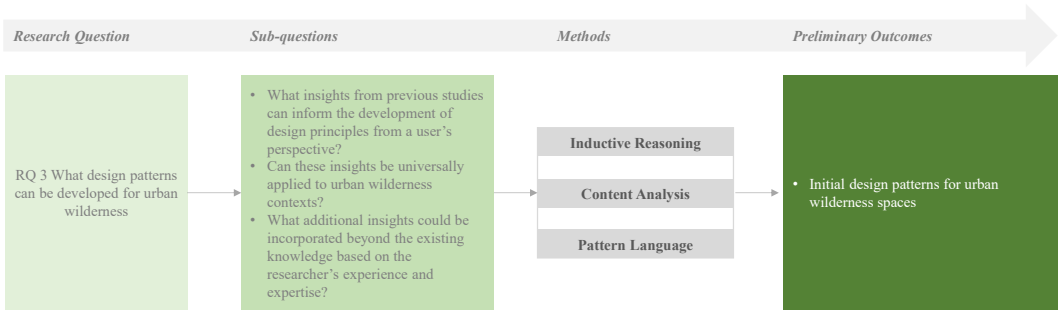

FIG. 1.8 Workflow of Part 3

Inductive reasoning

This PhD thesis employs inductive reasoning to develop generalized design principles for urban wilderness based on holistic data collection from specific observations and findings, including theoretical, practical, and empirical design knowledge.

The multiple design knowledge sources contribute unique insights during the inductive reasoning process. For instance, literature review and precedent studies provide foundational theories and concepts, case studies reveal practical applications and spatial characteristics of urban wilderness practices, and site surveys highlight user experiences and preferences in urban wilderness areas. The synthesis of these findings identifies the crucial topics and design metrics that allow for the development of universal, evidence-based design principles and patterns for the urban wilderness.

This approach ensures that the principles and patterns generated are grounded based on theoretical studies and empirical data, making them adaptable to diverse urban contexts. Inductive reasoning thus facilitates a bottom-up approach to creating convincing design principles.

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Content analysis and Pattern language

The content analysis and pattern language approaches conducted after the inductive reasoning stage critically process and synthesize diverse design principles into patterns for urban wilderness areas. During this stage, the researcher actively engages with and interprets the gathered design knowledge, using expertise and professional judgment to inform and refine the interpretation.

Firstly, content analysis will systematically review and categorize the previously developed design principles. Through coding and thematic grouping, coherent categories can be identified to reflect key aspects of the planning and design of urban wilderness environments. The pattern language method is then employed to extract and articulate specific planning and design patterns within these categories. Pattern language claims the complex nature of spatial planning design, which constructs a logical system to form a language for planning and design and translate abstract notions into spatial configuration (Deming & Swaffield, 2011). Drawing on this approach, recurring configurations, user needs, and contextual conditions were analyzed to generate actionable and transferable design solutions. This process translated specific principles into universal spatial patterns, providing a practical design language to guide future urban wilderness planning and enhance interdisciplinary communication among planners, designers, and diverse stakeholders.

1.3.4 Part 4: Application

Part Four addresses Research Question 4 in Chapter 6: How to test the applicability of design patterns through the RTD method, and what is their added value? Several sub-questions guide this investigation. For instance, how can urban wilderness's initially developed design patterns be adapted to a practical project and integrated into the design process? Which methods and tools should be employed during the RTD process? What insights on the design patterns could be obtained from diverse practitioners during the planning and design? How might these reflections enhance existing design patterns for urban wilderness?

To address these sub-questions and evaluate the initial principle developed in the previous section, various practitioners are invited for expert interviews to provide insights on urban wilderness and relevant design principles based on their experience and expertise. Following this, a design workshop is conducted involving design students with selected design sites to test the adaptability of the urban

wilderness principles in a practical process. This process facilitates the validation of the initial principles. It allows for provisional reflections and refinements, thereby practically advancing the principles for planning and designing urban wilderness (Figure 1.9).

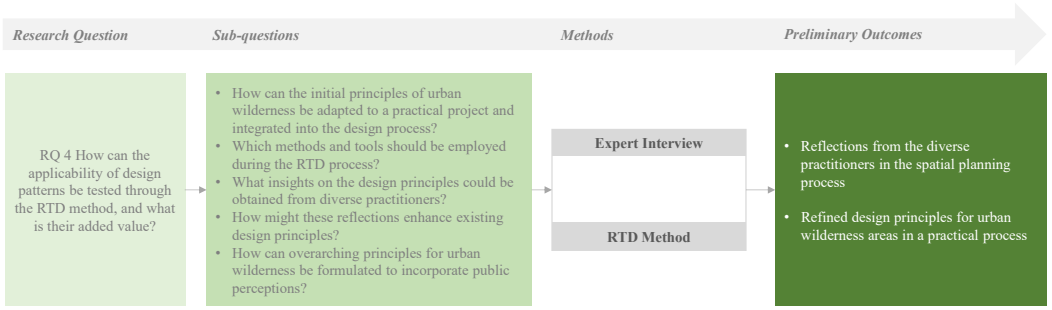

FIG. 1.9 Workflow of Part 4

Semi-structured interview

Semi-structured interviews have proven effective for data collection (Kallio et al., 2016), requiring in-depth knowledge of the relevant discipline (Kelly, 2010). To collect comprehensive feedback and insights from urban wilderness planning and design experts, the interviewees include various practitioners, such as ecology researchers, landscape scholars, independent landscape designers, government spatial designers, design consultants, and policymakers.

The interview questions focused on the interviewees' perspectives on urban wilderness based on their professional knowledge and experience and their opinions on the validity and applicability of the design patterns. The interview transcripts are then processed for content analysis, with the crucial comments used to refine the initially developed design patterns for urban wilderness planning and design.

RTD (Research Through Design)

The RTD method in this thesis seeks to expand existing knowledge through integrated analysis and spatial translation (Nijhuis & de Vries, 2020), verifying the urban wilderness patterns developed from theoretical, practical, and empirical design knowledge through spatial design applications.

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To assess the applicability and validity of these patterns, a design workshop is conducted, inviting design students and PhD candidates to participate and apply the patterns in practice. The workshop provides participants with a research background on the PhD research and the development process of urban wilderness design patterns, including detailed explanations of each pattern. Participants apply these principles in specific tasks, generating feedback and **reflections** to assess design patterns' applicability and validity and refine and enhance them for future studies and practices.

To conclude, Figure 1.10 outlines the Four Parts and corresponding methodologies, data collection processes, and preliminary findings associated with each section, as discussed in the previous sections.

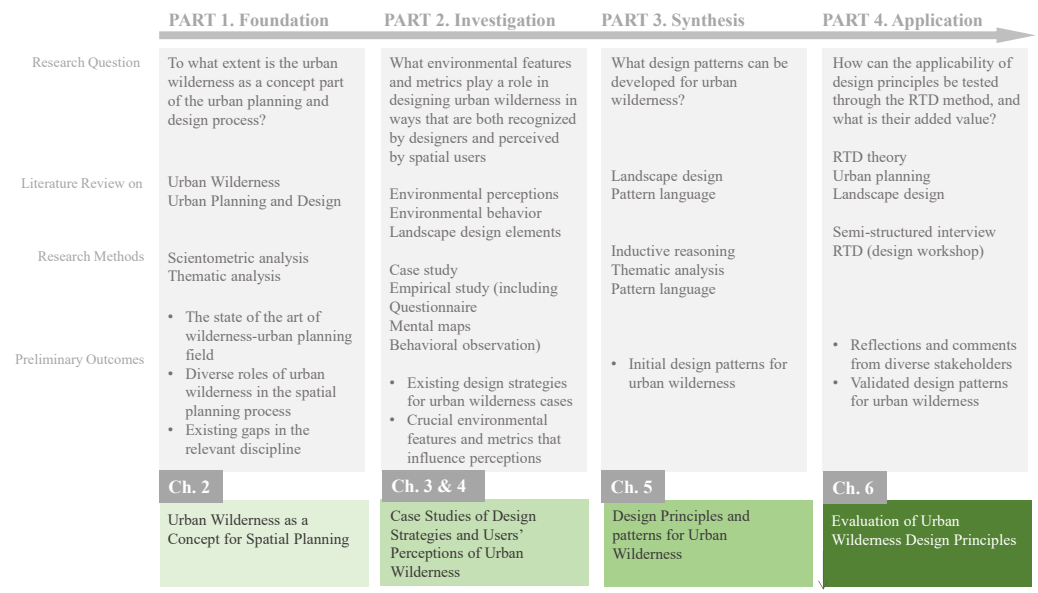

FIG. 1.10 Research Design of the Thesis

It clarified the argumentation's logical flow to meet the primary research objective: develop urban wilderness as a concept for urban planning and design while identifying principles that align with both the designer's recognition and users 'perceptions. The Foundation Part establishes the conceptual base for the following practical and empirical studies by reviewing the current state of the art of urban wilderness and spatial planning discipline. The Investigation Part includes case studies for practical knowledge and empirical studies to collect design knowledge

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from the existing practices and spatial users in the urban wilderness, which comprise the crucial input for developing design principles and patterns. The Synthesis Part explains the process of developing and interpreting design principles and patterns based on the evidence from the previous parts that practitioners could use as a communication tool and design strategy. The Application Part validates the developed design patterns with diverse practitioners through expert interviews and the RTD method. The Four Steps clarify how diverse research methods contribute to answering specific research questions and sub-questions, thus collectively building toward the final research outcomes. This structure enhances the coherence and clarity of the research, ensuring that the findings are firmly grounded in both theoretical insight and practical relevance.

1.4 Relevance

The significance of this research lies in its response to an increasingly urgent set of urban and ecological challenges. As cities face accelerating biodiversity loss, climate vulnerability, and growing disconnection between people and nature, this study proposes urban wilderness as a complementary and underutilized paradigm for spatial planning and design. It offers both scientific and societal contributions by conceptualizing wilderness as not just a remnant or ideal, but as a strategic, perceptual, and spatial resource within contemporary urbanism.

1.4.1 Scientific relevance

This research emphasizes the growing significance of wilderness as a vital yet unexplored component in contemporary urban planning. In response to escalating global environmental challenges, such as biodiversity loss, climate change, and the disconnection between people and nature, it proposes a novel framework for integrating urban wilderness into spatial planning and design. This research is distinctive in its multidisciplinary approach, combining spatial planning, landscape design, urban ecology, environmental behaviour, and environmental psychology to formulate actionable guidelines for the planning and design of urban wilderness.

By developing these principles, this research not only contributes to academic knowledge but also addresses a gap in the operationalization of wilderness concepts within urban contexts. It advances the emerging discourse on Urban Nature-based Solutions (NbS) by offering an alternative lens grounded in the wilderness paradigm (Davies et al., 2024; IUCN, 2020). Also, the research highlights urban wilderness as a strategic tool to promote ecological resilience, inclusive green spaces, and sustainable urban development. Ultimately, it strengthens and diversifies the multi-disciplinary foundation of urban wilderness, proposing a practical and conceptual bridge between abstract ecological ideals and real-world planning processes

1.4.2 Societal relevance

In light of increasing societal demand for accessible, authentic, and ecologically rich urban green spaces, this research responds with urgently needed design principles that reframe wilderness not only as a peripheral or philosophical ideal but as a viable and appreciable quality within urban environments. The proposed patterns offer urban planners and landscape architects concrete guidelines for embedding wilderness values into everyday planning practices.

This research is particularly unique in its integration of a public-preference approach, which incorporates the perceptions, values, and environmental psychology of spatial users. This is complemented by participatory input from professionals across planning disciplines, including urban planners, landscape architects, policymakers, and researchers, to ensure that the proposed design principles and patterns are both grounded and adaptable. In doing so, the research responds to international calls for resilient, inclusive, and participatory planning approaches as emphasized in the New Urban Agenda (UN-Habitat, 2017). This research does not merely conceptualize wilderness as an object of protection, but repositions it as a collective asset, a healing landscape, and a democratic form of nature within urban society.

1.5 Thesis Outline

The dissertation is structured into seven chapters, each addressing distinct yet interrelated components of the research. The structure follows a logical progression from conceptual grounding to practical application, aligning closely with the methodological framework outlined in Section 1.3. The chapters are grouped into four core parts: Foundation, Investigation, Synthesis, and Application (Figure 1.11).

As the Foundation part of the research, Chapter 2 addresses research question 1 by exploring the theoretical and disciplinary underpinnings of urban wilderness. It reviews academic literature to define key concepts, traces the historical evolution of wilderness thinking, and assesses the role of wilderness in planning practices. A scientometric analysis maps the research landscape, while a thematic analysis categorizes the roles of wilderness in spatial discourse. The chapter establishes the conceptual legitimacy and necessity of urban wilderness in planning and design.

Chapter 3 initiates the Investigation part by addressing the first part of the research question 2. It presents selected case studies of urban wilderness projects, analysing their spatial characteristics, design strategies, and contextual conditions, then extracts crucial design principles, which contribute to the assessment indicators for the site survey and principles development in the following chapters.

Continuing the Investigation phase, Chapter 4 addresses the second part of research question 2. It presents findings from an empirical study conducted at a representative urban wilderness site. Data collection methods include questionnaires, mental maps, and behavioural observations, revealing how people perceive, experience, and value wilderness elements in urban settings. The chapter identifies key environmental attributes that shape users' preferences and perceptions of urban wilderness. These attributes form a foundation for the design patterns developed in Chapter 5.

Chapter 5 marks the Synthesis phase of the research and addresses Research Question 3. It synthesizes theoretical, practical, and empirical knowledge into design principles using inductive reasoning and content analysis. The principles are translated into a pattern language that includes spatial forms, perceptual qualities, and planning strategies. Each pattern includes a rationale, application scenario, and relation to other patterns. The chapter produces a comprehensive and adaptable toolkit for wilderness-oriented planning and design.

Chapter 6 investigates the Application phase by addressing Research Question 4. It reports on a series of validation activities, including expert interviews with relevant scholars and practitioners and a pattern language workshop involving Master's students and PhD researchers. These activities test the applicability, validity, and added value of the design patterns. Participant feedback and expert reflections are analysed to refine the patterns and ensure their applicability and relevance. The chapter demonstrates how design knowledge can be applied and grounded through participatory experimentation.

The final chapter synthesizes the main findings, revisits the research questions, and reflects on the contribution to theory and practice. It discusses the limitations of the research and identifies areas for future study. The chapter proposes directions for further refining the urban wilderness design patterns, extending the framework across geographic and cultural contexts, and embedding wilderness more deeply into urban planning policy and education. It concludes with a call for a more inclusive, perceptual, and ecologically autonomous vision of urban nature.

This structure ensures that the thesis unfolds as a progressive inquiry, from conceptual investigation to empirical analysis and practical application. Each chapter builds on the previous ones, creating a narrative that culminates in a usable framework for reimagining wilderness within urban spatial planning and design.

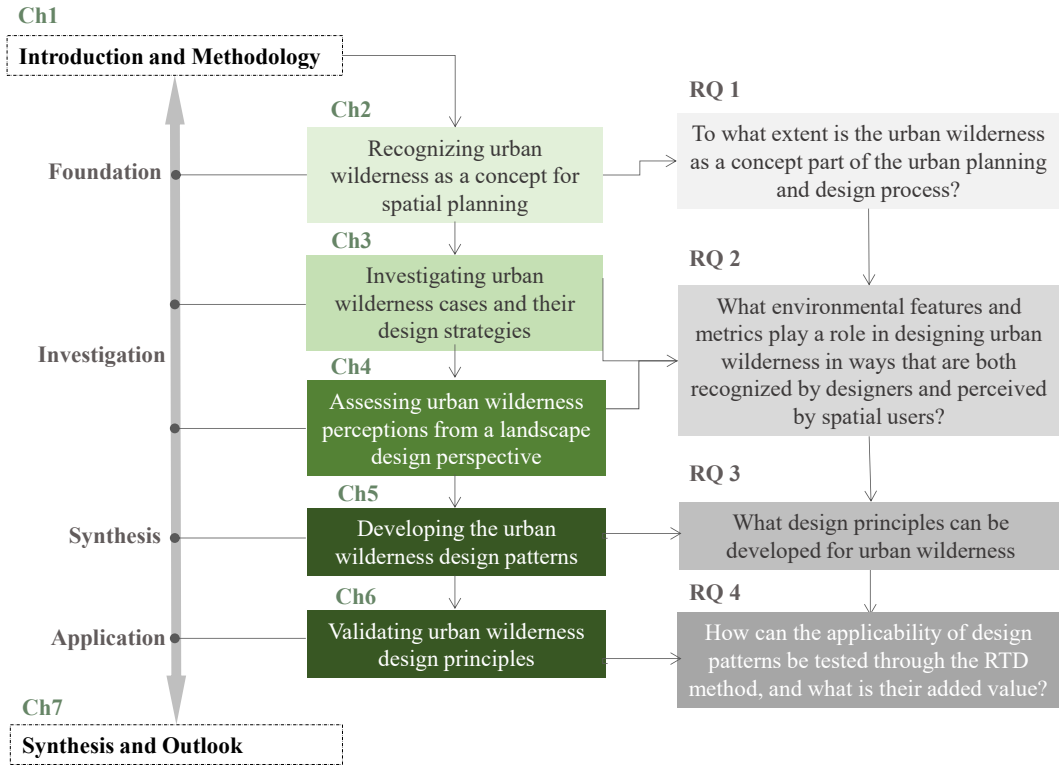

FIG. 1.11 Visual outline of the thesis

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2 Recognizing Urban Wilderness as a Concept for Urban Planning and Design

This chapter is based on an article (under review):
Chen, Y., Nijhuis, S., & van Dorst, M. J. (2025). Urban Wilderness as a Concept for Urban Planning and Design: A Systematic Review. *Journal of Environmental Management*.

Chapter Two aims to identify how urban wilderness connects to spatial planning disciplines by reviewing the recent decades of literature after brief background information on the basic definition of wilderness and urban wilderness in Section 2.1. Section 2.2 introduces the review methods and scientometric analysis approach. Section 2.3 includes the bibliographic analysis of the recent three decades of literature in wilderness-urban planning research areas. Sections 2.4 further illustrate the detailed findings in the three aspects of wilderness-urban planning-related literature and the state of the art in this research area. Section 2.5 concluded this chapter.

Recognizing Urban Wilderness as A Concept for Urban Planning and Design

Rapid urbanization and the ongoing exploitation of green space have significantly impacted urban environments and residents. As a distinct and underutilized form of green infrastructure, urban wilderness has attracted growing attention for its potential to mitigate these effects. However, research connecting urban planning with the concept of wilderness is lacking, and the significance and roles of wilderness are not yet clearly defined.

This chapter systematically reviews three decades of literature on wilderness-urban planning, combining scientometric and thematic analyses to investigate emerging trends, research gaps, and conceptual developments.

Thematic analysis recategorizes the literature into three analytical dimensions, respectively, wilderness as an idea, a reserve, and a space. The findings validate this framework. Research on wilderness-as-idea primarily addresses theoretical and philosophical perspectives in earlier studies. Wilderness-as-reserve, the most extensively studied dimension, reflects ecological and environmental concerns, emphasizing ecosystem conservation and humans-wildlife coexistence. The recent dominance of wilderness-as-space highlights its role in urban development and spatial planning, with increasing focus on aligning natural processes with human demands. This review also maps the state of the art in wilderness-urban planning and reveals the necessity and possibility of integrating wilderness as a deliberate instrument for urban planning and design practice. Ultimately, the chapter offers implications for scholars and practitioners, calling for deeper engagement with the wilderness concept to inform more resilient, inclusive, and ecologically responsive urban environments.

2.1 Introduction

Existing studies have demonstrated that the expansion of cities and associated human activities degrade urban green space and natural resources, adversely affecting both the biodiversity and vitality of urban areas (Kowarik, 2018; McKinney et al., 2018). Socio-ecological approaches are increasingly advocated, promoting diverse strategies for green space development and emphasizing the importance of natural environments in urban planning. For instance, Tate and Eaton (2002)

have categorized various urban green space typologies, including urban parks, metropolitan parks, and linear parks. Their multifunctional roles in enhancing biodiversity, moderating urban microclimates, and providing recreational spaces have been widely acknowledged (e.g., Vargas-Hernández et al., 2018).

Despite growing recognition of green space value, wilderness areas frequently remain overlooked within urban green infrastructure planning (Kowarik & Körner, 2005; Martin, 2021). Globally, wilderness areas with high ecological significance have dramatically declined since the early 1900s, primarily due to urban expansion and intensified human interventions (Watson et al., 2016; Allan et al., 2017). Traditionally, the concept of wilderness refers to large, relatively pristine landscapes where natural processes unfold largely free from human intervention. Defined by the U.S. Wilderness Act (1964) as 'an area where the earth and its community of life are untrammelled by man,' this classical interpretation emphasizes a clear distinction between wilderness and human-influenced landscapes, and was the first time wilderness was recognized and protected through national legislation (Martin, 2017). Wilderness is also a formal protected area category within the International Union for the Conservation of Nature (IUCN), which describes wilderness as "unmodified or slightly modified land" (IUCN, 1994). Regarding the definition claimed by The WILD Foundation in 2009, wilderness is a natural environment that has not been significantly modified by human activity or any non-urbanized land not under extensive agricultural cultivation (Martine, 1992). These consistent definitions across institutions reflect a collective understanding of wilderness as spaces where nature evolves autonomously, free from human dominance.

However, with ongoing urbanization, pristine wilderness has increasingly become fragmented, transitioning into agricultural land, infrastructure, and built environments (Wang & Wang, 2017). This phenomenon prompted landscape design and urban ecological scholars to broaden the wilderness concept to include urban areas that still exhibit significant natural processes, despite minimal or passive human (Jorgensen, 2011). Consequently, the concept of urban wilderness emerged, encompassing urban woodlands, vacant lots, abandoned sites, and other spontaneously vegetated areas within cities, which provide significant ecological, recreational, scenic, and educational values without formal design or management (Jorgensen, 2012).

In parallel, related terms such as urban wildscapes and wildness have emerged, further complicating the conceptual landscape (Table 2.1). Terms such as wildscapes specifically refer to spontaneously occurring urban spaces characterized by ecological processes driven by neglect, abandonment, or the absence of deliberate human intervention. These typically include vacant lots, urban woodlands, and

derelict industrial sites (Jorgensen & Tylecote, 2007). Also, informal green spaces describe different types of underutilized or spontaneous green spaces shaped by both ecological processes and human neglect (Rupprecht et al., 2015). The notion of rewilded urban areas refers to spaces that are passively or intentionally returned to a more autonomous ecological condition, often with minimal human maintenance (Lorimer et al., 2015). Wildness, on the other hand, is distinct from both urban wilderness and urban wildscape in that it does not signify a specific physical area but rather represents an intrinsic quality representing the autonomy and spontaneity within natural processes. Wildness characterizes ecological conditions that operate with minimal human management or intervention and can exist not only within traditional wilderness but also prominently within urban or peri-urban settings, demonstrating ecological spontaneity and resilience even amid intense human activities (Van Horn & Hausdoerffer, 2017; Martin & Hill, 2021).

TABLE 2.1 List of similar terms relevant to urban wilderness

Term	Focus	Human Intervention	Relevant Disciplines	Key References
Urban Wilderness	Ecological succession & autonomy	Minimal to none	Landscape architecture, urban planning	Jorgensen & Keenan (2012)
Wildscapes	Emotional & symbolic meanings	Variable	Cultural landscape studies	Jorgensen & Tylecote (2007)
Informal Green Spaces	Everyday access & informal use	Unplanned, low maintenance	Urban ecology, sociology	Rupprecht et al. (2015)
Rewilded Urban Areas	Reintroduction of wild ecological processes	Passive or strategic minimalism	Conservation planning, rewilding	Lorimer et al. (2015)
Urban Wildness	Community-valued wild patches	Semi-managed, often activist-led	Environmental justice, activism	Martin & Hill, 2021

Despite their subtle distinctions, these relevant terms share common ground in contemporary urban ecological discourse. They collectively address the preservation, protection, enhancement, and transformation of remnant wild or spontaneously natural spaces in urban environments. Fundamentally, discussions around these terms consistently focus on embedding wilderness attributes into urban planning and design, highlighting their potential roles in sustainable urban development. Hence, while each term carries unique definitional nuances, they are considered equally significant within this study, positioned alongside the concept of urban wilderness as indispensable components of the discussion. To clarify, while this study consistently uses the term ‘urban wilderness,’ related concepts such as ‘wildness’ and ‘urban wildscape’ are also included in the review to ensure a comprehensive analysis of the relevant literature.

Current research on wilderness and urban wilderness spans various disciplines, including ecology, social ecology, psychology, and environmental philosophy. Early foundational studies examined the ideological and philosophical underpinnings of wilderness concepts (e.g., Nash, 1967; Lutz et al., 1999), while subsequent research explored their cultural significance (e.g., Xie, 2019; Shao et al., 2021), and practical applications, such as restoration of urban wastelands and vacant lots (e.g., Gandy, 2013; Gandy, 2016). Additionally, wilderness has been examined in relation to national park systems and broader conservation strategies (e.g., Yang, 2014; Cao & Yang, 2017). Within urban planning and landscape design, recent attention has focused on wilderness areas' capacity to enhance environmental quality, biodiversity, and human well-being in urban contexts. A central challenge for urban planners is thus preserving open spaces that simultaneously fulfill public needs and maintain ecological integrity (Xie, 2019).

As urban expansion intensifies land-use conflicts, urban wilderness offers potential to balance competing demands for conservation, housing, infrastructure, and recreation. Wilderness areas within urban settings have been increasingly recognized as crucial components of sustainable city planning due to their ecological, aesthetic, and social benefits (Jorgensen, 2011; Jorgensen & Tylecote, 2007a). It supports biodiversity by providing essential habitats for wildlife, including migratory birds (Threlfall et al., 2016; Kowarik, 2013). Additionally, these areas foster human connections to nature, promoting psychological well-being and social resilience (Tremblay et al., 2015; Kendal et al., 2008; Botzat et al., 2016; Yu, 2021).

However, pressures from urban development frequently lead to the transformation or formal landscaping of these areas, resulting in the loss of their ecological uniqueness and wild characteristics. Consequently, the conceptual integration of urban wilderness into urban planning and design remains underdeveloped and fragmented. Addressing this gap, this study emphasizes the importance of the urban wilderness concept not merely as a reactive response to urbanization but as a proactive planning tool in shaping resilient urban environments.

To achieve this goal, this study conducts a systematic review, applying an AI-assisted literature screening process coupled with a dual-method analysis, including a scientometric analysis to identify research trends and a thematic analysis to explore conceptual dimensions within existing literature. This integrative approach enables a comprehensive examination and synthesis of how urban wilderness concepts have been articulated, interpreted, and practically applied across urban spatial planning and design disciplines.

Several key sub-questions remain unresolved regarding the relevance, necessity, and feasibility of integrating wilderness concept into urban planning and design frameworks.

Sub-RQ1. What is the current state of wilderness research within urban spatial planning, and what are the primary topics of focus?

Sub-RQ2. What distinct roles does the wilderness concept assume within urban planning and design processes, and what are the main scholarly concerns and thematic trends?

Sub-RQ3. Is incorporating wilderness as a practical instrument in urban planning and design both necessary and feasible, and what implications arise from this integration?

By addressing these questions, this review contributes a structured understanding of wilderness's evolving role in urban planning discourse. It not only clarifies conceptual ambiguities but also offers a foundation for future research and practice in integrating wilderness into urban spatial planning and design processes within global urbanization and other challenges.

2.2 Methods and Materials

A two-step literature review and data analysis were conducted to address the research questions and identify trends in wilderness-urban planning. First, scientometric tools like VOSviewer and CiteSpace were used to visualize keywords and clusters, revealing trending topics and research gaps. In the second step, these clusters were categorized into three main dimensions, with the literature grouped and coded by themes. This process helped identify different research focuses and wilderness's diverse roles in urban settings.

2.2.1 Wilderness-Urban Planning Relevant Literature Identification and Screening

The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) statements (Moher et al., 2009), using the Web of Science Core Collection as a bibliographic database. Figure 2.1 outlines the identification and screening process.

Two broad categories, "wilderness" and "urban planning," were searched using the Boolean operator "AND." To include a wider range of relevant literature, various synonyms and related terms from different disciplines were combined with the Boolean operator "OR." The search query was TS=("wilderness" OR related terms) AND ("urban planning" OR related terms), as shown in Table 2.2.

TABLE 2.2 Overview of the search terms related to wilderness-spatial planning

OR ↓	Wilderness	AND →	Urban Planning
	"Urban Wilderness"		
	"Wildscape*"		"Landscape planning"
	"Abandoned area*"		
	"Wasteland*"		"Landscape design"
	"Rewilding*"		
	"Protected area*"		"Spatial planning"
	"National Park"		
	"Wildness"		"City planning"
	"Vacant land"		

After removing duplicates, 11488 results were identified in the Web of Science Core Collection for screening regarding published date, article type, language, and research area. The time span covered January 1, 1995, to December 31, 2024, and included only peer-reviewed academic articles, proceeding papers, and reviews in English. Relevant research areas were environmental sciences, ecology, biodiversity conservation, environmental studies, urban studies, geography, forestry, regional urban planning, and architecture.

To streamline the process, ASReview was used to screen the literature efficiently. This AI tool, trained on a limited number of labeled examples, identified the 430 most relevant articles for scientometric analysis (van de Schoot, R. et al., 2021).

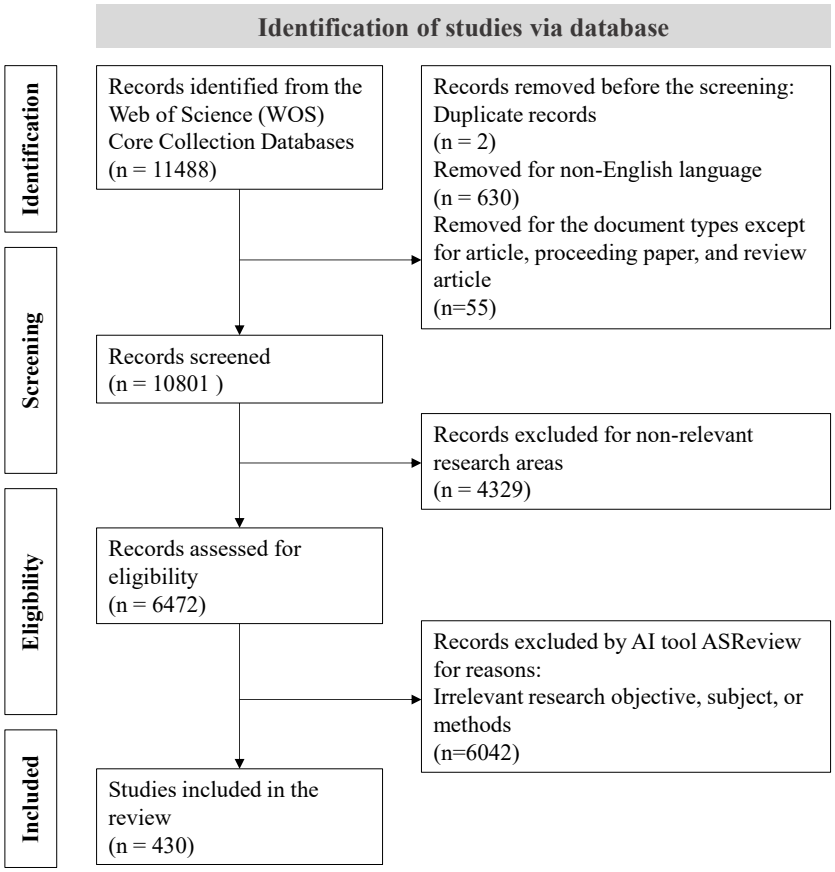

FIG. 2.1 PRISMA flowchart of the systematic literature screening

2.2.2 Scientometric Analysis of Wilderness-Urban Planning Research

Scientometric analysis tools like VOSviewer and CiteSpace are extensively used to map scientific trends (Shiffrin & Borner, 2004), offering researchers clear, color-coded bibliographic data on diverse topics (H. Zhang et al., 2022). To examine knowledge scales in wilderness-urban planning topics over the past three decades and highlight the necessity to explore urban wilderness from the perspective of spatial planners and designers, VOSviewer (1.6.16) and CiteSpace (6.2.R4) were employed. The analysis identified co-occurring keywords and clusters, revealing key trends and concepts in the wilderness-urban planning research field.

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2.3 Research Findings

2.3.1 Scientometric analysis results

Figure 2.2 illustrates the annual distribution of articles published on wilderness-urban planning from 1995 to 2024, showing a general upward trend. While the first decade saw relatively few publications, from 2006 onwards, there was a soaring rise in output despite some fluctuations. Notable increases occurred between 2005-2006, 2010-2011, 2013-2014, 2016-2017, and 2019-2020, peaking in 2022 with 37 articles. To reduce year-on-year volatility, Figure 2.3 presents five-year averages, confirming a marked rise in publications from 2015–2019, reflecting growing academic engagement with this topic.

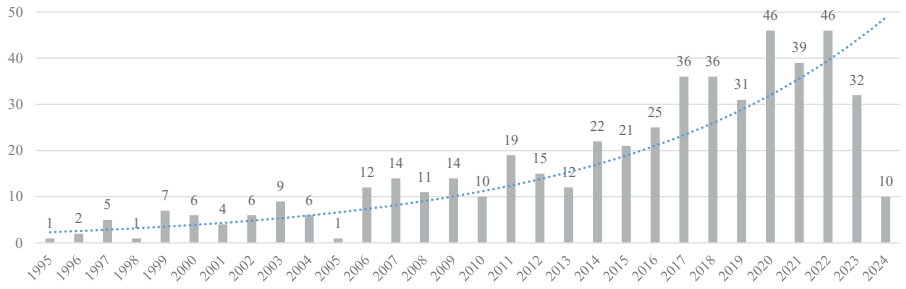

FIG. 2.2 Annual distribution of the published articles related to wilderness-urban planning topics

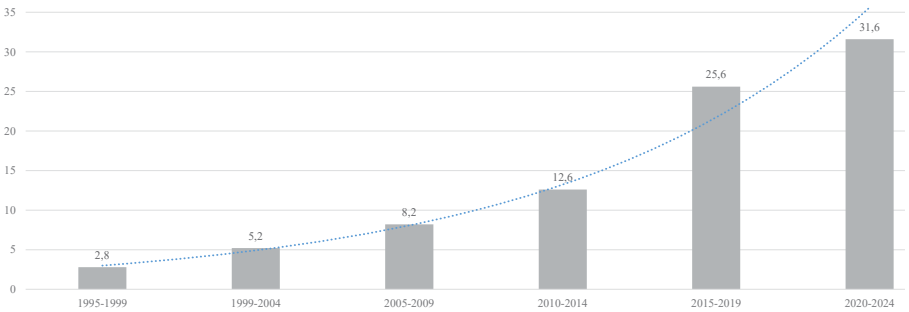

FIG. 2.3 Distribution of the average number of publications per 5-year period of wilderness-urban planning topics

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Using VOSviewer, the research focuses on wilderness-urban planning over the past three decades and is visualized as a keyword network (Figure 2.4). The figure highlights the predominant keywords (present by the node size), such as “conservation,” “biodiversity,” “protected areas,” “management,” “ecosystem services,” and “landscape.”, which reveal the highest co-occurrence across the total publications in relevant topics.

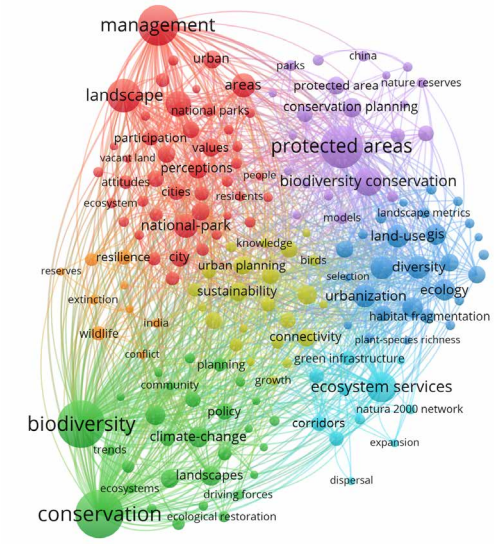

FIG. 2.4 Keywords network visualization of “urban wilderness” and “urban planning” related topics in VOSviewer

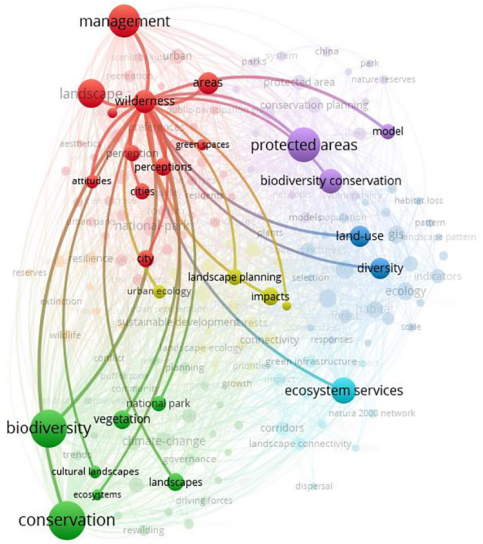

FIG. 2.5 Keywords network of “wilderness” with other topic terms

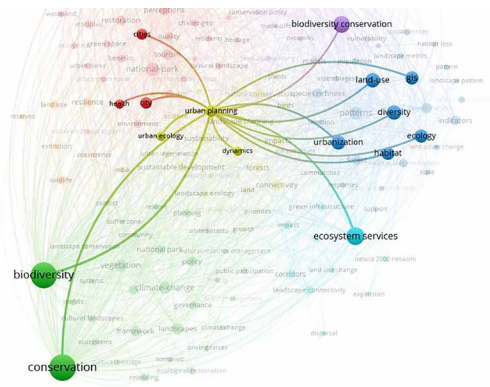

FIG. 2.6 Keywords network of “urban planning” with other topic terms

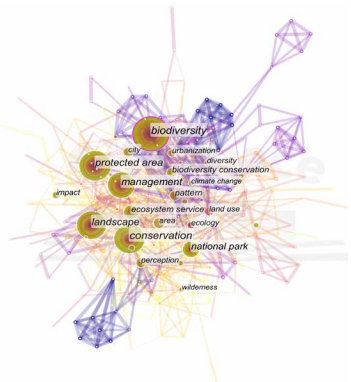

FIG. 2.7 Keywords co-occurrence network of “wilderness” and “urban planning” related topics in Cite Space

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In VOSviewer, a search for the term “wilderness” revealed a network of related topics, including “biodiversity,” “conservation,” “management,” “protected area,” and “ecosystem service,” indicating the broad scope of wilderness-related topics across diverse disciplines (Figure 2.5). However, when searching for “urban planning,” no apparent connection emerged between it and “wilderness” or related terms. This suggests a gap in research addressing the wilderness concept from the perspective of urban planning (Figure 2.6).

Keyword co-occurrence analysis using CiteSpace (Figure 2.7) echoed these findings, identifying the prominence of ecological terms like “conservation,” “protected area,” “biodiversity,” “management,” “ecosystem services,” and “landscape” (Table 2.3). Citation burst analysis (Figure 2.8) revealed early interest in “protected area,” “conservation planning,” and “urban planning”, while recent bursts include “climate change,” “ecological restoration,” “biodiversity conservation,” and “fragmentation,” indicating an emphasis on responding to the climate change crisis within urban areas, as well as growing concern for ecosystem conservation in urban environments.

Figure 2.9 traces the most prominent topics and their evolution. The “human-wildlife coexistence” cluster (No. 0) generated influential work on “ecosystem service” as early as 2004. Research on “urban forest” (No. 1) and “national park” (No. 2) also emerged as high-impact topics, such as “management” and “protected area” appearing around 2004. Notably, “landscape planning” gained prominence post-2019 within the “biodiversity conservation” cluster (No. 4), highlighting increased focus on biodiversity in urban planning.

TABLE 2.3 Top keywords of “wilderness” and “urban planning” relevant literature in Cite Space

Count	Central	Year	Keywords
84	0.26	1997	Biodiversity
78	0.10	1999	Conservation
71	0.03	2004	Protected area
56	0.14	2005	Management
52	0.05	2006	Landscape
46	0.14	1997	National park
31	0.04	1999	Biodiversity conservation
28	0.01	2004	Ecosystem services
25	0.08	1998	Area
24	0.10	1998	Pattern
24	0.14	1997	Diversity

Keywords	Year	Strength	Begin	End	1995 - 2024
ecology	1995	3.11	**1998**	2009	
reserve	1995	3.06	**1998**	2006	
planning	1995	2.45	**1998**	2012	
conservation planning	1995	2.59	**2001**	2018	
aesthetics	1995	2.48	**2007**	2012	
pattern	1995	2.64	**2010**	2012	
biodiversity	1995	2.41	**2010**	2015	
vegetation	1995	2.09	**2010**	2018	
park	1995	2.68	**2013**	2018	
indicator	1995	3.17	**2016**	2021	
preference	1995	2.39	**2016**	2021	
tourism	1995	2.39	**2016**	2018	
policy	1995	2.27	**2016**	2021	
scenario	1995	2.16	**2016**	2018	
landscape planning	1995	2.55	**2019**	2024	
rewilding	1995	2.38	**2019**	2024	
governance	1995	2.16	**2019**	2024	
restoration	1995	2.08	**2019**	2024	

FIG. 2.8 Keywords with the most robust citation bursts in Cite Space

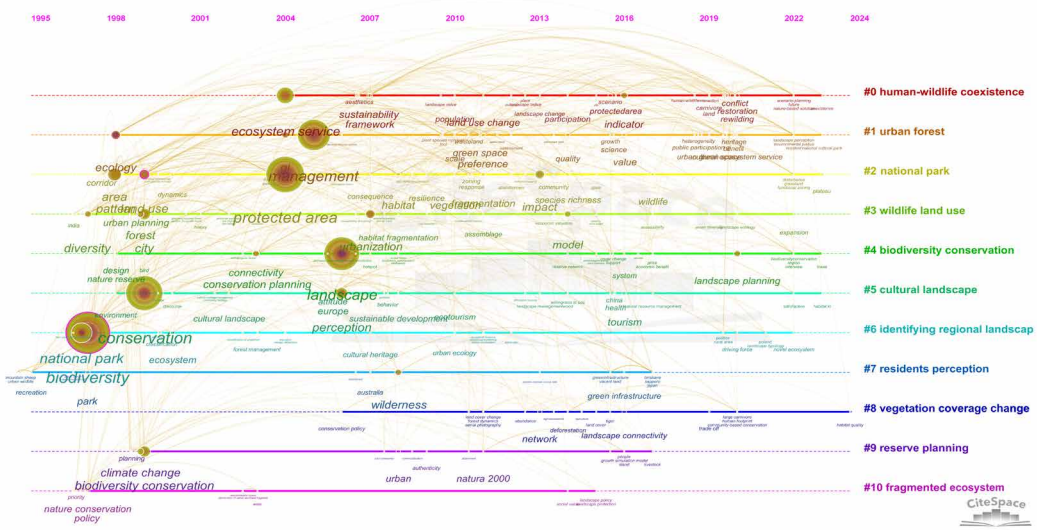

FIG. 2.9 Timeline of keywords clustering visualization of “wilderness” and “urban planning” related topics in CiteSpace

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TABLE 2.4 The most prevailing terms in clusters related to wilderness-urban planning research topics

Cluster NO.	Cluster Name	The Most Relevant Terms	Size	Mean (year)
#0	**Human-wildlife coexistence**	human-wildlife coexistence; protected area; varied need; habitat fragmentation; nature recovery	40	2015
#1	**Urban forest**	urban forest; cultural ecosystem service; temporary conservation; urban biodiversity; recreational use intensity	36	2015
#2	**National park**	national park; species loss; human population pressure; rural building; agricultural landscape	34	2009
#3	**Wildlife land use**	wildlife land use; urban planning; landscape-scale control; urban habitat fragment; human disturbance	34	2006
#4	**Biodiversity conservation**	biodiversity conservation; explicit nature reserve network construction; extinction probability; conservation status assessment; key protected wildlife	31	2011
#5	**Cultural landscape**	cultural landscape; leisure landscape; human well-being; new wilderness; nature development landscape	31	2009
#6	**Identifying regional landscape**	identifying regional landscape; nature-based solution; land-use legacies; rural landscape; historical trace	26	2008
#7	**Residents perception**	residents perception; wilderness setting; informal urban green space; wildlife-related attitude; management preference	23	2004
#8	**Vegetation coverage change**	vegetation coverage change; existing protected area network; habitat representation; landscape conservation approach; protected space	20	2015
#9	**Reserve planning**	reserve planning; national park buffer zone; land use; forest management; management strategy	19	2007
#10	**Ancient woodland**	ancient woodland; forest restoration; woodland conservation; cultural landscape; cross-cultural value	17	2001

Table 2.4 outlines major clusters and their focus areas. Cluster #0, “human-wildlife coexistence,” features terms including “protected area,” “varied need,” “habitat fragmentation,” and “nature recovery,” focusing on human-wildlife interactions in wilderness-urban planning. Cluster #7 “Residents’ perception” highlights “wildlife-related attitude” and “management preference.” Reflecting similar concerns. Other clusters, such as #1 “Urban forest,” #2 “National park,” # 3 “Wildlife land use,” #4 “Biodiversity conservation,” #8 “Vegetation coverage change,” and #9 “Reserve planning,” emphasize ecological topics like “urban biodiversity,” “species loss,” and “urban habitat fragment” as top terms. Cluster #5, “Cultural Landscape,” # 6, “Identifying Regional Landscape,” and #9, “Ancient Woodland,” focus on the cultural ecosystem services significance of wilderness, featuring terms like “leisure landscape,” “cultural landscape,” “cross-cultural values,” and “historical trace.” Underscoring the role of wilderness in spatial planning.

2.3.2 Three dimensions of the existing wilderness-spatial planning research field

To further explore the focus of wilderness-urban planning research and examine how wilderness functions as a subject in urban planning, the study divides wilderness-related research into three dimensions, following Cao and Yang (2017) (Figure 2.10). A metric based on these three dimensions recategorizes the identified clusters and terms. Table 2.6 outlines the re-categorization and key research concerns, with representative literature for each theme provided in Appendix A. This approach clarifies wilderness's varied roles in urban planning research.

FIG. 2.10 The three dimensions of the wilderness concept in research
(Source: adapted from Cao and Yang, 2017)

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TABLE 2.5 Diverse research themes and concerns regarding the different roles wilderness plays in urban planning-relevant research areas

Dimension	Most Relevant Cluster (s)	Research Theme (s)	Research Concern
A. Wilderness as an idea	#0 Human-wildlife coexistence #1 Urban forest #5 Cultural landscape #6 Identifying regional landscape #9 Reserve planning #10 Ancient woodland	**A1. Definition and values**	Wilderness; Wilderness concept; Wilderness values; Urban nature; Legislative frameworks; Derelict land
		A2. National park system	American national park; Buffer zone; Reserve; Boundary; Policy; Planning
		A3. wilderness attitudes and preference	Users group; Rewilding; Wilderness perception; Stakeholder participation; Visual quality; Landscape preference; Wilderness objective; Worldviews
		A4. Specific landscape	Cultural landscape; urban woodland conservation; Brownfield landscape; Ecological landscape; Public spaces; Private land; Protected sites
B. Wilderness as a reserve	#0 Human-wildlife coexistence #2 National Park #4 Biodiversity conservation #8 Vegetation coverage change #9 Reserve planning	**B1. Ecosystem services**	Eco-system services; Biodiversity conservation; Wildlife land use; Habitat conservation; Urban ecology
		B2. Protected area planning and management	Protected area; Biodiversity conservation; Management policy; Reserve planning; Natura 2000 network; Protection priority;
		B3. Human-wildlife coexistence	Human–wildlife interaction; Nature recovery; Habitat fragmentation; Species loss; Damage prevention; Land cover; Land use; Biogeography
		B4. Landscape Connectivity	Buffer zone; Urban development; Urban planning; Landscape connectivity
		B5. Wilderness mapping	Wilderness recognition; Wilderness mapping; Location-based services (LBS); Geographical Information Systems (GIS)

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TABLE 2.5 Diverse research themes and concerns regarding the different roles wilderness plays in urban planning-relevant research areas

Dimension	Most Relevant Cluster (s)	Research Theme (s)	Research Concern
C. Wilderness as a space	#0 Human-wildlife coexistence #1 Urban forest #3 Wildlife land use #5 Cultural landscape #6 Identifying regional landscape #7 Residents' perception	**C1. Informal urban green spaces**	Unregulated space; interstitial; vacant land; wasteland; brownfield; derelict land; abandoned area
		C2. Spatial planning and management	Planning strategies; policy; community-based planning; evaluation; forest management; management strategy; nature-based solution; land use policy; land use pattern; Urbanization; Urban planning; urban green space; landscape planning; geographic information system (GIS); community engagement
		C3. Urban re-naturing	Wilderness interaction; human disturbance; urban regeneration; rural landscape; urban decline; human-wildlife coexistence; passive restoration; human-wildlife conflict
		C4. Biodiversity conservation	Urban habitat fragment; urban biodiversity; plant diversity; wild habitat; wild urban woodland; landscape conservation approach
		C5. Public perception and cognition	Cross-cultural value; residents' perception; stakeholder participation
		C6. Ecosystem services	Ecosystem service; recreational use intensity; wilderness setting; Social inequality; wildlife-inclusive urban design

Dimension A captures the theoretical, symbolic, and cultural interpretations of wilderness. Key clusters include "Human-wildlife coexistence," "Urban forest," "Cultural landscape," "Identifying regional landscape," "Reserve planning," and "Ancient woodland." Themes are categorized as definition and values (A1), national park system (A2), wilderness attitudes (A3), and cultural wilderness (A4). Theme A1 explores the conceptual underpinnings of wilderness (e.g., Shao et al., 2021; Vosloo, 2018), while A2 focuses on the national park system (e.g., Shafer, 1999). A3 addresses the public's attitudes and psychological responses (e.g., Zoderer & Tasser, 2021). Theme 4 investigates the role of wilderness in cultural landscapes and ecosystem services (e.g., Kirby, 2003; Schmidt, 2017).

Dimension B regards wilderness as a managed ecological entity. Prominent clusters include "Human-wildlife coexistence," "National Park," "Biodiversity conservation," "Vegetation coverage change," and "Reserve planning." The literature is recategorized into five themes. Theme B1 focuses on wilderness contributions to urban resilience (e.g., Kuttner et al., 2014; Cao et al., 2022). Theme B2 addresses

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strategies for managing protected wilderness areas (e.g., Watson et al., 2009; Shroyer et al., 2000). Theme B3 (Human-wildlife coexistence) emphasizes minimizing conflict and promoting balance (e.g., Martinuzzi et al., 2021; Markovchick-nicholls et al., 2007; Brown et al., 2015). Theme B4 explores wilderness as corridors or nodes in urban ecological networks (e.g., Gutiérrez et al., 2020; Xun et al., 2017). B5 concerns methodologies for identifying and assessing wilderness potential (e.g., Zhu et al., 2024; Carver et al., 2011; Ma & Long, 2019; Suárez et al., 2024).

The C dimension views wilderness as a spatial element embedded in the urban landscape. Key clusters include "Human-wildlife coexistence," "Urban forest," "Wildlife land use," "Cultural landscape," "Identifying regional landscape," and "Residents' perception." The literature is recategorized into five themes. Theme C1 addressed unmanged or spontaneously vegetated urban spaces (e.g., Jorgensen & Tylecote, 2007; Kim et al., 2020; Newman et al., 2018; Naghibi, 2024). Theme C2 addresses strategies for land use, design, and public engagement (e.g., Trentanovi et al., 2021; Morgan et al., 2022; Zoderer & Hainz-Renetzeder, 2024). Theme C3 explores the vital role of wilderness in re-naturing (e.g., Yuan et al., 2021; De Valck et al., 2014; Tarsitano et al., 2021). Theme C4 discusses biodiversity conservation in the urban wilderness (e.g., Merwin et al., 2022; Thomas et al., 1997). Theme C5 examines public perception and attitudes toward wilderness (e.g., Brun et al., 2018; Rupprecht, 2017; Kim, 2016). Theme C6 concerns how urban wilderness area supports cultural ecosystem services (e.g., Brandner & Schunko, 2022; Toor et al., 2023; Pietta & Tononi, 2021).

2.4 Discussion

This chapter reviewed the current state of the wilderness-urban planning research field by a two-step approach, including scientometric and thematic analyses. The analyses identified the crucial topics and trending clusters and recategorized the relevant literature into three dimensions according to wilderness's roles as a research subject.

Growing concerns for wilderness-urban planning during the studied time span were found. Moreover, concerns in academia have shifted from a theoretical to a practical perspective. More specifically, recent studies focus on the instrumental value of urban wilderness rather than its intrinsic benefits for urban environments and dwellers, as previous research is concerned.

The possibility of recategorizing the relevant studies into three categories according to the roles of wilderness in wilderness-urban planning studies is confirmed. The primary concerns and trending topics regarding the three categories of relevant studies are concluded. Furthermore, the possibility and necessity of incorporating the wilderness concept as an instrument for urban planning and design practice are discussed.

Also, in this section, limitations are acknowledged, and insights are offered for future conservation, management, and planning of urban wilderness in both academic and practical contexts.

2.4.1 The three roles of wilderness in spatial planning research area

Our findings confirm that dividing and reclassifying wilderness and urban planning-related research into dimensions is valid, echoing Cao and Yang's (2017) work. The "idea" dimension addresses philosophical and conceptual discourses; "reserve" emphasizes ecological heritage and non-anthropocentric conservation, and "space" highlights human engagement, viewing wilderness as a site for interaction and experience. These categories are not rigid but often overlap. For instance, a wilderness area may originate as a concept, be managed as a reserve, and serve as public green space. Recognizing these dimensions as interconnected allows for a more nuanced approach to spatial planning and landscape design. Across all dimensions, the literature emphasizes the integration, preservation, and transformation of wilderness within urban settings. This review treats all three perspectives as equally critical for understanding how wilderness contributes to contemporary spatial planning and design.

Wilderness as an idea

Wilderness as an idea refers to the conceptual and ideological foundations of wilderness thinking, rooted in Western environmental thought, where it emerged in contrast to civilization and industrialization (Oelschlaeger, 1991). Figure 2.11 illustrates the evolution of American wilderness ideas. The U.S. Wilderness Act of 1964 formalized this view, framing wilderness as land 'untrammeled by man' (Wilderness Act, 1964; Martin, 2017). Early natural philosophers emphasized wilderness's moral, spiritual, and aesthetic significance (e.g., Thoreau, 1854; Muir, 1901; Leopold, 1949). Key topics include environmental ethics, human-nature relationships (e.g., Rolston, 1986), the history of wilderness ideas (e.g., Nash, 1967), and ecological psychology (e.g., Kaplan, 1987).

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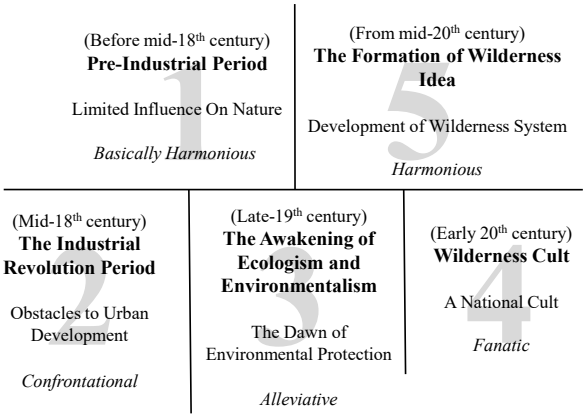

FIG. 2.11 The Evolution of American Wilderness Ideas

Our review reveals a significant gap: concerns about wilderness and ecological ethics have been overlooked in wilderness-urban planning research. However, building on previous studies, scientometric and thematic analyses focus on ideological and theoretical discussions of wilderness for its conservation, transformation, and construction in the urban environment. Studies by Cao and Yang (2017) and Vosloo (2018) proposed conceptual frameworks treating wilderness as a socio-cultural construct shaped by urban settings. Shao et al. (2021) explored wilderness's evolving definitions and values in urban settings. These studies reflect a growing awareness that wilderness is not a fixed entity but a culturally mediated and dynamic concept (Rolston, 1986; Zweers, 2000; Hoffman & Sandelands, 2004; Cao et al., 2019).

Scientometric and thematic analyses also show evolving research trends. Early studies focused on national parks, biodiversity conservation, management, and policy (Shafer, 1999), whereas more recent studies emphasize urban wilderness preservation. Kirby (2003) explored woodland conservation in England. Van de Berg and Koole (2006) studied the transformation of agricultural land into new wilderness in the Netherlands. These studies emphasize wilderness's intrinsic values and its relevance in spatial planning.

Human-nature interactions within urban settings have been a trending topic. Zoderer and Tasser (2021) explored European attitudes toward wilderness. Österlin et al. (2020) identified how perceptions influence wilderness conservation practices in Sweden. Other studies explored cultural diversity, including Xie's (2019) research on wilderness aesthetics in China and Cordell et al.'s (1998) study on how race and social factors affect wilderness awareness in the U.S. These findings highlight the importance of incorporating public attitudes and cultural interpretations into urban wilderness discourse.

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Wilderness as a reserve

Beyond its conceptual meaning, wilderness is formally recognized as a protected area. The IUCN (1994) defines wilderness as “unmodified or slightly modified land,” encompassing national parks, habitat management areas, or nature reserves (Dudley et al., 2008). Similarly, Cao and Yang (2017) described wilderness reserves as clearly delineated nature areas.

Our analysis identified that this dimension has received the most attention, predominantly focusing on large-scale reserves. Key topics encompass biodiversity conservation, reserve planning, habitat management, and human-wildlife coexistence. Most studies are ecocentric, viewing wilderness as self-regulating ecosystems minimally intervened by humans, aligning with discussions of Kowarik (2018).

Critical concerns involve managing ecologically valuable areas under urbanization pressures. Watson et al. (2009) noted biases in the Australian protected area network, while Xun et al. (2017) and Liu et al. (2016) demonstrated prioritization and sustainability strategies in China. Mitigating urban impacts remains central. Liu et al. (2024) proposed strategies against habitat fragmentation, while McGinlay et al. (2020) addressed overcrowded European nature reserves. Wiersma et al. (2004) linked human intervention to habitat degradation and species extinction within urban parks. Martinuzzi et al. (2021) utilized human footprint data to quantify anthropogenic impacts, offering guidance for urban planners and policymakers.

Additionally, the proximity of wilderness reserves to urban areas introduces new complexities. König et al. (2020) highlight human-wildlife conflicts and infrastructure damage, proposing coexistence and risk reduction frameworks. Recent research integrates technological tools such as Geographical Information Systems (GIS) and location-based services (LBS) data to identify, map, and manage wilderness reserves effectively. Ma and Long (2019), for instance, demonstrated how LBS data can delineate non-human activity wilderness zones.

International cases highlight varied approaches. The Oostvaardersplassen in the Netherlands, near the highly urbanized region, employs active management, including the reintroduction of large herbivores to stimulate ecological processes (Wigbels, 2001). In contrast, the U.S. national park model prioritizes minimal interference. These examples reveal divergent philosophies, European practices often balance ecological functions and urban integration, while American models emphasize preservation and separation.

In summary, wilderness reserve planning increasingly requires adaptive strategies that integrate ecological goals with urbanization, ensuring the sustainable integration of wilderness into an increasingly complex urban context.

Wilderness as a space

Traditionally, scholars have viewed wilderness and urban environments as opposites (Cronon, 1996; Vicenzotti & Trepl, 2009; Kowarik, 2018). Yet, with ongoing urbanization and the decline of natural spaces, wilderness is increasingly integrated into cities, revealing its value as urban green space (Kowarik, 2018).

Our findings identify key trends on wilderness as informal green space (IGS). Unt et al. (2013) explored wilderness as leftover urban land, while Kim et al. (2020) investigated community-led regeneration of vacant sites. Jorgensen and Tylecote (2007) emphasized the ecological and social benefits of modern urban wilderness.

Wilderness in urban settings provides ecological, social, cultural, spiritual, and economic benefits (e.g., Hartig and Evans, 1993). Unlike traditional large-scale reserves, current literature emphasizes restoring small-scale urban wilderness for ecosystem services and biodiversity. Bonthoux et al. (2014) found that urban wastelands promote biodiversity and reduce fragmentation, while Villaseñor et al. (2020) showed urban wilderness supports native bird species and human-nature harmony. Toor et al. (2023) called for further research on the ecological benefits of wilderness, particularly in developing regions.

Key issues in urban wilderness involve conservation, planning, and management. Studies have addressed topics such as social inequality associated with vacant land (Welch et al., 2022), restoration of abandoned urban mines (Lei et al., 2016), sustainable urban forestry (Morgan et al., 2022), and urban foraging (Brandner & Schunko, 2022). Recent work also highlights the importance of renaturing cities, minimal-intervention rewilding (Yuan et al., 2021), and encouraging public participation in selecting wild-friendly species (Apfelbeck et al., 2019).

Our scientometric and thematic analyses reveal an intensifying interest in urban wilderness as a spatial category. As human impact increases, research increasingly explores how to reconcile wilderness with urban life through planning and management. This anthropocentric perspective highlights user perceptions, and studies show urban residents' preferences shape informal green space design (Rupprecht, 2017; Kim, 2016) and indicate the value of participatory approaches to align management with stakeholder needs (De Valck et al., 2014; Pietta & Tononi, 2021).

2.4.2 The State of the Art in the Wilderness-Urban Planning Research Field

Our review of the past three decades of literature reveals significant development in wilderness-urban planning, with a noticeable rise in interest since 2006. Research trends have shifted from abstract philosophical debates to practical planning and design as urbanization has reduced the distance between wilderness and urban residents. Increasingly, studies focus on human-wildlife coexistence and anthropocentric perspectives, addressing public attitudes toward wilderness and the practical benefits wilderness areas offer to urban environments. Despite these concerns, the harmony between humans and nature remains the core theme.

From abstract to concrete

Traditionally, wilderness was understood as remote, untouched land (Cronon, 1996), a view that shaped early environmental thought. Foundational thinkers such as Thoreau (1854), Muir (1901), and Leopold (1949) emphasized its intrinsic, spiritual, and symbolic significance. This perspective influenced the establishment of the U.S. national park system, reinforcing a separation between wilderness and urban environments and promoting policies that minimized human interference.

However, with accelerating urbanization and the decline of untouched nature, scholars began recognizing the value of wilderness in everyday urban life (Cao et al., 2019). In many developed countries, truly untouched wilderness has become rare, prompting a shift from distant, protected nature to novel wilderness forms embedded in urban landscapes. The three dimensions of wilderness-urban planning reflect this evolution. Wilderness as an idea remains conceptual and abstract, while as a space, it becomes tangible and experience-based. Wilderness as a reserve falls between these two, supporting ecosystem conservation and human-nature coexistence. Kowarik's (2013) "Four Natures" framework illustrates this continuum (Figure 2.12), outlining the transformation from pristine remnants (Nature 1) to spontaneous or designed wilderness in urban settings (Nature 4).

This transformation has redefined derelict sites such as brownfields and abandoned railways that could be opportunities for novel wilderness. Recent planning practices embrace this shift. Projects such as New York's High Line, where wild vegetation reclaims an old rail line, exemplify how ecological spontaneity can be celebrated in dense urban settings (Margono & Zuraida, 2019). Similarly, European efforts in rewilding urban rivers or restoring industrial lands illustrate how wilderness can be reimagined as a source of ecological, social, and aesthetic value (De Sousa, 2003; Ganday, 2013).

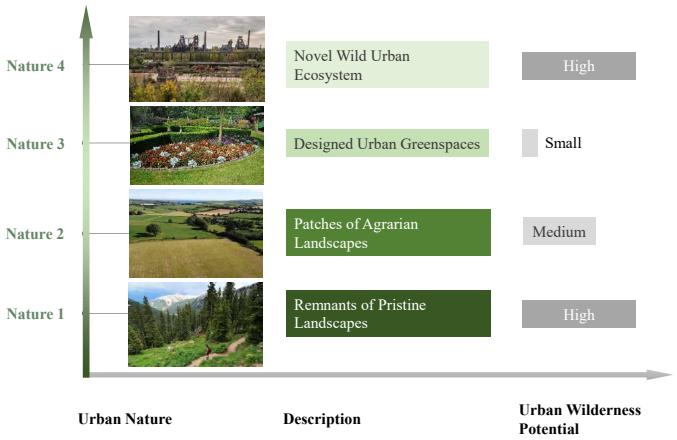

FIG. 2.12 Four Natures approach *(Source: adapted from Kowarik, 2013)*

Looking ahead, research increasingly calls for integrating philosophical reflections with practical design. As cities continue to expand, design thinking must mediate the interface between humans and nature by translating conceptual aspirations into tangible, everyday experiences of urban wilderness.

Take humans' demands into account

Early studies of wilderness topics were primarily driven by ecocentrism rather than anthropocentric ideas, although debates between these two ideas have existed historically (Zweers, 2000). Historically, Western attitudes toward wilderness have been shaped by the Industrial Revolution, the growth of cities, and the rise of environmentalism (Vicenzotti & Trepl, 2009). Wilderness was once regarded with fear and suspicion, viewed as a danger in contrast to the ordered urban area. Yet, the rise of environmentalism and the recognition of the ecosystem services provided by wild nature led to a gradual rehabilitation of wilderness in urban contexts (Thoreau, 1854; Lupp et al., 2011; Xie, 2019).

Recent decades have brought a greater emphasis on public involvement and stakeholder engagement in the planning and management of urban wilderness. Studies increasingly focus on how city residents, policymakers, and other actors participate in shaping, preserving, or restoring urban wild spaces (McHarg, 1969; Jorgensen, 2012; Shao et al., 2021). Participatory approaches that range from community-driven regeneration of vacant lots (Kim et al., 2020) to collaborative mapping of wild areas (Pietta & Tononi, 2021) have become integral to contemporary wilderness-urban planning.

However, not all experiences of urban wilderness are positive. Research on environmental restoration and landscape psychology suggests that certain wild spaces can provoke discomfort or anxiety, especially among vulnerable populations (Ulrich, 1983; Kaplan & Kaplan, 1989). According to Gatersleben and Andrews (2013), overly dense natural environments or limited visibility may evoke fear rather than relaxation. Low accessibility and lack of clean paths can similarly cause fear, particularly among women, children, and elderly residents (Jorgensen & Anthopoulou, 2007). These findings highlight the necessity for urban wilderness design to balance ecological integrity with safety, comfort, and inclusivity.

Shifting trends in wilderness value concerns

Zweers (2000) categorized wilderness values into two categories: intrinsic value, focusing on ecological aspects, and instrumental value, serving human interests. In spatial planning, modern wilderness areas are viewed as urban natural environments or wildscapes (Jorgensen, 2012; Wang & Wang, 2017), offering intrinsic ecological benefits and instrumental values like education, aesthetics, and recreation. Our review highlights a shift in wilderness research focus. While the intrinsic ecological value of wilderness is initially being prioritized, recent studies have increasingly recognized instrumental values, reflecting its broader benefits for urban environments and residents.

Rolston (1986) regards wilderness as ecosystems and nature, refusing the idea of wilderness as barbaric and valueless, emphasizing its role as a self-regulating ecosystem vital for urban stability and biodiversity (Kowarik, 2021). Additionally, wilderness areas provide stability, enhance biodiversity, and balance natural and artificial systems, making them valuable for urban planners (Cronon, 1996; Shao et al., 2021). Wilderness increases visible greenery and improves the visual comfort of the urban landscape (Rupprecht & Byrne, 2014), which contributes to the diversity of the urban landscape (Shao et al., 2021). According to Wang (2019), wilderness offers low-maintenance habitats conducive to urban biodiversity. Research (e.g., Joas et al., 2010; Bonthoux et al., 2014) supports this, indicating that reducing management intensity and promoting wild experiences in urban planning can enhance biodiversity in green spaces (Müller et al., 2018).

Instrumental values of wilderness are increasingly emphasized, including educational, aesthetic, recreational, and psychological benefits (Hofmeister et al., 2003). Wilderness is considered vital for human health (Baines, 1986), and fosters childhood learning through exploration (Kahn, 1997; Cloke & Jones, 2010; Wang & Lin, 2011) and aids cultural heritage preservation, particularly in brownfield regeneration (Tate & Eaton, 2002; Wang & Wang, 2017). Scholars regard wilderness as the most aesthetically valuable green space, contributing to the public's ecological and aesthetic awareness (Peng, 2005; Hofmeister et al., 2003; Cronon, 1996).

Numerous studies affirm positive impacts of natural environment on physical and psychological well-being (e.g., Kaplan and Talbot, 1983; Hartig & Evans, 1993; Kowarik, 2018). Wilderness parks, for instance, enhance health and life quality (e.g., Ulrich, 1979; Hester, 1989); Kaplan & Kaplan, 1989; McNally, 1995). However, rapid urbanization has diminished green spaces, limiting social interaction and relaxation opportunities (Martin, 2017; Xie, 2019). Increasing research focuses on creating healing green spaces (Stigsdotter & Grahn, 2014), and applying therapy emerging to address psychological issues (Ma, 2010). Urban wilderness, characterized by low maintenance and sustainability, provides recreational opportunities, economic benefits, and community value (Navarro & Pereira, 2012; Cao et al., 2019; Headwaters Economics, 2019; Martin, 2021). Additionally, facilities like visitor centers can generate income and employment (Rudzitis & Johnson, 2000).

Existing vacuum in the wilderness-urban planning research field

Our scientometric analysis reveals a limited connection between the keywords "spatial planning" and "wilderness," suggesting that despite some efforts to develop strategies for wilderness and informal urban green spaces, studies focusing on wilderness within spatial planning have been scarce over the past three decades.

Furthermore, public attitudes toward urban wilderness remain divided. Some users perceive urban wildness as threatening or uncomfortable, while others find it calming and restorative (Jorgensen et al., 2007). There is a clear need for more research into how people from diverse backgrounds and with different needs experience, value, and interact with urban wild spaces.

Finally, much remains to be explored regarding the role of different stakeholders, including planners, designers, policymakers, and local communities, during the planning, design, and management of wilderness in cities. Future research should prioritize participatory, cross-disciplinary approaches, embracing not only ecological and design expertise but also the lived experiences and preferences of urban residents.

2.4.3 Wilderness as an instrument for urban planning and design

Urbanization intensifies competition for limited urban land, with increasing demands for housing, infrastructure, and economic activities often threatening the survival of pristine wilderness and urban ecosystems (Mahtta et al., 2022). Traditional efforts to regenerate wilderness or introduce its qualities into urban spaces sometimes fail to preserve intrinsic ecological values. A more sustainable strategy is to integrate wilderness as an instrument within spatial planning, treating it as a fundamental outcome of urban extension rather than an afterthought. This approach better ensures the preservation of wilderness values and helps mitigate their loss as cities expand.

This study confirms the necessity of integrating wilderness into urban planning and design processes. The role of wilderness has evolved beyond theoretical debate to emphasize its practical applicability in urban contexts. Early research focused on recognizing, preserving, and managing large-scale, distant wilderness areas. In contrast, contemporary studies emphasize the retention of wilderness qualities and values within cities, promoting human-wildlife coexistence even amid intense urbanization, as highlighted by Kowarik (2018). There is also a growing focus on accommodating public preferences and demands, indicating an increasing trend toward human-centered urban wilderness integration.

Current findings illustrate the multifaceted potential for integrating wilderness as an instrument in planning and design. Wilderness can serve as a conceptual element in spatial planning, fostering environments with wild qualities that provide urban residents with opportunities for natural experiences and enhanced landscape aesthetics, as exemplified by rewilding projects in Shanghai (Li et al., 2024). It can also be preserved for its ecological functions, addressing challenges such as biodiversity loss, habitat fragmentation, and climate change, as shown in German wilderness reserve assessments (Edejer et al., 2024). Moreover, wilderness can be formally recognized as a category of urban green space, offering residents diverse recreational and social opportunities, consistent with the intentions of the Wilderness Act (1964).

Ultimately, wilderness, particularly pristine wilderness, remains a vital, non-renewable resource. Early integration and sustained management within urban planning are essential for preserving these values for current and future generations.

2.4.4 Limitations and prospects

Wilderness-relevant topics have been discussed for years, especially in response to rapid urban expansion and advancing human civilization. Using scientometric and thematic analyses, this review systematically discussed wilderness-urban planning relevant literature, trending topics and existing gaps were recognized and analyzed, and future implications for research and practice were provided.

However, our review mainly used data generated by the Web of Science (WOS), which may limit the search scope of the studied research field. Future studies should include broader databases to investigate the research field from diverse perspectives. Besides, some representative literature related to the wilderness, such as books from philosophy, ecological ethics, and natural writing, was not included in the scientometric and thematic analyses, limiting the exploration of the wilderness-as-an-idea dimension.

In future studies, researchers and practitioners should develop design strategies for incorporating urban wilderness as an instrument into the planning and design process. This process should also consider diverse stakeholders' cultural contexts and demands, including government, policymakers, researchers, planners, designers, and spatial users.

2.5 Conclusion

Within accelerating urban expansion, the significance of wilderness areas within cities has gained growing academic interest. Despite this, integrating the urban wilderness concept into planning and design remains unexplored, and the overall landscape of wilderness–urban planning research has yet to be comprehensively addressed.

Combining scientometric and thematic analyses, a systematic review was conducted to investigate trending topics and the diverse roles of wilderness during the previous three decades. Three dimensions emerged, namely, wilderness as an idea, which focuses on theoretical and conceptual discussions; wilderness as a reserve, which emphasizes ecocentric perspectives and harmonious human–nature coexistence; and wilderness as a space, which highlights human demands and experience. The findings reflect a notable shift in scholarship from abstract, value-oriented debates to practical concerns that increasingly address public attitudes and instrumental benefits, such as education, aesthetics, and recreation.

However, research gaps remain, particularly regarding stakeholder perceptions and the operationalization of wilderness concepts in urban planning practices. There is a clear need for future studies to investigate how diverse stakeholders understand and value urban wilderness, as well as how these perceptions influence design and management outcomes. As cities continue to grow and natural spaces diminish, wilderness provides essential opportunities for residents to connect with nature. Planning and design approaches should prioritize the preservation, integration, and accessibility of wilderness within urban environments, always accounting for public demand and perceptions.

In sum, Chapter 2 demonstrated that urban wilderness is increasingly recognized as a valuable concept in spatial planning, yet the translation from theory to design practice remains underexplored. To build on this conceptual foundation, the following chapter turns to concrete cases in the Netherlands and beyond, investigating how wilderness principles have been implemented in real projects and what design strategies can be distilled from them.

3 Investigating Urban Wilderness Cases and Their Design Strategies

This chapter is based on a published article:
Chen, Y., Nijhuis, S., & van Dorst, M. J. (2022). Towards landscape design strategies for Urban wilderness: Case studies from the Netherlands. Chinese Landscape Architecture (中国园林), 38(8), 24.

This chapter discusses three representative urban wilderness cases in the Netherlands. Section 3.1 gives a brief introduction to the aims and context of this chapter. Sections 3.2 demonstrate the overall wilderness design ideas of the Dutch landscape. Section 3.3 introduces three detailed cases from diverse perspectives during their planning and design process. Section 3.4 discusses the critical planning and design principles extracted from the three cases. The chapter is concluded in Section 3.5.

Investigating Urban Wilderness Cases and Their Design Strategies

Building on the preceding analysis of state-of-the-art knowledge and the theoretical exploration of urban wilderness as an instrument for spatial planning and design, it remains essential to explore how these ideas are translated into practice. While conceptual frameworks provide the foundation, they must be complemented by insights from real-world applications, particularly how urban wilderness has been designed, implemented, and managed within actual planning contexts.

In recent decades, the preservation and design of wilderness within expanding urban boundaries have become pressing concerns for planners and landscape architects. The integration of natural wilderness spaces into the fabric of urban development is no longer a theoretical ideal but an inevitable and necessary part of sustainable urban planning.

This chapter addresses these issues through an investigation of three representative case studies in the Netherlands, each reflecting a different scale and typology. The cases are examined in terms of their project background, design rationale, and spatial functions. From this analysis, four core principles are extracted: nature first, wilderness protection, human intervention control, and public participation. These principles serve as the basis for extracting scalable and transferable design strategies, contributing to a more nuanced and actionable framework for planning and designing urban wilderness areas.

3.1 Introduction

As urban areas continue to expand, the natural resources and green spaces in urban settings are encroached and limited by human intervention. Unlike pristine wilderness located in remote areas, urban wilderness is inherently shaped by urbanization and anthropogenic influence (Wang & Wang, 2017). However, scholars argue that while fully untouched primary wilderness may no longer exist in modern cities, the environmental characteristics and atmospheric qualities of wilderness can, and should, be preserved within urban landscapes (Cao et al., 2019).

Urban wilderness reshapes the relationship between humans, urban environment, and nature (Kendal et al., 2008). It enhances opportunities for urban dwellers to encounter nonhuman life forms and supports psychological restoration by offering a sense of immersed remoteness and solitude, which are qualities that increasingly become scarce in modern urban life (e.g., Harper et al., 2019). These spaces allow users to meditate, reconnect with natural rhythms, and experience the aesthetics of untamed nature within the city.

The literature review presented in Chapter 2 revealed three interlinked dimensions in which urban wilderness is addressed within spatial planning and design disciplines, including 'wilderness as a concept,' 'wilderness as a protected area, ' and 'wilderness as a space. ' Respectively, these dimensions represent wilderness as an ideological orientation, a formally designated and managed nature reserve, and a physical landscape within the urban environment. These dimensions not only frame the scholarly debate but also influence how wilderness is envisioned and implemented in design practice.

Globally, intentional urban wilderness-relevant projects have been explored for decades. Since the 1970s, European cities have experimented with park designs that prioritize natural succession and wildlife habitats (Wang, 2019). A notable example is Irchel Park in Zurich, where sections were intentionally left to develop as wilderness to strengthen the human–nature connection (Li & Hou, 2011). Similarly, the New York High Line, designed by Piet Oudolf, transformed an abandoned railway into a thriving plant landscape by allowing spontaneous vegetation to play a central role, thereby producing a wilderness-like experience embedded in the urban fabric (Margono & Zuraida, 2019).

The Netherlands provides a particularly compelling context for studying urban wilderness practices. Located in the western part of Europe and known as the "Low Countries", the Netherlands has a significant portion of its land below or near sea level. Much of the country's territory has been reclaimed from water, resulting in a landscape heavily shaped by centuries of human control and engineered interventions (Rosemann & Hui, 2008). Historically, land use was oriented toward singular utilitarian functions, such as drainage and polder systems, which reflected a technocratic approach to survival and development (Vos & Meekes, 1999).

However, major shifts occurred in the 20th century with the implementation of three Land Consolidation Acts. These legislative efforts marked a turning point by incorporating landscape considerations into land-use planning and broadening the conceptual scope of spatial design (Sha & Jin, 2017). This laid the groundwork for the emergence of wilderness thinking in Dutch planning culture, including a growing emphasis on ecological values and spatial diversity.

Today, the Netherlands faces some of the highest urbanization pressures in Europe, driven by its limited land availability, industrialization, and dense population (Chen et al., 2011). In this context, urban wilderness serves not only as a design solution but also as a cultural response to the need for meaningful human–nature relationships within compact cities. Dutch planners and designers have responded with innovation, integrating wilderness aesthetics, ecological processes, and maintenance strategies into spaces influenced by urban development (Sha & Jin, 2017). These practices have resulted in a distinct form of urban wilderness that reflects the country's spatial constraints and ecological aspirations. Moreover, these landscapes have become integral to Dutch cultural identity and everyday life. They are valued not just for their ecological function but also for their contribution to aesthetics, urban vitality, and public engagement with nature.

This chapter selects three representative Dutch practices to illustrate the range and richness of urban wilderness practices. By analysing these cases, the chapter aims to extract design strategies grounded in practical experience. In doing so, it offers preliminary but substantive contributions to the development of practical planning and design principles for urban wilderness, which are scalable, adaptable, and relevant beyond the Dutch context.

3.2 Urban Wilderness Design Experience in the Netherlands

3.2.1 Perceived wilderness in urban settings

Since the early 21st century, most areas in the Netherlands with potential for wilderness development have been recognized and protected in the EU Guidelines on Wilderness in Natura 2000 (European Commission, 2013). These designated areas, comprising nearly 15% of the Dutch territory, include both inland and aquatic wilderness environments. The guidelines offer a strategic vision for the conservation and development of high-biodiversity areas across the EU region, supported by clear definitions and categorizations of wilderness types.

Pristine, undisturbed wilderness is scarce among these recognized natural wilderness areas, and most are affected to varying degrees by urban expansion and human activity. A distinct spatial category that has emerged within this context is referred to as *de nieuwe wildernis* (the new wilderness). These landscapes are shaped by passive land management strategies under largely unmanaged natural conditions, yet they remain the product of conscious design approaches that respond to and adapt to natural processes. Drawing from centuries of experience with land reclamation and dyke construction, Dutch planners have developed a pragmatic and technically informed relationship with nature, believing that natural environments can be enhanced through carefully calibrated human intervention.

In the Netherlands, areas classified as “national parks” differ markedly from the traditional conception of national parks in, for example, the United States. Rather than being strictly protected and untouched, Dutch national parks are often managed landscapes that simulate wilderness conditions. As a result, visitors may perceive them as “pristine” even though they are actively shaped by human influence. A prime example is the Oostvaardersplassen Reserve, located near Amsterdam. Despite its seemingly wild character, the reserve is a largely constructed environment, featuring controlled water levels, introduced wildlife, and designed ecological succession. Through landscape planning and targeted interventions, the site offers an urban-accessible wilderness experience that balances ecological function with aesthetic and recreational value.

3.2.2 Explicit distributions of diverse functions

One of the defining characteristics of urban wilderness design in the Netherlands is the deliberate spatial separation between man-made and natural zones. The overarching planning approach concentrates human activity and infrastructure within confined areas, thereby minimizing disturbances to adjacent wilderness spaces and facilitating coexistence between human and non-human users.

One prominent case exemplifying this principle is The Hoge Veluwe National Park, which consists of a mosaic of forests, sand piles, and marshes. In addition to its natural features, the park also includes a renowned modern art gallery and an outdoor sculpture garden. The design employs a zoned landscape strategy tailored to the area’s ecological and social dynamics. In the northern sector, which constitutes approximately 8% of the total park area, infrastructure and amenities are concentrated to accommodate large visitor flows. Here, efforts are made to enhance the quality and appeal of built facilities (van Tilborg & Dou, 2012).

FIG. 3.1 Cyclists in the Hoge Veluwe National Park
(Source: https://www.hogeveluwe.nl/)

In contrast, vehicle access is limited in the forest zone, and strict speed controls are enforced to minimize human disturbance (Figure 3.1). The core wilderness zone, which makes up about 85% of the park, is intentionally kept inaccessible to the general public to preserve native habitats and support biodiversity. The park's ecological integrity is further supported by planned interventions in transportation infrastructure, woodland management, and grassland maintenance. These measures demonstrate how human involvement can be structured to protect and reinforce ecological processes, rather than dominate them.

3.2.3 Prominent educational values for the public

Urban wilderness spaces in the Netherlands are often characterized by a high biodiversity of wildlife, providing habitats for a wide range of flora and fauna. These ecological assets make such areas attractive destinations for nature enthusiasts and educational programming.

To reconcile ecological preservation with public access, a range of thoughtfully designed observational infrastructure is provided, for instance, bird-watching huts, elevated wooden platforms, and observation towers. These facilities allow visitors to experience wildlife without disturbing sensitive ecosystems, especially in areas where rare or endangered species are present.

In addition, many urban wilderness sites, such as national parks, ecological parks, and small reserves, offer structured wildlife observing tours supported by guide maps for mobile applications. Educational initiatives such as guided walks, cycling tours, and seasonal events are organized to deepen public appreciation for the values of wilderness. These programs not only foster environmental literacy but also strengthen the cultural and emotional connections between urban residents and the natural environment.

3.2.4 Wild elements in the limit urban space

Dutch landscape designers view the relationship between humans and nature as one of integration rather than opposition (van Tilborg & Dou, 2012). This philosophy has led to the incorporation of wild elements even within conventional urban parks. By integrating spontaneous vegetation and ecologically dynamic elements into the urban landscape, designers aim to evoke wilderness experiences within highly spatially constrained settings. These design approaches simultaneously enrich ecological value, offer aesthetic and recreational opportunities, and improve public understanding of natural processes.

A leading figure in this design ethos is Piet Oudolf, whose work since the early 1980s has challenged traditional notions of ornamental gardens. Through observation of plant life cycles and morphological changes, Oudolf has championed the use of perennials and ornamental grasses that reflect the evolving beauty of nature across seasons. A striking example of this is the garden at Museum Voorlinden in The Hague. Situated in a semi-natural setting, the museum grounds are surrounded by Oudolf's wilderness-inspired planting design. Visitors experience a fluid interaction between built form, cultivated wildness, and natural scenery， highlighting the potential of urban wilderness to merge architecture, art, and ecology in a meaningful spatial dialogue (Wang & Zhang, 2002).

3.3 Practices of Intentional Urban Wilderness Areas

From a landscape architecture perspective, scale plays a critical role in shaping environmental characteristics and, consequently, affects the selection of appropriate planning strategies. To explore the spatial characteristics and planning principles of intentional urban wilderness in the Netherlands, three representative cases with distinct scales are categorized as national, urban, and community park-scale. This categorization allows for a comparative understanding of how wilderness is conceptualized, implemented, and experienced across different spatial contexts.

3.3.1 The Oostvaardersplassen reserve

TABLE 3.1 Site information of case 1

Oostvaardersplassen	
Category	National park-scale
Location	Lelystad, the Netherlands
Scale	5600 hm^2
Construction time	Around 1974
Current nature/function	Natural reserve/national park

Project background

The Oostvaardersplassen reserve in Lelystad is a well-known wetland reserve in Europe. The whole reserve is divided into a marsh zone and grassland, with the marsh zone accounting for almost two-thirds of the area (Table 3.1).

The current spatial nature of Oostvaardersplassen is a National Park and reserve. Before 1965, however, it was only a small part of the sea. After land reclamation, this area was designated for industrial development as a polder. Due to the oil crisis and subsequent economic downturn, the site was derelict, and nature was allowed to develop, and the area became a place for wildlife to inhabit and thrive. The government and manager of the site decided to sow reed seeds on the marshland

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formed after the dereliction and let nature take its course. The creation of artificial facilities followed this, the introduction of wildlife, and natural succession over time, culminating in forming this wilderness reserve within the city.

The nature of the original Oostvaardersplassen site, the planning and design strategy, and the vision for its management and maintenance indicate that this area is characterized as an urban wilderness space and that the process of designing, creating, and maintaining the site contributes to future urban wilderness development.

Design Considerations

Wilderness with appropriate human intervention

The Oostvaardersplassen developed into a complete marsh ecosystem in the mid to late 20th century, after being abandoned. The managers planned dykes around the area to prevent the loss of internal water, which became an effective measure to protect the wetland. The Oostvaardersplassen was recognized as a 'Temporary Nature Reserve'. To control the water level in the wetland area during different seasons, the managers decided to install pumps to keep the water level stable throughout the year. This implementation facilitated the survival of flora and fauna, and as a strategy to intentionally create an urban wilderness perceived as 'nature' under adequate human intervention (Wigbels, 2001).

Strict zoning between man-made and natural areas

An increasing number of visitors have visited the Oostvaardersplassen in the course of the continuous development of the space and the natural environment. To prevent crowded visitors from impacting the natural environment and the wildlife therein, the planners have consistently concentrated on the man-made facilities in the eastern triangle of the park, including the visitor center, the tea room, and the souvenir store. Vehicular, cycling, and most of the walking paths are also located at the edges of the area to prevent visitors from exploring further, thus leaving the wildlife habitat to develop by itself (Vera, 1980).

Scientific and educational values

As a well-known nature reserve, Oostvaardersplassen has a highly diverse wildlife resource. Inside the site are several bird-watching huts and signage for nature lovers and children to learn about nature.

Master planning to link grassland and wetland areas

In the 1980s, the scale of the grassland area expanded due to the expansion of surrounding agricultural land and urban areas, providing space for different species to survive. As the region grew, the grassland had to be zoned according to landscape planning, utilizing multiple landscape spaces to connect the grassland with the marsh zone. This implementation contributed to the completion of Oostvaardersplassen as an ecosystem.

Dynamic development vision

In 1986, Oostvaardersplassen was recognized as a national reserve. The following year, the first development vision was presented. Landscape strategies were proposed for different zones, e.g., water level management in the marsh zone and grazing and farming strategies in the marginal grassland.

Human management and self-development made the area a wetland where diverse bird species migrate, breed, and live. The new development vision emphasizes the importance of wild birds, and the decision was made to open up parts of the grassland. Moreover, planning for walking and cycling routes increases visitors' proximity to wildlife (Wigbels, 2001).

FIG. 3.2 Horses in the Oostvaardersplassen
(Source: https://www.staatsbosbeheer.nl/uit-in-de-natuur/fietsroute-oostvaardersplassen)

The latest development strategy is to make the Oostvaardersplassen more natural, with as little human intervention as possible, allowing nature to take control of the land and develop independently. Currently, the Oostvaardersplassen has become a representative of the 'New Nature' (de Nieuwe Wildernis) in the Netherlands (Figure 3.2).

Roles for urban wilderness

A protected area for native and surrounding wildlife

Oostvaardersplassen is home to wild herbivores, for example, cattle, horses, and red deer, small omnivores such as red foxes, and a variety of wetland birds such as cormorants, starlings, and the rare white-tailed eagle (references). A large number of migratory birds come here to spend the winter. Meanwhile, since 1996, year-round grazing activities by large herbivores have been carried out throughout the reserve to maintain the state of the grassland, and almost all species of plants can be sustained with intermittent but adequate grazing. In addition, the intensive grazing behavior of wildlife, such as geese, has controlled the overgrowth of weeds in the wetland.

Buffer green spaces between cities

The Oostvaardersplassen Reserve is situated between Almere and Lelystad and is surrounded by a continuous process of agricultural reclamation, urban expansion, and the creation of man-made facilities such as railroads. The reserve continues to adapt to the surrounding development, for example, creating fringe areas to extend the space and changing the accessibility by adding entrances and visiting routes according to the surrounding transportation. The reserve thus becomes a flexible ecosystem, providing a green buffer for the sprawling city and an ecological corridor for wildlife.

National park for the public

Even though most areas of the reserve are closed to the public so that the native wildlife can be undisturbed, visitors can enjoy wilderness scenery and nearby wildlife within the accessible areas. Manmade features, including fringe paths, provide routes for various experiences, including walking, cycling, or hiking, and a small number of structures, such as bird-watching lodges and tea rooms, are available for public enjoyment of the scenery and recreation.

3.3.2 Dr. Jacobus P.Thijssepark

TABLE 3.2 Site information of case 2

Dr. Jacobus P. Thijsse park	
Category	Urban park-scale
Location	Amstelveen, the Netherlands
Scale	5.3 hm^2
Construction time	1940
Current nature/function	Botanical garden/Heempark

Project background

Dr.Jacobus P. Thijssepark, located in Amstelveen, was designed and constructed by ecologist and botanist Christiaan P. Broerse. The park's main design intention is to attract economically affluent city dwellers who want to escape the busyness within the municipal boundaries (Table 3.2).

The Thijssepark is one of the most famous 'Heemparks,' coined by Broerse in 1946. It is regarded as "an area where wild vegetation is the main object of landscaping" (Woudstra, 1997). Currently, a Heempark is also referred to as a botanical park. The creation of Heempark was historically and designed significantly. It pioneered using wild flora and long-term maintenance to create a wilderness that brings nature into residential and recreational areas.

Design Considerations

The use and exhibition of native wild flora species

The park's designers believe that the purpose of planting design is to preserve the characteristics of the native wild flora community. Local botanists collected and cultivated native wild flora and adequately utilized them in the planning and design by increasing the diversity of native species and quantities appropriately, instead of directly imitating nature. Therefore, the park presents the designer's ideal state of wilderness, meanwhile providing a natural "wilderness museum" for visitors (Kowarik, 2021).

Meticulously managed and maintained ‘natural’ wilderness

Despite presenting visitors with a naturalistic wilderness in urban settings, the daily maintenance of Thijssepark Park is very intensive and meticulous, and is mainly carried out manually. Managers constantly consider which areas need to be taken care of and which areas just need to be left to develop by themselves. This strategy ensures a balance between wildlife growth and human intervention.

Dynamic landscape scenes

The park’s attractiveness is reflected in the landscape’s seasonally changing colors. Walking paths meander through tall trees, dense shrubbery, and herbaceous plant communities to open spaces of varying sizes that combine with sidewalks and ponds to create a natural landscape. The vegetation design in the park is varied, developed through spontaneous seeding and germination, ensuring the vegetation’s non-fixed location.

Roles for urban wilderness

Natural museum for native wildlife

Thijssepark Park encompasses a wealth of native wildlife species. Most visitors come here because they are interested in natural landscapes and spend hours or even a day enjoying the natural wilderness (Figure 3.3). Many birds and insects find a safe and peaceful habitat and food sources in Thijssepark. All the implementations make the park an open-air wilderness museum that fully embraces and exhibits native wildlife.

National monuments protected by legislation

A ‘national monument’ in the Netherlands mainly refers to properties protected under the Dutch Heritage Act due to their universal significance, scientific significance, or cultural-historical value. As one of the most famous ‘Heem Park’, the Thijssepark became a ‘national monument’ in the Netherlands in 2011 due to its excellent natural landscape and wildlife resources (De Rijksdienst voor het Cultureel Erfgoed, 2021).

FIG. 3.3 Landscape and visitors in Thijssepark Park *(Source: https://thijssepark.nl/fotos/)*

Urban eco-park

The park's landscape characteristics, its strategy of using native vegetation, and its rich diversity of species have extended its popularity beyond national borders, attracting nature lovers, photographers, and designers from all over the world. As an intentional urban wilderness, the park provides a shelter for the users to experience the beauty of nature in an urban setting, with aesthetically pleasing sidewalks and open space facilities that take into account the users ' needs. The variety of landscaped spaces within the park also provides a rich experience, and meticulous management and maintenance ensure the usefulness of man-made facilities.

3.3.3 The Eco-Cathedral Project

TABLE 3.3 Site information of case 3

The Eco-Cathedral Project	
Category	Community park-scale
Location	Several locations in the Netherlands, and overseas
Scale	5600 hm^2
Construction time	Since 1983
Current nature/function	Small-scale artificial ecological landscapes

Project background

The 'Eco-Cathedral' Project could be regarded as a workshop for studying the long-term interaction processes between humans and nature (Table 3.3). The first 'Eco-Cathedral' was located on a plot of land in the middle of the Mildam forest. Louis le Roy, an art teacher and ecologist at the time, initiated the project to develop complex ecological structures through the collaboration of nature and creative human interventions, building a vibrant environment and re-establishing the connection between humans and nature (Figure 3.4).

Le Roy's philosophical ecological ideas were developed before the 'Eco-Cathedral.' Initially, he acquired a pilot site in Mildam and began exploring the "Eco-Cathedral" project in 1983. As the project developed, the public became attracted to its vegetation's rich diversity and special structures, and volunteers began to participate (Wu & Zhao, 2008). Le Roy gained an international reputation and is considered the "father of the natural garden concept" in the Netherlands.

FIG. 3.4 the Eco-cathedral in Mildam forest *(Source: https://www.ecokathedraal.nl/)*

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Design Considerations

Utilizing Waste Materials and Tools

Even before the 'Eco-Cathedral' project, Le Roy began using waste materials provided by the park management department from the government, including bricks, pavers, and demolition materials. Le Roy continued this design strategy in the construction of the 'Eco-Cathedral' project. Waste materials and tools such as bricks, tiles, and sand were used to stack, especially in the interstices of urban settings, to create a complex ecological network in which wildlife can develop naturally. Such networks also maintain regional ecosystems, with plants rooting in grooves and crevices and stone piles storing rainwater for long periods, thus contributing to regional stormwater processes (Vollaard, 2001).

Intersperse urban architectural elements with wilderness

The public's first impression of the 'Eco-Cathedral' could be a forgotten patch of urban woodland or a gravel dump left over from road excavations. However, a deeper exploration reveals a different picture: the wilderness, covered with weeds and wild plants, is interspersed with a network of brick-paved paths, which are interspersed with a network of pipes on the site. These architectural elements, hidden amongst the wilderness vegetation, allude to the continuous interaction between nature and culture.

A natural landscape area with educational value

The 'Eco-Cathedral' project is not an ordinary urban community park or pre-designed landscaped space, but a cultural landscape with certain educational value. The cultural elements of the wilderness are not completely forgotten, and the man-made accumulation of waste materials forms a unique spatial structure that reminds people of their connection to the natural process. This process does not possess a so-called "ideal" or "completed" state but develops in an infinite but orderly manner in space and time. As the project's official website declares, 'The Eco-Cathedral is an area where humans, flora, and fauna work together in equal measure, without prior planning. It is a place where nature and culture come together.

Roles for urban areas

Public Art

In 2001, Le Roy and his wife set up the TIME Foundation to continue observing the interaction between humans and nature. The foundation developed projects in Belgium and Paris alongside the Eco-Cathedral project. Some have disappeared, and others are still developing. These projects are free and open to the public but lack manmade facilities, e.g., parking lots.

Naturalized Community Space

At a time when people were more accustomed to clean and sophisticated urban green parks, Leroy's ecological philosophy and the 'Eco-Cathedral' project changed the public's traditional view of urban space and the aesthetics of wilderness space, the design ideas and practices were explored on a television program, and the 'Le Roy-style garden' became familiar to the public, with more community participation in the urban environment, making the 'Eco-Cathedral' project a paradigm for sustainable urban wilderness communities, with outstanding ecological, social, educational, and cultural value.

Urban Interstitial Landscapes

In addition to public projects, there are many private 'Eco-Cathedral' projects where the public built private gardens based on Le Roy's design ideas. In contrast to the surrounding buildings, this interstitial landscape can be useful for regulating the urban microclimate and enhancing the interaction of the inhabitants with nature under limited conditions, where everyone can participate in the project and make a difference. The public participation process within an urban wilderness is strengthened.

3.4 Design Principles of Urban Wilderness Areas

A comprehensive analysis of the three representative urban wilderness projects in the Netherlands reveals that their design elements strongly align with the national-level planning experiences discussed in the previous section, thereby offering concrete validation of those principles. At the same time, differences in project contexts, particularly in spatial scale, location, and social function, have led to the differentiated application of these strategies.

For example, Oostvaardersplassen, as a representation of natural wilderness, owes its perceived wildness to sustained human management. Its planning and design have consistently emphasized a strict separation between human activity zones and ecologically sensitive areas to protect native wildlife habitats. The integration of scientific infrastructure and visitor facilities enhances its value as both an ecological preserve and an educational landscape. However, due to its location on the urban periphery, its design strategy does not focus on incorporating wilderness into dense urban settings, which is unlike smaller-scale urban parks.

In contrast, Thijssepark emphasized a more intimate urban wilderness model by preserving a rich diversity of native wild species within the city fabric. Its ecological design creates a living museum of natural species for urbanites and showcases strategies for fostering perceived wilderness and introducing wild elements in limited urban space. The park's immersive, nature-dominated atmosphere provides visitors with a deep sense of connection to wilderness within the constraints of the urban environment.

Finally, the Eco-Cathedral represents a unique case of community-driven wilderness creation in residential urban interstices. Beyond its experimental approach to long-term ecological succession and minimal intervention, the project functions as a public laboratory for ecological thinking. The designer's philosophy, which centered on time, natural processes, and human humility, has deeply influenced public perception, adding significant educational value to the project. Together, these three cases illustrate the diverse manifestations and applications of urban wilderness principles across scales, contexts, and user expectations (Table 3.4).

TABLE 3.4 Correspondence between the Dutch study case and the national experience

	Perceived wilderness in urban settings	Explicit distributions of diverse functions	Prominent educational values for the public	Wild elements in limit urban space
Case 1	√	√	√	
Case 2	√		√	√
Case 3			√	√

The differences in geographic location, spatial features, planning vision, and target groups across the three cases offer a more nuanced understanding of how urban wilderness can be conceptualized and implemented, extending beyond the general national-level experiences. These variations reveal context-sensitive strategies and highlight the importance of adapting core principles to specific environmental and social conditions. Based on the insights drawn from the Dutch experience, this chapter proposes a set of initial design principles for intentional urban wilderness, as summarized in Table 3.5.

Nevertheless, it is important to acknowledge that interpretations of "wilderness" and "urban wilderness" vary significantly across different cultural, ecological, and urban development contexts. These conceptual divergences reflect localized values, histories, and relationships between humans and nature. As such, spatial planners and designers must engage with international precedents in a critical and dialectical manner, not to replicate models directly, but to extract adaptable insights that resonate with local realities and planning goals.

TABLE 3.5 Design principles of intentional urban wilderness from Dutch practice

Nature First	Intervention Control
Wild Preserve	Public Participant

Nature first

Urban wilderness is inherently dynamic due to continuous interactions with the surrounding urban environment and human activities. Planning and design should align with natural ecological succession, creating conditions that allow wilderness areas to evolve over time. The overarching aim is to ensure that nature remains the dominant force in shaping these landscapes, rather than being subordinated to human control.

Wild preservation

High levels of biodiversity are a defining feature of urban wilderness and must be actively protected. The ecological, educational, and aesthetic values of such landscapes can be enhanced through a combination of active strategies, such as targeted design interventions, ecological programming, species introduction, and passive strategies such as limiting human access or disturbance. These efforts should aim to safeguard wildlife and promote a meaningful connection between people and the living systems around them.

Human Intervention Control

In sensitive areas such as habitats for endangered or rare species, human disturbance should be minimized. This can be achieved through clearly delineated protection zones, ecological buffering, and access control. Preservation measures should prioritize the long-term protection of wilderness resources, ensuring that human presence does not compromise ecological integrity.

Public participant

Inclusive planning and design processes that encourage public engagement are essential for cultivating ecological literacy and cultural acceptance of urban wilderness. By involving communities in both the creative and stewardship aspects of urban wilderness, people can develop a deeper understanding of how to coexist with complex and dynamic natural systems. While the public is accustomed to experiencing well-maintained urban parks, there is a growing appreciation for the raw, unmanicured beauty of wilderness landscapes. This shift supports a more reciprocal and balanced relationship between humans and nature in urban settings.

3.5 Conclusion

The planning and design principles derived from Dutch urban wilderness projects reveal that urban wilderness, although conceptually abstract, manifests in diverse forms across different cultural and spatial contexts. Urban wilderness is not limited to a specific land type, it can also serve as a planning and management approach, an artistic landscape expression, or even an experiential condition perceived by visitors. This conceptual flexibility offers vast potential for future research and practice, where urban wilderness can be interpreted through multiple lenses and implemented in various forms.

Despite these promising directions, several critical issues require further investigation. For example, more attention should be given to how urban wildernesses are planned, designed, and managed throughout their life cycles, from initial construction to long-term stewardship. Moreover, the public's perception and attitudes toward urban wilderness across different cultural settings remain underexplored. Understanding how these perceptions influence, shape, or challenge urban wilderness design strategies is essential for creating more inclusive and resonant landscapes.

Furthermore, as urbanization intensifies and natural resources continue to decline, the conceptual boundaries of "wilderness" will inevitably shift. Future research must consider whether entirely man-made or loosely defined wilderness-like spaces, such as spontaneous vegetation patches, post-industrial ruins, or art-driven ecological experiments, can and should be included within the broader framework of urban wilderness. Doing so would expand the interpretive capacity of the concept in response to evolving urban realities.

Chapter 3 analysed urban wilderness planning and design from a practical aspect, mainly from the perspectives of spatial planners and designers. However, how people perceive and comprehend the intentional urban wilderness areas should also be investigated to develop design principles considering users' demands.

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4 Assessing Urban Wilderness Perceptions from a Landscape Design Perspective

This chapter is based on a published article:
Chen, Y., Nijhuis, S., & van Dorst, M. J. (2024). Visitors' perceptions of urban wilderness. A case study of Jiangyangfan Ecological Park in Hangzhou, China, *Urban Forestry & Urban Greening*, Volume 95, 128319, ISSN 1618-8667

Chapter Four explores how users perceive urban wilderness and to what extent they comprehend this intentionally designed wilderness. A case in China is selected for the site analysis and data collection. Section 4.1 introduces the context of this chapter. Section 4.2 illustrates the methodology of the data collection and analysis process. The study results are presented in section 4.3, and data interpretation and discussion are shown in section 4.4. Finally, the conclusion of this chapter is explained in section 4.5.

Assessing Urban Wilderness Perceptions from a Landscape Perspective

Numerous studies show that human-wilderness interactions can be contradictory, e.g., relaxing while feeling anxious and insecure. How individuals perceive and comprehend intentional urban wilderness, what dimensions contribute to their perceptions, and how these dimensions influence the visitors' perceptions remain to be investigated.

In this chapter, Jiangyangfan Ecological Park (Hangzhou, China), as a survey case, is selected to investigate if and how people perceive intentionally incorporated and designed urban wilderness and how various dimensions of attributes shape their perceptions. Three dimensions are identified that may contribute to visitors' perceptions of the urban wilderness: cognitive landscape attributes, perceived environmental attributes, and their visitation experience. A mixed-method approach is employed using a questionnaire, mental maps, and environmental behavior observation as diverse data sources to assess visitors' urban wilderness perceptions and comprehension from the three dimensions.

Results indicate a high propensity to visit the park as an urban wilderness. The findings also revealed that visitors' perceptual environmental attributes, e.g., the existence of vegetation and waterbodies, and encounters with wild animals. Their visit experiences, e.g., their satisfaction with the visit and their motivation for experiencing nature, significantly influence their perceptions. In contrast, prior knowledge and experience-based cognition of urban wilderness attributes showed no significant influence on their perceptions. Moreover, attributes like plant diversity, water visibility, and plant density emerged as critical factors shaping visitors' perceptions. These findings underscore the importance of considering visitors' on-site perception of environmental attributes and actual visit experience when assessing the value and acceptability of urban wilderness areas. Future implications of this chapter for urban wilderness planning and management were also discussed.

4.1 Introduction

Urban planners and landscape researchers have worked on urban green spaces for centuries, recognizing green as a component of livable, healthy, and aesthetically appealing environments (Ulrich, 1983). Urban wilderness, also known as urban wildscapes (Jorgensen & Keenan, 2011) or urban wildness (Martin & Hill, 2021), is an expanding concept of wilderness as human civilization and urbanization progress. Urban wilderness belongs to a category of green space with many ecological, educational, aesthetic, and social values for urban environments and their residents (e.g., Jorgensen and Tylecote, 2007; Threlfall & Kendal, 2018). Except for the ecological values for urban biodiversity that have been demonstrated in precedent studies (e.g., Threlfall et al., 2016; Kowarik, 2013). There are also enormous studies on the positive influence on human well-being, e.g., their healing effect of wilderness space (Harper et al., 2019), and their benefit for increasing access to urban nature and native wildlife for city dwellers, thus promoting residents' physical and mental health (Botzat et al., 2016a; Kendal et al., 2008).

Existing research also indicates that there are contradictory perceptions regarding the interaction between humans and urban wilderness areas, e.g., visitors claimed to feel calm despite experiencing anxiety and insecurity and viewed wilderness as a potential threat (Jorgensen et al., 2007), which implies the importance of investigating the visitors' perceptions for the specific category of 'designed' urban wilderness.

Some research indicates that environmental perception can be evaluated by different influencing attributes, including external attributes, e.g., spatial features of the environment, and internal attributes, e.g., visitors' experience and motivations (Marques et al., 2020). Lev et al. (2020) examined the relationship between the public's visit experience and the environmental wildness of space, showing that relatively non-intervened natural features positively affected environmental perceptions and enhanced people's visit experiences. Mathey et al. (2018) explored the public's perception and attitude toward the natural environment in different stages of succession, showing various vegetation densities.

Researchers also explored how people's profiles influenced their wilderness perceptions. For instance, Li et al. (2019) examined the residents' ecological and aesthetical perceptions of wild-grown vegetation in urban parks. They discovered that citizens' acceptance and recognition of spontaneous plants may be related to their educational attainment. As Lutz et al. (1999) demonstrated, urban and rural

residents hold differing perceptions and understandings of wilderness. In addition, research has been conducted on the differences in perception between different age groups of urban residents (Jorgensen & Anthopoulou, 2007).

However, limited research discussed the combination of external environmental attributes and internal cognitive attributes, e.g., attitudes based on people's previous visiting experience and on-site experience, and investigated how these attributes contribute to forming visitors' urban wilderness perceptions from a planning and management perspective.

Additionally, from the spatial planning and design perspective, quantitative techniques, e.g., questionnaires and statistical and modeling analysis, are employed to explore wilderness perception. For instance, Kliskey (1994) explored participants' perceptions using multivariate analysis and geographic information systems (GIS) to provide insights for wilderness planning and management, and Tyrväinen et al. (2007) used a postal survey and followed GIS software to evaluate people's attitudes toward green space. Zhang and Tan (2019) proposed that the public's attitude and perceived spatial accessibility prominently influenced their visiting demand after evaluating the relationship between the public's environmental behaviors and their park use via household survey and structural equation modeling (SEM). To understand people's perceptions of the environment, conventional qualitative methods such as semi-structured or focus group interviews and mental maps are commonly conducted in environmental psychology and behavior studies (e.g., Downs and Stea, 1977; Gieseking, 2013).

To inform the planning and design of urban wilderness, knowledge-based design principles need to be identified that are built on the visitors' urban wilderness perception. This implies that a type of research that addresses multiple layers of attributes is needed and can only be effectively explored by mixed methods (Deming & Swaffield, 2011). Nonetheless, this comprehensive research approach is lagging. Only a few researchers have employed mixed methods to explore visitors' perceptions of urban areas. Examples include research on how environments serve as restorative physical and mental well-being spaces. For instance, Grace et al. (2024) conducted mixed methods to explore participants' experiences of the restorative urban blue spaces by collecting solicited diaries. However, the current body of knowledge lacks a comprehensive understanding of the combination of diverse evaluated dimensions regarding visitors' perception of urban wilderness. This, coupled with a relatively homogenous approach to investigating this intricate realm of wilderness perception, may pose challenges to comprehending visitors' perceptions and, subsequently, the effective planning and management of urban wilderness areas.

This chapter 1) investigates how visitors perceive, experience, and interact within the urban wilderness and 2) identifies the key attributes that significantly shape a user's perceptions of an urban wilderness. Therefore, a mixed-methods approach is employed to explore a range of attributes across various levels. The findings are expected to yield insights for the development of planning and design principles and patterns of urban wilderness in the following steps of this PhD project.

4.2 Methodology for Assessing Urban Wilderness Perceptions

4.2.1 Study site conditions

Jiangyangfan Ecological Park (Hangzhou, China) is selected as a case study. Hangzhou represents a high-density urban environment where natural green spaces coexist harmoniously with the urban landscape and its inhabitants. Large amounts of green spaces and ecological parks attract residents and tourists, providing a rich and diverse pool of responses for this chapter. Jiangyangfan Ecological Park, the specific case selected, is considered a representative urban wilderness park in China, located within the West Lake Scenic Area (Cao et al., 2019). The park is the result of a 20-hectare land reclamation initiative (see Figure 4.1). Extensive site investigation informed the park's primary design objective, which is the preservation of a substantial portion of its pristine wildlife, therefore fostering human-nature interactions within an urban context (Wang, Lin, 2011).

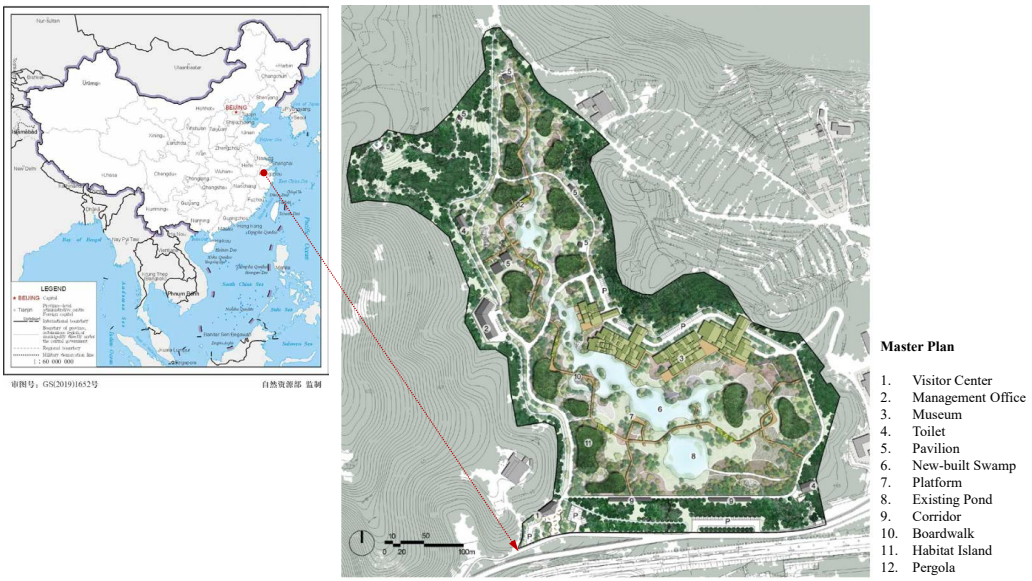

FIG. 4.1 The location and master plan of Jiangyangfan Ecological Park
(Source: adapted from http://bzdt.ch.mnr.gov.cn/ and http://www.atelierdyjg.com/content/details2_176.html)

The Jiangyangfan Wilderness Ecological Park in Hangzhou is an abandoned land renewal program covering 20 ha. It is located east of North Hupao Road and Phenix Mountain Road, south of Hangzhou. Its predecessor was a dumping ground for silt dredging in West Lake. After six years of drying, the seeds of aquatic and terrestrial plants that have slept in the silt of West Lake for hundreds of years have sprouted. Jiangyangfan has become a secondary wetland dominated by weeping willows and wet plants. In 2008, the government turned the old silt reservoir into a new Hangzhou West Lake Ecological Park model in the 21st century. During the renovation, the design team hardly removed a single original ecological plant and kept the original ecological vegetation intact. In the selection of plants for replanting, all native varieties are selected, which are wild and natural, and are integrated with the pioneer vegetation that naturally grows in the silt of the West Lake. It became the first appearance of an urban wilderness area in China.

This renewal program harmonizes human activities with an abandoned wilderness landscape. The site was formed by sludge accumulation during the West Lake Scenic Area construction. The sludge accumulation area has been abandoned for a long time, and many plants have grown to form its ecosystem. After two years of design and construction, the park was finally completed. The park's design fully respected, maintained, adapted, and demonstrated the natural evolution of this secondary

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wilderness (Wang, 2019). It is the first park named after an ecological park in Hangzhou. Since its opening in October 2010, Jiangyangfan Ecological Park has become a recreational place for residents, especially children, to appreciate nature. It is also a perfect educational base for nature observers. Today, the park presents a landscape full of natural vitality and dynamic changes.

4.2.2 Research design

To assess an individual's perceptions of and experience within the urban wilderness, focusing on landscape planning and design, a range of evaluation attributes has been chosen from distinct layers of the designed urban wilderness, namely natural, cultural, and social layers (Figure 4.2).

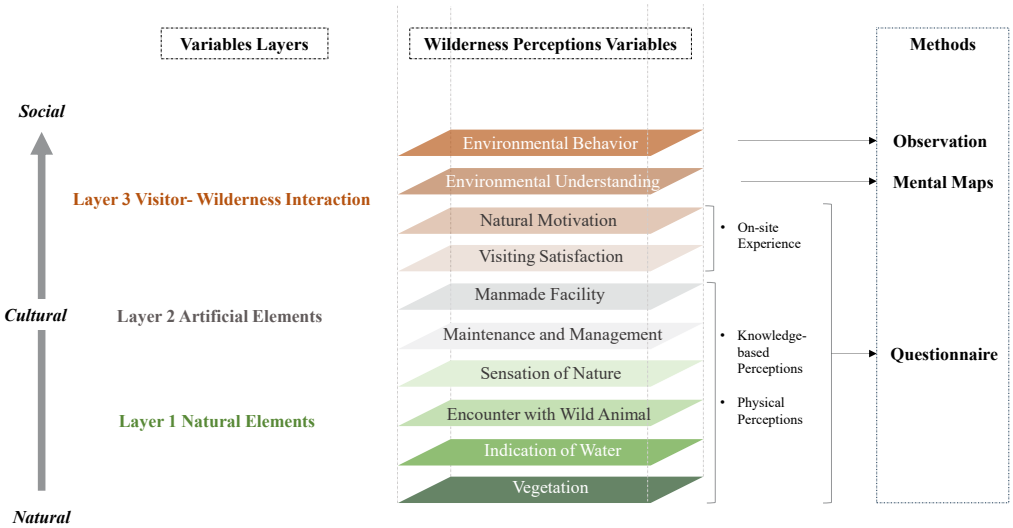

FIG. 4.2 The three layers of evaluation dimensions in investigating visitors' urban wilderness perceptions

According to Grahn (2010), the natural layer in an environment distinguishes the wilderness space from artificial facilities. From the natural layer, this chapter intends to assess how visitors' urban wilderness perceptions are influenced by the existence of fundamental physical elements within the environment, e.g., the vegetation and waterbodies that have been proven to be the most prominent physical attributes that form people's environmental perceptions (e.g., Deng et al., 2020; Yuan et al., 2023),

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and are also the discipline of spatial planning and landscape design frequently adapt to. In addition to the fundamental landscape elements, wilderness areas also possess a range of environmental characteristics that contribute to visitors' environmental perceptions; 'encounter with wild animal' (e.g., Hester et al., 1999; Grahn, 2010) and 'sensation of nature' (e.g., Kaplan & Kaplan, 1990) were selected in the matrix based on precedent studies. The cultural layer encompasses the artificial elements in common landscape spaces that may influence visitors' perceptions and be experienced as the link between natural settings and human interaction. It reveals how people engage with the environment through planning and design interventions, e.g., the landscape facility and the maintenance and management after construction. The uppermost layer pertains to the social dimension in perception assessment, including the interactions between visitors and the urban wilderness, i.e., how people experience, understand, and behave in the environment.

Multiple methods were employed to explore the perception variables within the three layers. As depicted in Figure. 2, the natural and cultural layers were examined using a questionnaire about visitors' perceptions of diverse attributes. These attributes encompass vegetation, the existence of waterbodies, encounters with wildlife, the sensation of nature, maintenance and management, and man-made facilities. The questionnaire not only probed into visitors' current physical perceptions during their visits and their pre-existing knowledge-based perceptions within these natural and cultural attributes but also considered two extra variables from the social layer: visitors' natural motivations and overall satisfaction with the visit. To investigate visitors' understanding of wilderness within the social layer, the study employed mental maps, a conventional research method, to gain insights into environmental understanding (Gould & White, 1986). This approach also allowed participants to recollect and describe their experiences during their site visits. The researcher observed visitors' environmental behavior within the chosen case to eliminate the possibility of subjective or ambiguous feedback from participants and to enhance the validity of other data sources.

4.2.3 Data collection

A comprehensive multi-methods survey was conducted from June to October 2022 to achieve the research objective. Before data collection, the West Lake Scenic Area management committee reviewed and approved the related materials. Notably, the data collection process was conducted anonymously and with the informed consent of all participants.

Questionnaire

Responses to the questionnaire were gathered through an online survey platform, and respondents could access the questionnaire via a QR code or, if they preferred, complete a printed version. The questionnaire began by clearly stating the study's purpose and assuring participants of the privacy and security of their personal information. Participants were only directed to proceed with the questionnaire if they willingly agreed to share their personal data.

Notably, the site survey was conducted in Hangzhou City, China, the participants were Chinese citizens in the selected site, and the questionnaire was designed and conducted in Chinese. Since most visitors, the common public, might not understand the professional definition of urban wilderness, the research team decided to replace the term 'urban wilderness' with 'wild nature in urban settings' in the questionnaire to avoid confusion (see the original Chinese version of the questionnaire in Appendix B-2).

The questionnaire began with a question requiring the respondents to answer to what extent they regard the site as an urban wilderness to evaluate an overview of the respondent's perception of it as an urban wilderness. The rest of the questionnaire predominantly comprised three dimensions: the respondents' perceptions of physical attributes, their cognitions of urban wilderness attributes based on previous experience, and their on-site visit experiences. Each dimension consisted of a range of statements designed to capture an individual's perceptions of various environmental attributes and personal experiences. Respondents were asked to respond using a five-point Likert scale, inviting them to indicate the extent of their agreement or disagreement with the statements, expanding from '1-completely not' to '5-completely yes' (see Appendix B-1).

1 Environmental perception has been defined as the interaction process between people and surrounding environments and how people comprehend it (Ittelson & William, 1973). The physical setting in the environment has been proven to be prominent in influencing people's perceptions (e.g., Tuan, 1990). This chapter included questions to assess visitors' perceptions of the diverse physical environmental attributes of the site as an urban wilderness during their visit, e.g., the vegetation, the waterbodies, encounters with wild animals, the facilities, the sensation of nature, and the management and maintenance of the site (see Questions 2-a to 2-f in Appendix B-1).

2 Distinct from perception, cognition of an environment reflects people's previous knowledge and awareness of the space (Ittelson & William, 1973). To evaluate respondents' cognition and understanding of an urban wilderness based on their previous experience, one question required the respondents to fill in an example of an environment they had previously visited and regarded as an urban wilderness that was distinctive to the study site. This was followed by a series of questions focused on their perception of various landscape elements that contributed to their perceptions of the example they gave, which contained the same categories of landscape elements with physical environmental attributes (see Question 5 and Questions 6-a to 6-f in Appendix B-1).

3 Grahn and Stigsdotter (2010) claimed that people's environmental perceptions may be relevant to their visiting expectations and experiences. The questionnaire also investigated respondents' on-site experience and satisfaction with their visit via related questions.

4 Personal profiles were collected via the questionnaire, including gender, age groups, residence, and whether respondents lived in rural or city areas. Notably, the investigation of individual perceptions of different groups of the public was not the main focus of this site survey; some residents regarded individual backgrounds such as income and educational level as sensitive during the random interviews during the study. Therefore, the questionnaire did not include the respondents' socioeconomic status, e.g., annual income, and educational level.

Furthermore, the questionnaire also includes questions to investigate, for example, what environmental attribute the respondent regarded as the most influential one contributing to their urban wilderness perceptions, whether the respondents were first-time visitors or not, whether the respondent had a professional interest experience in natural parks, the purpose of the respondents' visit, and the activities they engaged in, to learn more details about respondents' visiting experience in the site.

Mental maps

Mental maps, also called cognitive maps, have been recognized as valuable tools for assessing an individual's comprehension and the material imagery they hold of their environment (Gould & White, 1986). To investigate participants' understanding and subjective reflections on the environment, mental maps were employed as supplementary data sources to augment the findings obtained through other research methods.

The recruitment of participants was conducted on the site. Visitors aged between 10 and 65, able to draw by memory, and already or almost finished with their visit were invited to join the map drawing. During the study, participants were requested to sketch their visit experience on A4-sized sheets of paper based on their recollections and impressions, with no specific time constraints imposed, including their walking routes and the most remarkable landmarks or elements encountered during their visit.

All participants finished their drawings on the site after or during their visit, ensuring a fresh and concise memory. The mental maps were collected at three nodes in the park: the main entrance, the corridor, and the central pavilion, where visitors commonly gather and rest during or after their visit.

Behavioural observations

The researcher performed behavioral observations using a non-participate approach to avoid disturbing the visitors' activities. By investigating the site's layout and states, three nodes with the highest visitor concentrations, encompassing the central pavilion, the southern corridor, and the lotus pond, were chosen as study locations.

Observations of the visitors' environmental behaviors in these locations were carried out on distinct dates and at diverse periods. An observing protocol (see Appendix B-3) was employed during the study process, which included both descriptive and reflective notes, respectively documenting visitor behavior (also including information, e.g., the weather, the location, activities, and the exact observing period) and the observer's interpretation of the interaction between visitors and their surroundings, including assessment of whether the environment and facilities supported or hindered the behaviors.

4.2.4 Data analysis

During the analysis of the questionnaire responses, a reliability test was conducted on the perception questions in the three dimensions: physical environmental attributes, knowledge-based cognitive attributes, and the participants' on-site experience. The test used a five-point Likert scale (Questions 2-a to 2-f, Questions 6-a to 6-f, Question 7 and Question 8 in Appendix B-1), which yielded a Cronbach's α value of 0.898, exceeding the threshold of 0.7, indicating a high level of internal consistency among the designed questions in assessing participants' urban wilderness perceptions (see Appendix B-5),. Furthermore, the KMO (Kaiser-

Meyer-Olkin) and Bartlett's test of the perception questions in the three dimensions showed a KMO value of 0.864 and a significant value of <.001(see Appendix B- 5). These results suggest a strong correlation among the questions used across various dimensions, thus supporting the feasibility of conducting a factor analysis in the following steps.

A correlation analysis explored the relationships between the three assessed dimensions and participants' perceptual rankings of the site as an urban wilderness. Subsequently, we conducted ordinal logistic regression using IBM SPSS Statistics 29 (IBM corporation, Somers, New York, USA) to model the relationship between the three factors output from the factor analysis and participants' perceptual rankings of the site as an urban wilderness.

The sketching responses from the participants during mental maps were coded by the analytic matrix proposed by Gieseking (2013), which was influenced by Lynch's classic study (1960). Table 4.1 displays the analytic techniques and components of mental maps, which include four categories for tracing trends in research findings. Considering this survey's main objective and focus scale, some analytic elements were excluded from the original matrix. Besides, according to Stea (1969b) and Ittelson & William (1973), people's drawings of locations and paths could also indicate their environmental perception. This is why the relevant analytic elements were considered in this chapter.

As shown in Table 1, the mechanics of the method (MOM) include nine analytics that reveal participants' understanding of spatial reality and their response to sketching. The drawing element (DE) consists of six analytics demonstrating how participants drew the core elements and how the maps are expected to appear and convey information. The narratives of place (NOP) include eleven analytics that reveal how the physical elements in space influence participants' understanding. The personalization (P) component consists of two analytics indicators of the participants' significant individual experience. The respondents' sketches were coded and analyzed through the four analytics categories to investigate the visitors' understandings and experiences on the site.

TABLE 4.1 Analytical categories of mental maps

Category	Analytic
MOM	Drawing sequence; Count of drawn items; Text labelling; Map elements about one another; Drawing anxiety; Drawing skills; Enjoyed mapping process; Used the entire paper; Mirror the physical space
DE	Centre; Borders; Symbols; Legend; Shapes; Included elements at various scales
NOP	Built environment elements; Physical environment elements; Districts; Edges; Nodes; Landmarks; Paths and roads; Personal paths; Went to and from space often; Discuss emotions through physical space; Remembering intimate spatial details
P	First-drawn element; Last-drawn element

Note: MOM = mechanics of method; DE = drawing element; NOP = narratives of place; P = personalization

(Source: adapted from Gieseking, 2013)

According to Marques et al. (2020), people's behaviors indicate their interactions with their surroundings and how they perceive them. Therefore, in this chapter, observation records were combined with the feedback from the questionnaire and mental maps. The various data sets will be compared and used to complement each other by checking the consistency between participants' behavior patterns in various locations, the impressive experience shown in mental maps, and responses to the questions related to participants' experiences and conducted activities in the questionnaire.

4.3 Results of the Case Study

4.3.1 Descriptive results from the questionnaire

The online questionnaire registered 262 subjects, 13 of whom did not complete all questions or provided ambiguous responses. Thus, 249 (95.0%) participants had complete, accurate data for further analysis. Table 4.2 shows the frequency of demographic variables of the participants.

TABLE 4.2 Frequency of demographic variables in the questionnaire (N=249)

Variables	Options	Frequency	Percent
Age groups	<18	14	5.6%
	18-35	112	45.0%
	36-50	89	35.7%
	51-65	26	10.4%
	>65	8	3.2%
Gender	Female	142	57.0%
	Male	103	41.4%
	Prefer not to tell	4	1.6%
Residence	Hangzhou/local	223	89.6%
	Non-local	26	10.4%
City or countryside	City	232	93.2%
	Countryside	17	6.8%
First-time visitor or not	Not first time	125	50.2%
	First-time visitor	124	49.8%

When participants were asked about the extent to which they perceive the site as an urban wilderness, using a Likert scale ranging from 'completely not' (1) to 'completely yes' (5), the mean score for all responses averaged 3.96, indicating that the vast majority of participants perceived the site as an urban wilderness with 'completely agree' (15.3%) or 'mostly agree' (71.5%) (see Question 1 in Appendix B-1). Among all the physical environmental attributes that contribute to forming participants' perceptions of the site as an urban wilderness, 'vegetation' was regarded as the most prominent attribute, with a mean score of 3.38 (see Question 2 in Appendix B-1). More specifically, for the characteristics that contributed to forming visitors' urban wilderness perception, the density and variety of species of vegetation were the most prominent chosen ones. Besides, water quality was also considered significant according to the responses (see Question 4 in Appendix B-1). For the respondents' previous experience and cognition of urban wilderness, responses showed that 'vegetation' was also reported as the most influential environmental attribute, with a mean score of 3.96 (see Question 6 in Appendix B-1).

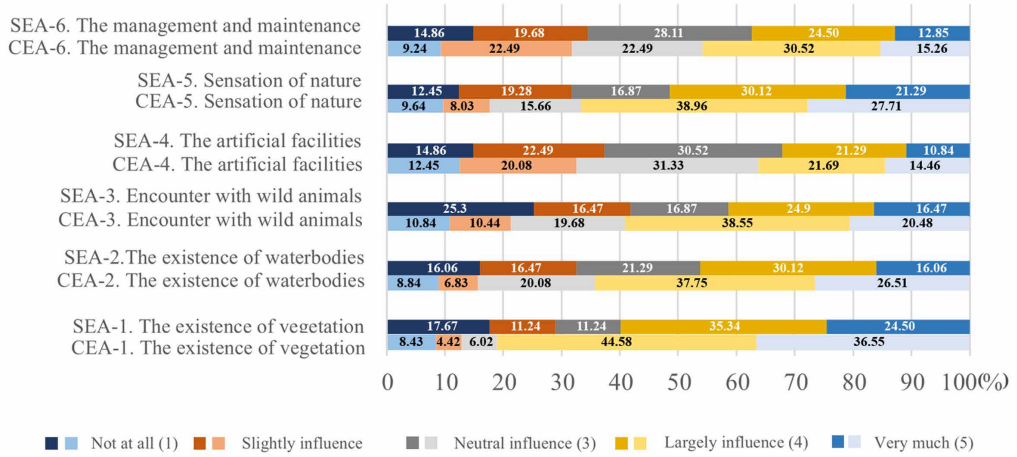

FIG. 4.3 Comparative responses to the extent to which urban wilderness perception is influenced by physical perceptual attributes and experience-based cognitive attributes (Question 2 and Question 6 in Appendix B-1)

Figure. 4.3 illustrates the distinct contributions to urban wilderness perceptions from cognitive environment attributes (CEA) and site physical environmental attributes (SEA). The natural layer, encompassing attributes such as the existence of vegetation, waterbodies, encounters with wild animals, and the sensation of nature, emerges as the most influential environmental attribute. Positive responses (score ≥4) dominate both the SEA and CEA dimensions, with the CEA dimension displaying significantly more positive responses for the perceived impact of vegetation in the urban wilderness (81.13% compared to 59.84% in the SEA dimension). Similar trends are observed for other natural attributes, with the CEA dimension consistently yielding more positive responses than the SEA dimension.

In contrast, the cultural layer, which includes artificial facilities, management, and maintenance, predominantly elicits neutral and negative responses (score ≤ 3) regarding their contribution to participants' urban wilderness perceptions. Notably, there is no significant difference in the number of responses across scores for these cultural environmental attributes between the SEA and CEA dimensions.

Furthermore, respondents' experiences in an urban wilderness were also shown in their willingness to revisit the site, with 'mostly agree' (37.4%) and 'completely agree' (28.1%) being the predominant responses (see Question 8 in Appendix B-1). 50.2% of the respondents were not first-time visitors (see Question 9 in Appendix B-1), and despite over half of them expressing 'no particular interests' (48.6%) or being 'not sure' (19.3%) about ecological parks and stating

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a lack of general comprehension of the specific type of urban wilderness park (see Question 10 in Appendix B-1), the majority of visitors perceived and comprehended the nature and characteristics of the urban wilderness.

The most common motivations to visit the site, as claimed by the respondents, were 'to get close to and experience the wild nature,' 'to spend leisure time with families,' and 'to enjoy the beautiful natural landscape.' The respondents' most common activities during their visits were 'hiking,' 'taking a walk,' and 'wildlife observing and bird watching.' When asked what facilities they expect on the site, the respondents regarded 'cabin for bird watching,' 'pavilions,' and 'lounge seats' as the most relevant. The most preferred path material by the respondents was 'unpaved landscape path' (37.85%), followed by 'part with marble/wood or other soft materials' (35.46%) and 'path well-accessible' (26.69%). Importantly, 32.13% of the respondents claimed they 'relax in a natural environment within an urban city' as their most meaningful experience on the site. At the same time, 'get close to the wildlife' and 'find and enjoy different natural scenery' came in a close second at 21.29% and 19.28%, respectively (see Questions 11 to 15 in Appendix B-1).

4.3.2 Correlation and Regression Analyses

To further build the correlation between urban wilderness perceptions (UWP) and diverse influential factors, including cognitive environment attributes (CEA), site environmental attributes (SEA), and visiting experience (VE), we conducted a two-step analysis consisting of correlation and regression analysis.

Pearson correlation tests found no significant correlation between CEA and UWP. Meanwhile, significant positive correlations between UWP and SEA, between SEA and CEA, between SEA and VE, between VE and UWP, and between CEA and VE were found, see Table 4.3.

TABLE 4.3 Pearson correlation tests between participants' urban wilderness perception, their cognitive environmental attributes, physical attributes of the site, and their visiting experience

Variables	UWP	SEA	CEA	VE
UWP	1			
SEA	.201**	1		
CEA	0.097	.524**	1	
VE	.230**	.256**	.254**	1

*** Correlation is significant at the 0.01 level (2-tailed).*
UWP=urban wilderness perception; SEA=site environmental attributes; CEA=cognitive environment attributes (based on previous experience); VE=visiting experience

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A factor analysis on the perception questions in the three dimensions was performed, and the rotated factor matrix showed consistency between the output factors and the initially designed factors (see Appendix B-6). The table below shows that the physical site environmental attributes (SEA) exhibit strong loadings on Factor 1. The cognitive environment attributes (CEA) are substantially loaded on Factor 2. And the visiting experience attributes (VE) load significantly on Factor 3. The factor loading value of all attributes is higher than 0.6, indicating the effectiveness of the attributes to represent correspondent factors. The results also indicate that Factor 1 contributes the most to the total variance, followed by Factor 2 and 3. Cumulatively, the three factors explain 66.909% of the total variance. The result indicates that the perception questions and factors exhibit sufficient structural validity (Table 4.4).

TABLE 4.4 Rotated Factor Matrixa

	Factor		
	1	2	3
SEA1. The existence of vegetation	0.842		
SEA2. The existence of water bodies	0.850		
SEA3. Encounter with the wild animal	0.794		
SEA4. Artificial Facilities	0.643		
SEA5. Sensation of nature	0.844		
SEA6. Management and maintenance	0.645		
CEA1. The existence of vegetation		0.747	
CEA2. The existence of water bodies		0.746	
CEA3. Encounter with the wild animal		0.673	
CEA4. Artificial facility		0.803	
CEA5. Sensation of nature		0.808	
CEA6. Management and maintenance		0.806	
VE1. Importance of natural experience when visiting parks			0.730
VE2. Visiting experience (willingness to revisit)			0.802
Initial Eigenvalues	6.185	1.919	1.263
% of Variance	28.592	27.538	10.779
Cumulative %	66.909		

Extraction Method: Principal Factors Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

The model performance evaluation indicates the reliability of using the SEA, CEA, and VE variables in the regression model to predict the UWP p (significance value of < 0.001). The test of parallel lines showed a significant value of $0.089 > 0.05$, which indicated that all significant variables passed the assumption of proportional odds (see Appendix B-7).

TABLE 4.5 Parameter Estimates of the ordinal regression tests

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	UWP = 1	-5.765	1.002	33.100	1	0.000	-7.729	-3.801
	UWP = 2	-2.945	0.279	111.361	1	0.000	-3.492	-2.398
	UWP = 3	-2.038	0.202	101.719	1	0.000	-2.434	-1.642
	UWP = 4	1.869	0.188	98.577	1	0.000	1.500	2.238
Location	SEA	0.446	0.145	9.477	1	0.002	0.162	0.729
	CEA	0.057	0.138	0.174	1	0.677	-0.212	0.327
	VE	0.536	0.143	14.049	1	0.000	0.256	0.816

Link function: Logit.

As shown in Table 4.5, both SEA and VE showed a statistically significant impact on UWP, whereas CEA presented no statistically significant. Furthermore, VE showed a more substantial positive impact on UWP than SEA. The results implied that perceptions of urban wilderness environmental attributes and visiting experiences strongly, substantially, and positively impact participants' perception of the site as an urban wilderness rather than those environmental attributes based on visitors' previous experience.

4.3.3 Visitors' Mental Maps Sketching

Approximately 50 respondents were asked to participate in mental maps; 40 (80.0%) agreed to sketch and leave valid maps for analysis (examples shown in Figure 4.5; for all the maps, see Appendix B-4). Among the participants, 9 (22.5%) of the participants visited the site by themselves, 5 (12.5%) in couples, 17 (42.5%) with their families, and 9 (22.5%) with their acquaintances. The most popular location on the site, where 25 (62.5%) of the participants completed their sketches, was the park's central pavilion. 9 (22.5%) of the participants drew in the corridor at the southern entrance, while 6 (15.0%) sketched in random locations while visiting (Figure. 4.4).

According to the analytic matrix adapted from Gieseking (2013), specific information was abstracted from participants' sketches in categories of MOM (mechanics of method), DE (drawing element), NOP (narratives of place), and P (personalization).

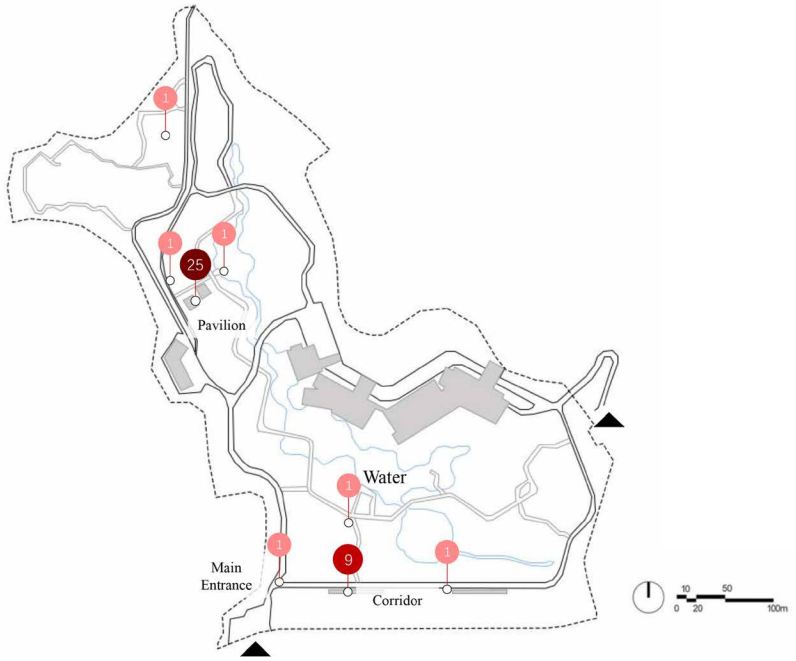

FIG. 4.4 Distribution of participants' locations when sketching mental maps
Note: Different shades of red circle indicate the number of maps drawn at the corresponding location; the darker the color, the more maps there are. The number on the circles indicates the exact frequency of maps

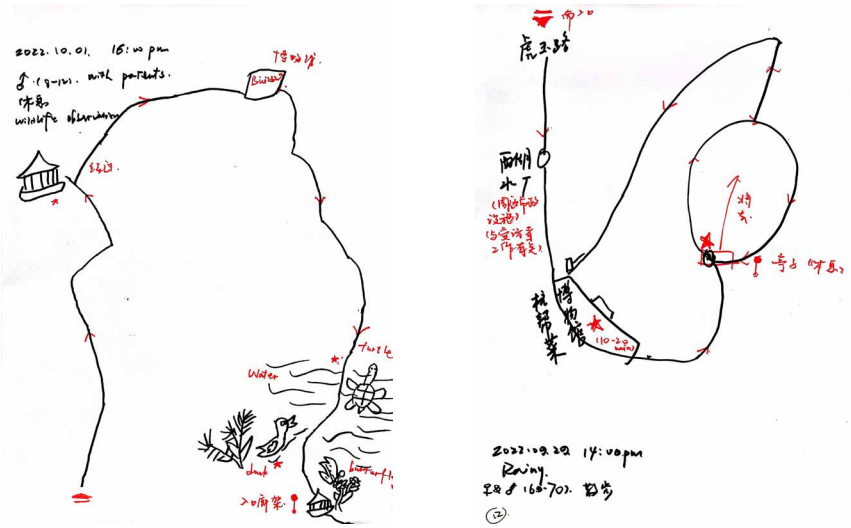

FIG. 4.5 Examples of mental maps sketched by participants
Note: The content in red was added as extra information by the researcher according to the participants' explanation

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Participants' MOM (mechanics of method) revealed several common patterns during sketching. Among the forty mental maps sketched, the most prevalent sketching sequence and method involved starting with the entrance, visiting routes, and adding nodes or landmarks that participants deemed significant or remarkable. On average, each map possessed approximately 6–7 drawing items (precisely 6.65), indicating the wealth of information provided by the participants. Notably, the researcher added the majority of text labelling on these maps, as participants generally preferred to convey information orally while sketching. Interestingly, many participants found the mapping procedure enjoyable to recall their visit experiences, while several displayed nervousness and anxiety while sketching. Furthermore, the majority of them did not exhibit exceptional sketching abilities. Several participants only utilized a small portion of the paper to sketch fragments rather than the entire park, indicating that mirroring the physical space of the site could be difficult for most participants.

The sketching details showed DE (drawing element) features of participants. Most participants sketched without a 'center' in their maps, and some marked pavilions or buildings as prominent elements. Participants rarely outlined the border of the entire site, but some drew the waterbody and edge of surrounding mountains from memory. During sketching, participants used symbols and legends, demonstrating their comprehension of various elements. Most participants drew elements with regular shapes, such as circles or rectangles. Several participants replicated the shapes of the elements based on their observations. Most participants sketched various environmental elements using the same scale. However, a few preferred to use distinct scales to denote the relative importance of the elements.

Participants' NOP (narrative of place) analytic modes could be extracted from their maps. All forty participants sketched elements of the built and physical environments. However, for the majority of them, built elements were more prevalent. Most participants divided their maps into districts and depicted the boundaries between districts. The park's most frequently drawn nodes and landmarks were the central pavilion, buildings, corridors near the southern entrance, lakes, and lotus ponds, where participants always congregate. Nearly all participants drew their visiting paths and routes, but only a few mentioned the park's overall transportation system, including roads and paths. Several participants indicated their locations before entering or revealed information about the site's connectivity with its surroundings. Some participants discussed their sentiments or impressions of the spaces they visited. Some participants also mentioned intimate spatial details while experiencing particular emotions or personal sentiments in a particular space, e.g., nervousness or insecurity.

The maps revealed distinct patterns, revealing the P (personalization) analytic elements. Most participants initiated their sketching by drawing their routes, often starting with the southern entrance. After illustrating their routes or roads, some participants added other elements to indicate a clear site layout. In some cases, participants marked their next destination by marking it with the last-drawn elements.

4.3.4 Behavioural observation

Our study's three designated observation sites afford visitors an optimal vantage point to appreciate the urban wilderness scenery, complemented by well-designed artificial amenities catering to visitor needs. The central pavilion emerged as a focal point, offering shelter from sun exposure and rain, with lush vegetation enhancing the experience for visitors. Wooden tables and benches facilitate diverse activities such as rest, chatting, picnics, natural education, and playing instruments. The southern corridor, adjacent to the main entrance, features wooden benches and shelter spaces for visitors' respite. The lotus pond, our third observation site, centrally positioned near the pavilion, lacks dedicated resting facilities but offers an unobstructed view of lotus blooming and wetland scenery, complemented by a wooden platform and natural educational board.

During the study process, 573 visitors were observed. They conducted 999 activities, 363 of which (63.4%) participated in more than one activity (Figure. 4.6). Table 5 displays the statistical composition of observed activities, and various activities were divided into three categories: social activities, natural activities, and those in between (Table 6).

Social activities were the most frequently performed category, with 'resting or eating' as the most frequent, followed by 'chatting' and 'having fun,' while 'reading or working' was the least frequent in this category. In the category of natural activities, 'bird watching' was the rarest one, which was also observed as the most minor activity in all categories. The number of visitors who participated in 'natural education' accounted for a large proportion of this category and the total activity. As shown in Table 6, in the category of activities in between, 'picnicking' was the most popular activity, 'walking' was the second most popular activity in the category of intermediate activities, and 'taking photos' appeared to be the least popular.

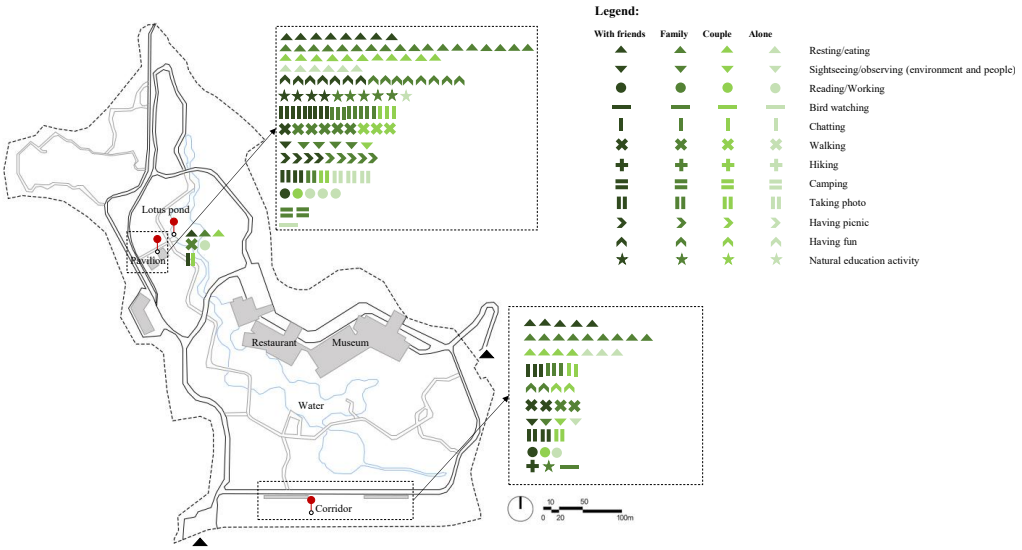

FIG. 4.6 Behaviour mapping of different visitor groups

Table 4.6 also displays the distinctions between different visitor groups. The observed visitors were grouped into four categories according to the number of people in each group, including ‘alone,’ ‘couple,’ ‘family,’ and ‘with friend or other. The table shows that solo visitors engaged in the fewest activities, accounting for only 1.5%. Individuals who visited the park with friends or others engaged in the largest number of activities, accounting for 65.3%. 26.6% of the observed activities were conducted by visitors in the park with families. Approximately 6.6% of all activities were performed when individuals visited the park in couples.

In addition, Table 4.6 reveals that visitors who visited the park alone and in couples engaged in 50% and 58.3% of the total types of activities. In contrast, visitors who visited with their families and friends or others engaged in 83.3% of the activities.

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TABLE 4.6 Composition of visitors' activities

		Alone	Couple	Family	Friend/Other	Total	Percentage
Social Activities	Resting/ eating	3	32	100	49	184	18.4%
	Reading/ working	6	6	-	8	20	2.0%
	Chatting	-	10	31	65	106	10.6%
	Having fun	-	2	40	58	100	10.0%
Natural Activities	Sightseeing/ observing	1	2	15	2	20	2.0%
	Bird watching	1	-	3	-	4	0.4%
	Hiking	-	-	-	17	17	1.7%
	Camping	-	-	15	-	15	1.5%
	Natural education	1	-	14	216	231	23.1%
Activities in Between	Taking photo	3	8	3	15	29	2.9%
	Walking	-	6	22	21	49	4.9%
	Picnicking	-	-	23	201	224	22.4%
Total		15	66	266	652	-	
Percentage		1.5%	6.6%	26.6%	65.3%		

4.4 Discussion

This chapter primarily investigated three issues utilizing a combination of a questionnaire, mental mapping, and environmental observation as supplementary data sources. First, it explored how individuals perceive urban wilderness areas that were intentionally designed. Second, this chapter investigated how their visiting experience and environmental attributes contribute to their perceptions. Finally, the study delved into how visitors comprehend and interact within an urban wilderness.

Significantly, the findings uncovered that visitors' perceptual environmental attributes and their actual visiting experience correlated with visitors' perception of an urban wilderness and strongly impacted the level of urban wilderness perception. In contrast, cognitive environmental attributes showed a weaker correlation and less influence on visitors' urban wilderness perception. These findings provide valuable insights for future planning and management of urban wilderness.

4.4.1 How visitors perceive and comprehend intentional urban wilderness area

The findings revealed that wilderness in high-density cities is widely comprehended and appreciated by most participants. While previous research has shown that city residents tend to harbor negative emotions, such as fear and insecurity, when encountering desolate wilderness (Jorgensen et al., 2007), urban wilderness with adequate human intervention, as a selected case in this chapter, could offer users a sense of security. Consequently, this type of urban wilderness is generally well-perceived and easily understood by users, echoing findings from precedent research. For example, E.P. Zefferman et al. (2018) conducted a public survey in the United States to evaluate the public's attitude toward Knoxville's urban wilderness, and participants' responses showed their appreciation for the wild nature in urban settings. Our work extends these precedent studies by assessing the public's perceptions and preferences toward diverse environmental attributes in an urban wilderness. Moreover, prior research has discussed the potential differences in environmental aesthetics between professionals and non-professionals (e.g., Gobster, 2010). Nevertheless, our questionnaire responses showed that most participants were not interested in natural knowledge and ecological parks. Despite the lack of interest, most respondents exhibited a positive experience during their visit to the site, perceiving it as an urban wilderness space.

Text labelling on the mental maps provided insights into the participants' level of familiarity with the routes and spatial layout of the site. Additionally, observation records indicated that most visitors' behaviors and activities aligned with the site's design intent. For example, natural education, picnicking, and resting/eating appeared to be the most common behaviors of visitors during observation, demonstrating the compatibility between visitors' demands and the shelter and resting facilities provided by the environment. These findings indicate the participants' profound comprehension of urban wilderness's ecological values, restoration, and recreation benefits. Furthermore, many visitors showed exploratory tendencies during their visit, conducting activities such as climbing the mountain on the site, insect observation, and bird-watching. These observations echo Kaplan and Kaplan's (2005) contention that the legibility and mystery variables in the environmental preference matrix.

How participants sketched their maps, and the sequence in which they drew elements, revealed how they understood the physical settings in an urban wilderness. The vegetation and waterbodies in the site were the most prominent or impressive natural elements or nodes depicted by the participants, which aligned with the questionnaire response. This finding is also supported by numerous previous studies. For example, Yuan et al. (2023) found that large waterbodies were critical when assessing

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participants' audio-visual experience and preference in 360° videos of landscape environments. According to Liang et al. (2023), the water biotope was the most preferred among different biotopes in urban green spaces. The restorative benefits of water and plants for visitors' perception were assessed by Deng et al.(2020) using physiological and psychological indicators. A study in Guyana indicated that visitors regarded spaces with a higher proportion of vegetation and waterbodies as more natural, showing more restorative and well-being benefits (Fisher et al., 2021).

The results highlight a pronounced interest in the site's wildlife, including insects, birds, and reed beds, as depicted in numerous mental maps. Correspondingly, questionnaire responses underscored a prevalent motivation for visiting the site, namely, the desire to 'get close to wild nature in an urban setting'. During environmental observation, natural education emerged as the predominant visitor activity. These findings revealed the distinctive ecological significance of urban wilderness spaces, setting them apart from conventional urban parks. This aligns with Yuan et al.'s (2023) study, which emphasizes the pivotal role of the natural environment sensation, e.g., the sound of insects and birds, in shaping visitors' landscape preferences.

4.4.2 What contributes to perceptions of urban wilderness

Environmental cognition is a knowledge-based component. Its multiple attributes have been associated with environmental awareness, perception, and aesthetics disciplines. This chapter revealed that visitors' previous cognition attributes of urban wilderness environments do not necessarily influence visitors' on-site perceptions of urban wilderness, while strong associations were found between visitors' urban wilderness perception and their on-site perceived attributes and actual experiences.

Compared to the knowledge-based cognitive attributes, the on-site experience of environmental attributes appeared more influential. The better people experience the environment, the higher their perceptions of the site as an urban wilderness. The diversity of plant groups and density of vegetation as environmental attributes showed a significant effect on urban wilderness perceptions, echoing Grahn's (1991) assertion that a wide variety of species in a limited landscape space profoundly impacts visitors' preferences, and Mathey et al.'s (2018) contention that the density of vegetation in different succession periods significantly influenced visitors' perceptions and aesthetics. Furthermore, the study revealed the importance of water quality in shaping perceptions of urban wilderness.

The questionnaire responses and mental maps revealed the vital role that natural elements and the unique traits of wilderness play in shaping people's comprehension and perception of the overall atmosphere of an urban wilderness. Natural elements tend to be more integrated into the visitor's impression of the environmental experience and wilderness ambiance than distinctly remembered and recognized as landmarks. In contrast, human-made elements stand out more straightforwardly and prominently.

According to the mapping results, the most frequently mentioned elements included artificial facilities and structures, such as a set of large buildings depicted in the site layout (see Figure 4.1). However, different responses and attitudes were found in the questionnaire. When participants were asked about the various environmental attributes that form their urban wilderness perception, 'facility' emerged as the least chosen element. This finding implies the invisibility and unimportance of facilities when urban green spaces are perceived as urban wilderness, whereas they become more prominent and relevant when urban wilderness serves as urban green spaces.

4.4.3 Implications for urban wilderness planning and management

It has been proven that intentionally planned and designed urban wilderness parks positively impact the urban environment and its dwellers from an ecological (e.g., Jorgensen and Tylecote, 2007; E.P. Zefferman et al., 2018), social, and economic (e.g., Welch et al., 2022) point of view. The landscape and urban planning field faces both opportunities and challenges in operationalizing the concept of urban wilderness in the urban planning and design context. Simultaneously, the environment of an urban wilderness is constantly changing, so feedback and suggestions from a wide range of stakeholders, including users, on how to enhance the environment should not be disregarded after the construction phase. It is thus essential to incorporate visitors' perceptions and preferences into the planning process, thereby providing practical strategies for designing urban wilderness from users' perspectives.

Our findings imply that urban planners and landscape architects should preserve more wilderness and design it in an urban setting to fulfill the public's growing appreciation and demand for natural environments. Additionally, it was proved in our study that the allocation and characteristics of specific physical environmental attributes significantly contribute to the perception of visitors to the urban wilderness, e.g., the diversity and density of vegetation and the waterbodies, as well as adequate maintenance and management. So, strong emphasis could be placed on considering these physical attributes during the planning and design process to create an authentic "wild atmosphere" and visitor experience. Importantly, native

species preservation and plant design, especially regarding species diversity, relatively higher vegetation density compared to ordinary urban parks, and the provision of high-quality waterbodies should receive adequate attention from spatial planners and designers.

Besides, this chapter aids in determining how urban wilderness is distinct from other urban green places in terms of visitors' comprehension and on-site experience, highlighting how the environmental features affect and support users' on-site behavior. In an intentionally planned and designed wilderness landscape in urban settings, one of the concerns was how to preserve the wilderness quality while avoiding the potentially negative experience in the primary wilderness through design action. From the results of our study, natural education proved to be the most common activity visitors employed, and facilities for wildlife observing and bird watching appeared to be the most expected facility in the questionnaire responses, even though related facilities were relatively scarce on the site. This implies that during the planning and design of an urban wilderness, an appropriate proportion of artificial facilities and buildings are essential for providing spaces and support for visitors' demands. The results of the mental maps also revealed that large complexes of buildings may leave visitors with a strong impression or are perceived as spatial landmarks but do not significantly contribute to urban wilderness perception. Therefore, the number of artificial facilities and building mass in the urban wilderness must be carefully controlled, creating an adequate nature-culture balance that enhances the visitors' urban wilderness experience and allows urban residents to get close to nature in urbanization.

4.4.4 Limitations

It was difficult to comprehensively interpret people's subjective perceptions and interactions with the environment from the landscape planning and design perspective. This chapter provided a mixed-method analysis of users' environmental perception and comprehension of intentional urban wilderness from diverse dimensions of landscape environmental attributes. However, although multi-dimensions have been considered, selecting a specific case rather than conducting a universal study using multiple cases might cause insufficient data and bias in this chapter. Therefore, one possible limitation would be selecting a single case from a specific cultural context. Furthermore, the multi-methods approach should recruit the same group of participants to join in both the questionnaire, mental maps, and observation to improve the reliability and solidity of the result. The research should consider the different seasons and other environmental factors that could affect the

number and perception of visitors. Besides, the experimental site is located in the non-central area of the West Lake Scenic, and its entrance is not located on the main road of the city, which leads to the relative lack of accessibility of the selected case compared to other parks in West Lake. Therefore, many visitors from other cities may not choose to visit Jiangyangfan Ecological Park, resulting in most participants being locals and nearby residents. This could lead to an insufficient sample size for accurate and reliable data collection. Although the forty mental maps can capture considerable information regarding participants' perceptions and awareness of urban wilderness landscape spaces, additional mental maps are required to ascertain the results. The current sample size is restricted without further differentiating participants' profiles (e.g., income, social status.), and the maps are drawn in unevenly distributed locations. Increasing the size and bias of participant sampling is necessary to obtain more comprehensive and meaningful data in future studies.

Besides, how participants drew their maps is closely tied to their backgrounds, such as occupation, age, and gender. For instance, one participant observed the drainage system of a park, as his occupation involved managing public water systems. On the other hand, some younger participants focused more on a lower line of sight of the landscape or more microscopic aspects when viewing the scenery. When children were invited to draw their mental maps, they drew details such as the wild animals and vegetation they had observed. Most individual participants conveyed more space-related details and information on their maps than those who visited the park with others. These findings provided insights for future steps to investigate the urban wilderness perception in different groups of people with different profiles.

Furthermore, even though the results indicate a great willingness to experience and admire the urban wilderness, the attributes that most contribute to visitors' perceptions show limited distinctions between the characteristics of common urban green spaces, e.g., vegetation density and species diversity or the visibility of waterbodies, and wilderness-related environmental attributes such as encounters with wildlife and the sensation of nature which have been proven as beneficial for people's perceptions in precedent research (e.g., Grahn and Stigsdotter, 2010), the latter showed a relatively lower impact on visitors' perceptions when compared to the physical elements in our study. This finding may be due to the city-center location and the medium-scale of the selected case, which limit the wild atmosphere visitors could experience and might, therefore, make the wilderness-related attributes less prominent than common environmental attributes. Consequently, an investigation of the differences in visitors' urban wilderness perceptions of urban wilderness spaces versus common urban green spaces is lacking. Therefore, valuable studies exploring the uniqueness of urban wilderness perception are essential in future research.

4.5 Conclusion

In the rapid development of urbanization, preserving the pristine nature in urban settings and conducting planning and design processes to balance the ecological succession of the space and the public's demand within it is increasingly challenging. This chapter selected a high-density Asian city as the case. It validated how residents perceive and understand natural wilderness spaces in urban centers and how they interact with the environment. Numerous studies have previously examined the diverse values of urban wilderness (e.g., Cao et al., 2019). In the selected case, despite its limited accessibility compared to other urban parks in Hangzhou, the park's high ecological value contributed to attracting urban residents longing for natural experiences. Apart from groups of nature enthusiasts and children, the selected site, as an urban wilderness, was planned and designed to include a wide range of other target groups.

This chapter demonstrated that most users perceived and comprehended the nature and distinctive characteristics of urban wilderness environments. They also exhibited a strong willingness to revisit the site despite lacking a general understanding of the specific categories of urban wilderness parks. While previous research has found that the general public might harbor negative emotions such as fear and insecurity towards pristine wilderness areas (e.g., Jorgensen & Tylecote, 2007), this chapter has revealed that urban wilderness environments with sufficient and adequate human intervention can offer a sense of relaxation and are consequently well-accepted and understood by users.

Moreover, the public's previous visit experience and environmental awareness were important, as claimed by existing studies (e.g., Ittelson & William, 1973; Kowarik, 2018), but the on-site perception of surroundings and their experience tended to pose a more substantial impact on their urban wilderness perceptions, according to our findings. Among the various environmental attributes that influence the visitors, the vegetation, and more specifically the richness and density of the species, shows the most prominent impact on shaping visitors' perceptions. These findings align with previous research and indicate the significant influence of environmental attributes and actual experience on people's environmental perception and the non-negligible role of plants as a crucial component of environmental attributes and landscape elements in shaping users' spatial perception and experience.

Notably, this chapter proposed a novel approach by combining different layers of attributes to assess an individual's environmental perception from a landscape planning and design perspective, namely natural, cultural, and social layers. Simultaneously, a mixed-method approach was employed throughout the study to gather comprehensive data, thoroughly exploring participants' perceptions and understanding of an urban wilderness.

Significant insights for planners and designers were provided in the findings, highlighting the importance of preserving the rare wilderness space in the limited urban space through adequate planning and design and incorporating visitors' perceptions and preferences into the planning process, thereby providing practical strategies for designing urban wilderness from users' perspectives. This approach lets the public fully perceive and experience the intrinsic value of intentionally designed urban wilderness areas. According to our findings, the physical environmental attributes and characteristics, such as dense vegetation, high-quality waterbodies, and opportunities to encounter wild animals, should be provided in an urban wilderness. Besides, planning and design must include an appropriate proportion of artificial facilities and management to support visitors' demands, even though large artificial buildings should be adequately controlled to maintain a balanced natural-cultural atmosphere. In this process, urban wilderness is a category of green space within urban settings and a tranquil oasis distinct from the bustling urban surroundings.

This chapter explores how visitors perceive and understand intentional urban wilderness and provides some environmental indicators contributing to their perception and preference. However, further exploration is needed to translate the knowledge from the studies into planning and design instruments.

5 Developing Urban Wilderness Design Patterns

Chapter Five illustrates the process of developing the design patterns from the knowledge contributions in previous chapters, mainly through inductive reasoning and content analysis. Section 5.1 introduces the purpose of this chapter and provides an overview of the chapter. Section 5.2 describes the methods used during the process of identifying, refining, and categorizing the design patterns based on previous evidence. Section 5.3 presents the urban wilderness planning and design patterns in three dimensions. Section 5.4 reflects on the chapter from discussion and conclusion.

5.1 Introduction

There is always order in disorder. For urban planners and designers, the search for this order is a guiding force, which helps them synthesize knowledge and propose context-sensitive solutions in complex environments. The design principles recognized in previous chapters, grounded in multiple data sources, serve as foundational but broad guidelines for urban planning and design. In contrast, design patterns are more actionable, they translate these abstract principles into specific, operational strategies that practitioners can adapt across diverse real-world situations.

Unlike research and surveys, which may follow linear processes and produce neatly bounded outcomes, spatial planning and design are characterized by diversity, complexity, and perpetual uncertainty. Every site displays unique spatial qualities, not only in physical form but also in social and cultural context. Stakeholders bring distinct perspectives, and both environmental elements and user groups are in flux, creating unpredictable variables that resist standardization. Therefore, universal, rigidly standardized principles for universal cases cannot suffice. Instead, the task is to extract shared qualities and recurring actions from accumulated experience, formulating adaptable principles that retain flexibility for case-by-case application.

Achieving alignment among diverse stakeholders at various stages of the planning and design process is a significant challenge. Effective collaboration requires clear communication and interdisciplinary expertise, emphasizing the necessity of translating theoretical insights into practical, accessible language. This ‘translation’ bridges theory and practice, ensuring the usability and applicability of design tools for practitioners in relevant disciplines, ensuring that design tools are both usable and relevant for all involved parties, and enhancing the efficacy of urban wilderness design.

Therefore, a coherent and pragmatic ‘language’ is essential to simplify and systematize the application of complex principles and to facilitate communication across disciplinary boundaries. Such a language serves two vital purposes: 1) it provides practitioners with an intuitive toolkit for design, and 2) it fosters mutual understanding among stakeholders, supporting shared objectives and visions for urban wilderness spaces.

Patterns are ever-present in our physical surroundings, in human-environment interactions, and in the fabric of society itself. They reflect environmental qualities that users perceive and interpret, filtered through their backgrounds and experiences (Bell, 2012). However, these perceptions vary, and what is evident to one observer may be invisible to another.

Pattern language, as advanced by Alexander et al. (1977), offers a proven framework for extracting, categorizing, and validating environmental patterns, connecting research and design in a way that bridges abstraction and practice. This method has gained wide adoption in architectural and planning contexts, supporting adaptable solutions for a range of design scenarios (Zhang et al., 2025).

Evidence-based planning and design strategies further enrich this process by incorporating insights from diverse stakeholders and methodologies, empowering planners and designers to select and adapt patterns for specific challenges. As demonstrated in this thesis, design principles were recognized through literature, case studies, and empirical research, then synthesized and transformed into patterns through iterative reflection.

This translation is not mechanical but involves interpreting, combining, and sometimes reconciling conflicting evidence or stakeholder priorities. For instance, while ease of access may be valued in one context, ecological protection may require restricted access in another. Such contrasts illustrate the diversity and multidimensional nature of design patterns. Consequently, in developing the design patterns in this chapter, we categorized them into multiple dimensions to facilitate future practitioners in selecting patterns that align precisely with the objectives and dimensions of planning and design considerations.

To conclude, this chapter traces the development of urban wilderness design patterns from the identification of foundational principles, through their refinement and synthesis, to the articulation of a pattern language that is both evidence-based and practice-oriented. to form the arguments contributing to developing design patterns. These patterns, therefore, are supported by diverse evidence, highlighting the significance of evidence. By engaging with multiple sources and perspectives, this approach seeks to minimize subjective biases, enhance validity, and provide practitioners with a robust set of adaptable tools for urban wilderness design.

5.2 Methodology: From Evidence to Patterns

To systematically develop urban wilderness planning and design patterns, this study employs a two-step research methodology (Figure 5.1). First, diverse sources of knowledge were gathered and analysed, spanning literature, precedent studies, empirical surveys, and expert interviews, to inductively generate a comprehensive set of design principles. Second, these principles were critically examined, synthesized, and recast as specific design patterns, organized for practical use.

FIG. 5.1 Translation of urban wilderness design patterns from prior knowledge

5.2.1 Inductive reasoning

Inductive reasoning underpins this process. Unlike deductive reasoning, which proceeds top-down from general theories, inductive reasoning builds from the particular to the general (Arthur, 1994; Polkowski, 2011). Patterns are thus extracted from specific empirical observations and practical experiences, ensuring that each pattern is grounded in real-world evidence.

This approach is especially appropriate for exploratory and descriptive research, where new theories or universal phenomena emerge from detailed, context-rich data. For example, in Forester's (1999) book *The Deliberative Practitioner: Encouraging Participatory Planning Processes*, inductive reasoning was used to understand the complexities of participatory planning processes and provides insights into the role of deliberation and communication in shaping planning outcomes. This approach begins with detailed descriptions and evidence, then builds to broader interpretations, and aptly shows the characteristics of exploratory research.

For this PhD study, data were collected from a wide array of sources to ensure that the resulting principles reflected both established knowledge and on-the-ground realities. Pattern recognition thus required a rigorous, bottom-up methodology that interprets and aggregates discrete findings into generalizable patterns that can inform future practice.

5.2.2 Content analysis

Content analysis was employed to systematically process and synthesize the qualitative and quantitative data gathered (Neuendorf, 2017). In this PhD thesis, the design patterns development process involved multiple stages, including data preparation, presentation, identification of key information, coding of recurring themes, thematic categorization, and the integration of diverse findings to ensure objectivity of the study evidence.

Given the complexity and overlap among identified principles, content analysis provided a structured approach for reorganizing and reconciling related ideas, extracting them into coherent patterns. Notably, some principles crossed multiple thematic boundaries, reflecting the fluid, interconnected nature of real urban wilderness contexts. In response, recurring themes were grouped, overlaps were identified and merged, and unique features were flagged for potential innovation in pattern development.

While chapter 4 refers to three core dimensions, including natural, cultural, and social, for classifying environmental attributes, this pattern-developing process takes a critical stance, rather than treating these as rigid, exclusive categories, they are reframed as lenses to provide dynamic perspectives through which to interpret, combine, and adapt patterns according to context. The natural lens foregrounds ecological processes and biodiversity features, the cultural lens highlights human-environment interaction and meaning, and the social lens attends to user needs, equity, and safety. This approach aligns more closely with the complexities encountered in actual planning and design practice.

5.2.3 Pattern Language

Pattern language serves as the methodological bridge between principle and practice. Principles, extracted from knowledge and experience, cannot always be directly applied to every unique site. Through the process of abstraction and synthesis by drawing on case studies, precedent research, and stakeholder engagement, these principles are transformed into patterns, which are actionable strategies that retain adaptability for diverse, evolving situations (Nijhuis & de Vries, 2020).

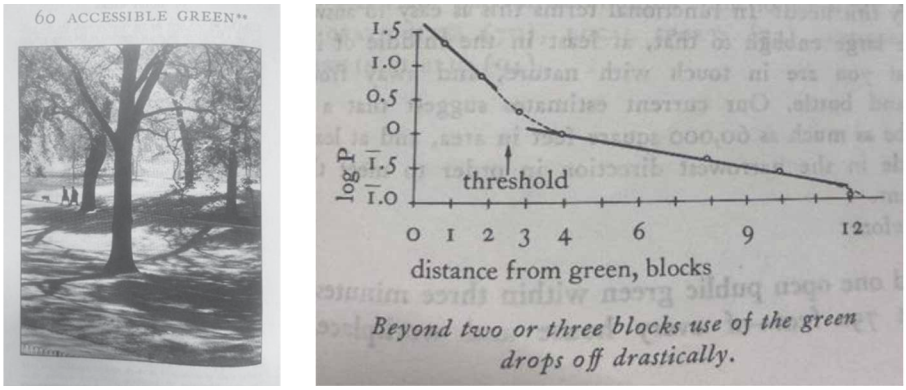

FIG. 5.2 Pattern of 'Accessible Green' from the book Pattern Language
(Source: Alexander et al., 1977)

Pattern language, articulated by Alexander et al. (1977), is a way of identifying and communicating recurrent solutions to spatial challenges, making abstract qualities tangible. Examples such as 'Accessible Green' or water-oriented urban development patterns (Figure 5.2), demonstrating how this methodology operationalizes complex insights for practical use (Alexander, 1977).

The pattern language research method addresses the inherent complexity of spatial planning and multifaceted spatial issues in different contexts, offering structured solutions (Rooij & van Dorst, 2020). This study approach constructs a logical system that functions as the language for planning and design and translates abstract ideas into concrete spatial configuration (Deming & Swaffield, 2011). Moreover, pattern language has enriched numerous disciplines by providing detailed, practical guidance for architecture, urban planning, and landscape design. In summary, pattern language could guide urban wilderness design by aligning with the spaces' character, user needs, and planning objectives, facilitating effective communication between researchers and planners (Rooij & van Dorst, 2020).

The pattern language research method addresses the inherent complexity of spatial planning and multifaceted spatial issues in different contexts, offering structured solutions (Rooij & van Dorst, 2020). This study approach constructs a logical system that functions as the language for planning and design and translates abstract ideas into concrete spatial configuration (Deming & Swaffield, 2011). Moreover, pattern language has enriched numerous disciplines by providing detailed, practical guidance for architecture, urban planning, and landscape design. In summary, pattern language could guide urban wilderness design by aligning with the spaces' character, user needs, and planning objectives, facilitating effective communication between researchers and planners (Rooij & van Dorst, 2020).

In this PhD project, pattern language was applied as both an analytic and communicative tool, enabling the extraction and organization of patterns from a wide evidence base. The identified design patterns, viewed through the lenses of nature, culture, and society, encompass the rich diversity of environmental elements and human perceptions found in urban wilderness, offering practitioners a flexible and nuanced toolkit for design and collaboration.

5.3 Extraction of Design Principles and Induction of Design Patterns

The extraction of design principles and their transformation into actionable design patterns from the core methodological bridge in this process. It is essential to clarify that the relationship between principles and patterns is not a one-to-one or linear correspondence. Instead, the translation from principle to pattern is inherently interpretive and context-sensitive, responding to both the complexity of urban wilderness and the diversity of stakeholder needs. This extraction process unfolds through several stages, including synthesis across multiple evidence sources, thematic coding and comparison, and interpretive bridging using lenses, and pattern formulation through iterative synthesis.

Table 5.1 summarizes the key urban wilderness design principles identified independently from previous chapters, drawing on theoretical literature, precedent studies, case studies, and a diverse set of empirical investigations. These principles capture the broad range of ecological, cultural, and social characteristics valued in urban wilderness. The table also clarifies the research methods supporting each principle, demonstrating the core approach used in this study, which is multi-source and evidence-based.

TABLE 5.1 The design principles of urban wilderness based on previous evidence

	Research Methods	Design Principles
Theory Base	**Literature Review**	Landscape complexity and homogenization Various land use Understandable visit routes Sense of security Exploratory environment Vegetation density Human facility ratio
	Precedent Studies	Provide large open spaces 'Big nature' like old-growth trees in the environment Varied habitats Relatively unmanaged land High levels of biodiversity Expansive vistas Experience of solitude and remoteness
Practical Experience	**Case Studies**	Nature first Native species are preserved and exhibited to the public Human intervention control Public participant in the planning, design, and management process

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TABLE 5.1 The design principles of urban wilderness based on previous evidence

	Research Methods		Design Principles
Empirical Study	**Empirical Survey**	Questionnaire	Considerable vegetation variety and density The planting form should be diverse and in a wild style Large degree of shade in the site Overgrown/naturally grown vegetation Changeable terrain Forest Reeds bed by the water Great waterscape and open view Good water quality The existence of animals The existence of birds Fresh air provided by the environment Fewer visitors compared to other urban parks Quite environments Sense of security Surrounding mountains Natural education activities An overall 'wild' quality Insecurity/sense of danger and anxiety Less human facility Less management and maintenance Delicate maintenance in some spaces Absence of janitor/manager Less neat and tidy landscape Desolate character
		Mental maps	The lower temperature in summer Wild zone without facilities Prominent landmark Guide signposts Shelter spaces Different transportation ways Walking routes (unpaved/partly with natural material) Nature observing facilities (e.g., bird-watching cabin) Coherent with surrounding space
		Behavioral observation	Family activities (camping/picnicking) A place to read and work for solid visitors Recreational and resting facilities Drink and eat provided Supporting facilities/buildings
		Expert interview	Less human intervention after construction Remain areas distinct from human Less accessibility Eliminate potential danger Valuable native elements/characters preserved Educate through design (with facilities provided) Facilities to support natural experience

Recognizing the overlapping and sometimes competing nature of these extracted principles, content analysis is used to code and group recurring concepts. This step highlights both consistencies and divergences, e.g., the recurring tension between accessibility and protection, which also represents user convenience and ecological integrity, respectively. The design patterns are extracted from clusters of relevant principles, informed by both the weight of evidence and practical relevance. Some principles, such as "vegetation density" or "native species first," give rise to multiple patterns depending on context and stakeholder goals. Conversely, certain patterns are the synthesis of several principles converging on a shared challenge, e.g., balancing solitude atmosphere with environmental safety.

Rather than assigning each principle to a rigid 'dimension', the synthesis is approached through three interrelated lenses. The natural lens focuses on ecological processes, biodiversity features, and environmental integrity. The cultural lens addresses human-environmental interactions, cultural values, and the provision of supportive facilities. The social lens emphasizes the users' demands, social dynamics, safety, and inclusiveness. These lenses are intentionally flexible and overlapping, acknowledging that many patterns will intersect and that their application in practice must be context-oriented. Ultimately, 24 specific urban wilderness planning and design patterns were summarized according to the three lenses (Figure 5.3 and Table 5.2).

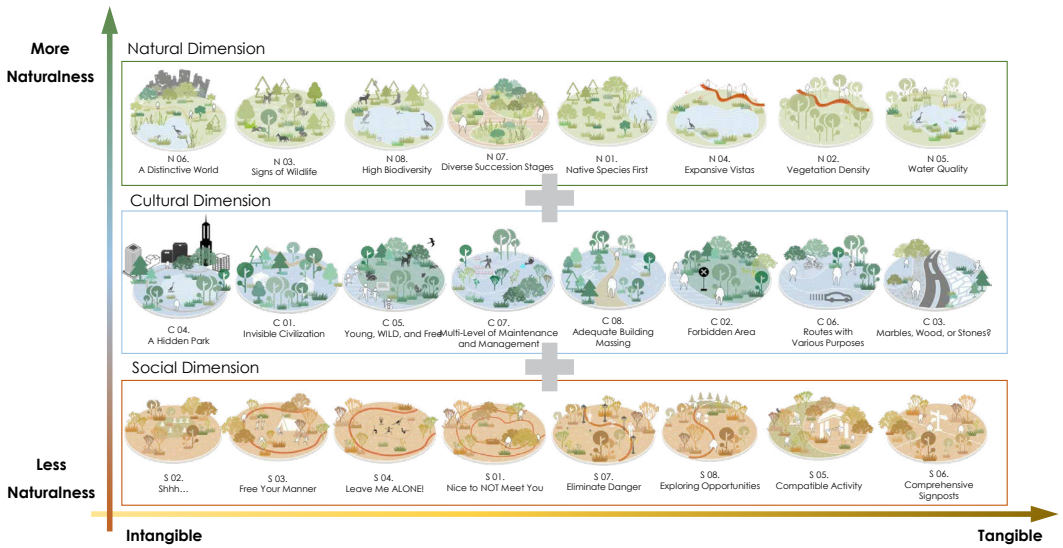

FIG. 5.3 An overview of the urban wilderness design patterns from three lenses

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TABLE 5.2 Urban wilderness design patterns in three dimensions derived from principles

	Design principles	Design patterns	Theoretical backup sources		
			Literature review	Case study	Empirical study
Natural Dimension	Nature first Valuable native elements/characters preserved Native species are preserved and exhibited to the public Human intervention control	N01. Native Species First		√	√
	Forest vegetation density The lower temperature at the site Large degree of shade in the site	N02. Vegetation Density	√	√	√
	The existence of wild animals 'Big nature' like old-growth trees in the environment Overgrown/naturally grown vegetation The planting form should be diverse and in a wild style	N03. Signs of Wildlife	√	√	√
	Great waterscape and open view Expansive vistas Provide large open spaces	N04. Expansive Vistas	√		√
	Good water quality Reeds bed by the water	N05. Water Quality			√
	Fresh air provided by the environments Less neat and tidy landscape The lower temperature in summer Wild zone without human facility Surrounding mountains Changeable terrain	N06. A Distinctive World	√		√
	Varied habitats Various land use Landscape complexity, and homogenization	N07. Diverse Succession Stages	√		
	High levels of biodiversity The existence of birds Considerable vegetation variety and density	N08. High Biodiversity	√	√	√

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TABLE 5.2 Urban wilderness design patterns in three dimensions derived from principles

	Design principles	Design patterns	Theoretical backup sources		
			Literature review	Case study	Empirical study
Cultural Dimension	Human facility ratio Less management and maintenance	C 01. Invisible Civilization	√	√	√
	An overall 'wild' quality Relatively unmanaged land	C 02. Forbidden Area		√	√
	Walking routes (unpaved/partly with natural material)	C 03. Marbles, Wood, or Stones?		√	√
	Less accessibility	C 04. A Hidden Park	√	√	
	Natural education activities Educate through design (with relevant facilities provided)	C 05. Young, WILD, and Free		√	√
	Understandable visit routes Different transportation ways	C 06. Routes with Various Purposes		√	
	Absence of janitor/manager Delicate maintenance in some spaces Prominent landmark	C 07. Multi-Level Maintenance and Management		√	√
	Less human facility Human intervention control	C 08. Adequate Building Massing	√	√	√

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To ensure clarity and usability, each pattern in the urban wilderness pattern booklet is articulated through seven essential components, namely the title, a short explanation, a provisional applied scenario, evidence backup, practical implications, related patterns, and a three-lens positioning (Figure 5.4).

- **Title:** Provides the name of the pattern
- **Short explanation:** The core proposition of the pattern
- **Provisional applied scenario:** Offers a visual scene to help readers envision the pattern in context
- **Evidence Backup:** Grounds the pattern in previous evidence
- **Practical Implications:** Details practical considerations for implementing the pattern in the design process
- **Related Patterns:** Lists other patterns that are conceptually or practically connected
- **Three-lens Positioning:** Visualizes the pattern's positioning within a three-dimensional framework that illustrates its interactions or balances with other patterns

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TABLE 5.2 Urban wilderness design patterns in three dimensions derived from principles

	Design principles	Design patterns	Theoretical backup sources		
			Literature review	Case study	Empirical study
Social Dimension	Fewer visitors compared to other urban parks Remaining areas distinct from human	S 01. Nice to NOT meet you		√	√
	Desolate character Less human intervention after construction Quite environments	S 02. Shhh…	√		√
	Family activities (camping/picnicking)	S 03. Free Your Manner		√	√
	A place to read and work for solid visitors Experience of solitude and remoteness	S 04. Leave me ALONE			√
	Nature observing/experiencing facilities Facilities to support natural experience Supporting facilities/buildings Recreational and resting facilities Drink and eat provided	S 05. Compatible Activity	√	√	√
	Guide signposts	S 06. Comprehensive Signposts		√	√
	Eliminate potential danger Sense of security Shelter spaces Insecurity/sense of danger and anxiety	S 07. Eliminate Danger	√		√
	Exploratory environment Public participation in the planning, design, and management process	S 08. Exploring Opportunities		√	√

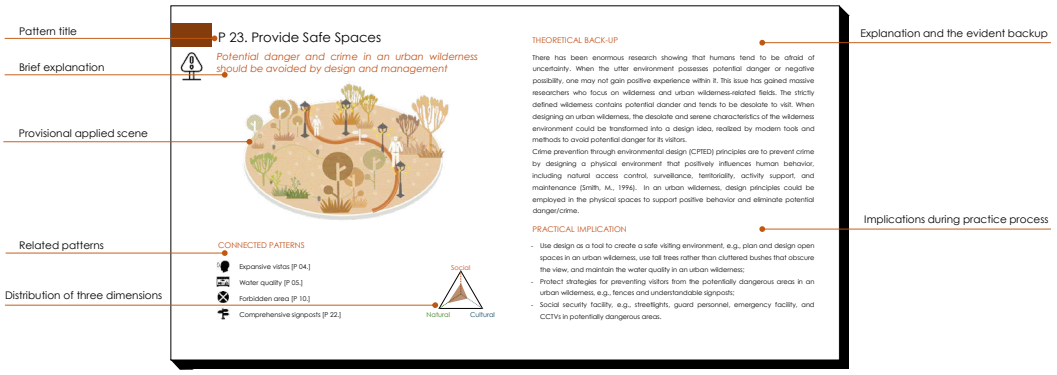

FIG. 5.4 Urban wilderness design patterns in the natural lens

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5.3.1 The natural lens

The natural lens foregrounds ecological integrity and the primacy of non-human life in urban wilderness design from an ecocentrism perspective. It includes what qualities should be maintained, how to enhance the natural features, and what landscape elements should be incorporated to present a sense of wildness in urban settings. Relevant patterns prioritize native biodiversity, minimal human intervention, and the preservation of wildlife, such as 'Native Species First', 'Signs of Wildlife'. These are derived from principles such as "vegetation density" and "nature first," interpreted through both evidence and practice. Importantly, the application of these patterns is not isolated, they interact with cultural and social considerations and also require context-oriented adaptation.

Figure 5.5 presents the eight patterns in the natural lens in a simplified format. This section provides an example to clarify the layout and detailed content of these patterns in the booklet, focusing on pattern N 03, titled 'Signs of Wildlife.'

FIG. 5.5 Urban wilderness design patterns in the natural lens

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Pattern N 03. emphasizes the wild character of urban wilderness by prioritizing spaces where native wildlife can thrive. It synthesizes empirical findings, e.g., user appreciation for encounters with wildlife, literature on habitat conservation, and expert interviews. Specifically, It has been proven that visitors' perception of landscapes is often connected to their encounters with various species (Grahn & Stigsdotter, 2010). The wild features of an urban area signify pristine wilderness for visitors. From the site survey in this research, participants' motivations and most impressive experiences in an urban wilderness include getting close to wild nature and observing wild species such as birds and insects on the site. These reveal the importance of the signs of wildlife in an urban wilderness in contributing to visitors' perceptions and preferences. Also, during the interview with the design leader of the park, the wildlife habitat was preserved and presented to the public through landscape design, which became a crucial attraction for visitors, especially nature lovers and children. The relevant application involves protecting habitats, designing buffer zones, and leveraging these features for environmental education.

The pattern card also indicates the connection between this pattern and others. For instance, the detailed action of pattern P 03 may include actions to distance the visitors from native species and animals. The distinction between public and wild space within an urban wilderness should be indicated through design actions (P 06. A Distinctive World). Besides, the wild quality of animals and native vegetation could be a nice knowledge source for natural education, as proposed by P 13. Young, WILD, and Free (see Appendix A).

During practical planning and design, designers should fully use native wild species and not disturb native wildlife habitats. Protect the wildlife's habitat through landscape planning and design. Visitors should be prohibited from entering during spatial planning and design to protect rare species' habitats.

5.3.2 The cultural lens

The cultural lens emphasizes the interaction between humans and their environments and the expression of collective meaning through design, considering how design can reflect cultural values, historical context, and social identity, making urban wilderness areas ecologically valuable, providing users with convenience and cultural services, and enabling urban residents to develop a sense of belonging to the environment. By incorporating different implementations, such as clarifying the places for human activities, distinguishing them from the wildlife domain, and providing supportive facilities, these patterns promote users' participation and experience, improve the

inclusiveness of urban wilderness, and create urban wilderness spaces that reflect both natural and social qualities. Relevant patterns include ‘Forbidden Area’, which emerges from principles advocating both wildness and controlled access, reflecting evidence that excessive visitation can undermine ecological and experiential quality.

Figure 5.6 shows the eight patterns in the cultural lens. To illustrate the pattern details, an example of pattern C 02, titled ‘Forbidden Area,’ is selected.

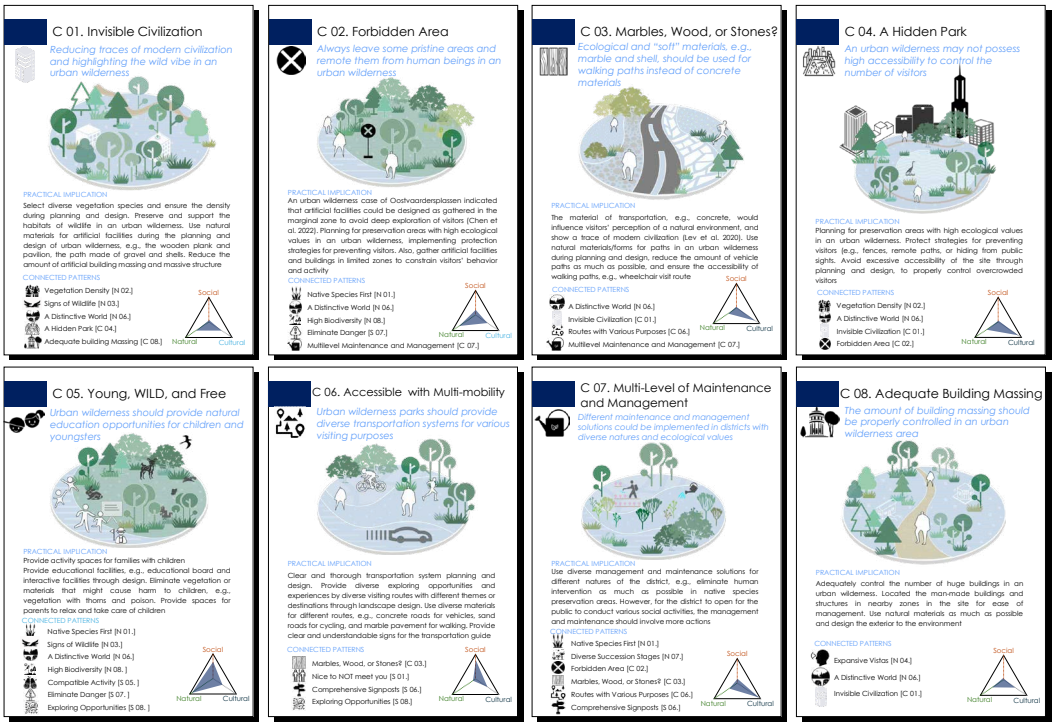

FIG. 5.6 Urban wilderness design patterns in the cultural lens

There has been enormous research and practice showing the adverse effects of many visitors on the natural environment. In an urban wilderness, the number of visitors and the visit zone should be constrained to ensure the quiet and pristine nature of the wild environment and its ecological value. An urban wilderness case of Oostvaardersplassen in the Netherlands indicated that artificial facilities, e.g., walking paths and buildings, could be designed as gathered in the marginal zone of the site to avoid deep exploration of visitors (Chen et al., 2022). Several eco-islands were planned in the survey site, Jiangyangfan Ecological in Hangzhou City, where the

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survey was conducted, to protect the pristine wildlife on the site. They built stainless fences to prevent visitors from entering. Drawing on the case study and empirical surveys, patterns from the cultural lens offer strategies for restricting access to sensitive areas using spatial design, signage, and facility placement to balance user engagement with conservation imperatives.

5.3.3 The social lens

Distinguish from the nature lens, where design patterns prioritizes wildlife and biodiversity, and the cultural lens, which emphasizes human-environment interactions, the social lens focuses on the social activity that the environment provides to meet the users' demands by creating spaces that promote social engagement in an urban wilderness area while ensuring security, legibility, and inclusivity. This lens is mainly anthropocentric, regarding urban wilderness functions for social cohesion, supporting users' experiences and interactions with other visitors and themselves.

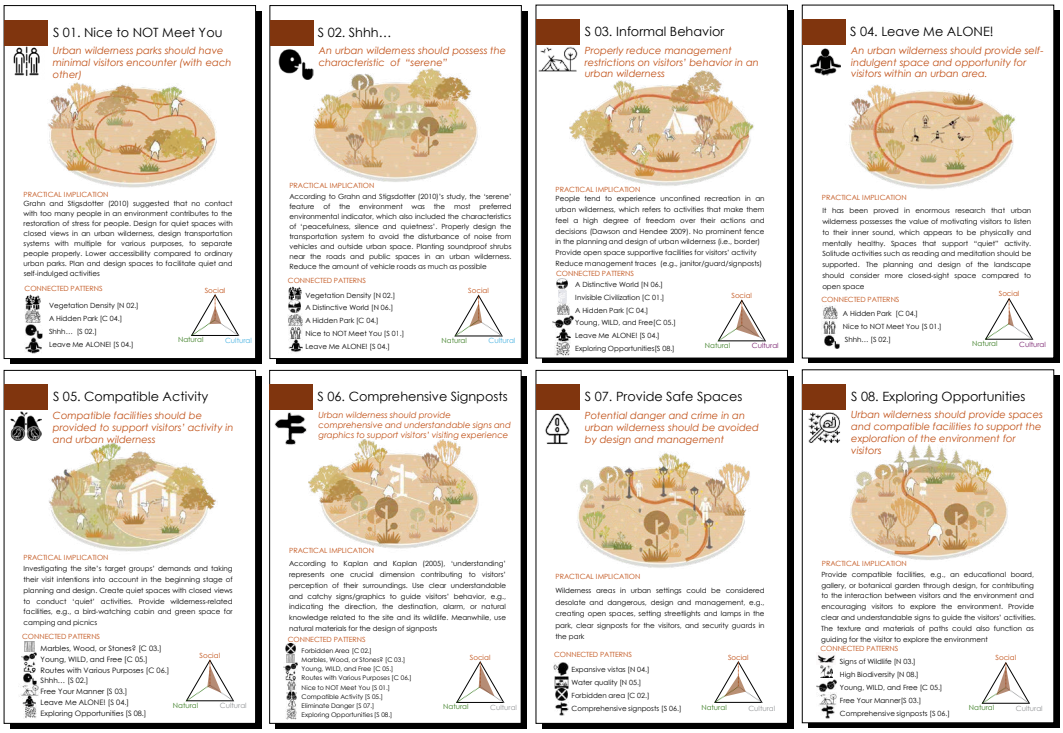

FIG. 5.7 Urban wilderness design patterns in the social lens

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Figure 5.7 shows the eight patterns in the social lens. Among these patterns, S 07. 'Provide Safe Spaces' presents an example of a wilderness design pattern in the social lens, which emphasizes safety and comfort into actionable design moves for visitors, for instance, creating clear sightlines, providing emergency infrastructure, and integrating cues for positive behavior. There has been enormous research showing that humans tend to be afraid of uncertainty. When the external environment possesses potential danger or negative possibilities, one may not gain a positive experience. This issue has gained massive researchers who focus on wilderness and urban wilderness-related fields. The strictly defined wilderness contains potential danger and tends to be desolate. When designing an urban wilderness, the desolate and serene characteristics of the wilderness environment could be transformed into a design idea, realized by modern tools and methods to avoid potential danger for its visitors.

Crime prevention through environmental design (CPTED) principles involve preventing crime by designing a physical environment that positively influences human behaviour, including natural access control, surveillance, territoriality, activity support, and maintenance (Smith, M., 1996). In an urban wilderness, design principles could be employed in the physical spaces to support positive behaviour and eliminate potential danger or crime.

Importantly, the feasible application of this pattern often depends on collaboration with other patterns. For instance, the quality that other patterns create could facilitate this pattern, including making the vistas expansive so the visitors can notice potential danger instantly. 'The Forbidden Area' also protects visitors from entering a wild and dangerous space within an urban wilderness.

1 During the practical process of urban wilderness planning and design, use design as a tool to create a safe visiting environment. The specific strategies could be, plan and design open spaces in an urban wilderness, use tall trees rather than cluttered bushes that obscure the view, and maintain the water quality in an urban wilderness; Protect strategies for preventing visitors from the potentially dangerous areas in an urban wilderness, e.g., fences and understandable signposts; Social security facility, e.g., streetlights, guard personnel, emergency facility, and CCTVs in potentially dangerous areas.

2 In summary, the extraction and induction process in this chapter is intentionally adaptive, non-linear, and evidence-driven. By moving beyond rigid classification and instead applying the three lenses as interpretive tools, the approach acknowledges the inherent complexity of urban wilderness and the need for patterns that are both grounded in research and adaptable in practice.

5.4 Discussion and Conclusion

This chapter details the process from evidence-based design principles to the induction of 24 urban wilderness design patterns, reframed through three interpretive lenses, namely natural, cultural, and social. It directly addresses the third research question: What design principles can be developed for urban wilderness?

Through systematic organization and synthesis, the abstract findings of previous research have been translated into practical tools that can be referred to directly by planners and designers, and also facilitate interdisciplinary communications. Each lens represents a distinct yet relevant perspective on urban wilderness.

The natural lens focuses on biodiversity conservation, the prioritization of native species, and the principles of minimal human intervention from an ecocentric worldview. The cultural lens emphasizes the mediation between people and environment, reflecting on human-nature interactions, cultural qualities, and the unique qualities embedded in specific sites. The social lens highlights issues of equity, safety, inclusivity, and the manifold needs of diverse urban users, centering an anthropocentric perspective.

Importantly, these lenses are not rigid categories but conceptual tools that enable practitioners to interpret, combine, and adapt patterns in response to the fluid realities of urban wilderness planning and design. The patterns themselves are not prescriptive solutions. Rather, they provide a starting point as a flexible, evidence-based framework from which practitioners can filter, interpret, and elaborate actions according to specific contexts, stakeholder needs, and their own professional judgment.

While the initial framework presented offers a practical foundation for design and communication, the adaptability, relevance, and ultimate efficacy of these patterns must be further tested due to the complexity of their implementation across varied design scenarios. Questions arise regarding how adaptable these patterns are to different design scenarios and whether they can be altered under varying constraints. Addressing these uncertainties requires ongoing validation and possible adaptation to ensure their robustness and applicability.

The preceding chapter synthesized theoretical, practical, and empirical insights into a set of design patterns for urban wilderness. While these patterns provide a structured framework, their validity and applicability depend on how they are received by practitioners and tested in design processes. Chapter 6, therefore, examines their evaluation by experts and students, using interviews and workshops to assess both strengths and limitations in practice

6 Validating Urban Wilderness Design Patterns

Chapter Six develops the evaluation of the initial design patterns extracted from the design principles of urban wilderness, mainly through semi-structured interviews and the Research through Design (RTD) methods. Section 6.1 introduces this chapter. Section 6.2 illustrates the preparation and conduct of interviews. Section 6.3 explains the design workshop to validate the applicability of design patterns. The discussions and reflections of the chapter are presented in section 6.4.

6.1 Introduction

Urban wilderness planning and design is a multidisciplinary process that integrates diverse fields of expertise. It involves professionals and stakeholders from spatial planning, landscape architecture, ecology, historical geography, visual arts, biology, and governance. These actors often hold different perspectives and expectations regarding urban wilderness spaces. Incorporating their experiences, knowledge, and feedback is therefore essential to address disciplinary differences and enhance design outcomes. Achieving the intended qualities of future urban wilderness requires clear interpretations and effective dialogue among stakeholders, ensuring both the relevance and applicability of design patterns. Against this background, this chapter presents the validation of the developed design patterns through expert evaluation and practitioner engagement.

In architecture-related research, including urban planning and landscape architecture, the importance of ensuring the validity of the final deliverable is of concern to many professionals. The urban wilderness design patterns extracted, synthesized, and interpreted from existing knowledge and the experience of researchers may lack applicability and validity. Although a plausible design pattern can be generated by summarizing general rules, for architecture or urban environments, different types of spaces or specific sites have their spatial characteristics and backgrounds. Applying the design principle generated by transforming knowledge in urban space, specifically in urban wilderness planning and design practice, is one of the questions this research needs to address.

Research and design can be interlinked in at least four different ways. For instance, research for design, research on design, research through design, and research about design (Nijhuis & de Vries, 2020). Research on and through design has already been applied as an approach in examples, in which the design experiment is based on landscape architecture typologies and design principles derived from several case studies (Nijhuis & Bobbink, 2012). Research through design (RTD) as a research strategy is a powerful way to explore the spatial possibilities of applying the principles frequently used in landscape architecture academia.

It regards the design process as a form of research that involves a culture of thought (Nijhuis & de Vries, 2020). Analytical and design thinking are carried out in the research process using this approach, in which analytical thinking aims to translate data into knowledge, and design thinking is an invention process that aims at developing new knowledge through integrated analysis and spatial translation (Figure 6.1) (Nijhuis & de Vries, 2020).

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To sum up, during the exploration of urban wilderness planning and design, the RTD method could be used to verify the patterns developed through previous design knowledge input. Then, the evaluation of design outcomes and participants' feedback could underpin it, which could avoid the incompatibility of the patterns with design practices due to general knowledge and experience.

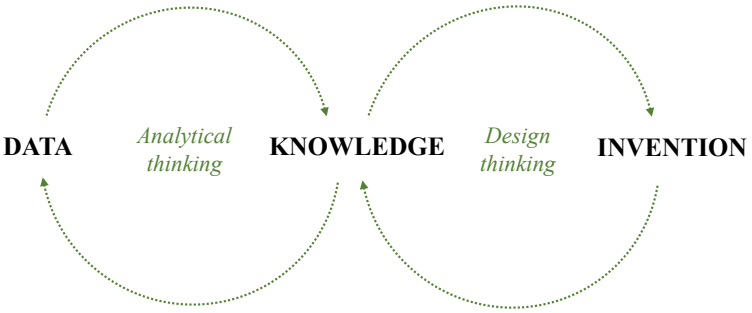

FIG. 6.1 Analytical thinking aims to translate and interpret data into knowledge (discovery), and design thinking seeks to develop new knowledge through synthesis and spatial translation (invention).
(Source: Nijhuis and de Vries, 2020)

This chapter answers Research Question 4: How can the applicability of design principles be tested through the RTD method, and what is their added value? The objective is to investigate how practitioners comprehend and implement the urban wilderness concept within the spatial planning process, and evaluate whether these practitioners perceive the initially developed design patterns as clear, comprehensible, and practical. Importantly, this chapter validates the usability of the design patterns in practice, therefore assessing their relevance and effectiveness in supporting urban wilderness planning and design.

The validating process employed a combination of semi-structured, open-ended interviews and a collaborative design workshop. During the expert interviews, participants were invited to share their comprehension and application of the urban wilderness concept in spatial planning, drawing from their professional knowledge and experience. Following this, the initially developed urban wilderness design patterns and their provisional application scenarios were presented to the interviewees to gather their feedback and suggestions for improvement. Following the expert interviews, a design workshop was conducted to validate the provisional urban design patterns further. During the workshop, the participants were introduced to the background and theoretical framework of the PhD thesis, as well as an in-depth explanation and analysis of the urban wilderness design patterns. Participants were then invited to engage in a collaborative urban wilderness project using the provided patterns to plan and design urban wilderness spaces based on actual sites in the Netherlands.

The validation of the developed urban wilderness patterns was assessed using several key criteria: clarity, understandability, usability, alignment with planning and design goals, and contextual appropriateness. During the expert interviews, these criteria were embedded within the interview questions to elicit direct evaluations and reflections from participants on the applicability and effectiveness of the patterns. In the subsequent transcript analysis, participant feedback was thematically analysed to extract insights relevant to these criteria, allowing for a structured assessment of the patterns' validity. In the collaborative urban wilderness design workshop, validation was further operationalized through observations and documentation of how participants engaged with the patterns during the co-creation process, as well as during group discussions and reflective activities. Participants' feedback offered critical insights into the framework's cognitive accessibility, practical relevance, and potential implementation challenges in real-world planning and design contexts.

6.2 Expert Interviews for Pattern Validation and Disciplinary Insight

6.2.1 Goal of the interview

The interviews were conducted face-to-face by individuals and were intended for at least five experts from diverse disciplines. Two goals are established for framing the semi-structured interview list to underpin this chapter's research objective.

Goal 1: The interviews intend to engage key stakeholders involved in the planning and designing of urban wilderness areas, requiring their opinions and ideas based on their professional knowledge and experience. Additionally, the interviews identify the interviewees' focuses and challenges encountered while planning and designing urban wilderness-relevant projects.

Goal 2: The interviews seek to evaluate the readability and applicability of the developed design patterns, inviting participants to provide constructive feedback and suggestions for refinement and improvement.

6.2.2 Interviewees recruitment

The criteria for selecting participants are based on their disciplinary backgrounds and professional reputations. As the interviews required in-depth discussions on participants' understanding and experience with urban wilderness areas, as well as their attitudes towards the developed design patterns, a certain level of design thinking and relevant practical experience is essential. Given that urban wilderness planning and design patterns are intended for application by stakeholders involved in spatial planning processes, it was crucial to gather informed feedback to support constructive refinement. Therefore, the validation process involved diverse scholars and practitioners from academia, industry, and government sectors. Special attention was given to ensuring a broad representation of expertise. Seven professionals with relevant backgrounds were selected, including independent landscape designers, municipal landscape designers, landscape researchers, ecologists, environmental psychologists, and policymakers (Table 6.1).

TABLE 6.1 Occupation background of the interviewees

Interviewee	Occupation
Interviewee 1	– Environmental psychologist – Landscape architect from a professional studio
Interviewee 2	– Professor of spatial planning and design at the University of Groningen
Interviewee 3	– Biologist at Delft University of Technology – Ecology designer from a professional office
Interviewee 4	– Landscape architect from a professional office
Interviewee 5	– Municipality landscape designer – Policy maker
Interviewee 6	– Social scientist at Wageningen Environmental Research – Environmental psychologist
Interviewee 7	– Landscape architect professor at Beijing Forestry University (China) – Landscape designer from a professional office

6.2.3 Interview design and analysis

Expert interviews are a common qualitative research method for gathering professional insights and knowledge, typically conducted through either unstructured or semi-structured formats (Deming & Swaffield, 2011). This study employed semi-structured interviews to facilitate open, in-depth conversations that allow flexible dialogue between the interviewer and participants. This approach supports sharing design knowledge and professional perspectives essential to developing urban wilderness design patterns.

Information regarding each interviewee's professional background and area of expertise was collected during the preparation phase. This allowed for tailoring interview questions to align with each participant's domain, resulting in subtle variations in questions across interviews while maintaining consistency in core themes. Prospective interviewees were invited to participate in face-to-face interviews. They were provided with a preparation package with a brief introduction to the research, theoretical background, provisional outcomes, the preliminary urban wilderness design patterns booklet, and an outline of the interview questions.

The interviews were conducted one-on-one to ensure confidentiality, with no third parties present. Before the interview began, participants were asked to read an opening statement outlining the study's main objectives and the session's estimated duration. They were informed that all questions and responses would be used solely for scientific purposes and treated with strict confidentiality and anonymity. Finally, each participant was asked to sign a consent form to confirm their understanding and to ensure compliance with ethical standards for this PhD research.

The expert interview consists of two main parts, with the provisional questions outlined in Table 6.2. In Part 1, interviewees were asked open-ended questions to explore their understanding and perspectives on urban wilderness planning and design based on their professional knowledge and experience. They were encouraged to provide concrete examples of projects or practices that reflected their approach to urban wilderness-related planning and design.

In Part 2, the focus shifted to an open discussion assessing the readability and applicability of the initial urban wilderness design patterns. To begin, the research context and the current version of the design patterns were introduced, including an explanation of how these patterns were developed from the prior studies of this PhD study. To support the discussion, pattern cards (Figure 6.2) were presented, each summarizing the vital content of an individual pattern. Interviewees were encouraged to suggest refinements or modifications. Their responses provided valuable insights into potential improvements and the practical relevance of the proposed design patterns.

TABLE 6.2 The Questions of the Interview

PART 1. Open Question Session	
Question 1	Do you have relevant experience or projects in urban wilderness planning and design, such as ecological design or urban green space regeneration?
Question 2	What is (are) the crucial focus (es) when planning and designing an urban wilderness area? Moreover, what difficulties have you encountered during this process?
Question 3	Are any solutions, strategies, methods, or tools for the core issues and difficulties?
Question 4	Did you have experience considering the perceptions and attitudes of the target users during your planning and design project?
PART 2. Design Patterns Session	
Question 5	Do you find the (format of) design patterns understandable? Moreover, do you think they are applicable and appropriate for future urban wilderness planning and design?
Question 6	If you have an urban wilderness design project, will you use the patterns as a tool during the planning and design process? If yes, at which stage will you use these patterns during planning and design? Moreover, what are the most critical patterns from your perspective?
Question 7	Do you have any suggestions for the PhD project?

FIG. 6.2 Example of a pattern workshop by Isabel van Ommen on 03.05.23
(Source: From Prof. Machiel van Dost's pattern language design studio in 2023)

The interviews were conducted between May 2022 and June 2024, each lasting approximately one hour. With the interviewees' consent, all sessions were audio-recorded for accuracy (see Appendix A. Informed Consent Forms). A thematic analysis approach was employed to analyze the interview transcripts and reflect on the discussions. This involved replaying the recordings, identifying and extracting key points from each in-depth interview, and summarizing them into concise thematic insights. The researcher then interpreted and reflected upon these findings to inform the refinement and evaluation of the urban wilderness design patterns.

6.2.4 Findings and Discussion

Seven interviewees were selected, representing a range of disciplines within the spatial planning field, including practical designers, academic researchers, and government policymakers. Most interviewees shared their experience planning and designing urban wilderness-relevant projects and acknowledged the developed design patterns as comprehensible and practically applicable. Several participants also offered constructive suggestions to refine the patterns and enhance usability in more advanced or context-specific applications.

All participants expressed their comprehension and concerns about urban wilderness areas, drawing on their professional experience. They discussed the essential qualities and characteristics that, in their view, define an ideal urban wilderness. Additionally, the interviewees emphasized that the design patterns serve a dual function as practical tools for spatial design and as communication aids that facilitate dialogue among stakeholders from diverse disciplinary backgrounds. This dual role highlights the patterns' value in bridging interdisciplinary perspectives and supporting collaborative decision-making in urban wilderness planning and design.

1 Comprehend and primary concerns in urban wilderness planning and design

There exists a classical debate between two sides of the wilderness idea. For instance, H.J. McCloskey, a representative of modern anthropocentric ideas, emphasizes that human concern for the environment is a concern for self-interest, which admits the necessity of recognizing moral concern for natural objects (McCloskey, 1984). However, Rolston (1986) questioned the anthropocentric view of nature and suggested that nature has its intrinsic value, which humans cannot judge by their values.

'Worldwide, there are different views on nature or wilderness; one group thinks that nature is better off without humans, and another group, from an anthropocentric perspective, as a human being, you are inextricably part of nature and the system. And the debate was fierce'. (Transcript of the interview with an interviewee, a landscape designer from the municipality)

Nevertheless, interviewees also mentioned that these two philosophical perspectives have become very close in practice for various pragmatic reasons. Environmental researchers agree that humans cannot distract themselves from the natural system and are part of it. The ecologists proposed that nature first, but also agreed that the values and interests of urban wilderness could not exist without the presence of humans in the environment. Policymakers also support this idea.

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'Philosophically, it is impossible to consider from nature's perspective, but it is a growing element in lawsuits.'(Transcript of the interview with an interviewee, an environmental researcher from academia)

Environmental psychologists regard urban wilderness as wilderness areas within and near urban contexts. The existence of urban wilderness benefits urban environments and helps fight the biodiversity crisis. Landscape architects, however, regarded wilderness and urban wilderness as places where humans have no or limited impact. Besides, interviewees discussed the wilderness-like landscape, in which man completely imitates natural wilderness. Mostly in cities, this mimics the natural wilderness's function, structure, and management.

'In my opinion, wilderness refers to a land with little or no human interference, which, as a natural environment, has not been changed by external disturbances and still evolves and develops according to its laws.' (Transcript of the interview with an interviewee, a landscape architect and researcher from academia)

Several interviewees also mentioned that different cultures and religions influenced their views of wilderness and urban wilderness. For example, a high proportion of the land in the Netherlands is artificial. Instead, it has made an intervention and plan based on the land, leaving space for the environment to develop spontaneously. Africa may have a clear separation of nature from the city. If humans enter wilderness areas, they must follow strict natural rules and be constrained as outsiders. So, residents' comprehension of wilderness and urban wilderness could be different in the Netherlands and Africa.

During interviews, participants from different disciplines and stages within spatial planning and design also show diverse concerns during their urban wilderness practices.

Early stage before the design

Academic landscape designers regard recognizing large-scale wilderness areas in urban settings as the crucial challenge practitioners face. Policymakers think the major challenge is convincing the government to create more urban wilderness-relevant projects.

'As well as within the industry, most planning designers are still not sufficiently aware of wilderness, which is a major impediment to developing wilderness landscapes.' (Transcript of the interview with an interviewee, a landscape architect, and researcher from academia)

Also, Ecologists are primarily concerned with selecting appropriate sites for planning and designing an urban wilderness and making the environment distinct from its surroundings.

'We must discuss where to stop the city and where the rural area begins. Some species live in urban spaces rather than rural/wilderness areas. Sometimes, it has relationships with the density of agriculture.' (Transcript of the interview with an interviewee, an ecologist from the academy)

Spatial planning researchers emphasized the collaboration between diverse stakeholders' knowledge and ideas in planning and designing an urban wilderness. They found that coordinating diverse stakeholders' demands and interests could be challenging.

'Balancing the stakeholders' interests and taking into account their knowledge, as well as integrating different disciplines and considering cultural and ecological dimensions of urban design.' (Transcript of the interview with an interviewee, a spatial planning researcher from academia)

Similarly, according to ecologists from the academy, the existing site conditions and possible reusable remains should be fully considered at the early stage of the planning and design of an urban wilderness. They regarded the focus within the early planning stage as more on analyzing site conditions and environmental characteristics, and preserving valuable native species and environmental qualities. This process takes a long time before the actual design process. Municipal policymakers and landscape designers hold similar concerns. Additionally, they are also concerned with financial issues.

'If you do not consider the natural condition initially, it will cause chaos.' (Transcript of the interview with an interviewee, a landscape designer, and a policymaker from the municipality)

Environmental psychologists regarded the clarification of design intent as crucial. They claimed that:

'The main issue you want to solve or realize during the planning and design of urban wilderness must be precise.' (Transcript of the interview with an interviewee, an ecologist from the academy)

Simultaneously, landscape designers from the academy regarded the recognition of the public's awareness of urban wilderness as a crucial concern, and the target group of the environment should be considered in the early stages of planning and design, since not all visitors might admire the disorder and desolate aesthetic value of an urban wilderness. This might lead to gaps between the public's perception and the design intention of urban wilderness. Municipal policymakers and landscape designers are skilled at dealing with citizens' demands regarding nature's merits. This may be because they are closer to the decision-makers and government and can directly address potential ambitions in the early stages of spatial planning. Similarly, landscape consultants and environmental psychologist identified their job as minimizing the gap between users' environmental perception and the planning process. So, their most important concern is understanding how people perceive wilderness and providing initial knowledge from the design vision, therefore balancing design intention and public demands. An efficient way to tackle this is to communicate with the spatial users and other stakeholders, which will improve the planning and design of urban wilderness areas.

Consider people's environmental perceptions and understanding during the early planning and design, and quickly define the target group suitable for the envisioned environment and those who are not. Also, concerns about what the goal of having urban wildness is. (Transcript of the interview with an interviewee, a landscape consultant and environmental psychologist from a professional studio)

During the planning and design stage

Many interviewees regarded integrating recreational facilities within urban wilderness areas while maintaining their natural qualities as a crucial challenge during planning. A similar concern was proposed the other way around.

'That is a challenge in the future to make nature inside and adjacent to cities, connected to the green structures of the city, as well as some biodiversity and a richer environment for people to be in.' (Transcript of the interview with an interviewee, a landscape architect from a professional design studio)

To tackle this potential challenge, according to the interviewees, the zoning strategy was crucial during the planning and design process, which benefits the distribution of the natural and cultural functions of the environment. A landscape designer from academia shared their practice when the design team implemented a technical retrofitting rate and relied on a zoning strategy through multidisciplinary discussions and collaboration. The site functions were divided into ecological areas, where wildlife is the main object of protection, and recreational areas, where visitors

dominate the space and the distance between people and wildlife is lengthened to provide habitat for their development. So, preserving the wilderness character is necessary, leaving some space dedicated to wild nature rather than humans.

'I focus most on not allowing people to interfere with it as much as possible, not to regulate the behavior of users directly, but to keep people away from it naturally through design means.' (Transcript of the interview with an interviewee, a spatial planning researcher from academia)

The need to avoid many visitors is also mentioned." Deactivation" is one crucial strategy during the planning and design. One landscape architect's planning and design concern is making the urban wilderness park "away from the crowd" to distinguish it from the other urban parks and make an urban wilderness area relatively inaccessible, with its wilderness style unfamiliar to people and thus less popular.

Challenges also come from the site's internal environment, such as desolation and pollutants. According to interviewees, the solution is usually first to confirm the remaining availability and improve the quality through ecological and planning strategies to reach the quality for reuse.

The educational character of an urban wilderness was mentioned, leading the relevant facility to consider it an important concern during planning to facilitate interaction between visitors and the environment.

Later stage, after the construction of an urban wilderness

Maintenance and management after construction were considered crucial at the late stage of urban wilderness planning and design. Landscape architects and researchers mentioned that the primary concern of planning and designing an urban wilderness is that:

'In the management and maintenance process after completion, human disturbance is reduced accordingly, thus allowing nature to gradually take control of the site development evolution rather than human-imposed maintenance, while also providing users with the site space to observe this development process, or at least to keep some areas free from human interference.' (Transcript of the interview with an interviewee, a landscape architect, and researcher from academia)

Indie landscape designers agree that space should always be left for nature to develop during the late maintenance and management stage of planning and designing urban wilderness practices, since the natural environment is always dynamic and ever-changing, which is the beauty of wilderness.

2 Qualities and characters of urban wilderness areas from diverse perspectives

Many interviewees emphasized the importance of environmental characteristics such as water bodies, soil, flora, and fauna in urban wilderness design. Ecologists highlighted that the quality and quantity of water bodies should be carefully considered during the planning and design process, stressing the need for water purity and the assessment of potential contaminants prior to construction. A landscape architect from a professional design studio noted that wilderness areas typically contain a higher density of vegetation than conventional urban parks, citing the *Amsterdamse Bos* as a successful example of urban wilderness within urban settings.

From an academic landscape design perspective, preserving native species, both flora and fauna, was considered essential. Using vegetation adapted to the original site conditions not only enhances biodiversity but also helps maintain the overall wild character of the landscape. The presence of fauna was also considered a defining element of an urban wilderness. For example, in certain Dutch urban wilderness areas, grazing animals such as horses have been introduced as part of biodiversity management strategies, helping to maintain ecological balance while reinforcing the site's wilderness identity.

The main design idea of the design team is to see the site's past, present, and future, to respect the site's own characteristics and development patterns, and to design and maintain the development dynamically. Not according to the aesthetics and human will, but to show nature itself' (Transcript of the interview with an interviewee, landscape architect, and researcher from academia)

Interviewees also mentioned that urban wilderness areas open to the public often provide specific places where people can get close to nature, such as bird observation from a distance. Meanwhile, some specific species and rare species of wildlife cannot be disturbed by humans; thus, keeping a distance between humans and nature is essential. Environmental psychologists proposed that an urban wilderness should not attract many visitors, which is the primary intent of ordinary public spaces. Possible strategies during planning and design could be the entrance planning and the site's accessibility, which could control the number of visitors.

'This is something special, so more visitors are not necessarily better than in urban wilderness cases.' (Transcript of the interview with an interviewee, an Environmental psychologist from a professional studio)

Also, the interviewees discussed constraints and rules for visitors' behavior within urban wilderness areas.

'It is crucial to control the visitors' behavior, which is very difficult, but maybe we can have some rules within different parts of the park.' (Transcript of the interview with an interviewee, a landscape architect, and researcher from academia)

Additionally, balancing the existence of wildlife and the safety of visitors is a primary concern of the practitioners. Thus, environmental facilities, especially those for child visitors, needed to be safe, and exploratory opportunities and readability of the facilities were also required. For instance, safe havens could be a way to deal with people in danger or on the sidelines.

The landscape architect from the professional design studio mentioned that the site's cultural and historical qualities should be considered in the planning and design to create a distinct urban wilderness. The environmental consultant proposed a similar idea; they consider the urban wilderness area to consist of both natural and cultural heritage and be prominent to be preserved. Academic landscape designers proposed that the site's cultural and historical remains should be preserved only if they are safe and valuable, transforming the function into a novel contribution to the environment and visitors.

'The heritage remains in an urban wilderness and could provide educational events that attract visitors, especially for families with children. '(Transcript of the interview with an interviewee, landscape architect, and researcher from academia)

Moreover, interviewees agreed that service-oriented facilities must be provided for the visitors to conduct compatible activities in an urban wilderness. Apart from some artificial facilities for supporting visitors to connect with the wildlife, landscape designers from professional studios also regard social activity and space for people to meet with each other as crucial qualities that an environment should provide for its visitors in an urban wilderness. Information boards should also inform people about the situation and the development of wildlife. Recreational facilities, such as a campsite, should be provided.

An urban wilderness needs space with serenity and for individuals to empty their minds. Zoning strategies could be crucial for providing a diverse environment for compatible activities. The spatial planning and design researcher proposed that during their practice relevant to the urban wilderness, relatively untidy conditions and a lack of neatness in some parts of the urban wilderness area facilitate visitors' perceptions of wild quality. Even though visitors may show diverse ideas and

acceptance of the neatness of the environment of an urban wilderness, landscape researchers believe it is a unique atmosphere that wilderness possesses and a distinct experience offered for visitors, rather than an ordinary urban park.

'I think it is scarce to be able to build a park around the West Lake scenic area that does not have the same temperament as the local cultural characteristics, not according to the aesthetics and will of man, but to show nature itself.' (Transcript of the interview with an interviewee, a landscape researcher and designer from academia)

The indie landscape designer admires the economic values that an urban wilderness area may possess. They try to preserve valuable environmental elements and qualities, as well as the native wildlife, to control the budget.

'So, use the force of nature, use the site's natural potential, and design it for human purposes. It is about how to match nature and human use.

Moreover, the prominent quality is the everlasting dynamic of an urban wilderness, even after the site is constructed. Therefore, an urban wilderness area could require less intensive management after construction.

3 Patterns as a communication tool

Most interviewees agreed that the design patterns contribute to explaining the concepts of urban wilderness and the values, qualities, and characteristics they should possess. The previous section mentioned that one of the existing challenges relevant practitioners face is the difficulty of convincing policymakers and the government to build more urban wilderness spaces. The municipality's landscape designer thought it would be good to share the design intention and the provisional scenario we would like to create with the site and show prospects for the government and policymakers.

'The design patterns could be a catalog guiding communication between the policymaker, the government, and the public.' (Transcript of the interview with an interviewee, a landscape designer from the municipality)

Spatial planning and design researchers show similar opinions; they regard planners and designers as connectors between diverse stakeholders, and design patterns provide guidelines for their conversations.

'A big challenge in my mind is to convince policymakers to create more projects like this. Then, you can use these patterns to explain an urban wilderness. The patterns could be a tool to help policymakers understand what kind of intention we want to meet.' (Transcript of the interview with an interviewee, a spatial planning and design researcher from the academy)

The environmental consultant regarded patterns as the crucial tool when proposing the vision of the urban wilderness area, during which the evidence from research will be brought to provide knowledge at the beginning of the planning and design process.

'The patterns are the type of thing that provides recommendations to planners and designers.' (Transcript of the interview with an interviewee, a landscape consultant, and an environmental psychologist from a consultant studio)

The academic landscape designer is concerned with the users' perspective. They proposed that the public's aesthetic could be educated and influenced, and design patterns could provide relevant opportunities to connect with the direct users and make them aware of the diverse values of an urban wilderness area.

4 Patterns as a design tool

According to some interviewees, except for the communication contribution of the urban wilderness design pattern booklet provided for diverse stakeholders during the planning and design process, the provisional design concerns and goals may have already been settled before the actual planning and design stage. The environmental consultant proposed that the pattern language is a toolbox to show the ambition for the urban wilderness. It was a starting point, and much work is needed to see how the patterns interact and how to use them in practice. So, it should be constantly aware of the intention and the site conditions before the pattern stage.

'The patterns booklet provides a framework for what can be used in an urban wilderness and what the needs will be in this area.' (Transcript of the interview with an interviewee, a landscape architect from the design studio)

The landscape designer from the professional studio agreed that the design pattern provides insights and knowledge to guide the designers in the project process. This process defines the qualities an urban wilderness should possess and ideal scenarios after construction. Thus, patterns could be used to recognize appropriate sites for constructing an urban wilderness area early in this process. Also, the orientations of different dimensions may target various users at different stages.

'Design patterns are beneficial in quickly getting an overview of all the options and possibilities, and also getting a rapid first grasp of what is possible, what is not possible, what should be useful, and what should not.' (Transcript of the interview with an interviewee, a spatial planning and design researcher from academia)

According to the academy's spatial planning and design research, the pattern booklet is similar to a design catalog, which is helpful at multiple stages during planning and design.

'You can choose the soil type, background condition, etc. I want that; it is very convenient and short, but it is also very technocratic from the belief that you can make nature; it is part of policy and regulation.' (Transcript of the interview with an interviewee, a spatial planning and design researcher from academia)

Similarly, the indie landscape designer regarded the pattern booklet as a menu. The planner and designer are equal to the cook.

'The patterns booklet is a framework of what you can use in an urban wilderness and what the needs in this area will be.' (Transcript of the interview with an interviewee, a landscape architect from the design studio)

5 Comments for practical implementation and prospects

Preserving, transforming, and constructing naturalized areas in cities has emerged as an effective strategy for enhancing urban green space, improving environmental quality, and supporting biodiversity. Increasingly, spatial planners, landscape architects, and academic researchers are focusing on how to foster the harmonious coexistence of humans and nature in urban settings. In parallel, efforts have been made to assess users' acceptance, aesthetic perceptions, and engagement with natural wilderness, thereby contributing valuable insights and knowledge for the planning and design of urban wilderness areas.

In this PhD project, after introducing the developed urban wilderness design patterns to interviewees from diverse disciplinary backgrounds, discussions focused on the potential challenges these patterns may encounter during future implementation. The interviewees shared critical reflections grounded in their professional experiences, offering concrete suggestions for refining and improving the initial set of patterns.

While the existing patterns articulate both spatial qualities and provisional functions, their successful application ultimately depends on the judgment and adaptation of planners and designers in practice. Design goals, intended outcomes, and specific actions must be context-sensitive and determined by professional expertise. Nevertheless, the design pattern booklet, as suggested by several interviewees, can serve as a practical guide by illustrating the implications and potential applications of each pattern in specific design scenarios.

Importantly, the interviewees emphasized the need to consider both anthropocentric and non-anthropocentric perspectives when applying the patterns in practice. This dual lens highlights the importance of defining the design intention and target user group at the outset of any planning process, as these decisions strongly influence spatial strategy, intended functions, and the range of activities to be provided. For instance, when the primary goal is to preserve and protect native wildlife rather than to facilitate public access, the associated planning strategies must differ significantly from those promoting human–nature interaction. In such cases, zoning strategies that differentiate between ecological, experiential, and recreational functions become foundational design considerations upon which other patterns can build.

Moreover, interviewees highlighted the importance of recognizing and preserving cultural heritage associated with urban wilderness areas. They recommended that cultural values and historical layers be explicitly reflected within the design patterns. Finally, the tranquillity quality of urban wilderness was regarded as an essential attribute that must not be overlooked. However, the social dimension, specifically, understanding and responding to the needs of diverse visitors, must also be carefully integrated into design thinking to ensure that urban wilderness remains inclusive and meaningful.

6.3 Collaborative Design Workshop: Application and Evaluation of Urban Wilderness Patterns

The initially developed urban wilderness design patterns in Chapter 5 are extracted through inductive and abductive approaches based on previous research evidence. These design patterns were further improved within the experts' interviews in section 6.2 via the discussions on urban wilderness comprehension and comments on the initially developed design patterns. This section selects a design workshop for presenting and testing the applicability of urban wilderness patterns.

According to Ørngreen & Levinsen (2017), workshops could function as a means, practice, and research methodology. In this PhD project, a design workshop is implemented primarily as a methodology, which gathers usage of the patterns as communication and design instruments while collecting and analyzing practitioners' insights and feedback as feasible data for the research objective. This collaborative planning and design process contributed to advanced applications and negotiations between diverse practitioners in spatial planning and design disciplines, both academia and the design industry.

6.3.1 Participants recruitment

18 participants joined the design workshop and were divided into four teams on two selected sites (4 teams * 4 or 5 members * 2 sites). The 18 participants included master's students and PhD candidates from Delft University of Technology. Regarding interdisciplinary, participants from various disciplines were invited, including landscape architecture, landscape management, architecture, management in the built environment, and urban studies (Table 6.3). The placement of the participants in each team and site was determined by their willingness, discipline, and prior experience (Table 6.4). (The complete list of participants is in Appendix A).

TABLE 6.3 Participants' information in the urban wilderness design workshop

Selection criterion and expertise	Participants disciplines
10 master students (M)	14 Landscape Architecture (la)
	1 Landscape management (lm)
8 PhD candidates (P)	2 Architecture (a)
	1 Management in the Built Environment (mbe)
3 Young professionals (YP)	1 Urban Studies (us)

TABLE 6.4 Distribution of participants in the teams of selected design sites in the urban wilderness design workshop

TEAM A1	TEAM A2	TEAM B1	TEAM B2
M/la	M/la	M/la	M/la
M/a	M/la	M/a	M/la
P/la	P/la	P/la	P/la
P/la	P/mbe	P/us	P/YP/lm
YP/la			P/YP/la

6.3.2 Workshop set-up

As shown in Figure 6.3, the urban wilderness design workshop was set up to include three sessions: lecture and design task explanation (0.5 H), collaborative design (1.5 H), and final evaluation and feedback (0.5 H). All sessions occurred in a lecture hall in the Architecture and the Built Environment faculty building at Delft University of Technology.

FIG. 6.3 The three-session agenda of the urban wilderness design workshop

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Session 1 introduces the PhD project as the knowledge base for the developed design patterns based on previous studies. It also briefly explains pattern language as a research approach. Afterward, the task of the design workshop is explained so that the participants comprehend the workshop objectives.

Session 2 requires the participants to work collaboratively, using the pattern language booklet for planning and designing an urban wilderness area in selected sites. Two distinct design sites were selected to represent different conditions: a reconstruction project focused on existing green space and a construction project on reutilizing a vacant lot. Both sites are located on campus to ensure that participants are relatively familiar with their conditions (Figure 6.4). The surroundings and detailed information of the sites are shown before the collaborative design task starts. Also, each team's participants' distribution and the design outcome requirement are claimed. Participants were divided into four groups, each tasked with selecting and applying the design patterns to their respective study areas. The drawing approach was not constrained during this design session, for instance, hand sketching or digital graphics; any output that helps participants express their ideas is applicable, and the participants were free to select the applicable patterns to implement in their design from the provided urban wilderness design patterns booklet, or their knowledge and experience, if are no compatible pattern provided (Figure 6.5). The results of session two aim to test the applicability of the design patterns for urban wilderness and provide insights for improving the developed urban wilderness design patterns (Figure 6.6).

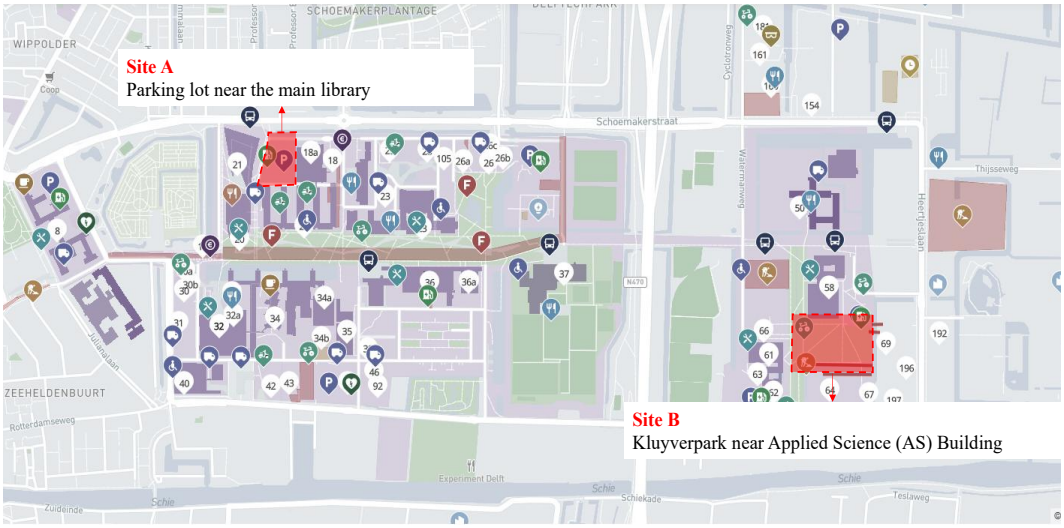

FIG. 6.4 Site locations within the TU Delft campus

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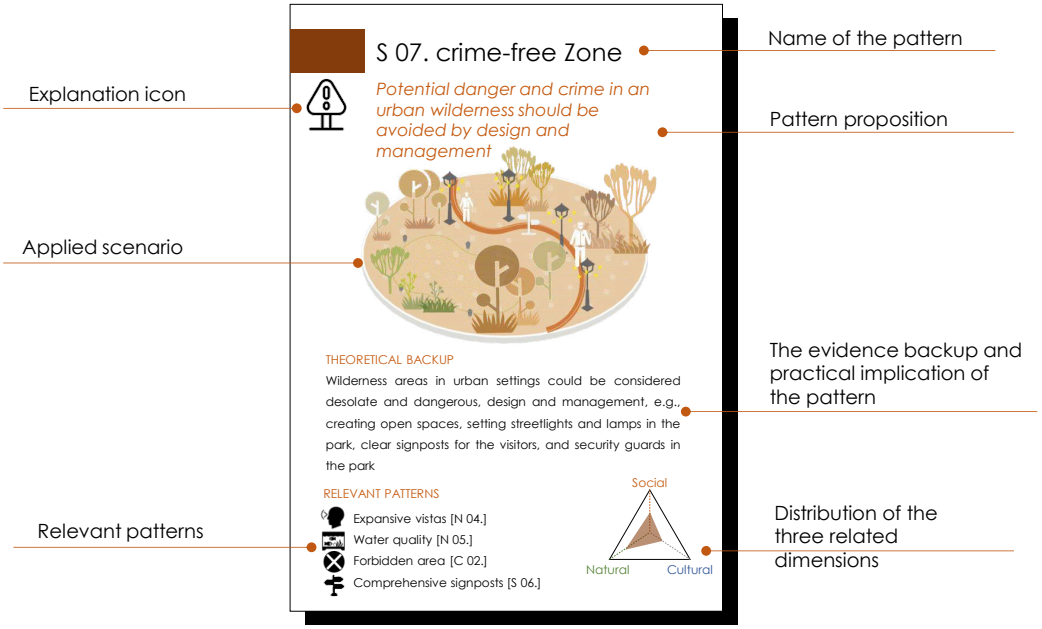

FIG. 6.5 Urban wilderness design patterns cards were provided during the feedback and evaluation session

FIG. 6.6 Collaborative urban wilderness design session

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After the collaborative design, Session 3 invited participants to share their evaluation of the applicability of each design pattern regarding universal consideration rather than the design sites in the previous design session, using point-shaped stickers to express their attitudes, namely blue points equal 'applicable,' and red points represent 'non-applicable'. Moreover, relevant comments, suggestions, or reflections must be added to the shortened version of pattern cards using sticky notes (Figure 6.7). This final session intends to collect participants' feedback and comments for improvements to the developed design patterns for urban wilderness areas.

FIG. 6.7 Urban wilderness design patterns cards provided during the feedback and evaluation session

6.3.3 Data collection

During the urban wilderness design pattern language workshop, several collection approaches were used to record and assess the participants' feedback and the applicability of the design patterns.

External observer and recorder: An observer was invited to record their unstructured observation of the complete sessions set up during the workshop, primarily using notes and photographs as the recording tools.

Internal observer and recorder: For each of the design teams, one participant was invited to be the observer to make a record of the working flow of their group members, the reflection on their collaboration, what and how design patterns were selected, and which patterns may raise arguments during their discussions. All the records and reflections were analyzed to align with the design plans by each team to deeply assess the applicability of the patterns and participants' evaluations toward them.

The outcomes of the design workshop: The design plan graphics from the four teams were produced on the same scale and blank sheets of drawing paper, though each team had subtle differences in detailed sketching styles. Also, the four teams included design descriptions and added information on the design plan to illustrate their design concerns and attitudes to the selected patterns (see Appendix C). The external experts checked these outcomes and discussed their attitudes and feedback.

6.3.4 Data analysis and interpretation

The design outcomes in session two demonstrate the readability and applicability of design patterns, which support further urban wilderness planning and design research and practice. The sketching outcomes show diverse concerns during each team's planning and design of urban wilderness areas for the two design sites. Moreover, the brainstorming sessions and reflective discussions among participants provided valuable insights, contributing to refining and enhancing the urban wilderness design patterns. These findings ensure the validity of the design patterns as a critical outcome of this PhD research, with practical implications for urban wilderness planning and design.

The two teams from Site A produced design plans for the vacant lot near the main library and faculty buildings on campus. The original site was not rich in natural environmental elements that could be adapted and utilized, so the participants were mainly concerned with the spatial connection of the urban wilderness areas and surroundings, and the remaining usage of the water bodies in the site.

Team A1 primarily concerns landscape zoning (Figure 6.8). They defined the priority zone and function area in the first step, making the site accessible for the students and employees on campus. However, they limited certain areas for entering by planning a wetland connecting blue and green spaces within the site. Moreover, the purpose of education is a design idea in the plan of Team A1. The majority of urban wilderness design patterns provided were selected by Team A1, which was regarded as compatible with participants' design concerns after the group discussion. Interestingly, several patterns raise arguments during their discussion, including P 07. Diverse Succession Stages (pattern title suggested changing to Different Zoning Strategy), P 10. Forbidden Area, and P 13. Young, WILD (confusing title), and Free (discussed the actual actions, finally regarded as applicable).

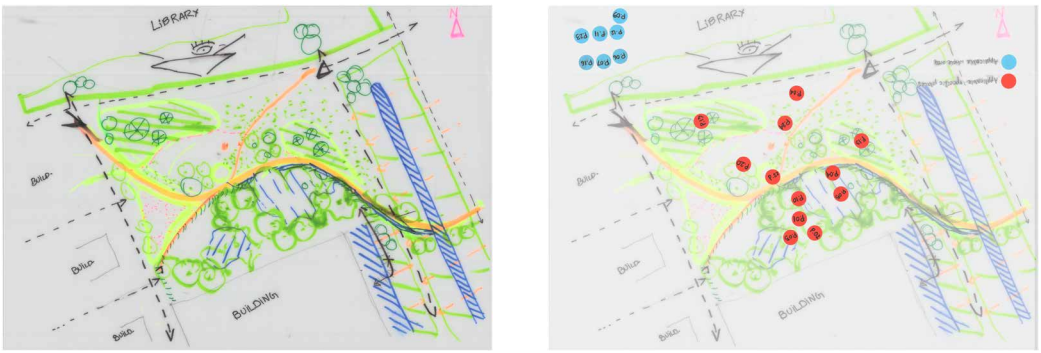

FIG. 6.8 Urban wilderness design outcomes of Team A1

Team A2 incorporated the spatial elevation changes into their design (Figure 6.9). Their ideas mainly came from the site's context and surroundings and from exploring the site boundary. The participants agreed on creating and zoning for social space, neutral areas, and changing vertical spaces. First, the most crucial concern is to provide social space for users around the city and keep some pristine, discrete space for urban wildlife. Also, the master plan of urban wilderness creates some 'forbidden areas' according to the design concern and provides patterns, including a large density and diverse vegetation typologies. The overall landscape traits were combined with the library's building features by creating the changing vertical

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landscapes. In the near-water area, ‘exploring opportunities’ were provided for students to conduct social activities according to the provided design patterns. The supportive facilities were designed to mix natural and reusable materials in the landscape. Moreover, environmental maintenance and management were considered, including the pattern of a ‘multiple-level management and maintenance’ system in planning. So, with the support of various design actions, ‘a distinctive world’ was created for students on campus that differs from daily concrete building life.

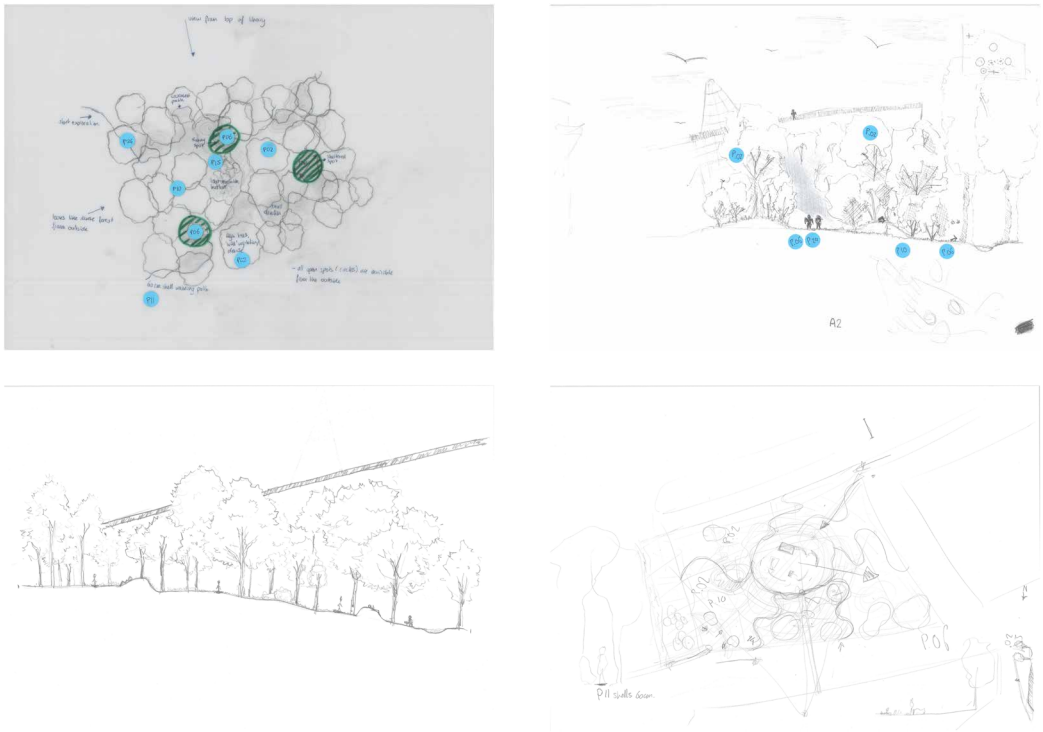

FIG. 6.9 Urban wilderness design outcomes of Team A2

The teams for site B were mainly concerned with reconstructing the Kluyverpark, considering its remaining natural elements, and using environmental characteristics to design urban wilderness on the site.

Team B1 implemented a four-step design phase (Figure 6.10). Overall, the design patterns were selected after the team members had made their initial design decisions and plans. First, individual team members pre-sketched the overall design concerns. In this step, the lack of cultural facilities was proposed and could be

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one of the planning and design concerns in the following step. Second, the team discussed and overlapped the topic with their sketching plans. The pros and cons of various design strategies were then analyzed and decided. Then, participants from Team B1 selected design patterns from the provided booklet that were compatible with their strategy. The detailed distribution of different facilities was then settled. Step three dived into the masterplan drawing. Participants located the selected patterns on fitting areas, took different user groups into account, and confirmed the main spatial layout of the urban wilderness areas. The final step is to evaluate the employed design patterns and organize the relevant of them. Also, the selection of vegetation species was confirmed.

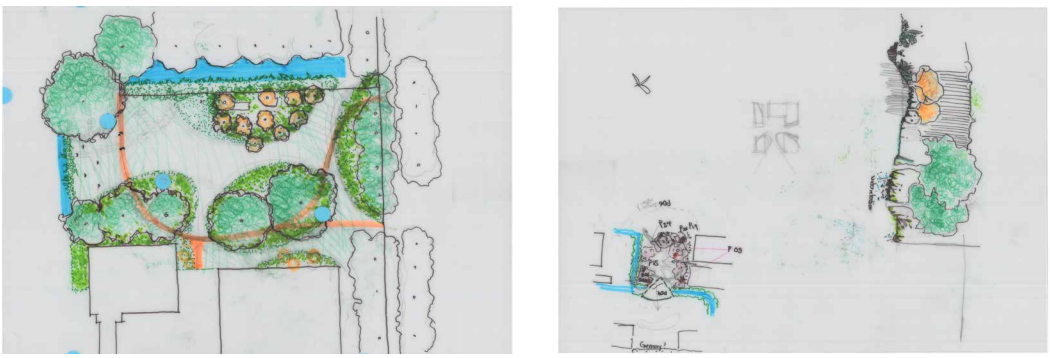

FIG. 6.10 Urban wilderness design outcomes of Team B1

Team B2 framed the composition form of the urban wilderness area primarily on the existing pathways and waterlines (Figure 6.11). After the zoning design, the participants selected combinations of patterns from the three dimensions for every landscape zone on the site. The gradient of 'wilderness' was defined from the core zone with open views. After selecting vegetation species for the urban wilderness design, the zoning functions were decided, including lawns for social interaction, such as picnics, salix forests, and reeds, with the existing waterbodies forming the enclosed landscape areas. Afterward, the sitting and staying points for the visitors were defined. Finally, the selection of the design patterns was rechecked to see their applicability.

Also, comments and suggestions for the design patterns were proposed during their discussion. For instance, the pattern 'Ecology First' is regarded as not applicable because, from the design site, there was not much to preserve except for water bodies and grass. Also, creating habitats, for instance, using waterbodies and reeds on the sites, is regarded as the most critical design pattern for the team. Another

design concern is preserving the previous pathways to connect the urban wilderness with surrounding buildings and facilities while creating sightlines and varied sensory experiences, moreover, for P 24. Exploring Opportunities, the team invites and stimulates movement and use through spatial design rather than by using signposts.

FIG. 6.11 Urban wilderness design outcomes of Team B2

Session 3 aims to evaluate and collect comments from the participants. It allows participants to express their evaluation of individual design patterns and add comments while discussing with other participants. By using point-shaped stickers, participants showed their judgment of 'applicable' or 'non-applicable' on individual patterns (Figure 6.12).

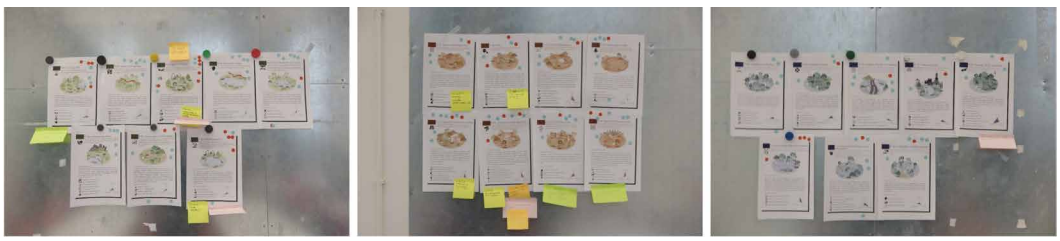

FIG. 6.12 Participants' comments and evaluation of individual urban wilderness design patterns

Regarding overall comprehension and attitudes toward the developed design patterns for urban wilderness, most participants showed positive attitudes and regarded the patterns as understandable and applicable. Specifically, the 'Expansive Vistas' pattern was selected as the most applicable design pattern for urban wilderness areas, which shows practitioners' concerns about creating open space in landscape areas. Also, the environment's security is relevant to this concern, which is a prominent design consideration when planning and designing urban wilderness areas. Patterns in the natural dimension, including 'vegetation density' and 'water quantity and quality,' were also considered applicable according to participants' feedback. Moreover, social dimension patterns such as 'leave me ALONE,' 'Supportive facility for activity,' and 'Exploring Opportunities' were regarded as applicable, indicating that the features that distinguish wilderness spaces from ordinary green spaces, such as space for users to engage in quiet personal activities, opportunities for exploration of the environment and wildlife, and corresponding cultural facilities.

Interestingly, the pattern 'Signs of Wildlife' appeared controversial, for an equal number of the participants showed their attitudes as applicable and non-applicable. These outcomes fit the acceptance discussed in previous studies in this PhD project. For example, the experience and knowledge from expert interviews show that many of the public show less interest in wildlife; however, nature enthusiasts find the wildlife in urban wilderness areas fascinating. A similar outcome was shown when discussing the pattern 'Wild biodiversity,' in which participants agreed that the selection of this pattern might depend on the scale and location of the site when planning and designing an urban wilderness. Also, patterns such as 'Ecology First' and 'Accessible with Multi-mobilities' may influence the site conditions, so practitioners in the future must consider the existing environment and design goals before selecting design patterns from the booklet.

6.4 Reflection and Conclusion

This chapter explains the validation and evaluation process of the urban wilderness design patterns developed in Chapter 5. Expert interviews and RTD research methods were implemented, the diverse comprehensions and applications of urban wilderness from multi-disciplinary perspectives were collected and discussed, and the design patterns were evaluated and applied in the practical design studio; the developed design patterns were thus deepened and improved according to the outcomes and feedback from participants. This chapter answers the research sub-question 4: How can the applicability of design principles be tested through the RTD method, and what is their added value?

In the validation process, a notable outcome was the uniformly positive attitude of both experts and design students toward the developed design patterns for urban wilderness. For design students, this response is consistent with the Dreyfus and Dreyfus (1980) model of skill acquisition, which characterizes them as advanced beginners who benefit from prescriptive rules and structured guidance. For experts, however, such a positive stance is more remarkable, as the same model suggests that professionals typically approach rule-based systems with scepticism, relying instead on intuition and holistic judgment. Several contextual factors may explain this divergence. Participants in expert interviews were from diverse disciplinary backgrounds, such as ecology, spatial planning, environmental psychology, and landscape design, and their professional focus often lies on different thematic or spatial scales. Rather than approaching urban wilderness as a singular, clearly defined domain, they engaged with the topic through a variety of lenses, which may have contributed to a more open and interpretive stance. Furthermore, the abstract and multidimensional nature of wilderness itself encourages conceptual flexibility, softening disciplinary boundaries and fostering openness across levels of expertise. Importantly, many professionals perceived the design patterns not as rigid prescriptions but as adaptable, strategic tools, especially valuable for facilitating collaboration across diverse stakeholders. Some even reported that certain patterns resonated with their “gut feeling” or tacit professional knowledge, suggesting a convergence between implicit expertise and the proposed framework. In this way, the design patterns were often welcomed as reflective amplifiers of existing knowledge and as practical guides for navigating complex, interdisciplinary design challenges.

One of the core findings from the expert interviews was the diversity of interpretations regarding urban wilderness. Participants’ perspectives were shaped by their disciplinary backgrounds, ranging from ecological conservation

and environmental psychology to spatial planning and public policy. Academic experts often emphasized ecological processes, intrinsic natural values, and long-term site dynamics, while practitioners focused on practical constraints, public needs, and implementation feasibility. These tensions echo longstanding debates in environmental philosophy between ecocentric and anthropocentric views (Rolston, 1986; Nash, 1967). The design patterns were praised not only for capturing a wide spectrum of values but also for their capacity to mediate between them.

Importantly, participants recognized the dual role of the design patterns as both tools for spatial design and instruments of communication. Concisely speaking, as design tools, they offered structured guidance, helping practitioners articulate spatial intentions, evaluate priorities, and align ecological, social, and cultural dimensions. As communication tools, the patterns helped bridge disciplinary language gaps, foster stakeholder dialogue, and clarify design intentions for non-expert audiences, including policymakers and the public. These communicative functions were especially valued in multidisciplinary processes, where alignment of vision is often as critical as technical expertise.

Several unexpected outcomes emerged during this validation process. Certain patterns, such as “Diverse Succession Stages” and “Young, WILD and Free,” elicited critical feedback on naming clarity and conceptual coherence. Participants’ debates over these patterns underscored the importance of linguistic precision and cultural readability in pattern communication. Moreover, while some teams used the patterns as creative stimuli at the beginning of their process, others turned to them during evaluation, treating them as checklists or analytical frameworks. This variation affirmed that the pattern language is not prescriptive, its flexibility across different design workflows is part of its strength.

Furthermore, while the validation confirms the utility of the patterns in both academic and practical contexts, it also highlights important areas for further refinement, especially regarding their transferability across cultural, ecological, and urban settings, as well as their long-term implementation. Given that both validation activities took place in the Netherlands, assessments of transferability relied primarily on the participants’ expertise and professional experience. This introduces a degree of bias and limits the ability to generalize findings across different cities, countries, or socio-ecological contexts. It is likely that the developed patterns would perform differently in regions with distinct urban morphologies, governance structures, or climate conditions. Future work could address this by conducting comparative case studies or involving participatory evaluations in diverse locations to assess real-world applicability. A refined urban wilderness design framework could also incorporate a structured classification that distinguishes transferable

principles from context-dependent pattern, organized for example by climate typology, urban morphology, or local governance. this validation did not cover long-term implementation outcomes or community-level reactions, both of which are critical for understanding the enduring impact and social reception of the patterns. Acknowledging these limitations strengthens the transparency of this research, and suggests concrete directions for future studies and practices, such as longitudinal studies or deeper engagement with community stakeholders over extended periods.

Besides, the integration of the RTD approach as a methodological backbone significantly shaped the research trajectory, which enabled iterative, practice-led inquiry wherein theoretical constructs were not simply tested but actively transformed through use. The collaborative workshop revealed that participants did not passively apply the patterns. Instead, they reinterpreted, combined, or adapted them to suit specific site conditions and design ambitions. This process demonstrated the epistemic strength of the RTD method, which foregrounds the performative and situated nature of design knowledge. In this PhD research, RTD not only validated the patterns but also produced new design insights that were unanticipated in earlier research phases.

RTD also exposed the challenges of translating conceptual richness into practical applicability. Some patterns proved difficult to operationalize without further contextualization or adaptation, particularly those requiring ecological expertise or long-term management planning. This friction between theoretical refinement and real-world applicability is not a flaw but a generative feature of design-based research. The RTD method made this friction productive, prompting critical reflection on the assumptions embedded in the patterns and encouraging refinements that made them more robust, adaptive, and grounded.

Through these processes, the pattern system evolved into more than a static design catalogue. It became a generative framework of a living tool that adapts through use. This aligns with Nijhuis and de Vries's (2020) understanding of the RTD method as a research mode that fosters the co-evolution of knowledge and practice. Design, in this sense, is not merely a medium for demonstrating research findings; it is a site of discovery in its own right.

While this study affirms the value of the RTD method in spatial planning and landscape design, it also reveals its limitations. One limitation in this validation was the choice of site for the design workshop, which used the campus setting, which may have introduced biases. The participants were very familiar with the context, and the sites were not fully representative of typical urban environments with complex stakeholder makeup.

Future validations on urban sites, for instance, within a city centre or a community with diverse residents, would further strengthen confidence in the patterns' generalizability. Before broad implementation in practice, it would be prudent to test these design patterns in additional real-world scenarios. This process possibly through pilot projects or further design exercises, including sites that pose different challenges, such as brownfields or densely populated areas. Such settings would provide richer feedback on pattern applicability, especially under competing demands.

Nonetheless, this chapter confirms that the RTD method is not only methodologically suitable but also strategically advantageous in advancing design-based research. In the emerging yet under-defined design domain of urban wilderness, the RTD method helped surface both tacit and explicit knowledge, fostered transdisciplinary dialogue, and yielded a pattern system that is both theoretically grounded and operationally meaningful. By embracing design as a mode of inquiry, this research contributes not only to better planning tools but also to a deeper understanding of how urban environments can accommodate wilderness within the fabric of contemporary cities.

This chapter marks a critical step in translating theoretical patterns into grounded practice through expert interviews and a participatory design workshop. By engaging practitioners and scholars in evaluating the proposed design patterns, the research moves from conceptual development toward practical validation. The dialogues surfaced both consensus and critical reflection, revealing how urban wilderness can be differently understood, adapted, and enacted across contexts. These insights not only affirm the relevance of the patterns but also inform their refinement. In doing so, this chapter strengthens the patterns' practical applicability and sets the stage for their empirical testing in real-world settings.

TOC

7 Synthesis and Outlook

This concluding chapter synthesizes the dissertation's key findings, draws an overall conclusion, discusses limitations, and offers an outlook for future research and practice. Section 7.1 gives a brief introduction to this chapter. Section 7.2 addresses each of the research sub-questions, demonstrating how they have been answered through the preceding chapters and how they collectively inform the main research question. The answers to the main research question are demonstrated below. Section 7.3 reflects on the limitations of the study, stemming from conceptual, methodological, and practical constraints. Section 7.4 then presents recommendations drawn from the research, targeting both design practice and future scholarly work in the planning, design, and management of urban wilderness.

7.1 Introduction

This dissertation explores the conceptual foundations of urban wilderness with the practice of urban planning and design, with a particular focus on how users perceive and experience these environments. Through a multi-method research approach integrating systematic literature review, precedent case studies, empirical fieldwork, and design experiments, this study examined how the concept of urban wilderness can be effectively incorporated into urban planning and design, and how design principles and patterns can be formulated that align with user perceptions. This chapter synthesizes the theoretical insights, methodological contributions, and empirical findings, while critically reflecting on the limitations and future directions of this PhD study.

The chapter aligns with the narrative logic of the entire thesis. It begins by summarizing the theoretical background and identifying gaps at the intersection of urban wilderness and urban planning. In particular, it highlights the lack of feasible design guidelines that can serve as practical references for researchers and practitioners, while also addressing the spatial demands and preferences of users. To bridge this gap, the study synthesizes evidence from diverse data sources to propose key thematic categories that planning and design patterns for urban wilderness should emphasize from the users' perspectives, namely, the natural dimension, the cultural dimension, and the social dimension. Each dimension contains indicators that influence user perceptions and shape design decisions.

To ensure objectivity and robustness, the developed design patterns were evaluated through expert interviews covering various professional backgrounds and stages of the spatial planning and design process. These interviews evaluate the practical relevance and future applicability of the proposed patterns. Based on feedback and insights gathered from these experts, the patterns are further refined. A design workshop further tested their applicability by engaging participants in applying the patterns in two experimental sites under distinct spatial conditions within the Delft campus.

Together, this concluding chapter demonstrates a coherent narrative that shows how each part of the research contributed to the overarching goal of developing and validating urban wilderness design patterns that are both scientifically grounded and practically applicable. It presents an overview of the key findings, discussions, conclusions, and recommendations derived from this PhD project. It addresses the main research questions and each of the sub-research questions in detail, reflecting

on the potential limitations that stem from both conceptual, methodological, and technical constraints within the field of urban wilderness planning and design. Finally, the chapter offers corresponding recommendations for future research and practice aimed at more effectively integrating urban wilderness areas into spatial planning and design processes that are responsive to users' demands and preferences.

7.2 Answers to Research Questions

7.2.1 Sub-questions 1: Research Overview and Theoretical Background (Chapter 2)

To what extent is the urban wilderness as a concept part of the urban planning and design process?

With accelerating urbanization and the constant expansion of built environments into remaining green areas, in urban contexts where space is limited, and competition for land is intensifying, urban wilderness, an informal and often overlooked type of green space, has attracted growing interest from scholars and practitioners. Despite this increased attention, our investigation revealed that current urban planning studies and practices have largely failed to integrate the concept of urban wilderness into mainstream spatial planning and design processes. Moreover, there remains a lack of concrete design principles to guide planners and designers in effectively incorporating urban wilderness into cities.

To assess the state of the art of research at the intersection of wilderness and urban planning, and to evaluate the necessity and feasibility of integrating urban wilderness within spatial planning and design frameworks, this PhD research conducted a systematic literature review spanning the past three decades. The goal was to identify the primary research themes and discern emerging directions in relevant fields. The review indicated that discourse on wilderness in the urban planning context revolves around three interrelated dimensions: wilderness as an idea, as a protected area, and as a special entity within the planning process. Each of these dimensions reflects different scholarly concerns and approaches.

Specifically, literature addressing wilderness as an idea in conceptual or philosophical terms often references the notion of pristine nature, rooted in the legacy of national park ideologies. Regarding wilderness as a reserve, the research emphasizes the coexistence of humans and nature, often approached from a conservation and non-anthropocentric perspective. It highlights the ecological and preservationist roles of urban wilderness, treating such areas as environmental legacies or ecological monuments. The third dimension, wilderness-as-spatial entity, shifts toward an anthropocentric perspective and explores how wilderness spaces function within urban settings, for instance, how they support human activities, provide experiences distinct from typical parks, and how they can be intentionally created or managed as part of urban green infrastructure.

Importantly, the literature review identified a shift in overall research orientation over time. Early studies heavily emphasized the intrinsic ecological value of wilderness, which aligns with ecocentric views. In recent years, there has been a growing focus on the instrumental value of urban wilderness, highlighting how these spaces can contribute to human quality of life and urban sustainability. This indicates a broader recognition of human-centered needs, such as recreation, mental well-being, and ecosystem services, alongside traditional ecological objectives. In other words, wilderness in cities is increasingly seen not just as an ecological asset but also as a social and cultural one.

The findings confirm both the necessity and feasibility of incorporating urban wilderness into spatial planning and design. There is a clear need for urban planning to embrace wilderness concepts as cities seek sustainable ways to reintroduce nature. However, a critical gap was evident: very few studies explicitly address urban wilderness from a design perspective. The systematic literature review thus reveals the opportunity to develop planning and design principles applicable to urban wilderness contexts. It provides a foundational knowledge base for this dissertation, affirming that urban wilderness can and should be part of urban planning discourse and guiding the subsequent phases of the research, which focus on developing practical design guidelines.

7.2.2 Sub-questions 2: Practical and Empirical Design Knowledge (Chapters 3 & 4)

What environmental features and metrics play a role in designing urban wilderness in ways that the users appreciate?

Building on the literature review findings that highlighted the gap in design-focused knowledge, the research turned to existing practices and empirical evidence to inform urban wilderness design. To formulate comprehensive and actionable design knowledge, it is essential to explore what practitioners have done in relevant projects and how users perceive such environments.

Currently, a range of spatial planning practices around the world align conceptually with urban wilderness. These include projects that share conceptual similarities with urban wilderness or explicitly incorporate wilderness principles within urban settings. For example, some involve rewilding initiatives on abandoned lands, others protect fragments of forest or wetland within limited urban environments, and some create new hybrid park-wilderness spaces. Many of these projects incorporate wilderness elements into urban contexts, offering city dwellers the opportunity to experience nature's spontaneity. By identifying and analyzing these cases, practical insights crucial for translating practical experience into general design knowledge could be extracted. Through case analysis, diverse spatial scales and each project's design intentions, key challenges, and solutions were examined. Strategies to preserve or simulate wilderness qualities, along with how they balanced potential threats, were emphasized. This practical evidence directly informed the development of the design patterns, ensuring they are grounded in real-world approaches.

Moreover, to ensure that users of urban wilderness spaces can perceive and engage with the intended design qualities, this research also considers users' perceptions, attitudes, and preferences toward the environmental characteristics of these spaces. In doing so, it seeks to ensure that the future urban wilderness spaces not only retain intrinsic ecological value but also possess aesthetic, cultural, and social values that are meaningful and appreciated by the public.

To investigate both the implementation of urban wilderness practices and users' experiences of these environments, this PhD research employs a combination of case study analysis and empirical investigation. These methods enable the collection of grounded, site-specific insights into how existing urban wilderness parks are utilized, perceived, and valued by users. The results contribute directly to the body of knowledge needed to inform future planning and design efforts in this emerging field.

Specifically, case studies were conducted to examine the practical process involved in planning and designing urban wilderness areas in the Netherlands. A diverse selection of cases, representing different spatial scales, respectively the local scale, regional scale, and national scale, was chosen to ensure a comprehensive analysis. The design intentions and current conditions of these sites were systematically analyzed to understand how planners and designers addressed key challenges and potential threats. Particular attention was given to the strategies employed for retaining and demonstrating the qualities and values of urban wilderness, as well as the primary planning and design considerations at each scale. These insights contribute to the development of practical design knowledge and inform the formulation of principles for urban wilderness planning and design.

The findings suggest that in existing practices, planners and designers have prioritized the preservation of natural processes and the presence of wildlife within urban wilderness spaces. Despite acknowledging the roles of humans as spatial users, the foremost concern remains the effective preservation of nature as a central environmental element, along with the protection and articulation of its unique ecological values. A key aspect of this approach involves controlling human intervention, which is closely tied to the ecological significance of urban wilderness and its function as a habitat for wildlife. By managing the extent of human impacts and minimizing artificial structures and disturbances, planners aim to maintain an environment in which natural processes can flourish and a balanced coexistence between humans and nature can be achieved.

Additionally, in smaller-scale urban wilderness projects, there is evidence of efforts to incorporate participatory planning and design processes. Given that urban wilderness spaces are typically situated within or at the edges of urban areas, their primary users are urban residents. It is also recognized that humans often experience instinctive apprehension or discomfort toward the perceived disorder and potential threats associated with pristine wilderness. As a result, users' perceptions of wilderness may differ significantly from those of professionals or experts.

To address this disparity, integrating public participation into the planning and design process is essential. By engaging spatial users, incorporating their preferences and concerns, and fostering dialogue between the design team and the public, planners can create spaces that both fulfill design intentions and resonate with user expectations. This approach aligns with the broader findings of the preliminary literature review, which highlight a recent shift in wilderness-urban planning research toward recognizing human needs and emphasizing the instrumental values of urban wilderness spaces.

Empirical studies conducted to investigate the spatial experience and perception of urban wilderness areas reveal a broad range of attitudes, with most participants demonstrating a clear comprehension and appreciation of urban wilderness. These findings diverge from earlier studies and suggest a growing recognition of the value and uniqueness of such spaces. The activities reported by visitors, such as hiking, climbing, environmental education, wildlife observation, and bird watching, highlight the experiential qualities of urban wilderness and its contribution to both urban ecosystems and residents' well-being. These findings also echo those of Kaplan and Kaplan (2005), who noted that people are drawn to environments that are both comprehensible and offer opportunities for exploration.

Specific environmental elements emerged as particularly influential for users, such as vegetation, water, and wildlife. High vegetation diversity and density, as well as the presence of high-quality water features, were strongly associated with positive perceptions. These elements contribute to an authentic “wilderness” feeling in the city, distinguishing the experience from a mown lawn or a paved plaza. Interestingly, while built elements such as trails and viewing platforms were noticed by visitors, people generally did not cite them as defining their experience unless those elements were obtrusive. This suggests that infrastructure in an urban wilderness should be minimal and carefully integrated. Visitors accept and even expect some infrastructure for access and safety, but it should not dominate the landscape.

Another finding was the evocation function of urban wilderness. Even participants with little prior interest in ecology or wilderness reported developing a positive attitude after direct experience. This suggests a critical point that exposure to urban wilderness can shape perceptions and potentially foster broader support for such spaces. It highlights the importance of the experiential aspect that design alone isn’t enough, facilitating direct human-nature interaction is key to revealing the value of urban wilderness to the public.

Drawing from the insights gained in both practical and empirical investigations, this research synthesizes multi-source knowledge to support the development of urban wilderness planning and design patterns. By analyzing past strategies for creating and managing urban wilderness spaces, alongside direct feedback from spatial users regarding their experiences and attitudes, the study contributes to advancing the integration of urban wilderness into spatial planning and design. This acknowledgment not only informs future scholarly and practical efforts but also supports the formulation of applicable, evidence-based design patterns grounded in real-world contexts.

Meanwhile, new challenges emerge that require urgent attention. How to integrate, sift, interpret, and translate diverse sources of evidence into usable tools for design and communication. Addressing this issue and developing a coherent and accessible framework that enables researchers and practitioners to apply these insights in planning and design practice is the next sub-question undertaken by this PhD research.

7.2.3 Sub-questions 3: Design Strategy Translation (Chapter 5)

What design principles and patterns can be developed for urban wilderness?

Having gathered a diverse body of evidence, including theoretical foundations, case study insights, and empirical user data, the research proceeded to translate this knowledge into concrete design guidelines. The aim was to create a pattern language or a set of design principles specific to urban wilderness, which practitioners and researchers can readily apply. The synthesized design principles and patterns are presented in a guidebook, attached as Appendix A.

This study first extracted a set of overarching design principles informed by three primary knowledge dimensions.

1 Theoretical Knowledge

Drawing from precedent studies, this dimension encompasses the conceptual evolution of wilderness and urban wilderness, highlighting key trends in scholarly discourse over recent decades. It also includes insights into environmental features typically associated with wilderness and urban wilderness spaces, as well as patterns of user-environment interactions as documented in prior studies. These form the conceptual foundation for the design principles.

2 Practical Knowledge

This involved synthesizing lessons from existing spatial planning and design practices that are relevant to urban wilderness. The research selected representative case studies at various scales, analyzing site conditions, spatial characteristics, design priorities, and present status. Unlike theoretical findings, these projects have been constructed, are publicly accessible, and have undergone ecological and

social transformations over time through ongoing user interaction. Consequently, they offer grounded, practice-based insights that inform the development of design principles applicable in real-world settings.

3 Empirical Knowledge

To enrich the theoretical and practical findings with primary data, empirical research was conducted at a selected urban wilderness site. This involved assessing its environmental characteristics and collecting users' perceptions, behaviors, and experiences. By documenting how users interact with these environments and how they interpret wilderness qualities, the study incorporates both professional and lay perspectives into the design process. This inclusive approach ensures that future planning and design efforts consider a broad spectrum of user perceptions and demands.

From these dimensions, a list of preliminary design principles was distilled. For example, principles covered include ensuring ecological conservation, facilitating spontaneous natural processes, creating a sense of discovery for users, acknowledging cultural layers, and designing for minimal management intervention, among others. These principles were then articulated as 24 specific design patterns, categorized under the Natural, Cultural, and Social dimensions. This structure was chosen to reflect the multi-dimensional character of urban wilderness design.

The natural dimension addresses ecological integrity from an ecocentric perspective, emphasizing the conservation of native species, biodiversity, and the regulation of human intervention to maintain wilderness character.

The cultural dimension focuses on facilitating meaningful interactions between users and the environment. It includes design strategies that reflect site-specific cultural values and enhance user engagement with the urban wilderness setting.

The social dimension highlights the importance of equity, safety, and inclusivity in urban wilderness design. It considers how to meet diverse user needs through spatial configurations and user-responsive design interventions.

It's important to clarify that the patterns are intended as flexible guidelines, not strict formulas. Urban sites are incredibly varied, and wilderness projects can differ in purpose. Therefore, the patterns are phrased in a way that they can be adapted. Practitioners are encouraged to select and tailor the patterns based on specific site conditions and project goals. The patterns serve as a toolkit, much like how an architect might use a pattern language as a reference rather than a rulebook.

Although there patterns have been established, their limitations and subsequent steps have also been acknowledged. Given the complexity of urban environments and the breadth of expertise among stakeholders, the initial set of patterns needed testing and refinement. Professional evaluation and practical trials are necessary to assess how well these patterns work in diverse scenarios and to refine their guidance accordingly.

7.2.4 Sub-questions 4: Expert Interviews and Design Experiments (Chapter 6)

How can the applicability of design principles be tested through the RTD method, and what is their added value?

After developing the urban wilderness design patterns, the research turned to validating them. It was critical to ensure that the patterns are not only theoretically sound but also practically valid and useful. To do this, this PhD project employed evaluation methods including expert interviews and a design workshop as a form of RTD experiment.

Seven experts with diverse disciplinary backgrounds and experiences, including ecologists, spatial planning scholars, independent landscape designers, municipal landscape architects, policymakers, and landscape design consultants, were interviewed. These individuals spanned stages of the planning and design process, ensuring a holistic critique of the patterns. The interviews served multiple purposes: experts provided insights into real-world challenges of urban wilderness projects, reflected on the qualities they believe such spaces need, and directly assessed the initial design patterns, commenting on clarity, relevance, and completeness. A central theme was exploring whether these patterns help bridge the gap between professional understanding of urban wilderness and what they perceive as user expectations.

The insights gained from the expert interviews were grouped into five thematic areas:

1 **Understanding and Concerns about Urban Wilderness:** Experts shared their personal interpretations of the concept and recounted challenges from past projects. For example, some emphasized the struggle of gaining public or political support, while others talked about difficulties in site selection or ecological constraints.

2 **Key Qualities and Characteristics:** This focused on what attributes an ideal urban wilderness should have, which echoes some of our design patterns. Responses included elements like biodiversity richness, sense of naturalness, presence of wildlife, and minimal human imprint.

3 **Patterns as a Communication Tool:** Many experts saw value in the patterns facilitating dialogue across disciplines and with stakeholders. The structured format of patterns can help explain complex ideas in simpler terms to non-specialists.

4 **Patterns as a Design Tool:** Interviewees assessed the utility of the patterns in supporting spatial design processes, particularly in generating, guiding, or refining design decisions. They considered whether the patterns provided enough guidance, were too general or too specific, and how they might influence creative design processes.

5 **Practical Implementation Comments:** Experts offered specific critiques, recommendations, and reflections on the practical application of the design patterns in future spatial planning and design projects.

Specifically, the expert interviewees shared their experience in planning and designing urban wilderness-related projects and articulated their perspectives on the qualities and characteristics that an ideal urban wilderness area should possess. Their insights into the definition of urban wilderness and the human-nature relationship revealed subtle differences shaped by disciplinary backgrounds and professional fields. While maintaining a shared emphasis on ecological value and biodiversity, the majority also highlighted the importance of human presence and interaction, suggesting that such interactions can enhance spatial vitality within urban wilderness contexts.

Experts also implicitly organized their feedback according to project stages. In the early stage, the focus lies on identifying and selecting appropriate sites for urban wilderness development, as well as gaining stakeholder support. At this phase, the design patterns were recognized as effective communication tools that facilitate dialogue and negotiation among stakeholders with diverse interests. Experts emphasized the importance of assessing site conditions, addressing existing contamination, preserving cultural memory, and considering budget constraints. Crucially, public needs and participation emerged as core concerns at this stage. During the design process, balancing nature and facilities, with zoning strategies often mentioned as a solution, was a recurring theme. Furthermore, the concept of visitor deactivation, which regulates visitor numbers to ensure wildlife habitats remain undisturbed, was mentioned. During this stage, the design patterns were applied as

practical design tools, particularly useful in facilitating interdisciplinary collaboration and guiding the selection of contextually appropriate strategies based on professional experience. For long-term management, minimizing human interference to let nature thrive was emphasized. These insights aligned well with some of our patterns.

Overall, most expert interviews found the design patterns to be comprehensible and relevant, validating the research outcomes. However, they also emphasized the need for continuous empirical evaluation and updates, the patterns should evolve as new knowledge comes in. Several participants also proposed constructive suggestions to enhance their functionality in real-world scenarios. Given the increasingly intense competition for limited green space, interviewees mentioned the necessity of interdisciplinary cooperation and active public participation to ensure the usability and acceptance of urban wilderness spaces, ultimately improving their effectiveness in meeting aesthetic and functional demands.

Following the expert interviews, a design workshop was conducted with 18 participants, including Master's students and PhD candidates from Delft University of Technology. The aim was to simulate applying the patterns to actual design problems. This hands-on experiment was crucial for observing the patterns' utility in action. Participants were asked to design urban wilderness concepts for two sites, using the pattern booklet as a resource, and then to evaluate the applicability of each pattern.

The workshop results were insightful. Through on-site observations and post-workshop discussions, it became evident that individual participants and design teams exhibited diverse approaches to applying the patterns. Some prioritized pattern selection early in their process, while others first developed their conceptual design ideas and then matched them to appropriate patterns. Even with the same pattern, teams might implement it differently due to personal interpretation or project context. This confirmed that patterns are flexible tools and that their application is significantly influenced by designers' expertise, which was also hinted at by the experts during interviews.

Notably, most participants found the patterns understandable and helpful. They used the pattern cards both for brainstorming and for checking their design decisions, reinforcing the patterns' dual function as both creative prompts and communicative or checklist tools. Several patterns received particular attention during the application process. For example, 'Expansive Vistas', 'Vegetation Density', and 'Water Quantity and Quality' were widely regarded as relevant and applicable across a range of urban wilderness projects. It indicated consensus on some core strategies for urban wilderness. Social dimension patterns such as 'leave me ALONE,' 'Supportive facility for activity,' and 'Exploring Opportunities' were also highly appreciated, indicating

participants' awareness of the unique experiential qualities of urban wilderness compared to conventional green spaces. Interestingly, a few patterns received mixed responses, such as 'Signs of Wildlife' and 'Wild biodiversity', suggesting that these patterns might require clearer guidelines or are inherently context-dependent.

In conclusion, the combination of expert interviews and the urban wilderness design workshop affirmed the applicability and partial validity of the proposed design patterns. Their implementation in simulated design scenarios, along with feedback from both professionals and emerging practitioners, confirms their potential as referable tools for future urban wilderness planning and design. The validation process also highlighted that while the patterns are useful, they are not static. They should be living guidelines, verified in practice, and adapted as necessary.

7.2.5 Conclusion of the Findings

To achieve the main goal, this PhD research developed a set of urban wilderness design patterns aimed at integrating the urban wilderness concept into the spatial planning and design process, in line with users' demands and perceptions. These patterns are meant to guide scholars and practitioners, serving as both communication aids and practical design instruments at various stages of planning and design.

A mixed-method approach underpinned the research. A comprehensive literature review was conducted to understand the state of knowledge in wilderness-urban planning relevant disciplines. Significant knowledge gaps were identified, thereby establishing the necessity and feasibility of introducing urban wilderness into spatial planning practice, providing a theoretical justification for this work.

Subsequently, multiple case studies were conducted to gather design knowledge from existing projects. Through analyzing site conditions, design priorities, and the outcomes of selected urban wilderness projects, this study offers insights into how practitioners tackle the challenges of designing for wilderness qualities in urban contexts and highlights common strategies and considerations that become the building blocks for the design principles.

Building on this, empirical fieldwork was carried out at an existing urban wilderness site to capture users' experiences and perceptions related to environmental elements and design intentions. This component addressed the human dimension, emphasizing user interaction with urban wilderness spaces.

Evidence from these three research stages, theoretical, practical, and empirical, was systematically analyzed, synthesized, and interpreted to extract meaningful planning and design knowledge. This process culminated in the development of a set of urban wilderness design patterns, intended to be practically applicable in real-world spatial planning and design contexts.

To assess and refine the patterns, an evaluation exercise was organized. Expert interviews with professionals from various disciplines provided critical feedback on the clarity, relevance, and completeness of the patterns, as well as suggestions for improvement. Additionally, a design workshop involving students with relevant academic backgrounds tested the applicability of the patterns in a simulated project context. Both evaluation methods confirmed that the patterns are valuable and generally applicable tools, while also offering suggestions for refinement.

The key conclusions of this research are presented as follows:

1 Based on the analysis of 416 wilderness-urban planning relevant literature reviews over recent decades, a significant increase in research output was observed in the years 2006, 2014, and 2017, with a peak around 2020. Predominant keywords across the literature include *conservation, preservation*, and *ecosystem services, reflecting the* dominant thematic concerns in the field.

2 A critical gap was identified in the current body of literature: very few studies approach wilderness from a spatial planning and design perspective. This lack underlines the originality and necessity of our focus on developing design patterns.

3 The analysis of trending topics revealed a shift in research focus from abstract philosophical discussions to more applied and site-specific concerns. Particularly, recent work places greater emphasis on the instrumental values of wilderness, such as ecosystem services and human well-being, alongside its intrinsic ecological value. Additionally, there is increasing attention to participatory and inclusive approaches to planning, reflecting a broader movement toward human stakeholders in what were once purely ecological discussions.

4 The literature review highlights the multifaceted roles urban wilderness plays in spatial planning and design studies, and three primary dimensions were identified. Urban wilderness as a concept is explored largely through philosophical and theoretical lenses, often concerning the evolution of wilderness ideals and national park creation amid urbanization. Urban wilderness as a reserve emphasizes a non-anthropocentric perspective, focusing on the coexistence of humans and nature and the preservation of wilderness as a form of natural heritage. Urban

wilderness as a space indicates how it could be part of the urban fabric as an active environment offering ecological value and facilitating human engagement through supportive infrastructure.

5 Based on the analysis of existing urban wilderness practices, this research identified four key design strategies for integrating urban wilderness into spatial planning and design processes, namely nature first, wild preservation, human intervention control, and public participation.

6 Through empirical studies on the existing urban wilderness site, this research investigated the spatial users' experience and perceptions of urban wilderness. The diverse environmental elements that might influence users' perceptions and attitudes toward environments were concluded based on the existing research and inter-disciplinary knowledge, respectively natural, cultural, and social dimensions. These align with the pattern categories and validate that each dimension contributes to the overall user experience of urban wilderness.

7 Despite limited formal knowledge of ecological or design principles, most spatial users at the studied site demonstrated strong positive attitudes toward the urban wilderness environment. Users valued the site as a natural haven within the city and appreciated its wild characteristics. This demonstrates urban wilderness to foster meaningful human–nature connections, even among non-expert users or typical nature enthusiasts.

8 Observations of behaviours at the case study site showed that what users chose to do closely matched the design intentions. The predominant motivation for visits was to experience 'wild nature' without leaving the city, confirming a fundamental demand that our design patterns aim to satisfy. Activities like nature observation and exploration, such as climbing, hiking, wildlife observation, and birdwatching, underscore the distinct ecological and experiential value of urban wilderness areas, setting them apart from conventional urban green spaces.

9 Users' feedback revealed that experiential qualities show a strong correlation between their perceptions of urban wilderness and the environmental attributes encountered during their visit. The experiential qualities of the environment, such as sensory, spatial, and atmospheric factors, were found to exert a greater influence on perception than cognitive or knowledge-based understandings. This highlights the importance of immersive environmental experience in shaping public appreciation and recognition of urban wilderness.

10 Among environmental attributes, vegetation and waterbodies stood out as the most influential on user perception and preference. In particular, the diversity and density of vegetation species, alongside the presence and quality of water features, contributed significantly to the perceived authenticity and attractiveness of urban wilderness environments. These became key elements in many patterns in the spatial users' assessment of wilderness character and ecological value.

11 Findings indicate that natural environmental elements contribute holistically to visitors' overall impression of the wilderness atmosphere, often being perceived as part of the broader landscape rather than as distinct or memorable landmarks. In contrast, man-made elements are more readily recognized and recalled due to their visual prominence and constructed nature. This suggests that design should strive to make built elements blend into a holistic natural landscape, while natural components should be designed/managed to collectively reinforce the wilderness character.

12 Insights from expert interviews emphasized the need for ongoing collection and refinement of design knowledge as foundational evidence for evolving urban wilderness design patterns. Future studies and practices should place greater focus on clarifying user demands and design objectives specific to various urban wilderness contexts. To ensure continued relevance and universal applicability, design knowledge must be periodically updated and tailored to the diverse conditions and constraints of individual projects.

13 Participants in the design workshop generally affirmed that the design patterns are applicable and useful for guiding planning and design. However, their feedback also highlighted the influence of contexts, including both the site's specific and the designer's background, on how the patterns are interpreted and used. They suggested some improvements both to the structure and to the specific content of individual patterns.

14 The design knowledge framework proved to be an effective communication tool, as evidenced by how it facilitated interdisciplinary dialogue in the workshop and interviews. It helped stakeholders from different backgrounds discuss urban wilderness in a more structured, evidence-based way. This indicates that the key objective of bridging understanding across disciplines was met by using the pattern format.

Further, in addressing the main question of this PhD research, namely, how can urban wilderness be meaningfully integrated into spatial planning and design in ways that reflect ecological realities and resonate with human perception, the study achieved

its primary goal of developing and validating a set of design patterns for urban wilderness that are scientifically grounded, perception-informed, and practically applicable. In addition, it proposed a novel paradigm for urban wilderness planning and design: the landscape ecological-perceptual design model. This model emerges from the convergence of three core domains that are the focus of this PhD research, including landscape ecology, environmental perception, and design strategy. This model reimagines the role of wilderness in cities not as an informal green space or remnants, but as a deliberate spatial practice that brings together the vitality of ecosystems, the subjectivity of human experience, and the intentionality of design.

Specifically speaking, the domain of landscape ecology provides the foundation. It emphasizes the role of urban wilderness as a habitat, a process, and a self-organizing system. The natural dimension of the design patterns prioritizes biodiversity, ecological continuity, and minimal intervention, allowing for the autonomy of non-human nature within the built environment. The public perception domain provides the interface. Empirical fieldwork has demonstrated that people's appreciation of urban wilderness is rooted not in their prior knowledge, but in direct, sensory encounters with the environment's complexity and wildlife. The emotional and experiential depth of these interactions gives meaning to urban wilderness far beyond functional green space. The design strategy translates these insights into actionable steps. The 24 design patterns, structured around natural, cultural, and social dimensions, synthesize theoretical foundations, professional practices, and user perceptions. They function both as a toolkit and a shared language, guiding the creation of wilderness spaces that are ecologically rich, culturally expressive, and socially inclusive.

In uniting these domains, the research proposes a coherent model for planning and designing urban wilderness that is adaptive rather than prescriptive. It provides an approach that respects ecological integrity while embracing human subjectivity and appreciation. This paradigm does not attempt to domesticate wilderness within urban settings, but rather to coexist with it, developing space in the city for that which is wild, unpredictable, and alive.

In summary, the research successfully addressed all sub-questions and achieved its main goal by producing a validated set of design patterns for urban wilderness. These patterns encapsulate a wealth of knowledge and serve as practical guidance, helping ensure that future urban wilderness projects can be planned and designed in ways that are ecologically sound, culturally meaningful, and socially welcomed. On the other hand, this PhD thesis offers more than a set of patterns. It also contributes a new paradigm for urban wilderness design, one that is informed by landscape ecology, shaped by environmental perception, and enacted through design strategy.

It lays the groundwork for future urban environments that are not only more sustainable but also more open to the presence of nature, allowing human and wildlife to encounter, shape, and transform one another in meaningful, enduring ways.

7.2.6 Synthesis: Toward an integrated planning model for urban wilderness

This research contributes to an integrated understanding of urban wilderness by bridging ecological integrity, user perception, and spatial design strategy. While each research question addressed a distinct thematic focus, with its respective conceptual foundation, environmental indicators, design patterns, and their validation. This synthesis reveals how these findings converge into a new planning model that redefines wilderness as a dynamic, perceptual, and designable entity within urban contexts.

Ecological Integrity as Foundation

At the core of the urban wilderness concept lies the principle of ecological autonomy. Design patterns such as Nature First and Wild Biodiversity emphasize the self-organizing potential of spontaneous vegetation, habitat succession, and biodiversity conservation. These ecological functions form the foundation of urban wilderness planning and design, differentiating it from man-made landscapes and aligning with sustainability goals such as urban resilience and species richness.

User Perception as Mediating Layer

Empirical findings from questionnaires, mental mapping, and behavioral observation indicate that ecological success alone is insufficient for urban wilderness acceptance. Visitors perceive the wildness of the environment through a combination of spatial features, such as openness, vegetation density, sensory stimuli, and symbolic associations. Key perceived environmental attributes, such as sense of enclosure, legibility, and perceived remoteness, mediate how ecological, cultural, and social processes are interpreted by spatial users. This insight highlights the importance of integrating users' perceptions with the investigation and knowledge-gathering process to ensure their psychological acceptance of urban wilderness while preserving the ecological value of the area.

Design Strategy as Translational Mechanism

Design patterns developed in the PhD research function as a bridge between abstract ecological processes and theoretical knowledge, with user experience and practical applications. Drawing from the pattern language approach, each pattern encodes applied scenarios that are context-responsive and perceptually attuned. The RTD method validates that these patterns not only perform spatially but also support iterative learning between theory and practice. Through this translational function, design becomes an instrument for shaping, creating, and managing wilderness in the urban planning process.

The three components, including ecological integrity, user perception, and design strategy, could be combined into an urban wilderness planning paradigm model (Figure 7.1). This model proposes that Ecological processes define the baseline conditions and limits of human intervention. User perceptions shape thresholds for acceptance, legibility, and engagement. Design patterns connect theoretical knowledge with practical application through evaluation and practices.

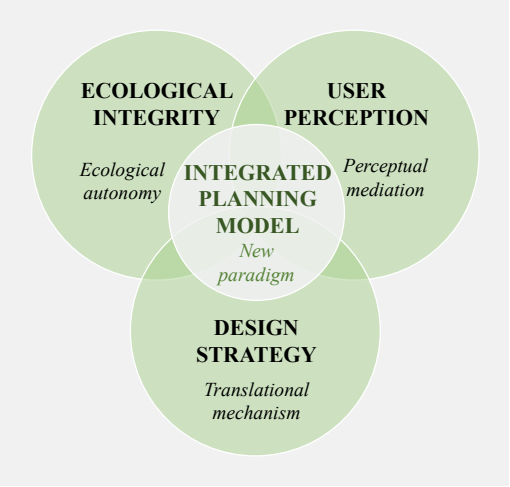

FIG. 7.1 The urban wilderness planning paradigm model integrates ecology, perception, and design

This synthesis presents a new paradigm in which wilderness is not merely a natural system, but also a cultural construct, founded on ecological integrity and scientific knowledge, integrated with users' experiences and perceptions, and interpreted and applied through design instruments. The model invites planners, designers, and policymakers to reimagine wilderness not as a residual or exceptional element, but as an intentional and integrative layer of urban environments.

7.3 Limitations

7.3.1 General Limitations

Urban wilderness, as a distinct category of urban green spaces, has gained growing attention over recent decades, particularly in response to the challenges posed by rapid urbanization. While existing literature demonstrates growing academic and professional interest in the diverse values of urban wilderness for both cities and their inhabitants, the practical integration of urban wilderness concepts into spatial planning and design practice remains limited. This PhD study addresses this gap by developing design patterns to guide scholars and practitioners in the communication, planning, and design of urban wilderness areas.

However, several broad limitations of the research should be acknowledged. Despite a comprehensive literature review and discussion of recent trends in wilderness–urban planning research, the concrete evidence base supporting the necessity and feasibility of incorporating urban wilderness into the spatial planning and design process remains lacking. Furthermore, although prior research has acknowledged the ecological and social benefits of urban wilderness, the mechanisms by which these benefits are realized and how to effectively optimize them through spatial interventions remain unclear. The emotional and psychological responses of users to urban wilderness environments stem from complex interactions among multiple environmental factors; further investigation is necessary to understand these relationships and their implications for human well-being.

This study proposed a conceptual framework including three dimensions for understanding users' perceptions and experiences of urban wilderness, respectively, natural, cultural, and social. While this framework offers a useful foundation, its components require ongoing evaluation, refinement, and expansion. Specifically, the content and composition of design patterns under each dimension should be continually updated to reflect new evidence and ensure their continued validity, applicability, and innovation.

Notably, the research perspective adopted in this study is primarily anthropocentric, focusing on the experiences and needs of human users, including planners, designers, and spatial users. This was intentional, given the goal to align wilderness design with user preferences. However, it does mean that a more biocentric

viewpoint may not be fully represented. While ecological criteria were included in patterns, the framing was often about how those ecological features contribute to human-appreciated qualities. Future research should incorporate a strong biological or ecological perspective, aiming to better understand the indicator characteristics of environmental elements from the standpoint of biodiversity, habitat health, and species interdependence. This dual focus can help foster the creation of urban wilderness environments that are both bio-friendly and socially inclusive. Moreover, future studies may benefit from the application of emerging technologies and tools, such as remote sensing, environmental sensors, GIS, participatory mapping, and wildlife monitoring systems, to more accurately assess and visualize the interactions among environments, wildlife, and humans. By integrating these technologies, researchers and practitioners can work toward a more balanced and evidence-based planning and design process that supports harmonious coexistence between humans and nature in urban settings.

In short, while this study breaks new ground in bridging wilderness and design, it operates within certain constraints. Expanding the evidence base, refining conceptual frameworks, and ensuring both human and ecological perspectives are balanced will be important as the field moves forward.

7.3.2 Methodological limitations

This study employed a mixed-method approach to collect evidence from theoretical, practical, and empirical perspectives, thereby ensuring a diverse and robust knowledge base for developing urban wilderness design patterns. However, several methodological constraints and challenges arose during the data collection, analysis, and interpretation process. These limitations may impact the objectivity, validity, and generalizability of the findings, and should be acknowledged to inform future research.

In the systematic literature review, data were primarily sourced from the Web of Science Core collection, which, while comprehensive, may have excluded relevant literature found in other databases, books, and design-focused publications. The exclusion of these sources potentially limits the breadth and depth of theoretical grounding. Future studies should consider expanding the database sources and including diverse publication types, especially design case studies, to capture a broader spectrum of knowledge and perspectives.

Regarding the practical case studies, while the selection included cases of varying scales, the geographical and cultural scope remains limited. To strengthen the universality and applicability of the resulting design patterns, future research should examine urban wilderness projects in a wider range of cultural and environmental contexts, enabling the inclusion of site-specific planning approaches and culturally responsive design strategies.

During the empirical study, certain simplifications were made to ensure participants could engage without confusion. Notably, to avoid the term “urban wilderness,” which might be misunderstood by laypersons, especially in translation to Dutch or Chinese. The term “natural spaces” was used in the questionnaire. While this likely helped participants relate, it introduces some ambiguity, since respondents might have thought of anything from a city park to a nature reserve. This could dilute the specificity of findings to “urban wilderness.” Such trade-offs between using technically precise language and ensuring participant understanding are common, but future research should refine how to communicate these concepts to the public, possibly by providing a clear definition or using visual aids to anchor the term “urban wilderness” for respondents.

Additionally, external variables such as seasonal changes were not fully accounted for in the current empirical study. Environmental factors, such as vegetation cover or users' activity patterns, may vary significantly across seasons and thus influence users' perceptions and experiences. Future research should consider longitudinal studies or repeated data collection across different seasons to account for temporal variations and enhance the reliability of empirical findings.

During the expert interviews, although the number of interviewees provided valuable insights into both the practice of urban wilderness planning and the evaluation of design patterns, increasing the sample size could enhance the diversity and depth of the findings and introduce additional viewpoints. Broader representation across disciplines, geographic regions, and levels of professional experience would further strengthen the comprehensiveness and generalizability of the results.

Moreover, while effective in validating the applicability of the developed patterns, the design workshop may face limitations in terms of site selection and participant diversity. It was conducted in an academic environment, which is not fully representative of a real-world planning scenario where community members and government officials would also be involved. The site selection on campus might have biased the designs because participants were very familiar with the area, and there were fewer “real” constraints than in a typical urban project. Also, while participants were interdisciplinary, they were largely early-career professionals or students;

involving experienced practitioners and a broader set of stakeholders in the workshops could yield a more rigorous evaluation. Future pattern validation could include multiple workshops in different cities, with participants ranging from community members to veteran professionals, and on different site typologies, to test pattern robustness.

Finally, while the RTD approach enabled the production of rich, situated knowledge that might not have surfaced through conventional empirical methods, it also presents distinct methodological limitations. As an inherently practice-driven and iterative process, RTD often lacks standardized protocols for validation, which can make it difficult to replicate, potentially affecting the objectivity and comparability of findings. In this research, some insights generated through design exploration were context-specific and interpretative, raising questions about their generalizability beyond the particular cultural, ecological, and social settings in which they emerged. Moreover, the workshop format revealed tensions between ecological ambitions, such as allowing for natural succession, and participants' tendencies to seek structured, controllable design solutions, which may reflect broader societal preferences. These observations, while valuable as design insights, also indicate a limitation of RTD that it might blur the line between research outcomes and creative speculation. Future research should consider hybridizing RTD with more formalized evaluative frameworks or a participatory approach to strengthen both its credibility and its relevance across disciplinary boundaries.

7.3.3 Practical Limitations

This study developed a set of urban wilderness planning and design patterns that facilitate effective communication and decision-making among scholars and practitioners in future spatial planning and design practices. While the research presents notable strengths, it also carries certain limitations regarding the formulation of planning and design objectives, the comprehensiveness of the design patterns content, and the robustness of the evaluation process used for assessing their validity.

The positive impacts of urban wilderness on both the urban environment and its residents, particularly in comparison to conventional urban green spaces, have yet to be fully recognized in policy or by the public, which may hinder their adoption. This gap remains one of the primary reasons why urban wilderness has not received sufficient attention in the context of urbanization. In future planning and design processes, it is crucial to clearly define and prioritize both the intrinsic and instrumental values of urban wilderness, ensuring that these values are conveyed in the design objectives and effectively communicated through spatial interventions.

In the future, integrating the concept of urban wilderness into spatial planning and design processes will require multidisciplinary collaboration. Practitioners from multiple disciplines, including academics, spatial planners, governments and policymakers, consultants, and landscape architects, must engage in coordinated and transparent decision-making. Continued evidence collection, along with efforts to enhance the adaptability, readability, and usability of the design patterns, will be essential. This refinement process also requires more application opportunities, incorporating the latest developments in spatial design theories, methods, and tools to keep the design patterns current and widely applicable.

Furthermore, it has not yet fully answered whether following these design patterns will indeed result in built projects that meet the intended goals. Key practical questions remain: if a planner uses these patterns to design an urban wilderness, will the result align with the design intent? Will users recognize the wilderness qualities as planned? Will they acquire more benefit from an urban wilderness space than they would from a conventional urban green space? These are unanswered because they require post-occupancy evaluations of actual projects designed with our pattern approach. Without those, it cannot conclusively be claimed that the patterns guarantee success. Therefore, a practical limitation is the need for future built experiments, which require actual urban wilderness pilot projects guided by our patterns, followed by rigorous evaluation to confirm outcomes. Only then can the credibility of the patterns be fully established.

Besides, the applicability of the design patterns might be constrained in certain urban settings or socio-ecological contexts. For instance, in extremely dense urban areas with scarce available spaces, implementing spatially generous wilderness elements may prove unfeasible. Similarly, in arid or water-scarce regions, ecological components such as dense vegetation or waterbodies may conflict with local environmental constraints. Furthermore, in highly privatized urban areas, access and management of wilderness-like areas may be constrained by ownership patterns, limiting public interaction and ecological succession. These contexts may require adapted or alternative strategies that align more closely with local constraints. Acknowledging these limitations emphasizes the importance of context-based application and suggests that further refinement of the patterns is necessary for effective implementation across diverse urban environments.

Another challenge is ensuring that designs based on patterns are actually perceived by users as intended. Urban wilderness may still be a novel concept to many citizens, and some might view a designed “wild” space as merely an unkempt park unless supported by interpretation or community engagement. The research gap concerning the alignment between design intention and user perception remains significant and represents a key area for further studies and practices.

In conclusion, while the study provides a valuable framework and toolset for urban wilderness design, its real-world impact will depend on continued effort to integrate these patterns into planning processes, adapt them with new insights, and verify them through practical application. Addressing these practical limitations will be crucial for the long-term success and acceptance of urban wilderness planning and design as a field.

7.4 Recommendations

Drawing from the entirety of this research, several recommendations are proposed, divided into those for design practice and those for future research, to further the integration of urban wilderness into urban planning and design.

7.4.1 Recommendations for Design Practices

This study systematically gathered evidence from multiple sources and extracted design knowledge from theoretical, practical, and empirical perspectives to develop design patterns for urban wilderness spaces. These patterns aim to help practitioners incorporate urban wilderness in the planning and design while accounting for users' perceptions and needs. They serve as communication tools among stakeholders and as reference guides for design strategies at different planning stages. Although the patterns have been evaluated and validated to an extent by professionals, there is room for enhancement. The following actions are recommended for design practice.

1 Continue to broaden the scope of the design patterns and their specific components as new insights emerge. This involves adding new patterns or refining existing ones to capture a wider array of wilderness qualities and scenarios. Over time, this will lead to a more universal and comprehensive toolkit for designing urban wilderness across various urbanization contexts. For example, patterns might be subdivided into more specific categories. The natural dimension could be enriched with patterns focusing on specific fauna or ecological processes, especially as new data on urban biodiversity becomes available. A concrete step could be developing wildlife-focused sub-patterns using biodiversity indicators, ensuring the natural dimension patterns address not just vegetation and habitat, but also species-specific needs.

2 Practitioners in the field should be encouraged to actively use the design patterns in real projects and to contribute to their ongoing development. Every application is an opportunity to validate and improve the patterns. Mechanisms should be established for practitioners to contribute feedback or case studies to the research community or the pattern repository. This ongoing engagement will help verify effectiveness, incorporate practical feedback, and update the patterns for a wider range of scenarios. For instance, design firms or city agencies could partner with academic institutions to document outcomes when patterns are applied, thus creating a continuous learning loop.

3 Foster multidisciplinary collaboration and innovation in future applications by utilizing design patterns as effective communication tools. Integrating insights and expertise from diverse disciplines can broaden the scope, increase the diversity, and strengthen the relevance of design patterns in addressing the complexities of urban planning and design.

This study gathers evidence through diverse research approaches and translates it via analysis, synthesis, and interpretation into design patterns for creating urban wilderness areas that are perceived and appreciated by users. The developed design patterns are structured along three dimensions: natural, cultural, and social. Although these design patterns have been evaluated and validated by professionals through expert interviews and design workshops, both the overall dimensions and individual patterns may still be limited by the scale and scope of the collected evidence. To address this, future research and practice should focus on collecting novel design knowledge and methodological innovations for enhancing the comprehensiveness and diversity of the patterns. Moreover, the three main dimensions could be further subdivided into more specific pattern categories to deepen their applicability and address a wider range of planning scenarios. For instance, the natural dimension could incorporate a wildlife perspective, drawing on biodiversity-related indicators and data to extract compatible, ecologically informed patterns.

In addition, the developed urban wilderness design patterns require continuous application and evaluation by scholars and practitioners. The integration of professional insights and practical experience could refine and expand the content of these patterns, ensuring they evolve in response to new evidence and applicable scenarios. Through this continuous process of iteration, the design patterns serve as a living toolkit that can be expanded, tested, and refined through practice. By doing so, the field can ensure that urban wilderness design remains dynamic, evidence-based, and responsive to new challenges and knowledge.

7.4.2 Recommendations for Future Research

While this PhD research has laid a foundation for integrating urban wilderness into spatial planning and design via design patterns, it also opens up several avenues for further inquiry. The following research directions are highlighted as particularly valuable.

1 Further research should continue to solidify the conceptual and practical link between urban wilderness and the larger framework of urban planning and design. This means ensuring future studies clearly define what urban wilderness means in planning terms and how it fits alongside other concepts, such as green infrastructure and nature-based solutions. A stronger theoretical foundation will help mainstream the idea in academia and practice and reduce ambiguities.

2 Continue exploring spatial users' perceptions and attitudes towards urban wilderness environments, as these insights are vital for shaping planning and design strategies and enhancing urban environments and residents' well-being. This includes expanding methodological approaches to gather data from diverse sources, thereby supporting more robust and nuanced analyses. Meanwhile, continuous efforts are needed to refine and expand the scope and content of urban wilderness design patterns to ensure their accuracy, applicability, and comprehensiveness in future research and practices.

3 A key recommendation is to reinforce the connection between theoretical research and practical application by ensuring that design knowledge is consistently informed by real-world complexities and that theoretical advances can be effectively translated into actionable planning and design guidance.

Even though this PhD research has proposed preliminary design patterns as tools to incorporate urban wilderness into spatial planning and design processes, the current findings have not yet fully elucidated the relationship between urban planning and the broader urban planning and design framework.

As noted in the limitations, more work is needed to distinctly characterize what sets urban wilderness apart from other urban green spaces within the planning and design context. Future research should articulate those defining characteristics clearly and perhaps quantify the added benefits of urban wilderness. This might involve comparative studies evaluating user experiences or biodiversity outcomes in wilderness-like parks compared with traditional parks. Clarifying this will reinforce why urban wilderness merits separate integration into planning frameworks.

In addition, emerging topics in wilderness-urban planning disciplines reveal a growing emphasis on the instrumental values of urban wilderness and the human demands placed on such environments. Participatory approaches in planning and managing urban wilderness areas are gaining attention, particularly in relation to users' aesthetic experiences and environmental perceptions. Building on the groundwork of this PhD research, future investigations should embrace these trends by developing advanced methodologies to measure instrumental benefits and by innovating participatory approaches for urban wilderness. Moreover, investigating how wilderness experiences affect people's mental health, or how participatory management of an urban wilderness might work, would be highly relevant.

The roles of various stakeholders in wilderness planning also remain unexplored. Future studies should investigate how practitioners involved in different stages of spatial planning and management interpret the concept of wilderness and how these interpretations influence practice outcomes. A deeper understanding of stakeholder recognition and perceptions will support more inclusive and collaborative approaches to planning, designing, and managing wilderness spaces in urban contexts.

Moreover, findings from the literature review suggest that wilderness-urban planning research has shifted increasingly toward applied and practice-oriented research in recent decades. This trend indicates the importance of expanding the body of knowledge to inform practice. Interdisciplinary collaboration, particularly among scholars in fields such as ecology and landscape architecture, plays a critical role in this process. As discussed in the expert interviews conducted for this PhD study, professionals from these disciplines provide essential input, including ecological assessments, biodiversity evaluations, wildlife identification, and preservation strategies, which influence planners' and designers' decisions and, in turn, shape the design goals and outcomes.

In conclusion, this PhD research provides a stepping stone, but fulfilling the vision of urban wilderness in cities will require sustained research efforts across multiple fronts, including conceptual, empirical, methodological, and collaborative approaches. By pursuing the above recommendations, future research can significantly enhance the understanding and capability to plan and design urban wilderness areas that meet both ecological goals and human aspirations.

7.5 Conclusion

This PhD research aimed to develop design patterns for the planning and design of urban wilderness areas that address the spatial needs and perceptions of users. These patterns also provide guidance for future studies and practices among scholars and practitioners in relevant disciplines. Generally, this study began with a thorough investigation of existing literature, followed by the gathering of practical evidence from real-world cases, and then conducted empirical studies on users' experiences. It ultimately formulated design patterns, which were subsequently evaluated and refined through expert and design experiments.

The first stage of the research involved a systematic review of contemporary work on wilderness and urban planning, which revealed a notable gap: the limited exploration of urban wilderness from a spatial planning and design perspective. This finding establishes a clear necessity for this research, confirming that while wilderness is a topic of growing interest, its integration into urban planning paradigms remains poorly defined. The review provided theoretical context and underscored the feasibility and importance of incorporating wilderness concepts into urban design, thereby providing a basis for developing specialised design patterns.

Practical design knowledge was then collected via case studies of urban wilderness practices in the Netherlands. Several cases of varying scales were analyzed in terms of site conditions, design considerations, and current status. This investigation yielded insights into common strategies and key considerations of urban wilderness design.

To complement this, empirical studies were conducted in China to capture users' experiences and perceptions at a selected urban wilderness site. This cross-cultural component added depth, highlighting which environmental elements contribute to these perceptions and how people value the wilderness aspect of an urban space.

By synthesizing theoretical, practical, and empirical insights, a cohesive body of design knowledge was consolidated and translated into a set of urban wilderness design patterns. In total, 24 patterns were proposed, structured into natural, cultural, and social dimensions, effectively translating abstract design knowledge into a concrete 'pattern language'. These patterns are intended as actionable guidelines or best practices for practitioners aiming to create wilderness-like spaces in urban environments.

To ensure these patterns were not just theoretically sound but also practically valid, the research proceeded to validate them through expert interviews and a design workshop. By engaging professionals from various disciplines and emerging designers in applying and commenting on the patterns, their strengths were evaluated, and areas for refinement were identified. The feedback confirmed that the patterns are promising tools for facilitating both communication and design in professional practice. Experts validated the relevance of our patterns while also emphasizing the need for continued refinement. The design workshop demonstrated that the patterns can indeed help guide design decisions and foster interdisciplinary collaboration among participants, thus fulfilling two of our key intended functions of the pattern language.

The findings demonstrate that the developed design patterns are recognized as promising tools for both communication and design among professionals engaged in incorporating urban wilderness into spatial planning and design. This dual utility is significant because the successful implementation of urban wilderness often depends on effective communication and innovative design strategies. The developed pattern language addresses both needs.

The validation processes emphasized the need for continuous refinement of the patterns. Experts and practitioners alike noted that while the patterns provide a solid foundation, they should be continuously improved as more practical experience and advanced knowledge become available. This means the work begun in this PhD research will ideally continue, with future researchers and designers updating the pattern toolkit.

In closing, this PhD research contributes a significant step toward bridging the gap between the urban wilderness concept and the practical urban planning and design process. It proposes a structured set of design patterns that provide both communication and design tools for researchers and practitioners. By validating these patterns with professionals and in design scenarios, it also provides confidence in their utility and effectiveness.

This dissertation advances the understanding and practice of urban wilderness by introducing a model that integrates ecological integrity, user perceptions, and design strategy, and by translating these insights into a coherent pattern language for design. Together, these contributions provide both a conceptual lens and a practical toolkit for planners and designers, offering clear guidance toward more resilient and inclusive urban landscapes.

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Appendices

APPENDIX A

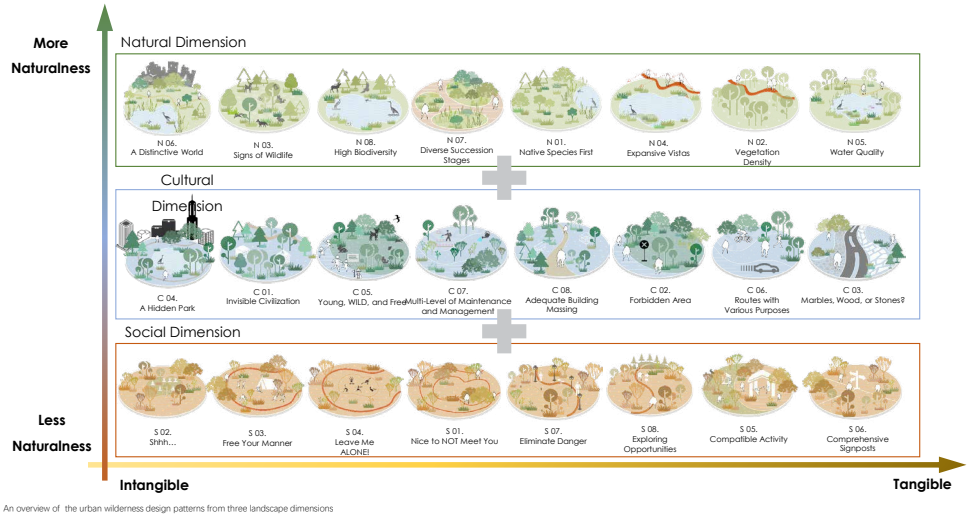
Design Patterns for Urban Wilderness Spaces

The Appendix A presents the design pattern booklet, which aligns with the research findings discussed in Chapters 5 and 6 of this thesis. This booklet outlines design patterns for developing urban wilderness spaces integrating urban nature and user perception. The 24 patterns are categorized and organised by three dimensions (i.e. natural, cultural, and social), with each dimension's patterns illustrate critical design considerations from different perspectives. Accompanying each pattern in this booklet, the titles, brief descriptions, the application scenarios, relevant patterns, theoretical back-up, and practical implication are all presented.

Users' Perception and Design of Urban Wilderness

Planning and Design Pattern Language Booklet

Yuan Chen



An overview of the urban wilderness design patterns from three landscape dimensions

3

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Wilderness, visitors and facilities in Jiangyangfan
(Source: author)

P 01. Ecology First

Valuable native wildlife species and environmental qualities should be preserved for the biodiversity

RELEVANT PATTERNS

- Signs of Wildlife [P 03.]
- Wild Biodiversity [P 08.]
- Forbidden Area [P 10.]
- Multilevel maintenance and management [P 15.]

THEORETICAL BACK-UP

An urban wilderness should preserve (at least partly) its wild value to signify pristine wilderness for visitors and provide shelter or habitat for wildlife through planning.

From the site survey in Jiangyangfan Ecological Park in this research, the responses showed that participants' motivation and most impressive experience in an urban wilderness include getting close to wild nature and observing wild species such as birds and insects on the site, which reveals the importance of native wild species. Also, the native species of reed beds on the site were preserved during the planning and design process to ensure the site's ecological value, according to the interview with the design leader of the park.

Relevant proof could also be found in spatial planning and design practice. In the planning and design process of the Highline Park in New York, Piet Oudolf used preserved vegetation in the railway interstices. He combined them with the overarching park design to preserve the wild elements on the site (Li., 2022).

PRACTICAL IMPLICATION

- Make full use of native species, e.g., precious vegetation and rare animal species
- Do not disturb native wildlife's habitats during the planning and design of an urban wilderness
- Supplement local species could be appropriately added during planning and design
- Special areas for the exhibition of native species could be considered in the design

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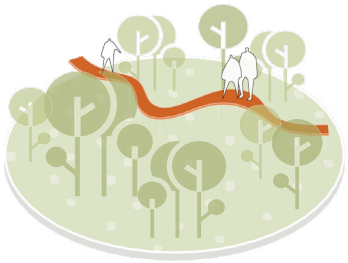
P 02. Vegetation Density

There should be areas with high vegetation density, thus providing a shelter for wildlife in an urban wilderness



RELEVANT PATTERNS

- Wild Biodiversity [P 08.]
- Signs of Wildlife [P 03.]
- A Distinctive World [P 06.]
- 'Invisible' Civilization [P 09.]
- Crime-free Zone [P 23.]

THEORETICAL BACK-UP

According to existing research, the naturalness of a landscape environment could be influenced by the density and neatness of the vegetation (Landres et al., 2015). Dense vegetation let fauna live far away from the visitors and create a natural boundary between nature and culture, Also, dense vegetation in an urban environment, such as urban forestry, has proven attractive for city dwellers (Andreas et al., 2023). Jiang B. et al. (2016) stated that vegetation density positively influences the restorative value of the environment for visitors.

In the survey in Jiangyangfan Ecological Park, responses from the questionnaire suggested that visitors regarded vegetation density as one of the essential landscape elements influencing their perception of an urban wilderness. Environmental observation records also showed that spaces with relatively dense vegetation were more popular than others, especially in rainy and sunny weather. These findings revealed that thick vegetation played a crucial role in shaping visitors' perceptions and preferences in an urban wilderness area, e.g., it functions as a shelter space in an urban wilderness.

PRACTICAL IMPLICATION

- Diverse species and layers of vegetation should be selected during the planning and design of an urban wilderness
- Avoid large amounts of over-neat and delicate maintenance of vegetation
- Ensure the volume of vegetation
- Select tall and dense-leave species during vegetation design

P 03. Signs of Wildlife

Wildness features, e.g., the existence of wildlife, and create conditions for wildlife of nature species

RELEVANT PATTERNS

- Ecology First [P 01.]
- A Distinctive World [P 06.]
- Wild Biodiversity [P 08.]
- Young, WILD, and Free [P 13.]

THEORETICAL BACK-UP

Visitors' perception of landscapes is often connected to their encounters with various species (Grahn and Stigsdotter, 2010).

The wild features of an urban area signify pristine wilderness for visitors. From the site survey in this research, participants' motivation and most impressive experience in an urban wilderness include getting close to wild nature and observing wild species such as birds and insects on the site, which reveals the importance of the signs of wildlife in an urban wilderness which contributing to the perception and preference of visitors.

Also, during the interview with the design leader of the park, the wildlife habitat was preserved and presented to the public through landscape design, which became a crucial attractiveness for the visitors, especially for nature lovers and children.

PRACTICAL IMPLICATION

- Make full use of native wild species
- Do not disturb native wildlife habitats
- Protect the wildlife's habitat through landscape planning and design
- To protect the rare species' habitats, visitors should be prohibited from entering in during the spatial planning and design

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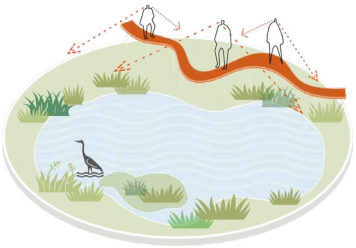
P 04. Expansive Vistas

An urban wilderness should provide relatively expansive and open vistas for visitors



RELEVANT PATTERNS

- Water Quantity and Quality [P 05.]
- Crime-free Zone [P 23.]
- Provide Exploratory Opportunities [P 24.]

THEORETICAL BACK-UP

Research showed that relatively large and open vistas of vegetation or water bodies could provide a sense or perception of nature for people. An expansive landscape vista has been regarded as essential when people perceive an environment as wild (e.g., Lev et al. 2020).

During the site survey in Jiangyangfan Ecological Park, participants' mental maps showed a strong impression of the large water body and the open landscape sights it provides.

PRACTICAL IMPLICATION

- Provide sizeable open space for visitors, e.g., water bodies, grassland, reed bed
- Control the growth of vegetation adequately in some specific areas to ensure the openness of spatial sights for visitors
- Avoid constructing tall and prominent artificial structures

P 05. Water Quantity and Quality

The existence of waterbodies and good water quality facilitates wildlife and the environment, as well as the visitors' experience and preference for an urban wilderness

RELEVANT PATTERNS

- Expansive Vistas [P 04.]
- Crime-free Zone [P 23.]
- Provide Exploratory Opportunities [P 24.]

THEORETICAL BACK-UP

The existence of waterbodies was crucial in contributing to visitors' experience and preference in an area. For example, Yuan et al. (2023) found that large water bodies were critical when assessing participants' audio-visual experience and preference in 360° videos of landscape environments. According to Liang et al. (2023), the water biotope was the most preferred among different biotopes in urban green spaces. A study conducted in Guyana indicated that visitors regarded spaces with a higher proportion of vegetation and water bodies as more natural, showing more restorative and well-being benefits (Fisher et al., 2021)

From the site survey in Jiangyangfan Ecological Park, the quality of the waterbodies was regarded as one of the most influential characteristics in shaping how visitors perceive the environment as an urban wilderness.

PRACTICAL IMPLICATION

- Eliminate the contaminant in the preserved water bodies in an urban wilderness in planning and design
- Ensure high-quality waterbodies provide a sustainable habitat for vegetation and animals on the site
- select species with purifying water properties during the hydrophyte planning and design process

TOC

P 06. A Distinctive World

An urban wilderness creates a whole different world for the visitors distinct from the hustle and bustle in the city

RELEVANT PATTERNS

- Vegetation Density [P 02.]
- Signs of Wildlife [P 03.]
- Wild Biodiversity [P 08.]
- 'Invisible' Civilization [P 09.]
- A Hidden Park [P 12.]
- Nice to NOT Meet You [P 17.]
- Leave Me Alone! [P 20.]

THEORETICAL BACK-UP

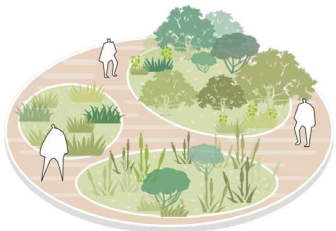
According to Jensen's (1998) study, one visit's motivation could be 'peace'—finding a place that is quiet, far away from densely built-up and populated areas, and finding a change in everyday city environments.
During the site survey of Jiangyangfan Ecological Park, the responses from the questionnaire suggested that visitors' intentions to visit the site mainly for the quiet vibe and serene environment compared to the urban area and getting away from the stress and pressure in the work and living.

PRACTICAL IMPLICATION

- Preserve the valuable native wild species, including wild flora and fauna
- Ensure the high biodiversity in the site
- Create serene spaces for visitors through landscape design
- Provide appropriate facilities to support visitors' activities
- Avoid constructing tall and prominent artificial structures

P 07. Diverse Succession Stages

The varied environmental zoning and different stages of vegetation development enhance visitors' perception of urban wilderness while supporting the sustainability of the ecosystem within the urban wilderness



RELEVANT PATTERNS

- Ecology First [P 01.]
- A Distinctive World [P 06.]
- Wild Biodiversity [P 08.]
- Young, WILD, and Free [P 13.]

THEORETICAL BACK-UP

Mathey et al. (2018) explored the public's perception and attitude toward the natural environment in different stages of succession, showing various vegetation densities. The findings suggested that diverse development stages of vegetation influence visitors' environmental perception. This might reveal that the diverse experience provided for the visitors in urban wilderness facilitates their perception and understanding.
In the interview with the design leader of the Jiangyangfan Ecological Park, the various species selected for the site and the diverse succession stages presented through planning and design instruments create a spontaneous feature in the urban wilderness.
Case studies in this PhD project also reveal that the varied environmental zoning of the urban wilderness clarifies the range of human and wildlife activities and controls their interactions, therefore efficiently maintaining biodiversity while providing space for human interactions.

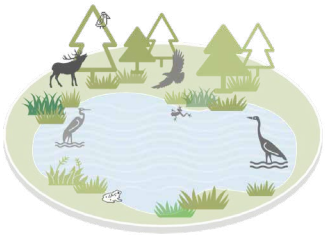
PRACTICAL IMPLICATION

- Rationalize the zoning of urban wilderness at an early stage, distinct human activity zones from wildlife protection areas
- Select diverse vegetation species during the landscape planning and design process
- Preserve valuable native species in specific areas and implement different levels of maintenance in different zones after construction process

TOC

P 08. Wild Biodiversity

Adequate wild biodiversity in an urban wilderness, e.g., rare and endangered species, suggests an abundance of wildlife and ecological values



RELEVANT PATTERNS

- Ecology First [P 01.]
- A Distinctive World [P 06.]
- Diverse Succession Stages [P 07.]
- Young, WILD, and Free [P 13.]

THEORETICAL BACK-UP

An important dimension influencing visitors' perceived naturalness is "biodiverse," but not necessarily tidy (Hoyle et al., 2019). Carrus et al. (2005) claimed that participants recognized broad levels of visual biodiversity in an environment. Also, Dallimer et al. (2012) and Fuller et al. (2007) argued that perceived biodiversity was one of the most prominent variables of human reaction to nature.

During the site survey of the questionnaire and mental maps, participants showed a strong impression of their experience of encountering wild animals and the diverse vegetation species on the site.

PRACTICAL IMPLICATION

- Preserve the native species of flora and fauna and adequately add diverse vegetation species in the planning and design process
- Use design instruments and maintenance to support the development and the habitats of diverse wild species
- Construct a supportive facility to let visitors get close to the wildlife

P 09. 'Invisible' Civilization

Reducing traces of modern civilization and highlighting the experience of being in the wild

RELEVANT PATTERNS

- Vegetation Density [P 02.]
- Signs of Wildlife [P 03.]
- A Distinctive World [P 06.]
- A Hidden Park [P 12.]
- Controlled Building Masses [P 16.]

THEORETICAL BACK-UP

According to the initial legal definition, wilderness refers to an environment where nature is untrammeled by humans (Wilderness Act, 1964). With the expansion of wilderness ideas and the development of urban wilderness in landscape architecture discipline, the core determining feature of a defined "wilderness," or "urban wilderness," stays the same: minimal human civilization trace.

During the survey in Jiangyangfan Ecological Park, many participants claimed that one of the motivations for visiting an urban wilderness was the absence of modern structures and facilities so they could indulge in the wild atmosphere an urban wilderness creates.

PRACTICAL IMPLICATION

- Select diverse vegetation species and ensure the density during planning and design
- Preserve and support the habitats of wildlife in an urban wilderness
- Use natural materials for artificial facilities during the planning and design of urban wilderness, e.g., the wooden plank and pavilion, path made of gravel and shells
- Reduce the amount of artificial building massing and massive structure

TOC

P 10. Forbidden Area

Always leave some pristine areas and remote them from human beings in an urban wilderness

RELEVANT PATTERNS

- Ecology First [P 01.]
- A Distinctive World [P 06.]
- Wild Biodiversity [P 08.]
- Multilevel Maintenance and Management [P 15.]
- Crime-free Zone [P 23.]

THEORETICAL BACK-UP

There has been enormous research and practices showing the adverse effects of many visitors on the natural environment. In an urban wilderness, the number of visitors and the visit zone should be constrained to ensure the quiet and pristine of the wild environment and its ecological value. An urban wilderness case of Oostvaardersplassen in the Netherlands indicated that artificial facilities, e.g., walking paths and buildings, could be designed as gathered in the marginal zone of the site to avoid deep exploration of visitors (Chen et al. 2022).

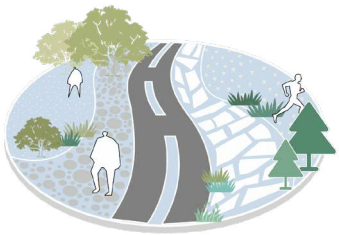
Several eco-islands were planned in the survey site Jiangyangfan Ecological in Hangzhou City, where the survey was conducted, to protect the pristine wildlife on the site. They built stainless fences to prevent visitors from entering.

PRACTICAL IMPLICATION

- Planning for preservation areas with high ecological values in an urban wilderness
- Protect strategies for preventing visitors (e.g., fences, remote from paths, or hide from public sights
- Gather artificial facilities and buildings in limited zones to constrain visitors' behavior and activity

P 11. Marbles, Wood, or Stones?

Walking paths in urban wilderness areas should prioritize ecological materials, such as marble, shell, stone, or sand, over modern alternatives like concrete



RELEVANT PATTERNS

- A Distinctive World [P 06.]
- 'Invisible' Civilization [P 09.]
- Accessible with multi-mobilities [P 14.]
- Multilevel Maintenance and Management [P 15.]

THEORETICAL BACK-UP

The choice of materials for transportation infrastructure, such as concrete, influences visitors' perceptions of the natural environment and reflects modern civilization (Lev et al., 2020). Survey responses from Jiangyangfan Ecological Park indicate that most participants prefer unpaved paths with no manmade traces, such as those made of sand or mud. Some respondents preferred paths partially composed of ecological materials, like marble, stone, or shells. Mental maps from the survey reveal that many participants noticed the presence of concrete paths in the urban wilderness but did not express admiration for them.

PRACTICAL IMPLICATION

- Use natural materials/forms for paths in an urban wilderness during planning and design
- Reduce the amount of vehicle path as much as possible
- Ensure the accessibility of walking path, e.g., wheelchair visit route

TOC

P 12. A Hidden Park

An urban wilderness may not possess high accessibility to control the number of visitors

RELEVANT PATTERNS

- Vegetation Density [P 02.]
- A Distinctive World [P 06.]
- 'Invisible' Civilization [P 09.]
- Forbidden Area [P 10.]

THEORETICAL BACK-UP

There has been enormous research and practices showing the negative effects of a large number of concrete buildings in an urban setting, with no park in the neighborhood. Studies showed that people would like to visit easily accessible green spaces, and thus their physical/mental health could be better when visiting them, e.g., reducing nervousness and restoration value the public could get from green spaces in their neighborhood.

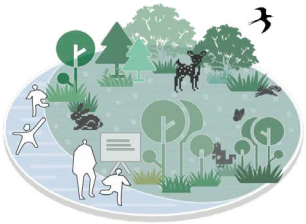
However, people's preferences might be different when they are attempting to visit an urban wilderness park. During the interview with the design leader of the Jiangyangfan Ecological Park, the interviewee claimed the design principle of keeping the park hidden from the city or letting the target visitors find the park spontaneously. This action could provide a peaceful and safe environment both for the visitors who wish to have a serene time in an urban wilderness and keep the massive visitors who might influence the wildlife in the environment.

PRACTICAL IMPLICATION

- Planning for preservation areas with high ecological values in an urban wilderness
- Protect strategies for preventing visitors (e.g., fences, remote from paths, or hide from public sights
- Avoid excessive accessibility of the site through planning and design, to properly control overcrowded visitors

P 13. Young, WILD, and Free

Urban wilderness should provide natural education opportunities for children and youngsters



RELEVANT PATTERNS

- Ecology First [P 01.]
- Signs of Wildlife [P 03.]
- A Distinctive World [P 06.]
- Wild Biodiversity [P 08.]
- Supportive Facility for Activity [P 21.]
- Crime-free Zone [P 23.]
- Exploring Opportunities [P 24.]

THEORETICAL BACK-UP

There has been enormous research investigating the educational value of the natural environment and wilderness, especially for children and young people, as well as its therapy function as a treatment for physical and mental health issues (e.g., Harper, N. J. et al., 2019).

During the site survey, there was a large group of children led by teachers or parents to the urban wilderness to learn about wildlife and be close to nature. During an interview with the design leader of Jiangyangfan Ecological Park, the children were regarded as one of the main target groups in the planning and design process.

PRACTICAL IMPLICATION

- Provide activity spaces for families with children
- Provide educational facilities, e.g., educational board and interactive facilities through design
- Eliminate vegetation or materials that might cause hurt to children, e.g., vegetation with thorns and poison
- Provide spaces for parents to relax and take care of children

TOC

P 14. Accessible with multi-mobilities

Urban wilderness parks should provide diverse transportation systems for various visiting purposes

RELEVANT PATTERNS

- Marbles, Wood, or Stones? [P 11.]
- Nice to NOT meet you [P 17.]
- Comprehensive Signposts [P 2.]
- Exploring Opportunities [P 24.]

THEORETICAL BACK-UP

Wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." (Wilderness Act, 1964). In an urban wilderness, encountering other visitors or sensing traces of modern civilization signs could detract visitors from opportunities to experience solitude (Landres et al., 2008).

From the feedback and analysis of data from the site survey, the majority of participants' intents to visit an urban wilderness park include "get close to wild nature", "enjoy leisure time with families", etc. Almost all these activities require a quiet and no-disturbing environment rather than a public social space.

PRACTICAL IMPLICATION

- Clear and thorough transportation system planning and design
- Provide diverse exploring opportunities and experiences by diverse visiting routes with different themes or destinations through landscape design
- Use diverse materials for different routes, e.g., concrete roads for vehicles, sand roads for cycling, and marble pavement for walking
- Provide clear and understandable signs for the transportation guide

P 15. Multi-Level of Maintenance and Management

For districts with diverse vegetation species and multiple ecological values, different maintenance and management solutions could be implemented

RELEVANT PATTERNS

- Ecology First [P 01.]
- Diverse Succession Stages [P 07.]
- Forbidden Area [P 10.]
- Marbles, Wood, or Stones? [P 11.]
- Accessible with Multi-mobilities [P 14.]
- Comprehensive Signposts [P 22.]

THEORETICAL BACK-UP

In an urban wilderness area, multiple vegetation succession could happen in different zones. Also, different landscape actions should be implemented regarding different design proposals for the zoning. Therefore, it's essential to conduct multi-level maintenance and management regarding specific districts in urban wilderness planning and design.

In the planning and design process of the Oostvaardersplassen reserve, the government and manager of the site propose a dynamic developing prospect, implementing different planning solutions regarding diverse districts of the site. For example, water level management in the marsh zone, and grazing action in the dry land (Chen et al., 2022).

PRACTICAL IMPLICATION

- Use diverse management and maintenance solutions for different natures of the district in an urban wilderness area, e.g., for the native species preservation area, eliminate human intervention as much as possible to protect wildlife. However, for the district to open for the public to conduct various social activities, the management and maintenance should involve more actions

P 16. Controlled Building Masses

The amount of building massing should be properly controlled in an urban wilderness area

RELEVANT PATTERNS

- Expansive Vistas [P 04.]
- A Distinctive World [P 06.]
- 'Invisible' Civilization [P 00.]

THEORETICAL BACK-UP

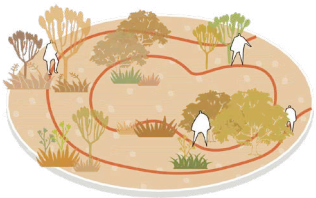
There has been enormous research and practices showing the negative effects of many building masses and manmade facilities on visitors' experience and restoration value of the environment. During the site survey, especially in mental maps, participants showed an unignorable impression of the massive buildings in the urban wilderness park. However, the manmade building tended to be the least interesting element in an urban wilderness according to the questionnaire response. An initial hypothesis could be concluded from the phenomenon that visitors could directly memorize manmade building mass but could not impress them aesthetically in an urban wilderness.

PRACTICAL IMPLICATION

- Adequately control the number of huge buildings in an urban wilderness
- Located the man-made buildings and structures in nearby zones in the site for ease of management
- Use natural materials as much as possible and design the exterior with the environment

P 17. Nice to NOT Meet You

Urban wilderness parks should have minimal visitors encounter (with each other)



RELEVANT PATTERNS

- Vegetation Density [P 02.]
- A Hidden Park [P 12.]
- Shhh… [P 18.]
- Leave Me ALONE! [P 20.]

THEORETICAL BACK-UP

Wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." (Wilderness Act, 1964). In an urban wilderness, encountering other visitors or sensing traces of modern civilization signs could detract visitors from opportunities to experience solitude (Landres et al., 2008). Grahn and Stigsdotter (2010) suggested that no contact with too many people in an environment contributes to the restoration of stress for people.

The responses from the site survey revealed that most participants' intents to visit an urban wilderness park include "get close to wild nature", "enjoy leisure time with families", etc. Almost all these activities require a quiet and no-disturbing environment rather than a public social space.

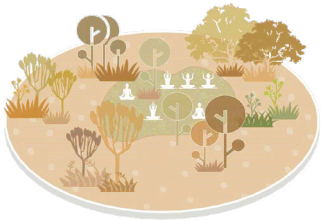
PRACTICAL IMPLICATION

- Design for quiet spaces with closed views in an urban wilderness
- Design transportation systems with multi-level for various purposes, to separate people properly
- Lower accessibility compared to ordinary urban parks
- Plan and design spaces to facilitate quiet and self-indulged activities

TOC

P 18. Shhh...

An urban wilderness should possess the characteristic of "serene"



RELEVANT PATTERNS

- Vegetation Density [P 02.]
- A Distinctive World [P 06.]
- A Hidden Park [P 12.]
- Nice to NOT Meet You [P 17.]
- Leave Me ALONE! [P 20.]

THEORETICAL BACK-UP

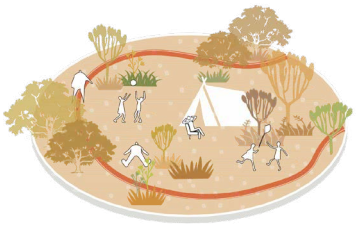
According to Grahn and Stigsdotter (2010)'s study, the 'serene' feature of the landscape environment was proved to be the most preferred compared to other environmental indicators, which also include the characteristics of 'peacefulness, silence and quietness'. Responses from the survey in Jiangyangfan Eco-Park indicated that one of the most relevant intentions of visitors was to get involved in the quiet and beautiful wilderness within urban spaces. Many of the visitors came to the site on their own to enjoy a serene way from the hustle and bustle of modern life.

PRACTICAL IMPLICATION

- Properly design the transportation system to avoid the disturbance of noise from vehicles and outside urban space
- Planting soundproof shrubs near the roads and public spaces in an urban wilderness
- Reduce the amount of vehicle roads as much as possible

P 19. Informal Behaviour

Properly reduce management restrictions on visitors' behavior in an urban wilderness



RELEVANT PATTERNS

- A Distinctive World [P 06.]
- 'Invisible' Civilization [P 09.]
- A Hidden Park [P 12.]
- Young, WILD, and Free[P 13.]
- Leave Me ALONE! [P 20.]
- Exploring Opportunities[P 24.]

THEORETICAL BACK-UP

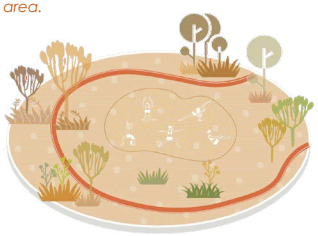
People tend to experience unconfined recreation in an urban wilderness, which refers to activities that make them feel a high degree of freedom over their actions and decisions (Dawson and Hendee 2009). Landres et al. (2008) proposed that the index of visitor management restrictions toward their behavior should be based on the size of the area affected, the duration of the restriction, and the intensity or magnitude of the restriction.

PRACTICAL IMPLICATION

- No prominent fence in the planning and design of urban wilderness (i.e., border)
- Provide open space supportive facilities for visitors' activity
- Reduce management traces (e.g., janitor/guard/signposts)

P 20. Leave Me ALONE!

An urban wilderness should provide self-indulgent space and opportunity for individual activities within an urban area.



RELEVANT PATTERNS

A Hidden Park [P 12.]
Nice to NOT Meet You [P 17.]
Shhh… [P 18.]

THEORETICAL BACK-UP

Wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." (Wilderness Act, 1964). It has been proved in enormous research that urban wilderness possesses the value of motivating visitors to listen to their inner sound, which appears to be physically and mentally healthy.

From the questionnaire and observation, a large group of visitors to an urban wilderness could be the elders, who prefer a quieter environment and solitude activity compared to ordinary urban parks. Also, some nature enthusiasts' motivation to visit an urban wilderness might be to observe wildlife, e.g., rare birds and insects, which also require a quiet and closed space for visitors to immerse in a wild atmosphere.

PRACTICAL IMPLICATION

- Spaces that support "quiet" activity
- Solitude activities such as reading, and meditation should be supported
- The planning and design of the landscape should consider more closed-sight space compared to open space

P 21. Supportive Facility for Activity

Compatible facilities should be provided to support visitors' activity in and urban wilderness

RELEVANT PATTERNS

Marbles, Wood, or Stones? [P 1.]
Young, WILD, and Free [P 13.]
Accessible with multi-mobilities [P 14.]
Shhh… [P 18.]
Informal Behaviour [P 19.]
Leave Me ALONE! [P 20.]
Exploring Opportunities [P 24.]

THEORETICAL BACK-UP

Kaplan (1990) environment should provide suitable facilities/opportunities for the visitors to realize their intention, that is the compatibility of a recreation space.

In the site survey process, people's environmental behavior in an urban wilderness could be observed. Visitors tended to have various intentions, which could be connected to their identity, their accompany, their intended activities, their spontaneous activities, etc. In general, visitors' visit intention could be supported by the facilities through park design. However, there were still some activities that might have been ignored before the park had real visitors. So, when designing an urban wilderness park, compatible facilities should be provided to support activities that meet visitors' demands.

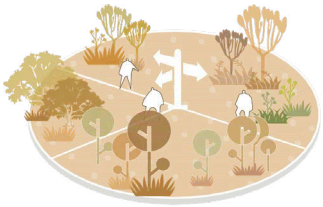
PRACTICAL IMPLICATION

- Investigating the site's target groups' demands and taking their visit intentions into account in the beginning stage of the planning and design process of urban wilderness
- Create quiet spaces with closed views for the visitors to conduct 'quiet' activity
- Provide wilderness-related facilities, e.g., a bird-watching cabin and green space for camping and picnic, to meet visitors' demand
- Use landscape design tools to construct signs and guiding facilities to encourage visitors' wilderness-exploring activities

TOC

P 22. Comprehensive Signposts

Urban wilderness should provide comprehensive and understandable signs and graphics to support visitors' visiting experience



RELEVANT PATTERNS

- Forbidden Area [P 10.]
- Marbles, Wood, or Stones? [P 11.]
- Young, WILD, and Free [P 13.]
- Accessible with multi-mobilities [P 14.]
- Nice to NOT Meet You [P 17.]
- Supportive Facility for Activity [P 21.]
- Crime-free Zone [P 23.]
- Exploring Opportunities [P 24.]

THEORETICAL BACK-UP

There has been enormous research investigating how the understandable feature of space contributes to the interaction between humans and the environment. According to Kaplan and Kaplan (2005), 'understanding' represents one crucial dimension contributing to visitors' perception of their surroundings. In an urban wilderness, providing comprehensive signposts and graphics facilitates visitors' understanding and feelings of environmental safety.

During the site survey, the responses to the mental maps showed that a large group of participants indicated the signposts on the site to guide their visiting routes, which revealed the importance of the guiding value of comprehensive signposts in an urban wilderness area.

PRACTICAL IMPLICATION

- Use clear and understandable signs and graphics to guide visitors' behavior in an urban wilderness, e.g., indicating the direction, the destination, or alarm
- Use understandable and catchy signs or boards to convey information for the visitors, e.g., natural knowledge related to the site and its wildlife
- Use natural materials for the design of signposts, e.g., wood and stones

P 23. Crime-free Zone

Potential danger and crime in an urban wilderness should be avoided by design and management

RELEVANT PATTERNS

- Expansive vistas [P 04.]
- Water Quantity and Quality [P 05.]
- Forbidden area [P 10.]
- Comprehensive signposts [P 22.]

THEORETICAL BACK-UP

There has been enormous research showing that humans tend to be afraid of uncertainty. When the utter environment possesses potential danger or negative possibility, one may not gain positive experience within it. This issue has gained massive researchers who focus on wilderness and urban wilderness-related fields. The strictly defined wilderness contains potential dander and tends to be desolate to visit. When designing an urban wilderness, the desolate and serene characteristics of the wilderness environment could be transformed into a design idea, realized by modern tools and methods to avoid potential danger for its visitors.

Crime prevention through environmental design (CPTED) principles are to prevent crime by designing a physical environment that positively influences human behavior, including natural access control, surveillance, territoriality, activity support, and maintenance (Smith, M., 1996). In an urban wilderness, design principles could be employed in the physical spaces to support positive behavior and eliminate potential danger/crime.

PRACTICAL IMPLICATION

- Use design as a tool to create a safe visiting environment, e.g., plan and design open spaces in an urban wilderness, use tall trees rather than cluttered bushes that obscure the view, and maintain the water quality in an urban wilderness;
- Protect strategies for preventing visitors from the potentially dangerous areas in an urban wilderness, e.g., fences and understandable signposts;
- Social security facility, e.g., streetlights, guard personnel, emergency facility, and CCTVs in potentially dangerous areas.

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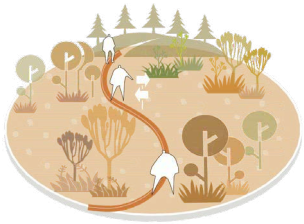
P 24 Exploring Opportunities

Urban wilderness should provide spaces and compatible facilities to support the exploration of the environment for visitors



RELEVANT PATTERNS

- Signs of Wildlife [P 03.]
- Wild Biodiversity [P 08.]
- Young, WILD, and Free [P 13.]
- Informal Behaviour [P 19.]
- Comprehensive signposts [P 22.]

THEORETICAL BACK-UP

One of the most prominent values of an urban wilderness compared to common urban green space is the diverse interactive and explorative opportunities it could provide for visitors. According to Kaplan and Kaplan (2005), 'exploring' represents one crucial dimension that contributes to visitors' perception of their surroundings.

The responses to the questionnaire and mental maps in the site survey of this research revealed that wildlife observing and bird watching comprise a wide range of visitors. Also, the site provided a climbing path for the visitors to explore diverse experiences in the park. During the planning and design of urban wilderness, spaces and corresponding facilities should be provided to support visitors' exploration of the environment.

PRACTICAL IMPLICATION

- Provide compatible facilities, e.g., an educational board, gallery, or botanical garden through design, for contributing to the interaction between visitors and the environment, and encouraging visitors to explore the environment
- Provide clear and understandable signs to guide the visitors' activities
- The texture and materials of paths could also function as guiding for the visitor to explore the environment

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APPENDIX B

Full Records and Results of Empirical Study

The Appendix B presents the full records and results of the empirical study, which aligns with the research findings discussed in Chapters 4 of this thesis. The appendix B includes the report of the questionnaire, the observation records, the mental maps, the reliability and validity tests, the factor analysis, and the tests of model fitting and parallel lines.

Appendix B-1: statistical report of the questionnaire

Survey about your experience in Jiangyangfan Ecological Park

1. Do you regard the park as an urban wilderness? *

Mean score: 3.96						
Options	Completely not (1)	Mostly not (2)	Neutral attitude (3)	Mostly yes (4)	Completely yes (5)	Mean score
Total	1(0.4%)	14(5.62%)	18(7.23%)	178(71.47%)	38(15.26%)	3.96

2. To what extent do the following aspects influence your perception of the site as an urban wilderness?

Mean score: 3.02						
Option	Not at all (1)	Slightly influence (2)	Neutral influence (3)	Largely influence (4)	Very much (5)	Mean score
The vegetation	44(17.67%)	28(11.24%)	28(11.24%)	88(35.34%)	61(24.50%)	3.38
The indication of water	40(16.06%)	41(16.47%)	53(21.29%)	75(30.12%)	40(16.06%)	3.14
Encounter with wild animals	63(25.30%)	41(16.47%)	42(16.87%)	62(24.90%)	41(16.47%)	2.91
The facilities	37(14.86%)	56(22.49%)	76(30.52%)	53(21.29%)	27(10.84%)	2.91
Sensation of nature	31(12.45%)	48(19.28%)	42(16.87%)	75(30.12%)	53(21.29%)	3.29
The management and maintenance	37(14.86%)	49(19.68%)	70(28.11%)	61(24.50%)	32(12.85%)	3.01
The other visitor ('s amount or activities) (deleted after factor analysis)	65(26.10%)	70(28.11%)	57(22.89%)	39(15.66%)	18(7.23%)	2.50
Total	317(18.19%)	333(19.10%)	368(21.11%)	453(25.99%)	272(15.61%)	3.02

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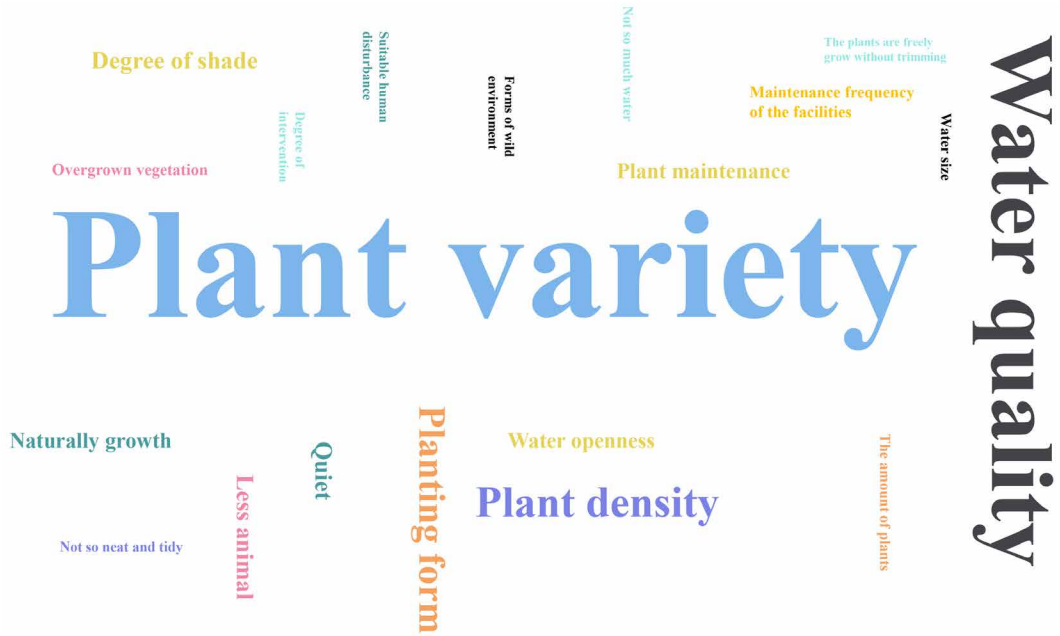
3. which aspect do you regard as the most influential one?

Option	Total	Proportion
The vegetation	119	47.79%
The indication of water	22	8.84%
Encounter with wild animals	12	4.82%
The facilities	22	8.84%
Sensation of nature	44	17.67%
The management and maintenance	24	9.64%
The other visitor ('s amount or activities) (deleted after factor analysis)	6	2.41%

4. What are the characteristics of the element you have chosen in the last question that makes you think so?



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5. To what extent do the following elements make a park natural and look like an urban wilderness based on your previous experience?*

Mean score: 3.37						
Option	Not at all (1)	Slightly influence (2)	Neutral influence (3)	Largely influence (4)	Very much (5)	Mean score
The vegetation	21(8.43%)	11(4.42%)	15(6.02%)	111(44.58%)	91(36.55%)	3.96
The indication of water	22(8.84%)	17(6.83%)	50(20.08%)	94(37.75%)	66(26.51%)	3.66
Encounter with wild animals	27(10.84%)	26(10.44%)	49(19.68%)	96(38.55%)	51(20.48%)	3.47
The facilities	31(12.45%)	50(20.08%)	78(31.33%)	54(21.69%)	36(14.46%)	3.06
Sensation of nature	24(9.64%)	20(8.03%)	39(15.66%)	97(38.96%)	69(27.71%)	3.67
The management and maintenance	23(9.24%)	56(22.49%)	56(22.49%)	76(30.52%)	38(15.26%)	3.20
The other visitor ('s amount or activities) (deleted after factor analysis)	53(21.29%)	80(32.13%)	54(21.69%)	43(17.27%)	19(7.63%)	2.58
Total	201(11.53%)	260(14.92%)	341(19.56%)	571(32.76%)	370(21.23%)	3.37

6. Is nature experience an important element of the motivation for you to visit? *

Mean score: 3.75						
Option	Completely not (1)	Mostly not (2)	Neutral attitude (3)	Mostly yes (4)	Completely yes (5)	Mean score
Total	6(2.41%)	25(10.04%)	44(17.67%)	124(49.8%)	50(20.08%)	3.75

7. To what extent do you agree with the statement: the visiting experience in Jiangyangfan Ecological Park is nice so I want to visit the site again. *

Mean score: 3.8						
Option	Not at all (1)	Slightly yes (2)	Neutral attitude (3)	Mostly yes (4)	Completely yes (5)	Mean score
Total	5(2.00%)	23(9.24%)	58(23.29%)	93(37.35%)	70(28.11%)	3.8

8. What is(are) the motivation(s) for you to visit the site? [Select all that apply] *

Options	Total	Proportion
To enjoy the beautiful natural landscape	106	42.57%
To get close to and experience the wild nature	175	70.28%
To spend leisure time with families	122	49.00%
To conduct activities on your own or with families/ friends	60	24.10%
To conduct a survey/work on the site	10	4.02%
Other answer (s)	16	6.43%

9. Do you have professional interests/experience in natural parks?*

Options	Total	Proportion
Yes	80	32.13%
No	121	48.59%
Not sure	48	19.28%

10. Have you been to Jiangyangfan Ecological Park before? *

Options	Total	Proportion
Yes, I've visited here before	124	50.2%
No, this is my first visit to this site	125	49.8%

11. What kind of activities do you employ on the site? [Select all that apply] *

Options	Total	Proportion
Hiking	182	73.09%
Picnic	56	22.49%
Camping	12	4.82%
Cycling	3	1.20%
Taking a walk	162	65.06%
Wildlife observing and bird watching	93	37.35%
Scientific investigation	9	3.61%
Do exercise	47	18.88%
Other answer (s)	27	10.84%

12. What kind of facilities do you expect on the site? [Select all that apply]*

Options	Total	Proportion
Tourist center	34	13.65%
Teahouse	81	32.53%
Cabin for birdwatching	118	47.39%
Pavilions	111	44.58%
Lounge seats	105	42.17%
Plank road	84	33.73%
Signposts	65	26.10%
Educational Board	98	39.36%
Educational gallery	58	23.29%
Toilet	96	38.55%
No facility	9	3.61%
Other answer (s)	14	5.62%

13. What kind of accessibility do you prefer on the site? *

Options	Total	Proportion
Path well-accessible	67	26.69%
Part of the path with marble/wood or other soft materials	87	35.46%
Unpaved landscape path	95	37.85%

14. What is your most meaningful experience on the site? *

Options	Total	Proportion
Find and enjoy different natural scenery	48	19.28%
Get close to the wildlife	53	21.29%
Relax in a natural place within an urban city	80	32.13%
Spend rare time with children/families	41	16.47%
Learn about nature/wildlife and build knowledge of the site	15	6.02%
No valuable experience	4	1.61%
Other answers (s)	8	3.21%

15. Which region/province are you from?

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Options	Total	Proportion
Hangzhou / local	223	89.56%
Non-local	26	10.44%

16. Are you from the city or the countryside?

Options	Total	Proportion
City	232	93.17%
Countryside	17	6.83%

17. What's your age? *

Options	Total	Proportion
< 18	14	5.62%
18-35	112	44.98%
36-50	89	35.74%
51-65	26	10.44%
> 65	8	3.21%

18. What's your gender? *

Options	Total	Proportion
Female	142	57.03%
Male	103	41.37%
Prefer not to tell	4	1.61%

Appendix B-2: statistical report of the questionnaire (in Chinese)

第1题 您认为江洋畈生态公园是城市中的野生自然环境吗? [矩阵量表题]

该矩阵题平均分: **3.96**

题目\选项	完全不是	多数不是	中立态度	多数是	完全是	平均分
请根据您的想法选择适宜的分值	1(0.4%)	14(5.62%)	18(7.23%)	178(71.47%)	38(15.26%)	3.96
小计	1(0.4%)	14(5.62%)	18(7.23%)	178(71.47%)	38(15.26%)	3.96

第2题 哪些环境因素影响了您上题的回答?它们又在多大程度上影响了您的判断?请选择合适的分值。[矩阵量表题]

该矩阵题平均分: **3.02**

题目\选项	完全不影响	微弱影响	一般影响	非常影响	完全影响	平均分
公园内的植物	44(17.67%)	28(11.24%)	28(11.24%)	88(35.34%)	61(24.50%)	3.38
公园内的水体	40(16.06%)	41(16.47%)	53(21.29%)	75(30.12%)	40(16.06%)	3.14
公园内的野生动物	63(25.30%)	41(16.47%)	42(16.87%)	62(24.90%)	41(16.47%)	2.91
公园内的人工设施	37(14.86%)	56(22.49%)	76(30.52%)	53(21.29%)	27(10.84%)	2.91
野生自然的整体环境氛围	31(12.45%)	48(19.28%)	42(16.87%)	75(30.12%)	53(21.29%)	3.29
公园的维护和管理	37(14.86%)	49(19.68%)	70(28.11%)	61(24.50%)	32(12.85%)	3.01
其他的参观者（数量或活动）（因子分析后删除）	65(26.10%)	70(28.11%)	57(22.89%)	39(15.66%)	18(7.23%)	2.50
小计	317(18.19%)	333(19.10%)	368(21.11%)	453(25.99%)	272(15.61%)	3.02

第3题 上一题的所有选项中，哪一项是您认为最重要的影响因素? [单选题]

选项	小计	比例
公园内的植物	119	47.79%
公园内的水体	22	8.84%
公园内的野生动物	12	4.82%
公园内的人工设施	22	8.84%
野生自然的整体环境氛围	44	17.67%
公园的维护与管理	24	9.64%
其他参观者（数量或活动）（因子分析后删除）	6	2.41%
本题有效填写人次	249	

第4题 该影响因素的哪些特征让您认为它最重要? [填空题]

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第5题 在国内/您的国家的城市内部和周边范围，您能举出一个您游览过并认为是野生自然环境的例子吗? [填空题]

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第6题 哪些因素让您认为这个例子是自然野生环境? 这些因素分别会在多大程度影响您的判断? [矩阵量表题]

该矩阵题平均分: **3.37**

题目\选项	完全不影响	微弱影响	一般影响	非常影响	完全影响	平均分
公园内的植物	21(8.43%)	11(4.42%)	15(6.02%)	113(44.58%)	91(36.55%)	3.96
公园内的水体	22(8.84%)	17(6.83%)	50(20.08%)	96(37.75%)	66(26.51%)	3.66
公园内的野生动物	27(10.84%)	26(10.44%)	49(19.68%)	96(38.55%)	51(20.48%)	3.47
公园内的人工设施	31(12.45%)	50(20.08%)	78(31.33%)	54(21.69%)	36(14.46%)	3.06
野生自然的整体环境氛围	24(9.64%)	20(8.03%)	39(15.66%)	97(38.96%)	69(27.71%)	3.67
公园的维护和管理	23(9.24%)	56(22.49%)	56(22.49%)	76(30.52%)	38(15.26%)	3.20
其他的参观者（数量或活动）（因子分析后删除）	53(21.29%)	81(32.13%)	54(21.69%)	44(17.27%)	19(7.63%)	2.58
小计	201(11.53%)	260 (14.92%)	341(19.56%)	571(32.76%)	370(21.23%)	3.37

第7题 自然体验是影响您游览的重要因素吗? [矩阵量表题]

该矩阵题平均分: **3.75**

题目\选项	完全不是	小部分是	中立态度	大部分是	完全是	平均分
请选择与您的想法最接近的数值	6(2.41%)	25(10.04%)	44(17.67%)	124(49.8%)	50(20.08%)	3.75
小计	6(2.41%)	25(10.04%)	44(17.67%)	124(49.8%)	50(20.08%)	3.75

第8题 您想要再次游览江洋畈生态公园吗? [矩阵量表题]

该矩阵题平均分: **3.8**

题目\选项	完全不想	有点想	中立态度	比较想	完全想	平均分
请选择与您的想法最接近的数值	5(2.00%)	23(9.24%)	58(23.29%)	93(37.35%)	70(28.11%)	3.8
小计	5(2.00%)	23(9.24%)	58(23.29%)	93(37.35%)	70(28.11%)	3.8

第9题 您之前游览过江洋畈生态公园吗? [单选题]

选项	小计	比例
我曾经游览过公园	124	49.8%
这是我第一次游览公园	125	50.2%
本题有效填写人次	249	

第10题 您对于生态公园相关专业知识和研究有兴趣或者经验吗? [单选题]

选项	小计	比例
有	80	32.13%
没有	121	48.59%
不确定	48	19.28%
本题有效填写人次	249	

第11题 您此次游览江洋畈生态公园的目的是什么? [多选题]

选项	小计	比例
欣赏优美的自然风景	106	42.57%
亲近和体验野生自然环境	175	70.28%
和家人度过休闲时光	122	49.00%
独自或者与家人朋友进行活动	60	24.10%
在公园内做调查或研究工作	10	4.02%
其他	16	6.43%
本题有效填写人次	249	

第12题 您在公园里进行了什么样的活动? [多选题]

选项	小计	比例
徒步	182	73.09%
野餐	56	22.49%
露营	12	4.82%
骑行	3	1.20%
散步	162	65.06%
野生动物观察或观鸟	93	37.35%
科学考察	9	3.61%
锻炼身体	47	18.88%
其他	27	10.84%
本题有效填写人次	249	

第13题 您期望公园内提供哪些人工设施? [多选题]

选项	小计	比例
游客中心	34	13.65%
茶室	81	32.53%
观鸟小屋	118	47.39%
休息亭廊	111	44.58%
休息座椅	105	42.17%
木质栈道	84	33.73%
指示牌	65	26.10%
科普标识牌	98	39.36%
科普展廊	58	2329%
卫生间	96	38.55%
没有人工设施	9	3.61%
其他	14	5.62%
本题有效填写人次	249	

第14题 您更喜欢什么样的公园道路? [单选题]

选项	小计	比例
道路硬质率和通达性较高，大部分区域可满足无障碍（轮椅等）要求	67	26.91%
部分道路采用碎石、卵石等材质铺设，丰富游览体验	87	34.94%
大部分区域不设置硬质道路，充分亲近自然	95	38.15%
本题有效填写人次	249	

第15题 您认为在江洋畈生态公园里最有意义的体验是什么? [单选题]

选项	小计	比例
欣赏到了和其他公园不同的自然风景	48	19.28%
与自然（动植物）亲密接触	53	21.29%
在城市中的自然场所放松身心	80	32.13%
与家人度过美好时光	41	16.47%
学习到了自然和公园建造相关知识	15	6.02%
并无非常有意义的体验	4	1.61%
其他	8	3.21%
本题有效填写人次	249	

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第16题 您来自于哪个城市? [填空题]

第17题 您生活在城市还是乡村地区? [单选题]

选项	小计	比例
城市	232	93.17%
乡村	17	6.83%
本题有效填写人次	249	

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第18题 您的年龄是? [单选题]

选项	小计	比例
< 18	14	5.62%
18-35	112	44.98%
36-50	89	35.74%
51-65	26	10.44%
>65	8	3.21%
本题有效填写人次	249	

第19题 您的性别是? [单选题]

选项	小计	比例
女性	142	57.03%
男性	103	41.37%
不方便说	4	1.61%
本题有效填写人次	249	

Appendix B-3: observational records

Spot A: Location_Liaoyu Pavilion

Descriptive Notes		Reflective notes	
When	17/09/2022 Sat. 11:00-11:30 am	**Why**	Shelter space, prevent direct sunlight; with seats and table, good to rest and have activity; surrounding with medium-dense vegetation, good view and quiet; near the lotus pool, good landscape.
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes, no changes.
Where **Who (with whom)** **What**	1. A couple aged 35-40, with kids (age 3-5; 1 male and 1 female), sitting in the pavilion, having a picnic; 2. Female*2, age 45-55, taking pictures for each other; 3. Sanitation worker, age 50-55, resting on the seat in the pavilion; 4. Mother (35-40) with kid (5-7), taking a stroll; 5. Couple (35-45), with kids (male age 5-6, female age 6-10), and grandparents (50-55), taking a stroll; 6. Mother, age around 60, with daughter, age 45-50, resting on the seat in the pavilion; 7. Couple (age 35-40), with daughter (5-6), resting on the seat; 8. Couple (35-45), with son (4-6), having lunch and resting on the seat.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Mostly yes. But the size of the tables and their combination forms can be more to suit different behaviours and activities.
		Whether environmental signs attract users	Yes.

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Descriptive Notes		Reflective notes	
When	17/09/2022 Sat. 16:10-16:40 pm	**Why**	The shelter space prevents the strong sunshine and possible rain. The dense vegetation also provides shelter for the visitors
Weather	Cloudy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes
Where **Who (with whom)** **What**	1. Female*5, male*3, age 25-35, with children*3 (female*1, male*2), age 5-10, playing games, having picnic on the table and benches. 2. Male*1, female*4, age 35-45, with children*4, age 5-10, resting and companying with their children having natural activities. 3. Parents, age 35-40, children*2, age 5-12, walking, playing and getting close to nature.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Yes, the educational board is the perfect facility to provide a source for natural education
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective notes	
When	18/09/2022 Sun. 10:15-10:45 am	**Why**	The shelter space prevents the strong sunshine and possible rain. Vegetation
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes
Where **Who (with whom)** **What**	1. Female*4, age 50-55, playing cards. 2. Old couple, age 55-65, resting and eating. 3. A family, age 35-45, with a child, age around 5, playing and resting. 4. Male*2, age 35-40, with male*1, age 5-10, resting. 5. A family: male*1, age 35-40, female*2, age 35-40 and 55-60, with children*2 (male*1 and female*1) , age 5-10, camping, resting and eating. 6. A family: male*2, age 35-45 and 60-65, female*2, age 35-45 and 60-65, with children*1 (male) , age 3-5, resting and eating. 7. Female*2, 35-40, children*3 (male*1 and female*2), age 5-10, drawing, chatting and resting.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Lack of camping spots, add more?
		Whether environmental signs attract users	Yes

Descriptive Notes		Reflective notes	
When	19/09/2022 Mon. 10:00-10:30 am	**Why**	Shelter space, and prevent direct sunlight. with seats and table, good to rest and have activities. surrounding with medium-dense vegetation, good view and quiet.
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes. On the weekdays there are fewer visitors in the park. Also, the ages of them tend to be older. They prefer "quiet" activities compared to weekends.
Where **Who (with whom)** **What**	1. Female, age 35-40, alone, resting in the pavilion, taking photographs. 2. Couple (50-60), resting, chatting, and listening to the radio. 3. Female, age 30-35, alone, chatting with someone on the phone in the pavilion. 4. Female*2, age 60-70, resting in the pavilion, chatting with each other. 5. Female, age 50-60, alone, reading a book on the table.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Mostly yes.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	21/09/2022 Wed. 10:00-10:30 am	**Why**	Shelter space. open ground for activities with seats and table, good to rest and have activities. surrounding with medium-dense vegetation, good landscape and quiet;
Weather	Cloudy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes. Most of the visitors seem like regular visitors who are familiar with the environment, and their behaviour matches the design intent in most cases. Among them, the majority are elders.
Where **Who (with whom)** **What**	1. Female*5+male*1, age 60-65, dancing and having picnics. 2. Female*5, age 60-70, and male*2, age 65-75, singing, playing instruments, chatting; 3. Family, parents, age 30-40, with daughter (3-5), resting and taking photos in the pavilion, short stay.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Mostly yes.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	22/09/2022 Thur. 10:15-10:45 am	**Why**	Shelter space. open ground for activities with seats and table, good to rest and have activities. surrounding with medium-dense vegetation, good landscape and quiet;
Weather	Cloudy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes. Most of the visitors seem like regular visitors who are familiar with the environment, and their behaviour matches the design intent in most cases. Among them, the majority are elders
Where, **Who (with whom)** **and** **What**	1. Female*3, age 65-75 for 2, and age 35-45 for 1, and male*1, age 65-75, chatting and resting. 2. Female*4, age 25-35, online teaching, chatting, and picnicking. 3. Male, age 40-45, female, age 40-45, taking photos and resting. 4. Female, age 35-45, bird watching, taking photos, short staying. 5. Female*2, age 50-60 and age 35-45, male, age 3-6, flower watching, eating, and resting.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Mostly yes.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	23/09/2022 Fri. 10:00-10:30 am	**Why**	Shelter space, and prevent direct sunlight. with seats and table, good to rest and have activities. surrounding with medium-dense vegetation, good view and quiet.
Weather	Cloudy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes. On the weekdays there are fewer visitors in the park. Also, the ages of them tend to be older. They prefer "quiet" activities compared to weekends.
Where **Who (with whom)** **What**	1. Female*2, age 65-75, male*1, age 45-55, resting in the pavilion, chatting (not locals). 2. Couple (50-60), resting, reading news via phones (regular visitors). 3. Couple(50-60), passing by and taking photos, short stay. 4. Couple(55-65), passing by, asking about the visit route, short stay.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Mostly yes.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	24/09/2022 Sat. 9:45-10:15 am	**Why**	Shelter space, and prevent direct sunlight. with seats and table, good to rest and have activities. surrounding with medium-dense vegetation, good view and quiet.
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes. On the weekdays there are fewer visitors in the park. Also, the ages of them tend to be older. They prefer "quiet" activities compared to weekends.
Where **Who (with whom)** **What**	1. Male*1, age 50-60, resting and photographing. 2. Female*1, age 30-35, resting, waiting for child (have activity). 3. Female*2, age 55-60 and 35-40, male*1, 55-65, boy*2, age 5-8, having fun, chatting and resting. 4. Male*1, age 50-55, female*1, 50-55, resting and chatting. 5. Male*1, age 35-45, girl*1, age 5-10, resting, eating, observing the wildlife.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Mostly yes.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	25/09/2022 Sun. 12:15-12:45 pm	**Why**	Educational board, lotus pond with good landscape, Platform with good view and quiet
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes, basically no changes.
Where **Who (with whom)** **What**	1. Male*4, age 20-30, female*1, age 20-25, children*16, age 5-10, natural activities, having meals, resting. 2. Male*2, age 55-65, female*2, age 55-65, female*2, age 5-8, resting and short-stay.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Lacking of bench, or other facilities to stay and rest, shelter, such as corridor, telescope?
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	25/09/2022 Sun. 10:00-10:30 am	**Why**	The shelter space prevents the strong sunshine and possible rain. Vegetation
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes
Where **Who (with whom)** **What**	1. Female*1, age 55-65, drinking tea, resting. 2. Male*1, age 50-55, female*1, age 45-50, resting and watching people. 3. Female*4, age 60-70, male*2, age 60-70, playing cards, eating. 4. Female*2, age 30-40, having online educational sessions. 5. Adults*16 (35-45), with children*18 (5-10), natural activities, resting and eating, long-stay > 1h.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Yes, the educational board is the perfect facility to provide a source of natural education
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	26/09/2022 Mon. 11:45-12:15 am	**Why**	The shelter space prevents the strong sunshine and possible rain.
Weather	Cloudy-sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Lying down on the bench might have slightly changed the original function of the facilities.
Where **Who (with whom)** **What**	1. A group of elders, age 65-75, (female*6, male*5), chatting, taking photos, exercising. 2. Female*2, 40-50 and 55-65. Resting, eating, short-stay for 20 min 3. Male*2, age 55-65 and 30-40, female*2, age 30-40 and 55-65, instrument playing, chatting, walking, long-stay.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	The composition of the tables and chairs can be changed slightly to be compatible with the user's activities.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	27/09/2022 Tues. 10:15-10:45 am	**Why**	The shelter space prevents the strong sunshine and possible rain.
Weather	Sunny-cloudy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Lying down on the bench might have slightly changed the original function of the facilities.
Where **Who (with whom)** **What**	1. Female*4, age 60-70, male*3, age 60-70, chatting, long-stay. 2. Male*1, age 60-75, reading, long-stay, 3. Male*1, age 55-65, female*1, age 55-65, lying down and resting. 4. Couple, age 50-60, walking and resting. 5. Female*3, 55-65, resting and chatting, for around 30 min.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	The composition of the tables and chairs can be changed slightly to be compatible with the user's activities.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	28/09/2022 Wed. 10:15-10:45 am	**Why**	The shelter space prevents the strong sunshine and possible rain.
Weather	Sunny-cloudy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Lying down on the bench might have slightly changed the original function of the facilities.
Where **Who (with whom)** **What**	1. Female*2, age 25-30, (teacher), children*30-50, age 8-12 excursion. 2. Female*1, age 25-35, (teacher), children*30-50, age 8-12. 3. Female*2, age 30-40, chatting, eating, short-stay, then disturbed by the children. 4. Female*1, 30-40, children*40-50, age 8-12, excursion, picnicking, natural sightseeing.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	The composition of the tables and chairs can be changed slightly to be compatible with the user's activities.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	29/09/2022 Thur. 11:15-11:45 am	**Why**	The shelter space prevents the strong sunshine and possible rain.
Weather	Cloudy-rainy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Lying down on the bench might have slightly changed the original function of the facilities.
Where **Who (with whom)** **What**	1. Female*4, age 35-40, playing cards and chatting. 2. Female*3, age 30-40, primary students*40, age around 10, having excursions, picnicking, resting and playing.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	The composition of the tables and chairs can be changed slightly to be compatible with the user's activities.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	(national holiday) 01/10/2022 Sat. 10:15–10:45 am	**Why**	The shelter space prevents the strong sunshine and possible rain.
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Lying down on the bench might have slightly changed the original function of the facilities.
Where **Who (with whom)** **What**	1. Female*2, age 25-35, (teacher), children*10 (female*6, male* 4), and parents (male*7, female*4), natural activities. 2. Male*2, age 30–40, female*2, age 30–35, children* 1, female, 3–6, having picnic, chatting and camping. 3. Elders*7 (female*3, male*4), age 65–75, playing cards and having fun. 4. A family, parents(25–35), daughter*1, age 3–5, having picnic, eating.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	The composition of the tables and chairs can be changed slightly to be compatible with the user's activities.
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	(national holiday) 02/10/2022 Sun. 14:00-14:30 pm	**Why**	The shelter space prevents the strong sunshine and possible rain. Vegetation
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes
Where **Who (with whom)** **What**	1. Female*2, age 55-60 & 30-35, children*2 (males), age 5-8, playing cards, chatting and resting. 2. Female*5, male*3, age 55-70, playing cards, having picnics and chatting. 3. Family, parents age 35-45, male*1, age 5-8, playing, resting and taking naps on the bench, eating. 4. Male*1, 35-45, resting and watching video. 5. Young couple, age 25-30, resting and chatting.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Yes, the educational board is the perfect facility to provide a source of natural education
		Whether environmental signs attract users	Yes.

Descriptive Notes		Reflective Notes	
When	(national holiday) 03/10/2022 Mon. 10:00-10:30 am	**Why**	The shelter space prevents the strong sunshine and possible rain. Vegetation
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes
Where **Who (with whom)** **What**	1. Family, parents age 35-45, male*1, age 5-8, female*1, age 55-65, resting, eating and short-stay. 2. Female*1, age 50-55, male*, age 30-35 (mother and son), walking, resting and chatting. 3. Female*3, male*3, age 55-65, playing cards and chatting. 4. Couple: female*1, male*1, age 55-65, resting and walking (routine walking). 5. Couple: age 60-70, resting and short-stay.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Yes, the educational board is the perfect facility to provide a source of natural education
		Whether environmental signs attract users	Yes.

Spot B: location_corridor near the south entrance

Descriptive Notes		Reflective notes	
When	17/09/2022 Sat. 15:10-15:40 pm	**Why**	The shelter space prevents the strong sunshine and possible rain. Vegetation
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes
Where **Who (with whom)** **What**	1. Family, parents age 35-45, male*1, age 5, resting and walking. 2. Father and son (age 35-45, and 5-7), resting and sightseeing. 3. Female*4, (2 for age 35-40, 2 for 5-10), walking, resting and short-stay. 4. Male*1, 35-40, resting and sightseeing. 5. Male*1, 35-40, female*1, age 8-12, playing, sightseeing and vegetation observing.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Yes, educational board is perfect facility to provide source for natural education
		Whether environmental signs attract users	Yes

Descriptive Notes		Reflective Notes	
When	18/09/2022 Sun. 14:20-14:50 pm	**Why**	Shelter space, prevent direct sunlight; with seats and table, good to rest and have activity; surrounding with medium-dense vegetation, good view and quiet; near the lotus pool, good landscape.
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes, basically no changes. Camping, eating and resting
Where **Who (with whom)** **What**	1. Family, couple age 35-40, boy age 5-6, bird watching, chatting and resting. 2. Young couple, male and female, age 25-30, resting and playing games. 3. Parents age 40-45, grandma age 55-65, son age 5-10, resting and playing. 4. Couple, age 35-45, taking photos, resting, short-stay. 5. Young couple, 25-35, male*4, age 25-35, taking wedding photos 6. Male*2, age 28-35, reading educational board and chatting.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Facilities for bird watching.
		Whether environmental signs attract users	Yes

Descriptive Notes		Reflective Notes	
When	18/09/2022 Sun. 15:15-15:45 pm	**Why**	Shelter space, prevent direct sunlight; with seats and table, good to rest and have activity; surrounding with medium-dense vegetation, good view and quiet; good landscape.
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes, basically no changes. Camping.
Where **Who (with whom)** **What**	1. Male*2, female*1, age 20-30, children(male*3, female*4), natural activity, drawing and playing games 2. Male*2, age 20-25, walking, resting and eating. 3. Male*2, age 25-30, chatting and resting. 4. Female*4, age 60-70, chatting, resting and eating. 5. Couple, age 50-55, resting and chatting. 6. Family, parents age 50-55, son age 2-5, walking, resting and eating. 7. Youngers*17, (male*9, female*8), hiking and resting.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Yes.
		Whether environmental signs attract users	Yes.

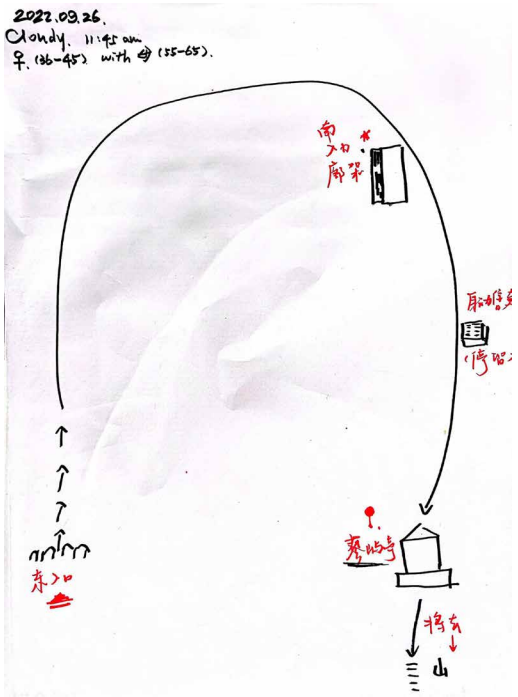
Descriptive Notes		Reflective notes	
When	22/09/2022 Thur. 16:30-17:00 pm	**Why**	Shelter space. open ground for activities with seats and table, good to rest and have activities. surrounding with medium-dense vegetation, good landscape and quiet;
Weather	Cloudy	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Not really, the user (2. Female) uses the chair to lie down and take a rest.
Where, **Who (with whom)** **and** **What**	1. Female*1, age 45-50, male*1, age 45-50, sitting and resting, reading news via phones, and chatting. 2. Female*1, age 45-55, lying on the chair, taking rest.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Mostly yes.
		Whether environmental signs attract users	Yes.

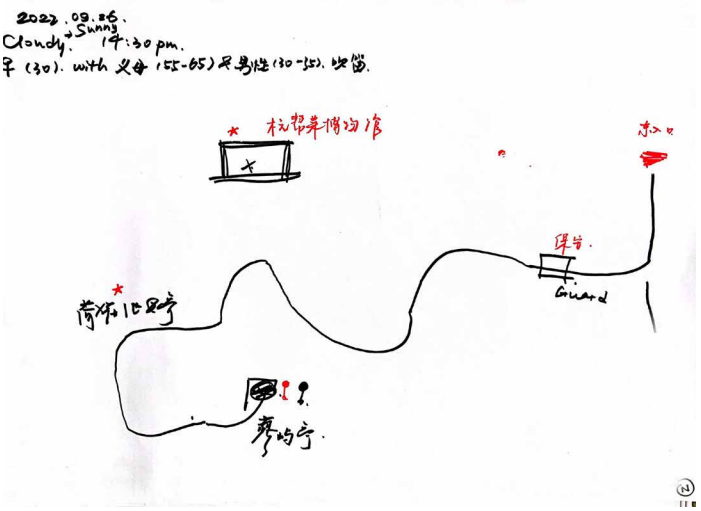
Descriptive Notes		Reflective notes	
When	(national holiday) 02/10/2022 Sun. 11:00-11:30 am	**Why**	The shelter space prevents the strong sunshine and possible rain. Vegetation
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes
Where Who (with whom) What	1. Male*1 age 35-45, children*2 (female*1 and male*1), age 5-8, Resting and eating. 2. Female*2, age 60-70 and age 40-50, taking photos and sightseeing. 3. Elders*2(female*1 and male*1), age 60-70, younger female*1, age 45-55, resting, chatting and drinking tea. 4. Female*2, age 35-45, and age 60-70, resting, chatting. 5. Male*1, 40-50, resting and watching news. 6. Male*1, 35-45, children*2 (females), age 5-8, resting and eating.	**Whether the site is planned and designed to support user behaviours. Is there any element that is inadequate for important behaviour patterns? How can it be improved?**	Yes, the educational board is the perfect facility to provide a source of natural education
		Whether environmental signs attract users	Yes.

Spot C: location_the lotus pond

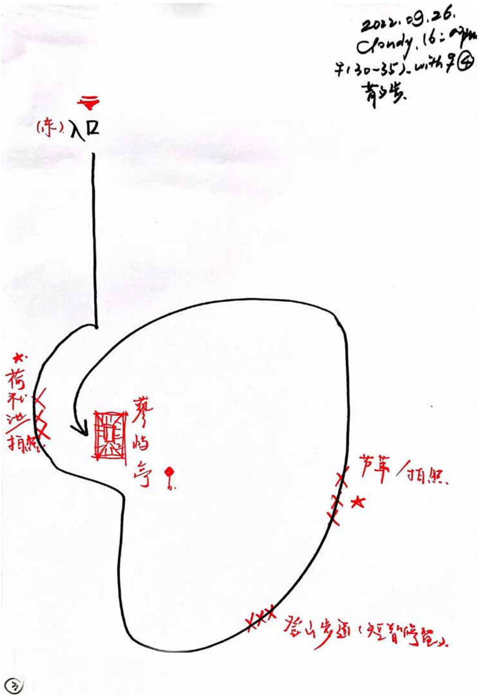
Descriptive Notes		Reflective Notes	
When	20/09/2022 Tues. 09:45-10:15 am	**Why**	Educational board, lotus pond with good landscape, Platform with good view and quiet
Weather	Sunny	**Whether the visitors' behaviours fit the facilities in the environment? Is there any change? How and why?**	Yes, no changes.
Where Who (with whom) What	1. Couple, age 45-55, chatting and resting. 2. Female*1, 35-45, working/reading. 3. Male*1, 35-40, boy*1, 3-5, walking, resting and eating. 4. Female*4, 55-65, resting and chatting.	**Whether the site is planned and designed to support user behaviours, is there any inadequate element for important behaviour patterns? How can it be improved?**	Lacking a bench, or other facilities to stay and rest, shelter, such as a corridor, telescope?
		Whether environmental signs attract users	Yes

Appendix B-4: mental maps

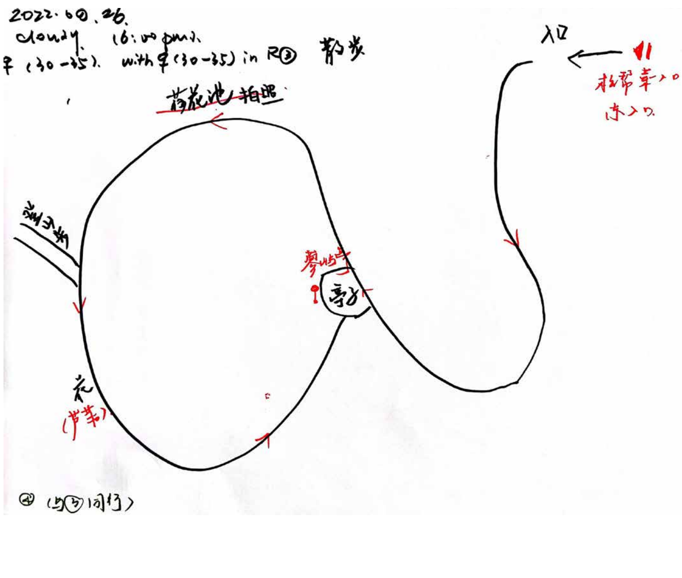




TOC

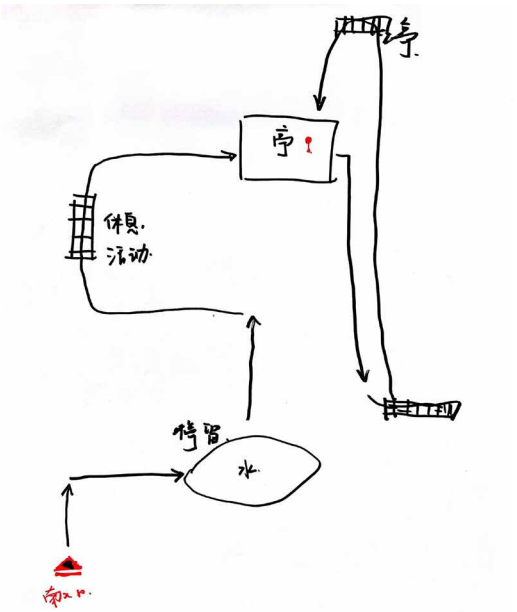


2022.09.26.
Cloudy. 16:00pm
with
入口
荷花池
拍照
蓼屿亭
芦苇/拍照
登山步道



2022.09.26.
cloudy. 16:00pm.
(30-35). with (30-35) in R③
静步
荷花池/拍照
入口
蓼屿亭
芦苇

TOC

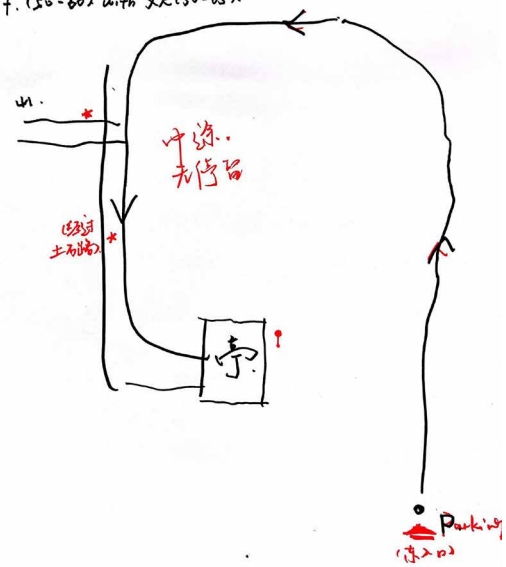


⑥

2022.08.27.
14:35.pm. Cloudy.
男性(50岁左右). 休息. 一人.

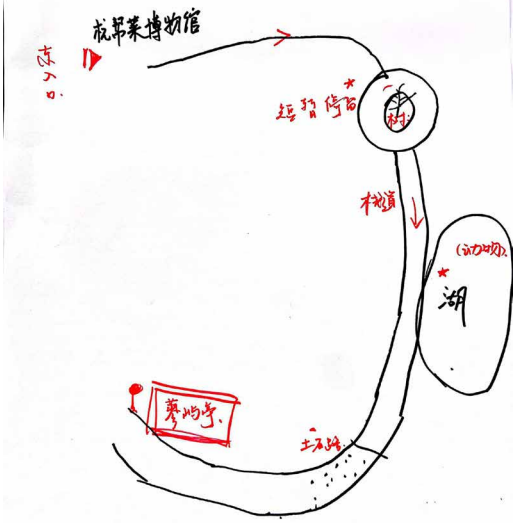
⑦

2022.08.27.
14:20pm. Cloudy.
♀.(50-60) with 父老(50-65).

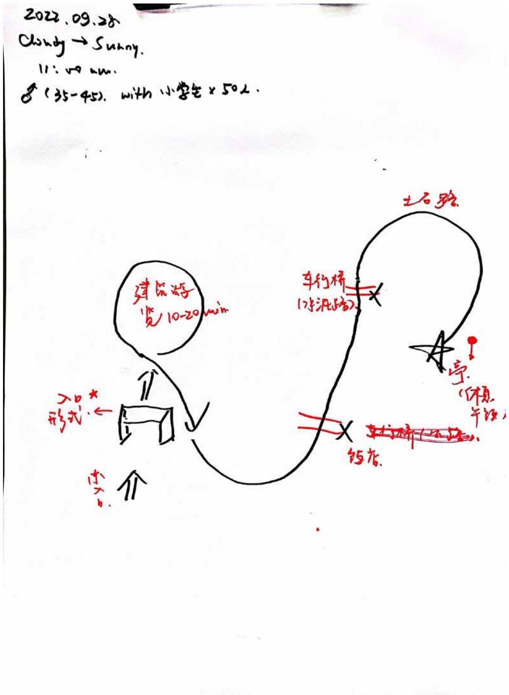


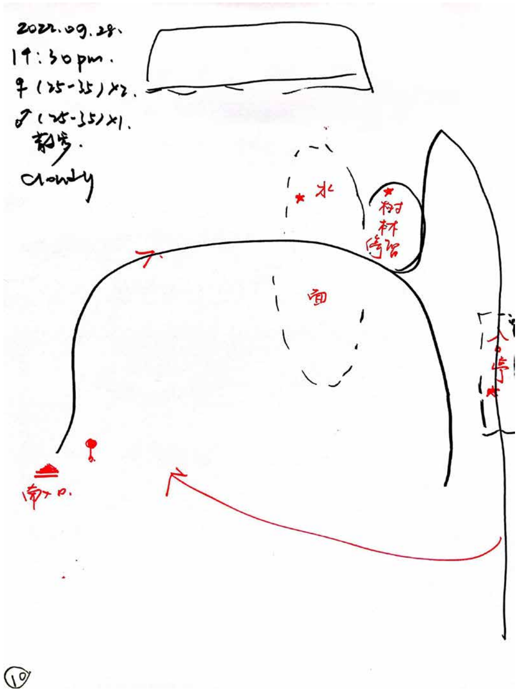
⑧

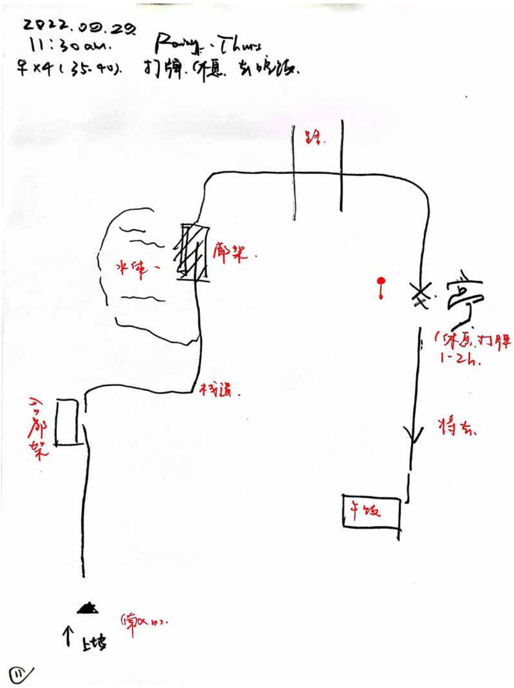
2022.08.27.
Cloudy. 15:15 pm.
♀.(35-45). with 母(55-65)及自己(5-8).

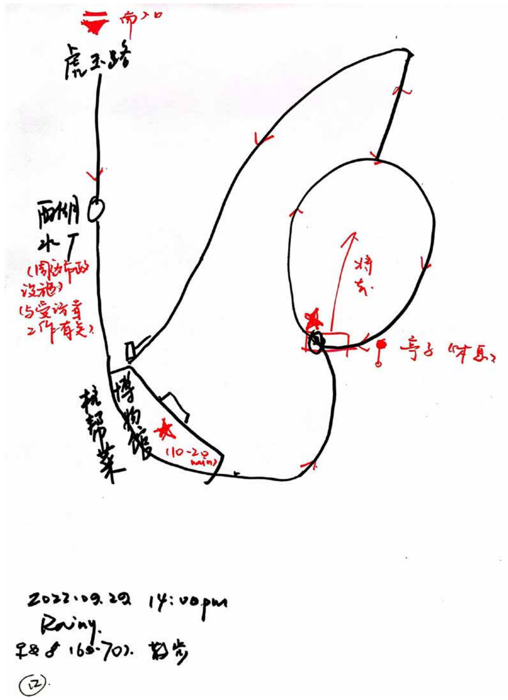


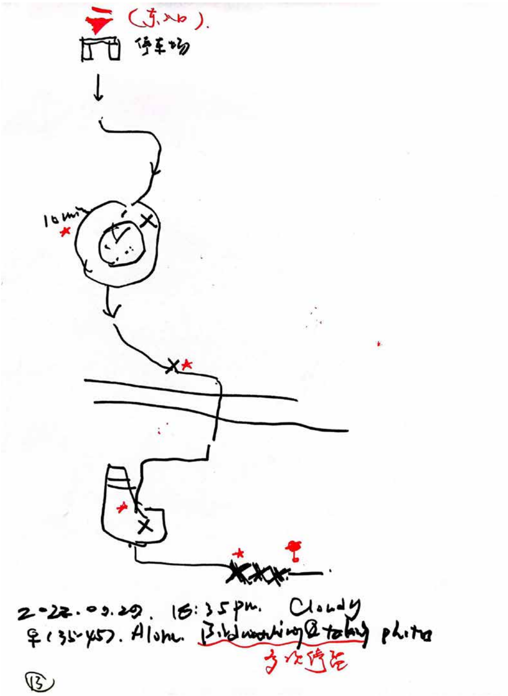
TOC

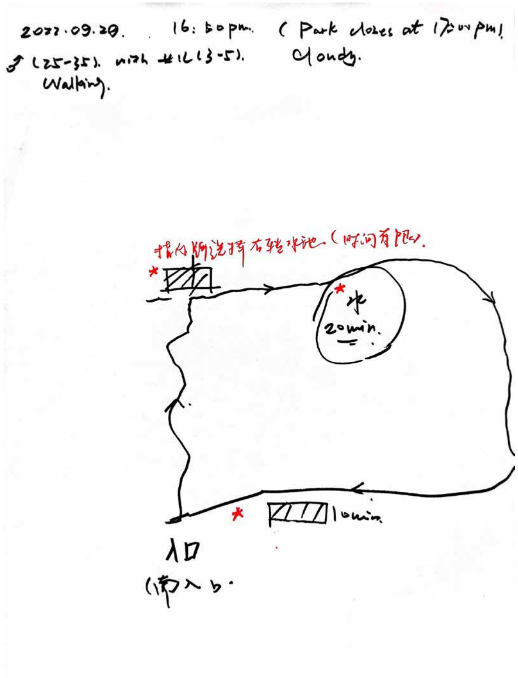

2022.09.28
Cloudy → Sunny.

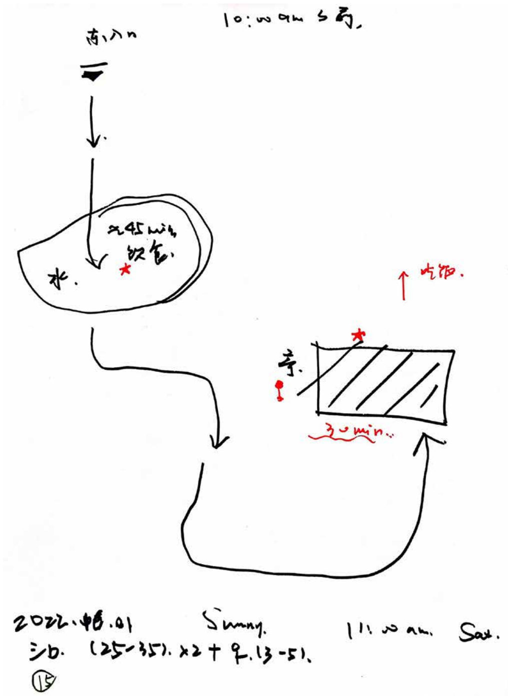

2022.09.28.
14:30pm.
Cloudy

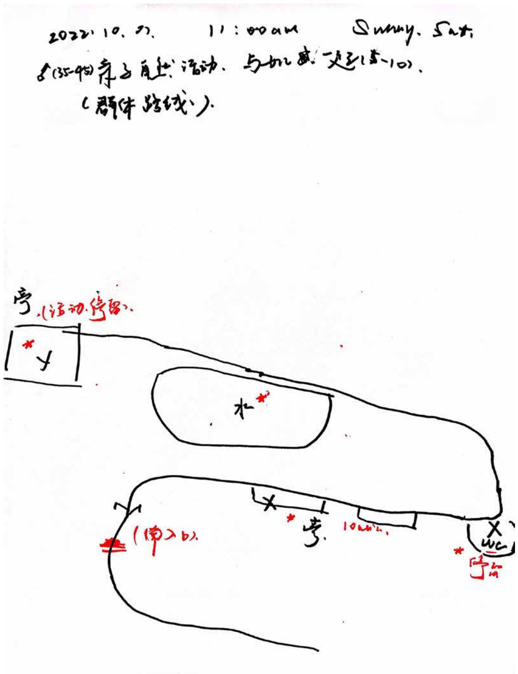

2022.09.29
11:30am.
Rainy. Thurs


2022.09.29 14:00pm
Rainy.

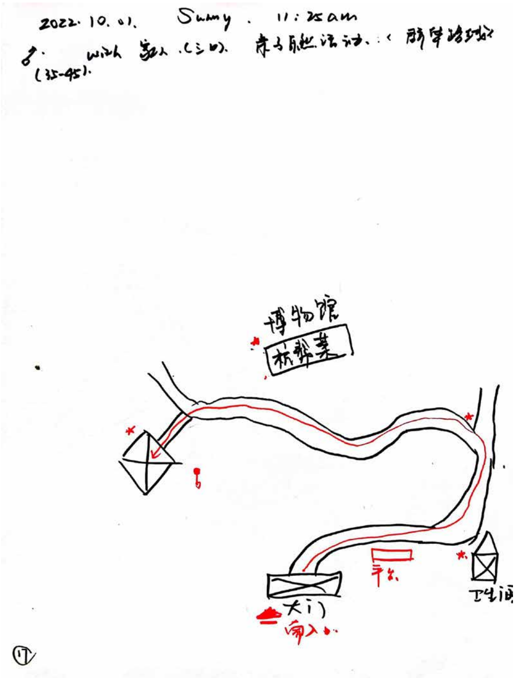

停车场
10min
2022.09.29. 15:35pm. Cloudy
多次停留
13

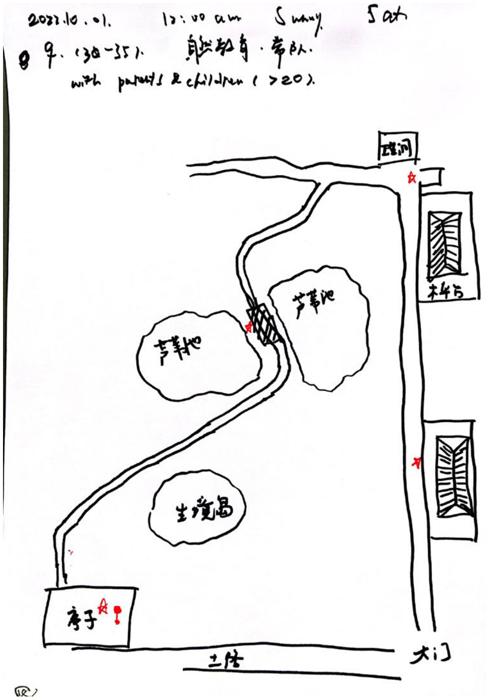

(Park closes at 17:00pm)
Cloudy.
Walking.
水
20min
10min
入口

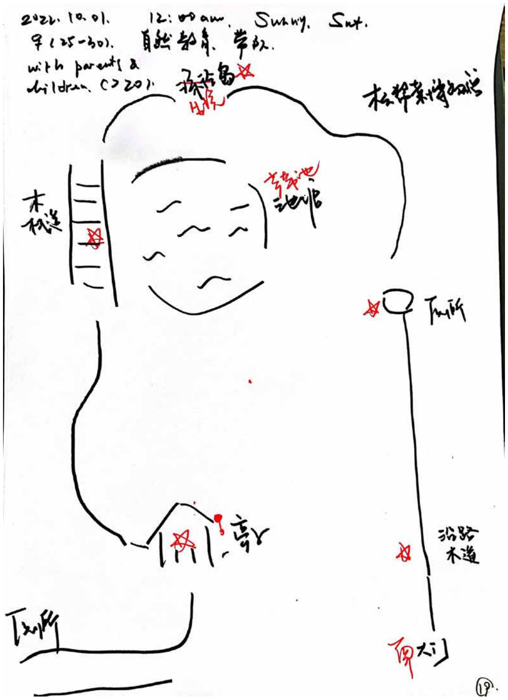

10:00am 左右.
水.
饮食.
亭.
30min..
Sunny.
11:00am. Sat.
15

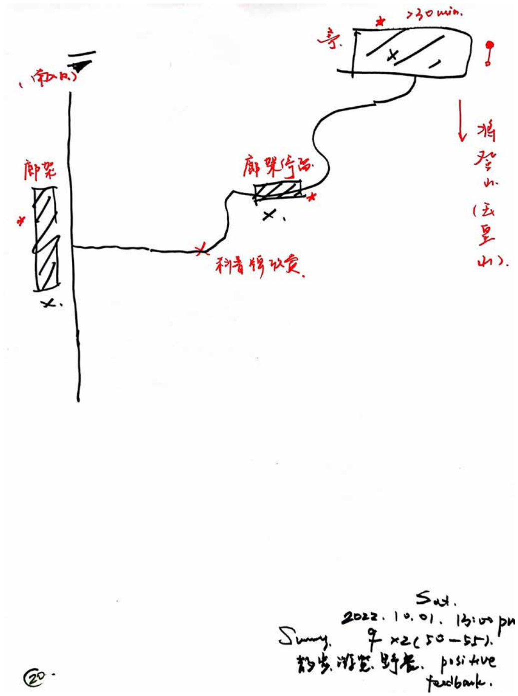

11:00am
Sunny. Sat.
水
亭
10min.
WC

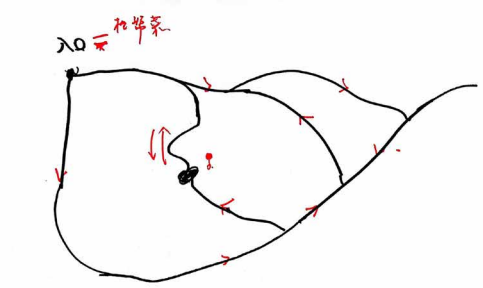
TOC


2022. 10. 01. Sunny. 11:25 am
博物馆
大门
卫生间

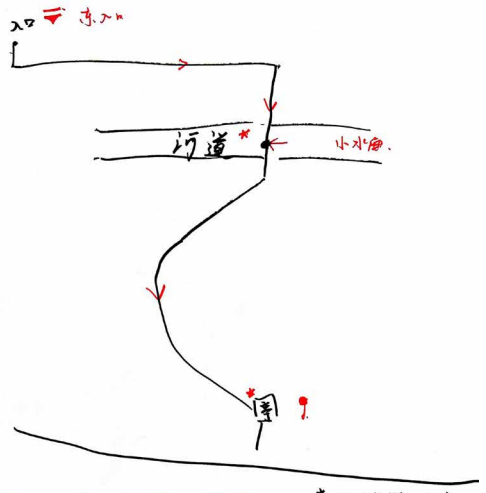

2022.10.01. 12:00 am Sunny Sat
芦苇池
芦苇池
生境岛
亭子
大门


2022. 10. 01. 12:00 am. Sunny. Sat.
厕所
沿路
木道
厕所

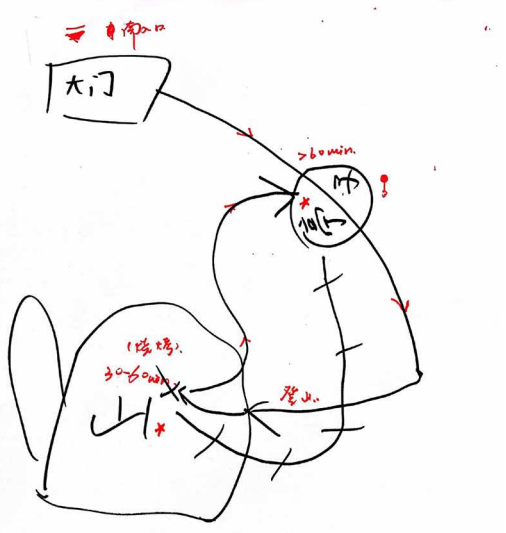

Sat.
2022. 10. 01. 13:00 pm
positive
feedback.



2022.10.01. Sat. Sunny. 14:00 pm.
♂ (10-12). with parents (25-45) & brother

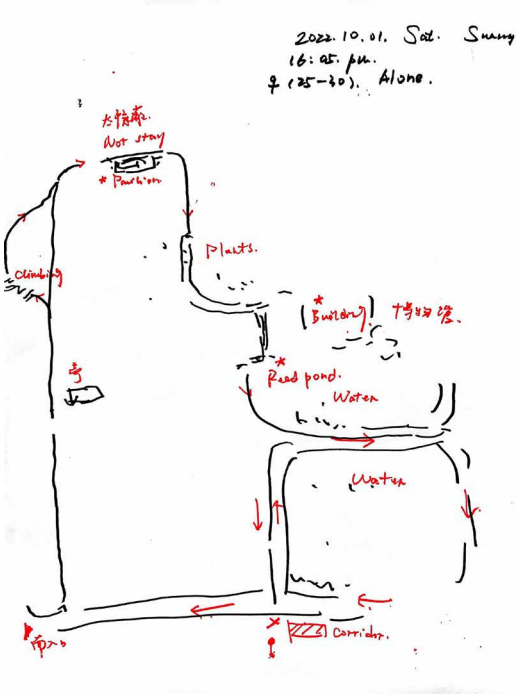


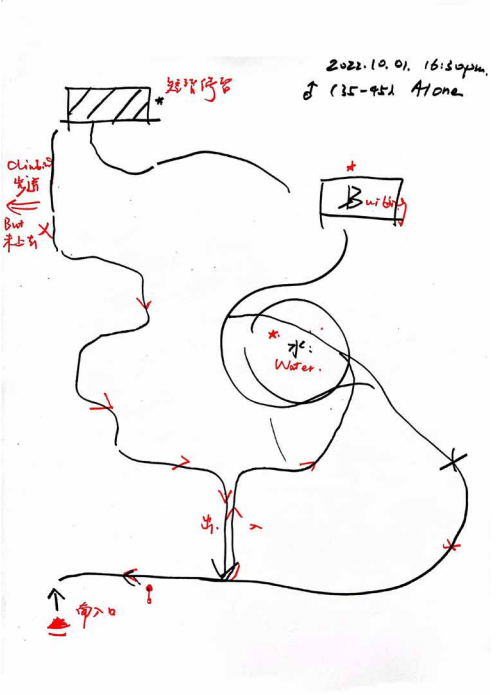
2022.10.01. Sat. Sunny. 14:00 pm.
♂ (8-12). with parents (35-45). & brother

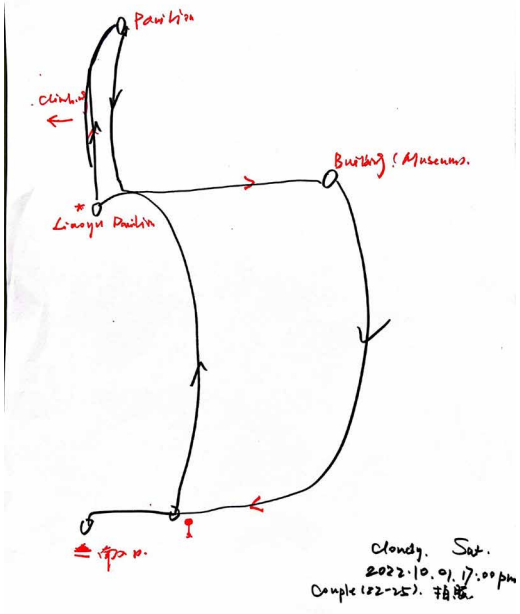


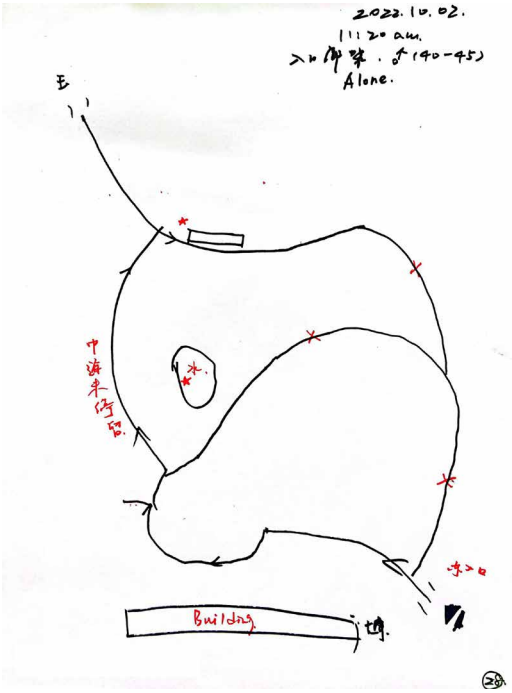
2022.10.01. Sat. Sunny.
♂ (8-12). with families. (♀×3 + ♂×1) + 12童×4 (8-12)

2022.10.01. 15:00 pm
♂ (8-12). with parents.


2022.10.01. Sat. Sunny
16:05 pm.
♀ (25-30). Alone.
Not stay
Pavilion
Plants.
Building
Reed pond.
Water
Water
Corridor.


2022.10.01. 16:30pm.
♂ (35-45) Alone
Building
水:
Water.


Pavilion
Building (Museums.
Lanyan Pavilion
Cloudy. Sat.
2022.10.01. 17:00 pm
Couple (22-25).


2022.10.02.
11:20 am.
Alone.
Building
29

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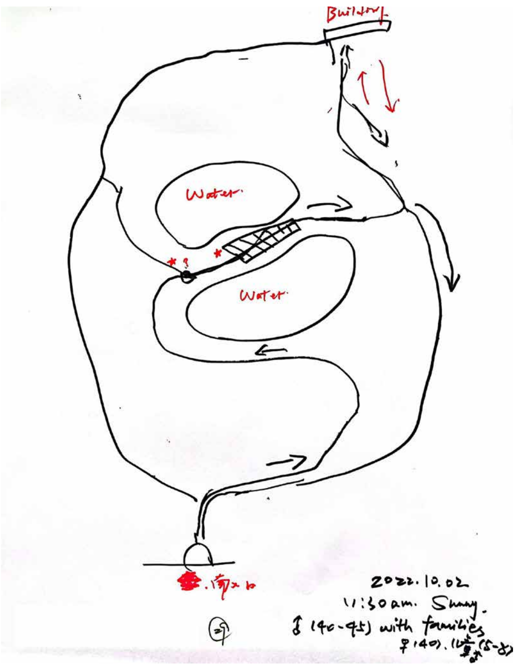
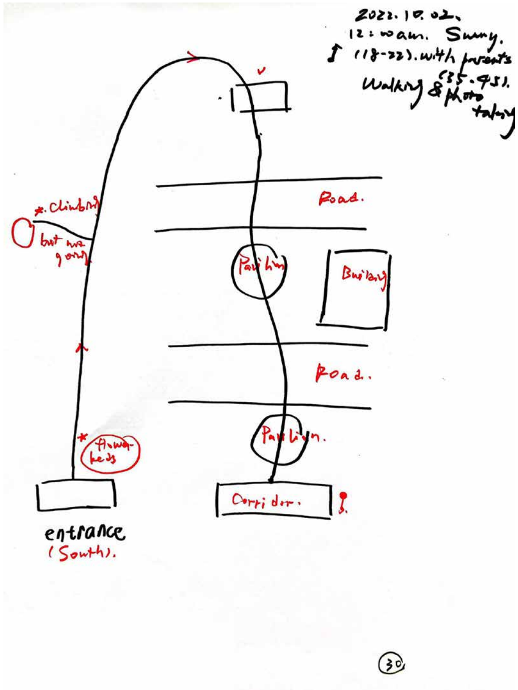
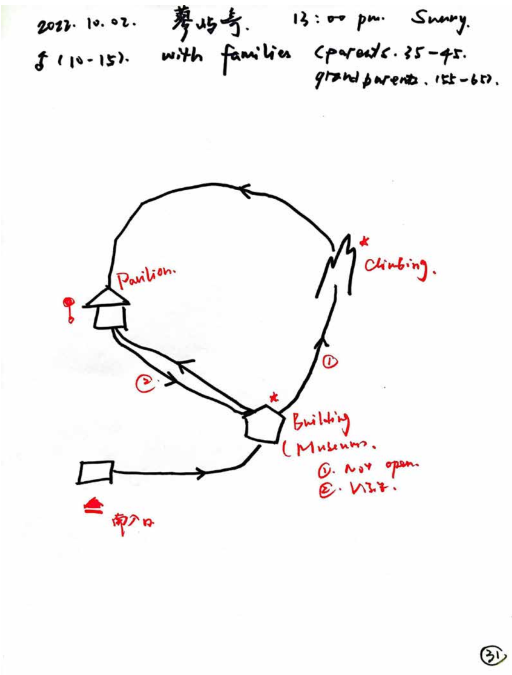
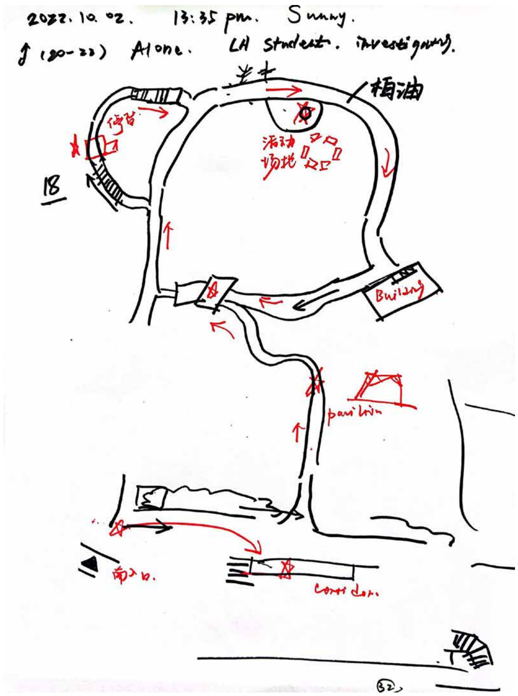
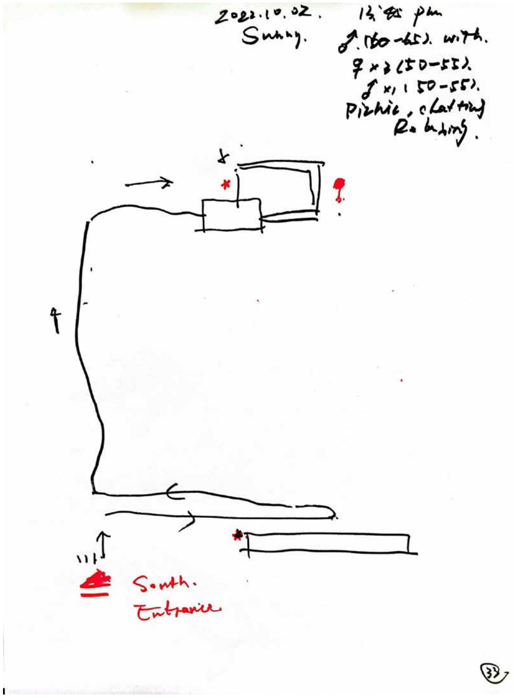

Building
Water.
Water.
2022.10.02
11:30am. Sunny.

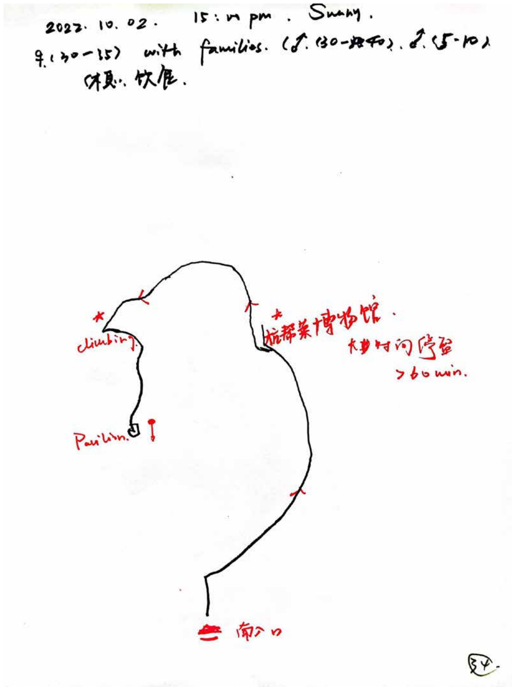

2022.10.02.
12:00am. Sunny.
Road.
Pavilion
Building
Road.
Pavilion.
Corridor.
entrance
(South).


2022.10.02.
13:00 pm. Sunny.
with families
Pavilion.
Climbing.
Building
(Museum.
南入口

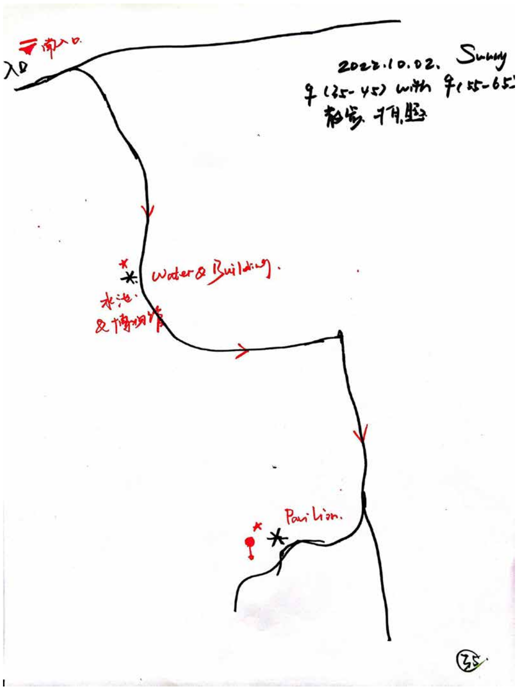

2022.10.02. 13:35 pm. Sunny.
Alone.
Building
pavilion
南入口
Corridor.



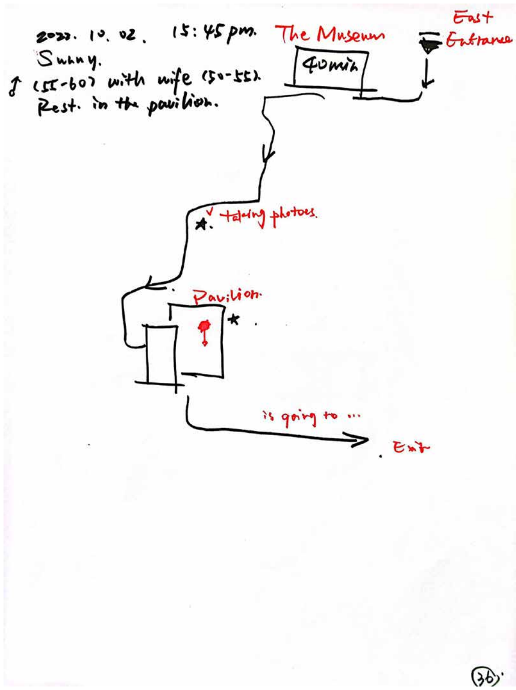
2022.10.02.
Sunny.
Picnic, chatting
South Entrance



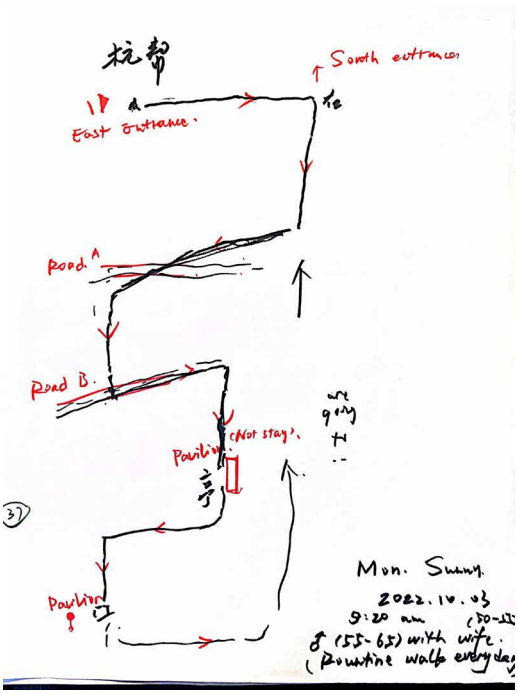
2022. 10. 02.
Sunny.
with families.
climbing
>60 min.
Pavilion.
南入口

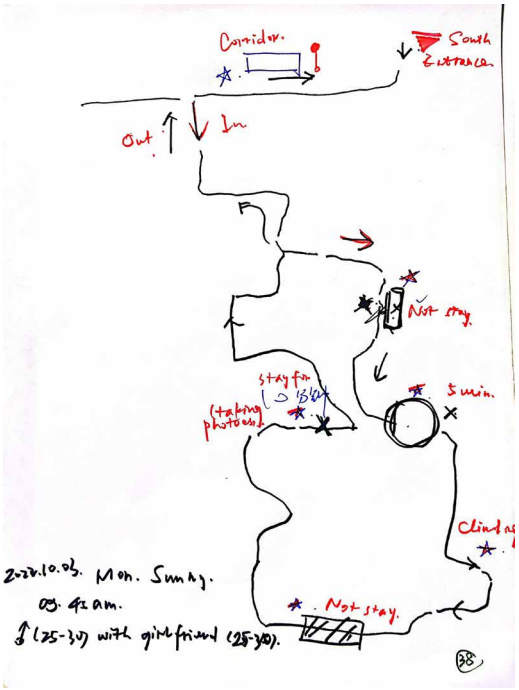


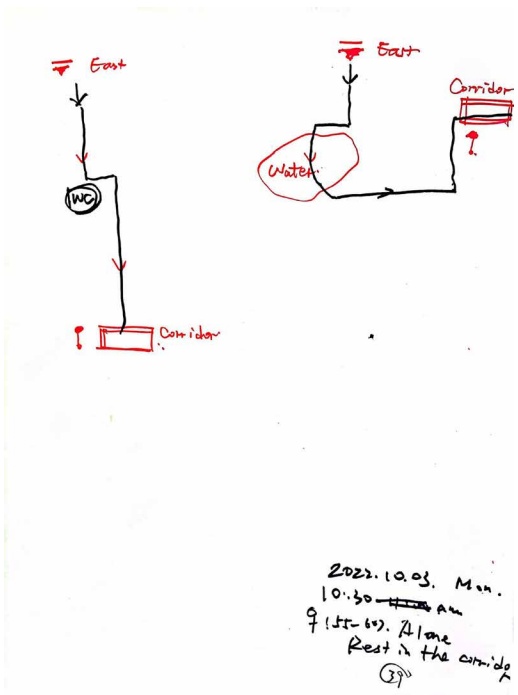
南入口
2022.10.02. Sunny
Water & Building.
Pavilion.

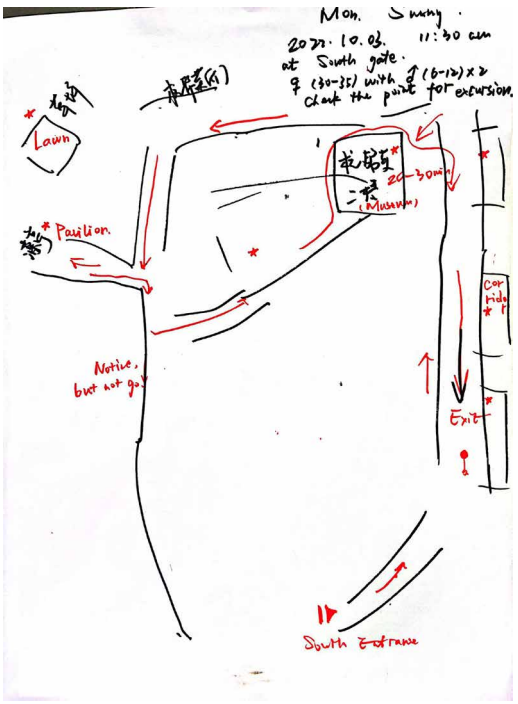


2022. 10. 02.
15:45 pm.
Sunny.
with wife
Rest in the pavilion.
The Museum
East Entrance
40min
taking photos.
Pavilion.
is going to ...
Exit


South entrance
East entrance.
Road A
Road B.
Pavilion
(Not stay).
Pavilion
Mon. Sunny.
2022.10.03
9:20 am
♂ (55-65) with wife.
(Routine walk every day)


Corridor.
South Entrance
Out
In
Not stay.
stay for
(taking photos)
5 min.
Not stay.
2022.10.03. Mon. Sunny.
09: 42 am.
♂ (25-30) with girlfriend (25-30).


East
East
Corridor
Water
WC
Corridor
2022.10.03. Mon.
10:30 AM
♀ (55-60). Alone
Rest in the corridor


Mon. Sunny.
2022.10.03. 11:30 am
at South gate.
♀ (30-35) with ♂ (6-12) x 2
check the point for excursion.
Lawn
Pavilion.
(Museum)
Notice, but not go
Exit
South Entrance

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Appendix B-5: reliability and validity tests

Table 1. Result of the reliability test

Reliability Statistics

scale	Cronbach's Alpha	N of Items	Cronbach's Alpha Based on Standardized Items
overall variables	0.898	14	0.895

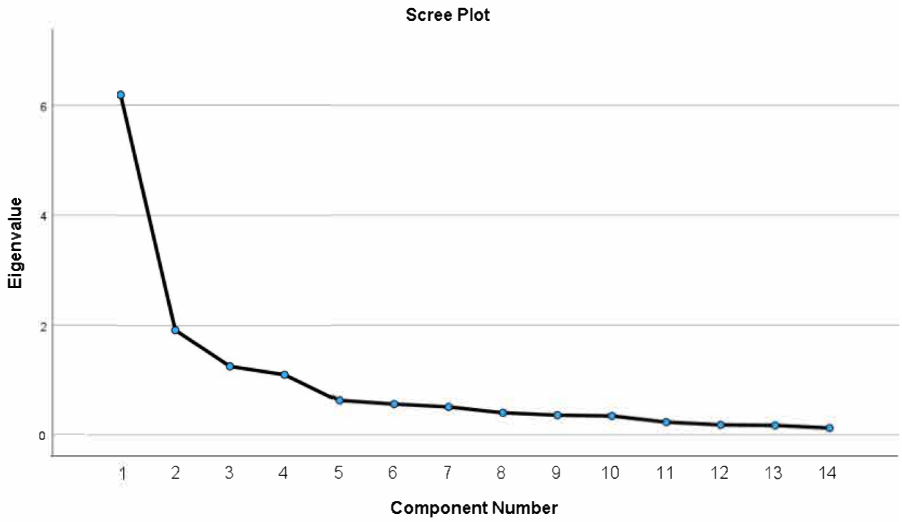
Table 2. Result of KMO and Bartlett's test

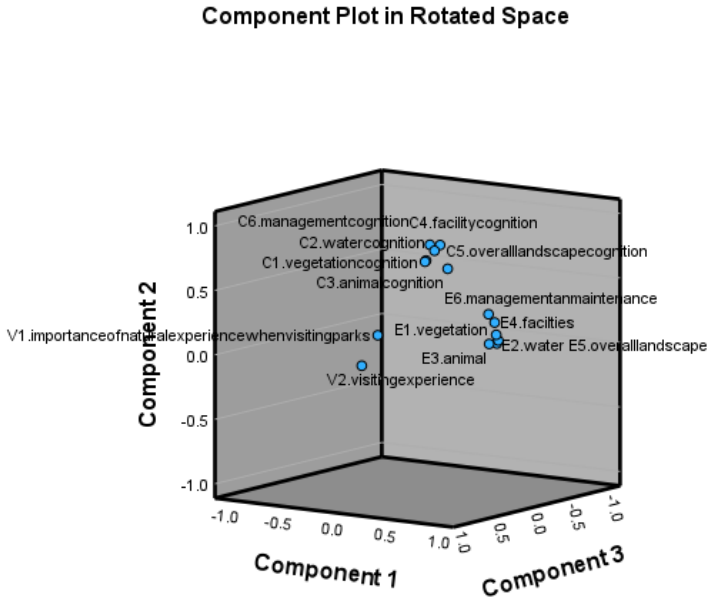
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.862
Bartlett's Test of Sphericity	Approx. Chi-Square	2152.651
	df	91
	Sig.	**<.001**

Appendix B-6: factor analysis

Table 1. Rotated Component Matrix[a]			
	Component		
	1	2	3
E1. vegetation	0.842		
E2. water	0.850		
E3. animal	0.794		
E4. facilities	0.643		
E5. overall landscape	0.844		
E6. management and maintenance	0.645		
C1. vegetation cognition		0.747	
C2. water cognition		0.746	
C3. animal cognition		0.673	
C4. facility cognition		0.803	
C5. overall landscape cognition		0.808	
C6. management cognition		0.806	
V1. importance of natural experience when visiting parks			0.730
V2. visiting experience			0.802
Initial Eigenvalues	**6.185**	**1.919**	**1.263**
% of Variance	**28.592**	**27.538**	**10.779**
Cumulative %	**66.909**		
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 4 iterations.			


Scree Plot
Eigenvalue
6
4
2
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Component Number


Component Plot in Rotated Space
C6.managementcognition
C4.facilitycognition
C2.watercognition
C5.overalllandscapecognition
C1.vegetationcognition
C3.animalcognition
E6.managementanmaintenance
E4.facilties
E1.vegetation
E2.water
E5.overalllandscape
E3.animal
V1.importanceofnaturalexperiencewhenvisitingparks
V2.visitingexperience
Component 2
1.0
0.5
0.0
-0.5
-1.0
Component 1
Component 3

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Appendix B-7: tests of model fitting and parallel lines

Table 1. Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	444.414			
Final	421.748	22.666	3	0.000
Link function: Logit.				

Table 2. Test of Parallel Lines[a]				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	421.748			
General	406.676[b]	15.072[c]	9	0.089
The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.				
a. Link function: Logit.				
b. The log-likelihood value cannot be further increased after maximum number of step-halving.				
c. The Chi-Square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.				

APPENDIX C

Workshop Records

The Appendix C presents the records in the pattern design workshop, which aligns with the research process and findings discussed in Chapters 6 of this thesis. The appendix C include the outcomes of each of the team during the collaborative design of an urban wilderness area using the pattern language booklet provided and the feedback notes for each patterns during the feedback and evaluation session of the workshop.

Figure C-1. Design outcomes of TEAM A1

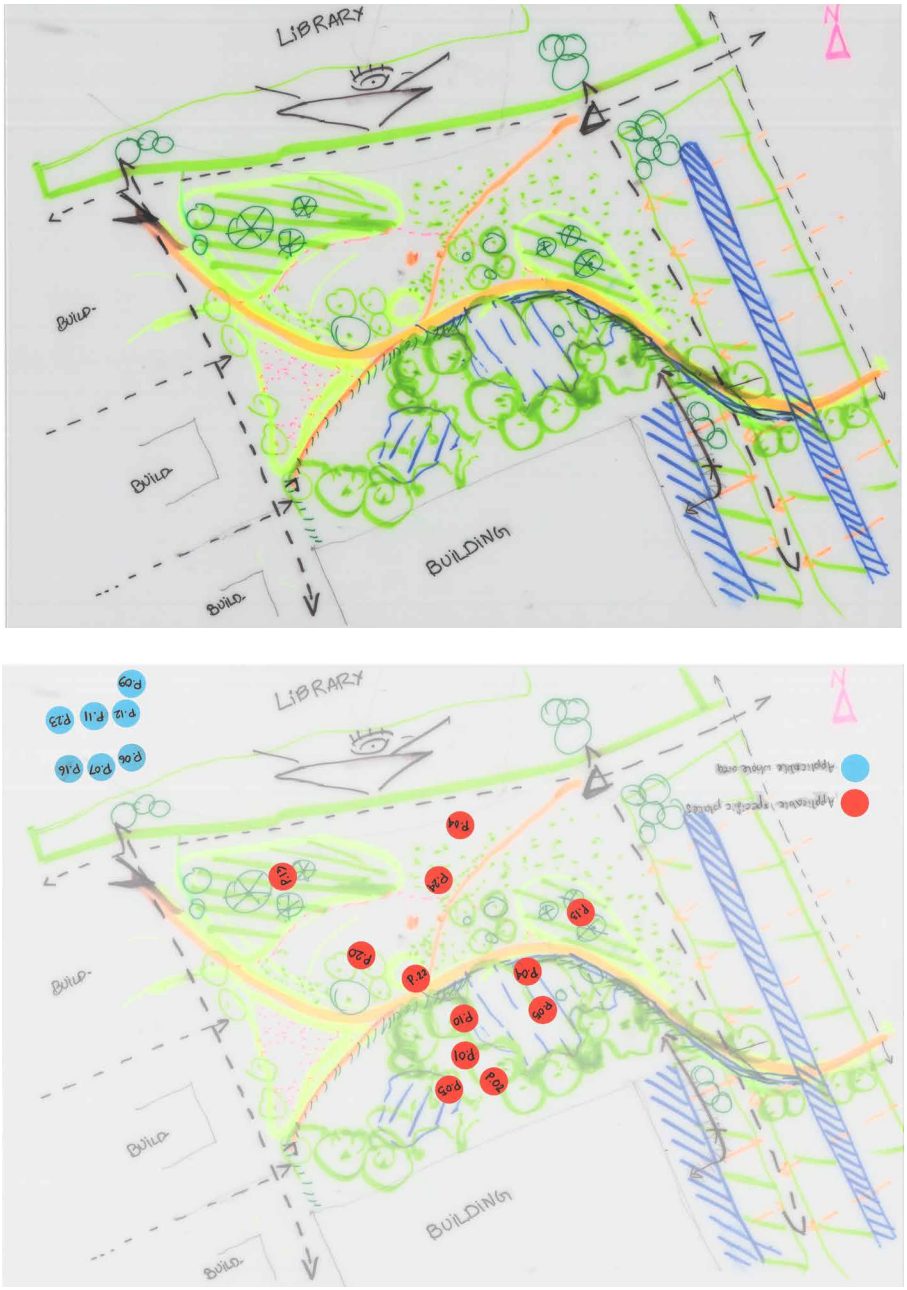

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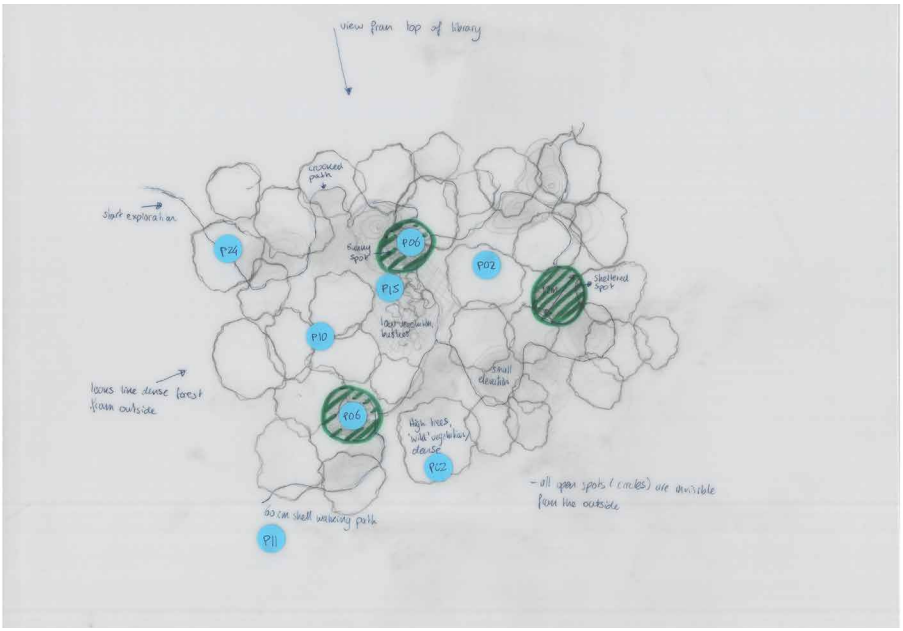
Figure C-2. Design outcomes of TEAM A2



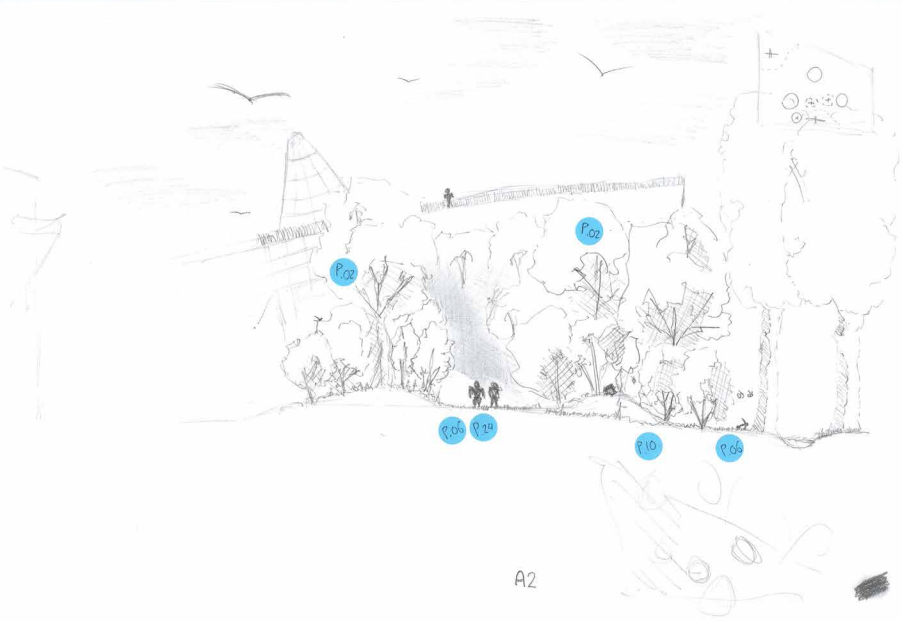


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Figure C-3. Design outcomes of TEAM B1

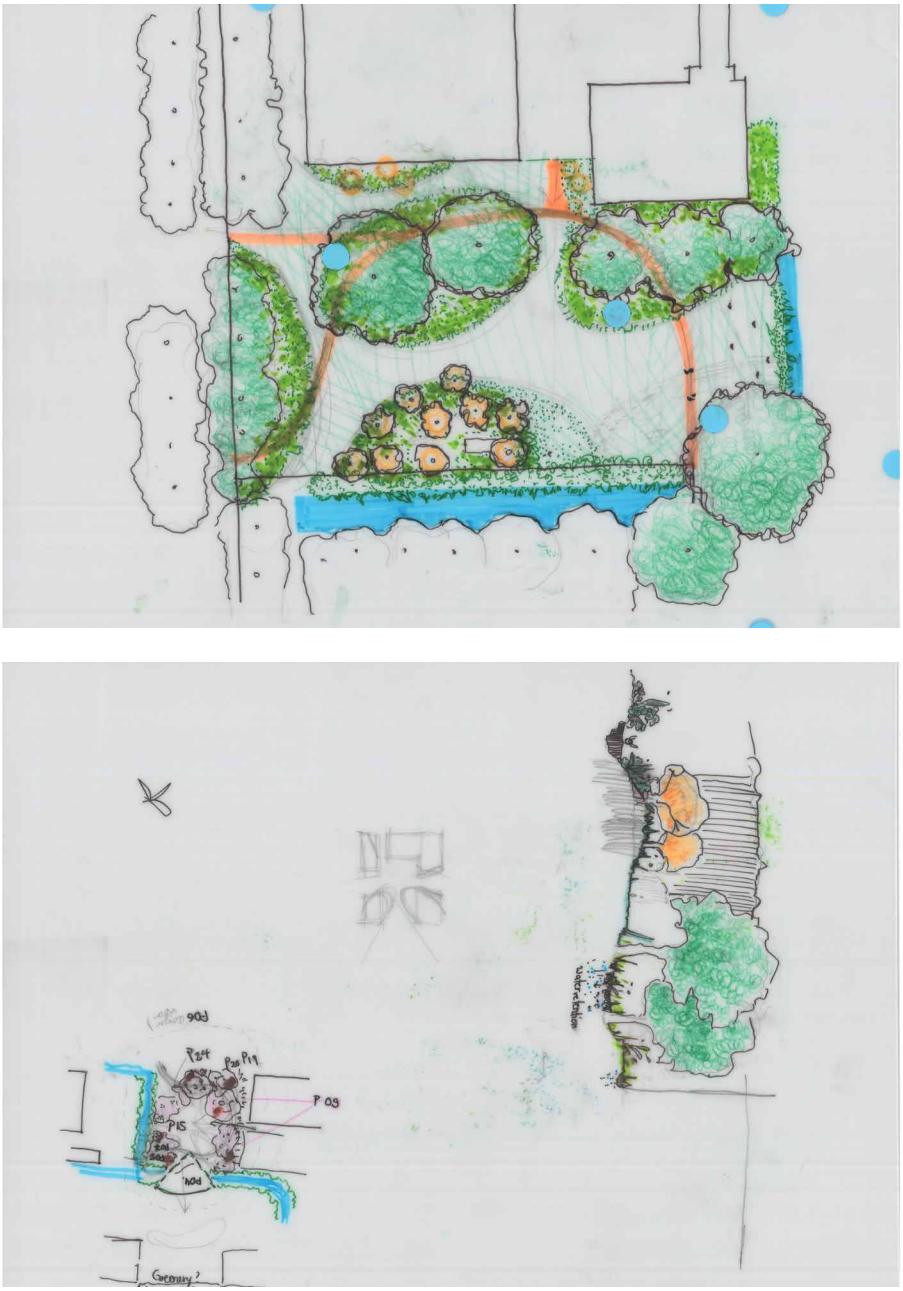

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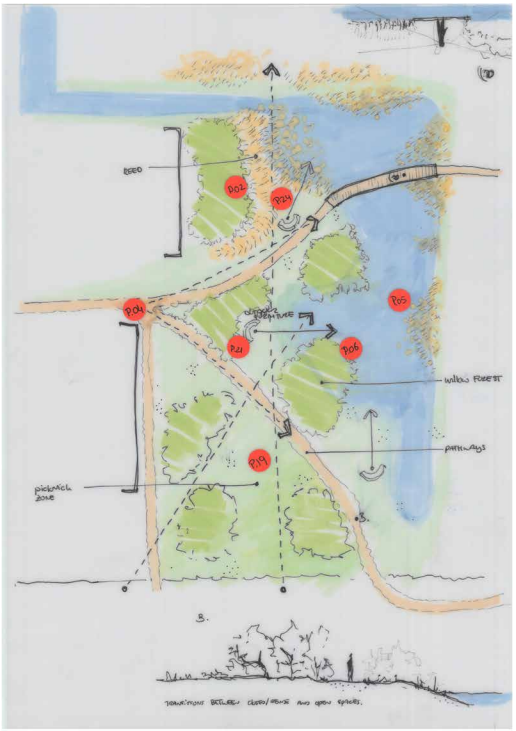
Figure C-4. Design outcomes of TEAM B2



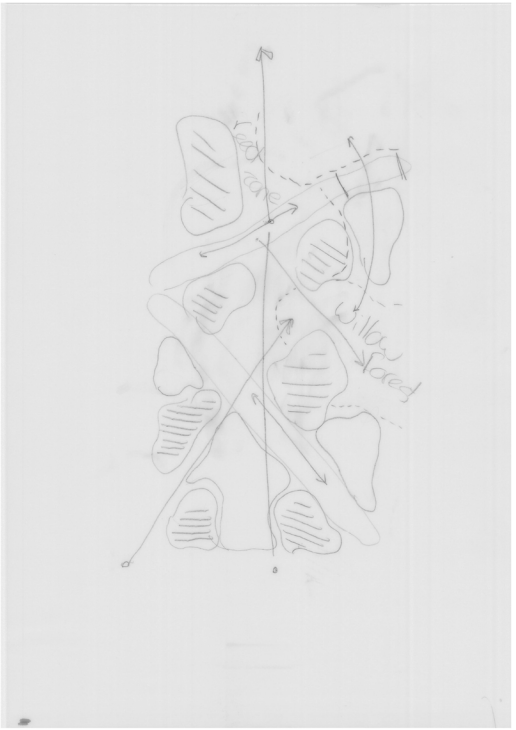


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Figure C-5. Feedback and comments on the design patterns

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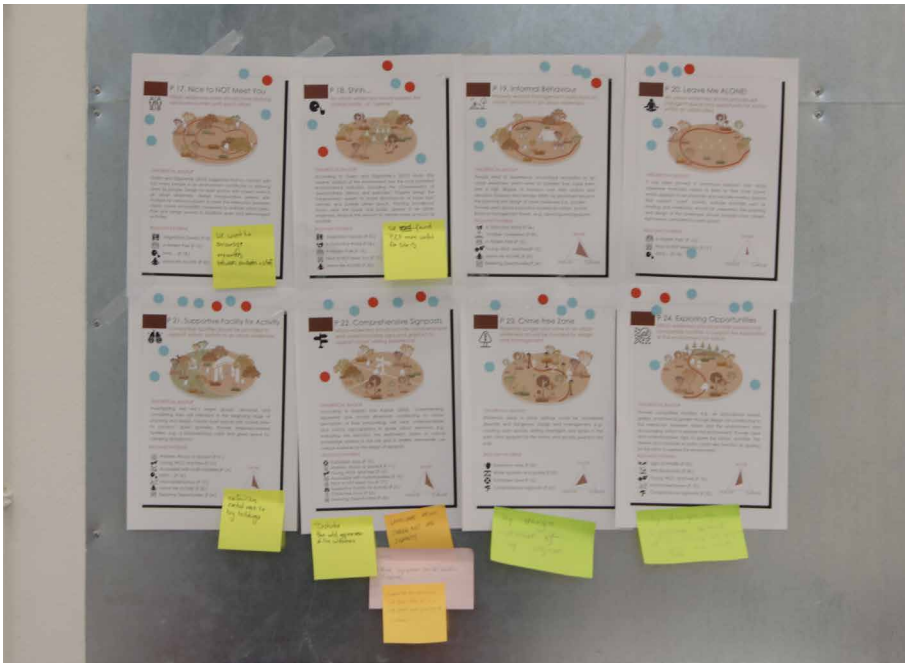
P.17. Nice to NOT Meet You
P.18. Shhh...
P.19. Informal Behaviour
P.20. Leave Me ALONE!
P.21. Supportive Facility for Activity
P.22. Comprehensive Signposts
P.23. Crime Free Zone
P.24. Exploring Opportunities

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Curriculum Vitae

Yuan Chen (陈媛)

Yuan Chen was born in Tongling, Anhui Province, China in 1993. From September 2011 to June 2015, she studied Gardening at Huazhong Agricultural University, where she obtained a Bachelor of Agriculture. In September 2017, she began her Master's studies in Landscape Architecture at Southeast University under the supervision of Professor Yuning Cheng. Her master's thesis was entitled "Research on Urban Mountain Plant Community Landscape Creation Guided by the Concept of Coupling".

In 2021, Yuan Chen was awarded a scholarship from the China Scholarship Council (CSC) to pursue her PhD in the Department of Urbanism at the Faculty of Architecture and the Built Environment, Delft University of Technology, the Netherlands. Her doctoral research lies at the intersection of urban spatial planning, design, and environmental psychology, focusing on the creation of urban wilderness spaces that consider users' perceptions and attitudes. The study proposes a set of design patterns formulated in a visionary manner for practitioners. Her research has been published in several academic journals, including *Chinese Landscape Architecture*, *Urban Forestry & Urban Greening*, and *Frontiers of Architectural Research*. Additionally, she has presented her work at various international conferences, including the International Federation of Landscape Architects (IFLA) World Congress 2023 and the Urban Transitions Conference 2024.

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Publications

Published Peer-reviewed Journal Articles

Chen Y.*, Nijhuis S., & van Dorst M. J. (2024). Visitors' perceptions of urban wilderness. A case study of Jiangyangfan Ecological Park in Hangzhou, China, Urban Forestry & Urban Greening, Volume 95, 128319, ISSN 1618-8667, https://doi.org/10.1016/j.ufug.2024.128319.

Chen Y., Nijhuis S.*, & van Dorst M. J. (2022). Towards landscape design strategies for Urban wilderness: Case studies from the Netherlands. Chinese Landscape Architecture, 38(8), 24. https://doi.org/10.19775/j.cla.2022.08.0024

(Accepted) Haoxiang Z.& Chen Y.* (2025). Exploring Public Experiences in Urban Green Spaces: A Social Media Analysis of Amsterdam, Frontiers Of Architectural Research

Submitted Articles

Chen Y.*, Nijhuis S., & van Dorst M. J. (under review). Urban Wilderness as a Concept for Urban Planning and Design: A Systematic Review, Journal of Environmental Management

Conference Presentation

Chen, Y. (November 2024). Why wilderness? Comparing landscape elements relevant sentiments in urban wilderness spaces and urban green spaces via social media analytics. In Urban Transition 2024. Sitges, Barcelona, Spain.

Chen, Y. (September 2023). Users' perception towards urban wilderness and its implications for design. In the IFLA World Congress 2023. Nairobi, Kenya.

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26#01

Urban Wilderness by Design

A Pattern-Based Framework Integrating Urban Nature and User Perception

Yuan Chen

This thesis examines the practical integration of urban wilderness into spatial planning and design, aiming to establish actionable knowledge through a pattern language that supports ecologically driven and perceptually engaging urban environments. The thesis systematically explores four interconnected aspects: clarifying the conceptual foundations of urban wilderness in the urban planning and design discipline; investigating its spatial features and user perceptions; synthesizing design knowledge into structured wilderness design patterns; and validating their applicability through expert interviews and collaborative design experiments.

First, the thesis maps the conceptual terrain of urban wilderness using scientometric and thematic analyses, identifying philosophical, ecological, and urbanistic dimensions while revealing a critical gap in design-oriented approaches. It establishes a methodological basis for translating wilderness ideas into planning and design practice. Subsequently, the thesis employs comparative case studies and mixed-method empirical research, including questionnaires, mental mapping, and behavioral observations, to generate both qualitative and quantitative insights into how urban wilderness is formed in practice and perceived by visitors.

Building on these findings, the thesis formulates 24 design patterns that articulate context-sensitive strategies through natural, cultural, and social lenses, providing structured guidance for integrating ecological spontaneity and human intelligibility. Their applicability and usability are subsequently assessed through expert interviews and a collaborative design workshop, yielding reflections that refine the pattern language and indicate future directions. Overall, the thesis provides a cohesive framework for translating the concept of urban wilderness into practical design interventions that enhance ecological resilience and enrich human experience.

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