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A systematic literature review

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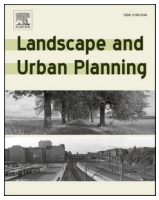

Review Article

Conservation and development of the historic garden in a landscape context: A systematic literature review

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HIGHLIGHTS

- Identification of the research gaps about conserving and developing historic garden in landscape context.
- 3 Linkages between landscape approach and historic garden conservation and development.
- 11 discourses of applying landscape approach in historic garden conservation and development.
- Establishing a landscape framework for the conservation and development of historic garden.

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ABSTRACT

Although there have been numerous studies on the heritage attributes, characteristics, and values of the historic garden as a special category of cultural heritage, the **question** is why a comprehensive review combining mainstream historic garden conservation with ways of understanding the garden in a landscape context has not been conducted. Landscape is an integrative concept that combines physical features and the diversity of functions with social and ecological processes throughout the scales of time and space. Therefore, this landscape context means applying the landscape approach to explore the organic connection between the scale of evolution and the architectonic elements in relation to each other. To elaborate, instead of viewing the garden as an object in one specific temporal-spatial frame, such an approach focuses on the evolution of the site in order to identify persistent structures and other values. The **method** used in this study involved paper coding as qualitative analysis combined with bibliometric visualization software. We reviewed 162 studies to explore the interconnections between the historic garden and landscape approach. The **result** is that there are three correspondences between landscape approaches and different stages of the historic garden's conservation and development: studies identifying the historic garden's characteristics using landscape mapping, studies demonstrating historic gardens' conservation based on landscape planning, and studies exploring the potential of development and reuse through landscape design. Finally, we **discuss** the research gaps and outline an action framework for the conservation and development of heritage gardens in a landscape context.

1. Introduction

Historic Garden is an important category of cultural heritage, which is identified as a dynamic living system rather than a simple composition assembling distinct heritage elements, as defined by the Florence Charter (1981). It is also listed in the UNESCO Operational Guidelines (1992) as a special type of cultural landscape (item 1): as an example of human intentional creation and design of nature. From this perspective, historic gardens' values lie precisely in their diverse heritage attributes, which show a succession of the transformation of a special natural environment conducted by human culture and address different scales of time and space (Connell, 2005; Gothein & Wright, 2014).

To understand historic gardens as a cultural landscape, we must view them more comprehensively and sustainably, specifically in a landscape context (Antrop, 2006). This implies that we should make more use of the connotations and meanings of the landscape approach (Arts, 2017;

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Ginzarly et al., 2018; Nijhuis, 2020; Nijhuis et al., 2023; Rossignol, 1992). Landscape, as an approach, emphasizes the acquisition, recognition, and sustainable management of surface features (Freeman, 2015; Reed, 2016), which is a means of spatial perception and serves territorial and regional planning and design (De-Fries and Rosenzweig, 2010). Its concern for ecological evolution and cultural transformations aligns with the multifaceted attributes of the historic garden, encompassing both unique application scenarios and universally applicable principles (Lassus, 1998; Branton, 2009). However, most heritage landscape conservation theories and methodologies focus on the historic garden as "fixed" objects addressing a specific scale, or architectural features without including relational and contextual aspects such as the relationships among garden clusters and the urban or rural context (Millward, 2011; Paiva, 2021; Scazzosi, 2004). The introduction of a landscape approach to conservation and development in the historic garden has compensated for the lack of systematization, weak integration, and poor dynamics of architectonic heritage conservation methods (Harvey, 2015; Sayer et al., 2013). In view of international conventions and previous research, one of the most relative angles associated with introductions to the field of the historic garden is not merely focusing on employing conventional methods to acquire intact conservation results for each element under restrictive conservation criteria; instead, they establish a cyclical process that applies an adaptive strategy to effectively support conservation (Obad Šćitaroci et al., 2019; Girard, 2013). Additionally, this is firstly an approach to the historic garden that provides a long-term chronological vision to articulate the initial design logic of the past, which involves revealing the territorial collection memory and identity to grasp ancient wisdom in response to changes in the natural environment (Funsten, 2020; Nijhuis, 2015). Secondly, it makes this continuous succession more feasible and practical in order to convert all these principles into present use by developing new functions with multiple interventions (Liu & Nijhuis, 2020; Czałczyńska-Podolska, 2014). Thirdly, these heritage values are progressively cognized, reinterpreted, and reused in a sustainable manner, which will benefit the next generation in the future (Benfield, 2013; Gullino et al., 2019).

This study attempts to propose the possibilities and potentials of using a landscape approach for the conservation and development of the historic garden while reflecting on the outcomes of design and planning (Fig. 1). Hence, the following questions will be answered in this research to address the aforementioned issue: What is the current research focus? What gaps exist in the literature regarding the landscape approaches used for historic garden conservation and development? How can the landscape approach be improved?

2. Materials & methods

The method of literature analysis used in this study can be broken down into two parts. First, based on paper coding and statistical

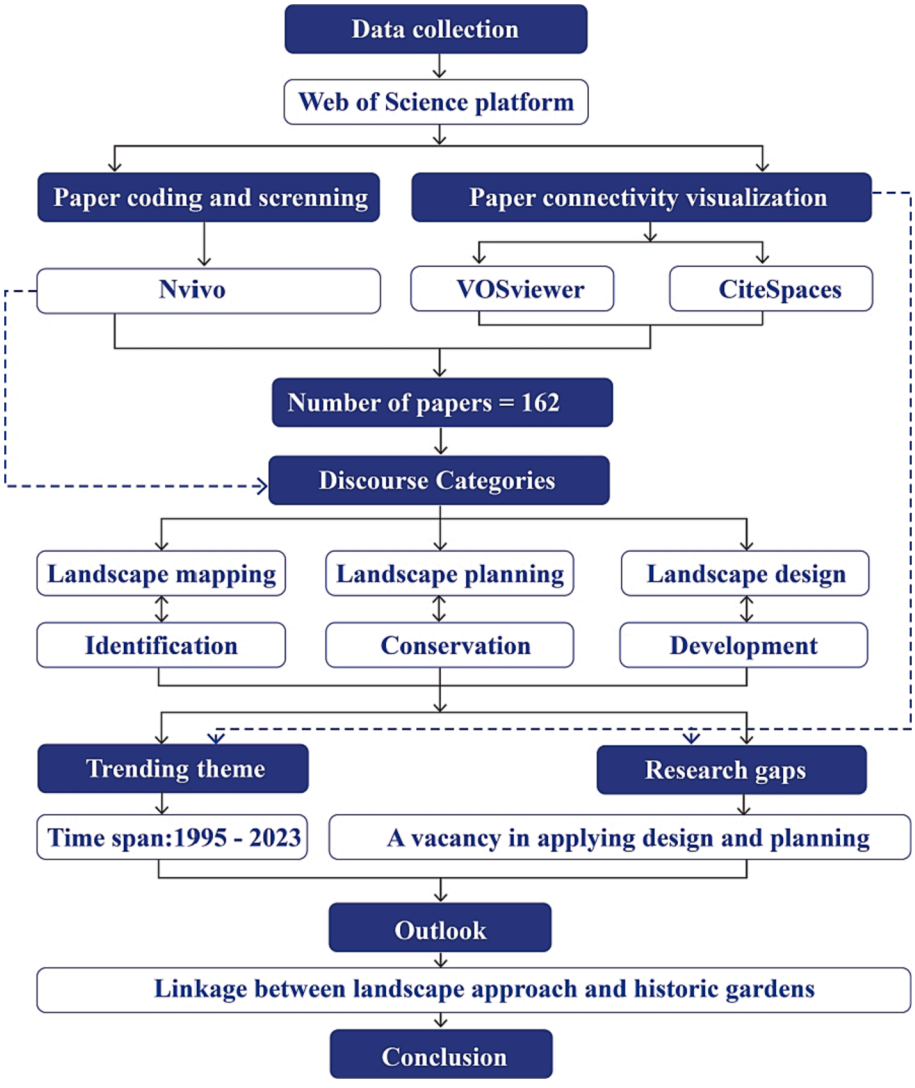

Fig. 1. Flow diagram for literature review.

methods, we used NVivo to visually obtain a direct overview of the paper's basic information (e.g., the number of studies published each year and site coverage). We also used NVivo to establish multiple criteria to classify and identify the specific content of the target literature in a detailed manner. Secondly, we used VOSviewer and CiteSpace to show and simulate the scientometric network between research literature in a macro sense so that we could obtain a more integrated understanding of the academic gaps and tendency of research, and particularly find the vacancies in the present research field.

2.1. Data collection

Web of Science (WOS) offers diverse accessible databases for publications that explicitly articulate and use landscape approaches to conserve and develop the historic garden from multiple disciplines, including humanities, social science, and natural science. Moreover, the Conference Proceedings Citation Index-Social Science & Humanities, Emerging Sources Citation Index, Conference Proceedings Citation Index-Science, Science Citation Index Expanded, Social Sciences Citation Index, and Arts & Humanities Citation Index were all chosen as data sources for the present research. We divided the topic into three main categories as obligatory terms ("landscape approach," "conservation and development," and "the historic garden"), with each of them having a set of keywords for their related concepts.

1) Landscape approach: TS_1 = ("landscape approach" OR "landscape method" OR "landscape planning" OR "landscape design")
2) Conservation and development: TS_2 = ("conservation" OR "protection" OR "preservation" OR "maintenance" OR "restoration" OR "adaptive reuse" OR "utilization" OR "regeneration" OR "rehabilitation" OR "renovation" OR "intervention")
3) The historic garden: TS_3 = ("historic* garden" OR "garden heritage" OR "historic* park" OR "park heritage" OR "botanic* garden")
4) (TS_1) AND (TS_2) AND (TS_3)

We then matched these three groups of keywords with each. The time span was set from 1995 to 2023.

2.2. Literature screening and paper coding

According to the PRISMA statement (2020) (Page et al., 2021) (Fig. 2), the results yielded 476 documents from the WOS, and 2 duplicated papers and 68 non-English papers were removed before screening. Overall, five previous review papers were excluded according to the PRISMA flow diagram and one paper did not contain the main content. The second screening of the remaining studies (n = 400) and 190 articles were excluded due to their lack of focus on using the historic garden as the research subject. A further 48 papers were excluded because the literature did not address the application of the "landscape approach" as a research method or tool, or provide relevant workflows from a landscape perspective, finally resulting in (n = 162) articles remaining as the final set of references used this study (Appendix A).

We used paper coding to categorize the literature for statistical and qualitative analyses (Finfgeld, 2018; Jensen & Allen, 1996). Regarding the coding logic, we drew inspiration from Onwuegbuzie et al. (2012) and their work on taxonomic analysis and theme analysis in qualitative research techniques. First, with reference to the elements of taxonomic analysis, we redefined the classification system for the papers, which includes the following 6 items: research design; study questions; research objectives; (mixed) qualitative and quantitative data; analysis techniques; findings. After repeatedly reading the papers, we systematically deconstructed the content based on these criteria. This process allowed us to create a comprehensive classification system for a more organized and efficient analysis of the papers. Furthermore, through theme analysis, we attempt to extract the various domains of different papers and conduct constant comparison analysis to identify the similarities among them. These findings were then summarized into distinct headings, which served as group names for the purpose of clustering.

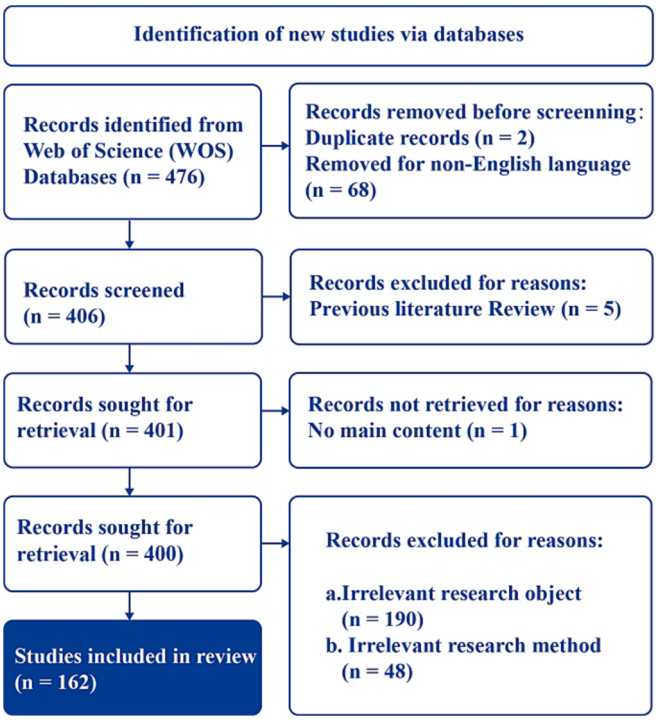

Fig. 2. PRISMA flow diagram for paper screening.

In the process of paper coding and analysis, the software *NVivo Version 20 1.7.1.153* was employed in this research. NVivo offers a method for paper coding that involves identifying key topics in the papers and linking them to nodes. The node system allows for the efficient management of complex data records, thus enabling researchers to explore patterns and connections between concepts within a broader discussion (Phillips & Lu, 2018). After multiple authors discussed and established grouping criteria and applied the two aforementioned analysis methods, the first author unified the coding process in NVivo and performed the categorization and organization.

2.3. Vosviewer and CiteSpace analysis

VOSviewer and CiteSpace are two prominent and widely used software. In this study, they were used for bibliometric analysis and visualizing a wide range of connectivity (clusters) between different papers to indicate the intrinsic meaning of the paper database. As many papers as possible should be collected to ensure that a complete database of relevant papers is obtained for further screening and analysis. These Java-based programs enable the creation of bibliographic data maps that are color-coded and provide an insightful representation of the underlying data (Waltman et al., 2010; H. Zhang et al., 2022). Additionally, CiteSpace stands out for its capacity to extensively utilize co-citation and co-occurrence analysis. This analysis identifies clusters of co-cited references and creates networks of co-occurring keywords. As a result, critical keywords in papers can be revealed, along with trending topics and concepts throughout the entire research field (Chen, 2006).

3. Results

Fig. 3 presents the number of papers screened in Section 2.2 that are related to research on the historic garden and published between 1995 and 2023 in the WoSCC database (Web of Science Core Collection). In the early stages (1995–2008), only eight papers were published, which

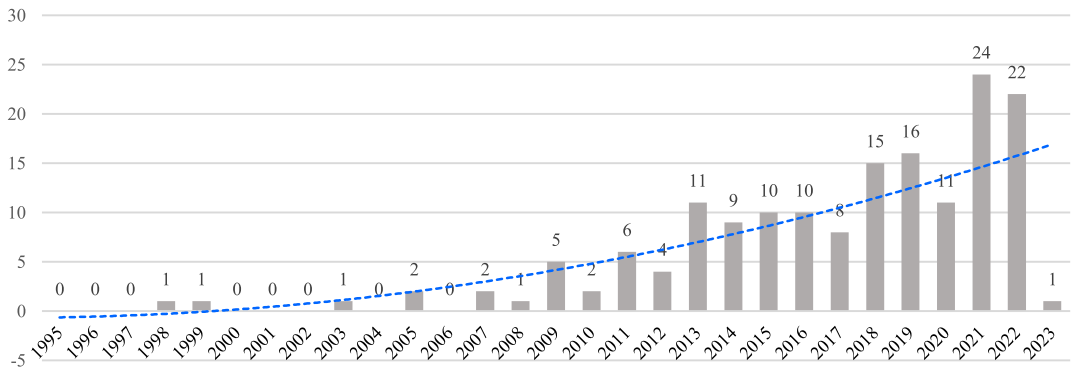

Fig. 3. Annual distribution of the studies.

indicates that the historic garden as a special type of heritage did not receive much attention from researchers. However, from 2009 onwards, this research field increasingly attracted attention, and the number of publications gradually increased. Although there were fluctuations, the number of documents increased rapidly from 5 to 23 from 2009 to 2022, with an annual growth rate of 12.58 %.

We also noted other attributes of the paper cases, such as the largest proportion of studies being published on Europe due to the application of ELC (Fig. 4), more case studies being published on the urban context than on suburban and mixed areas (Fig. 5), as well as cases that are not part of the conservation system receiving less attention than those related to national heritage and world heritage. (Fig. 6).

3.1. *Preliminary bibliometric analysis visualized using CiteSpace and VOSviewer*

The chronological graph presented by *CiteSpace 6.2.R1* illustrates the research priorities in the historic garden field during the 1995–2023 period. The focus of research on the historic garden ranges from "history" and "space" characteristics (Fig. 7a, c) to "communities," "city," and "identity." However, the existence of "landscape architecture" as the main topic spans a long period (with both purple and yellow circles). Moreover, according to the clustering analysis of the word cloud (Fig. 7b), investigations into the historic garden have primarily focused on two topics, namely climate change (NO. 0) and quality of life (NO. 1), which have gained considerable attention in recent years. Meanwhile, landscape design (NO. 2) has been the subject of numerous associated studies.

As demonstrated by VOSviewer, four clusters emerged, with the following four keywords showing the highest co-occurrence: "cultural landscape;" "conservation;" "landscape;" "sustainable development" (Fig. 8a). Furthermore, the historic garden field only shows connections

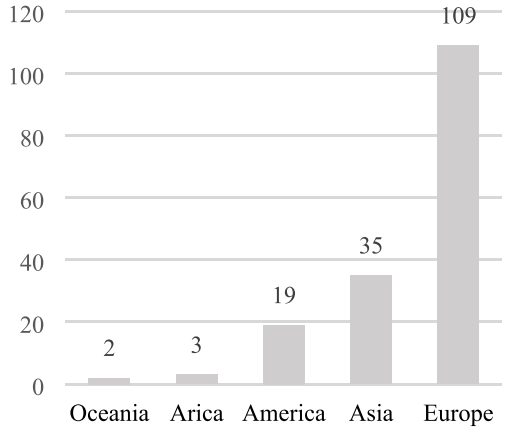

Fig. 4. Continental distribution of academic institutions.

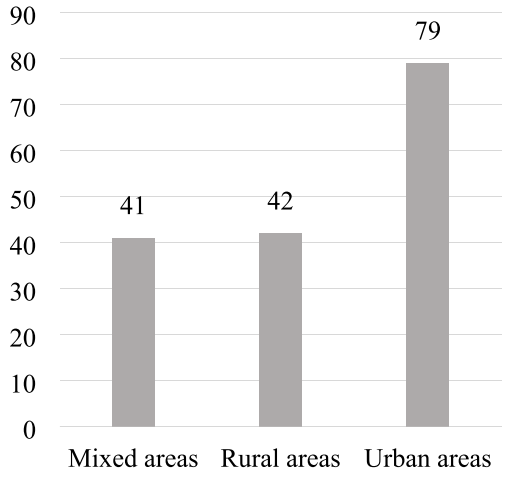

Fig. 5. Types of landscape environments for historic gardens.

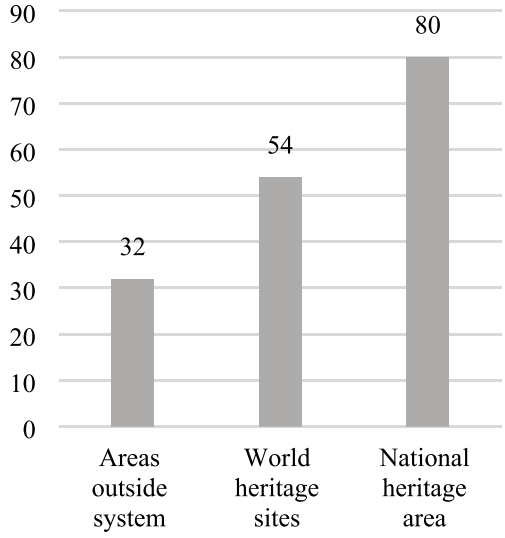

Fig. 6. Level of heritage conservation in the case studies.

with "restoration," "preservation," and "sustainable development" (Fig. 8b). When using "design" and "landscape" as connecting words to show relevance, the historic garden was established as a vacant position (see the portion framed in red) (Fig. 8c, d).

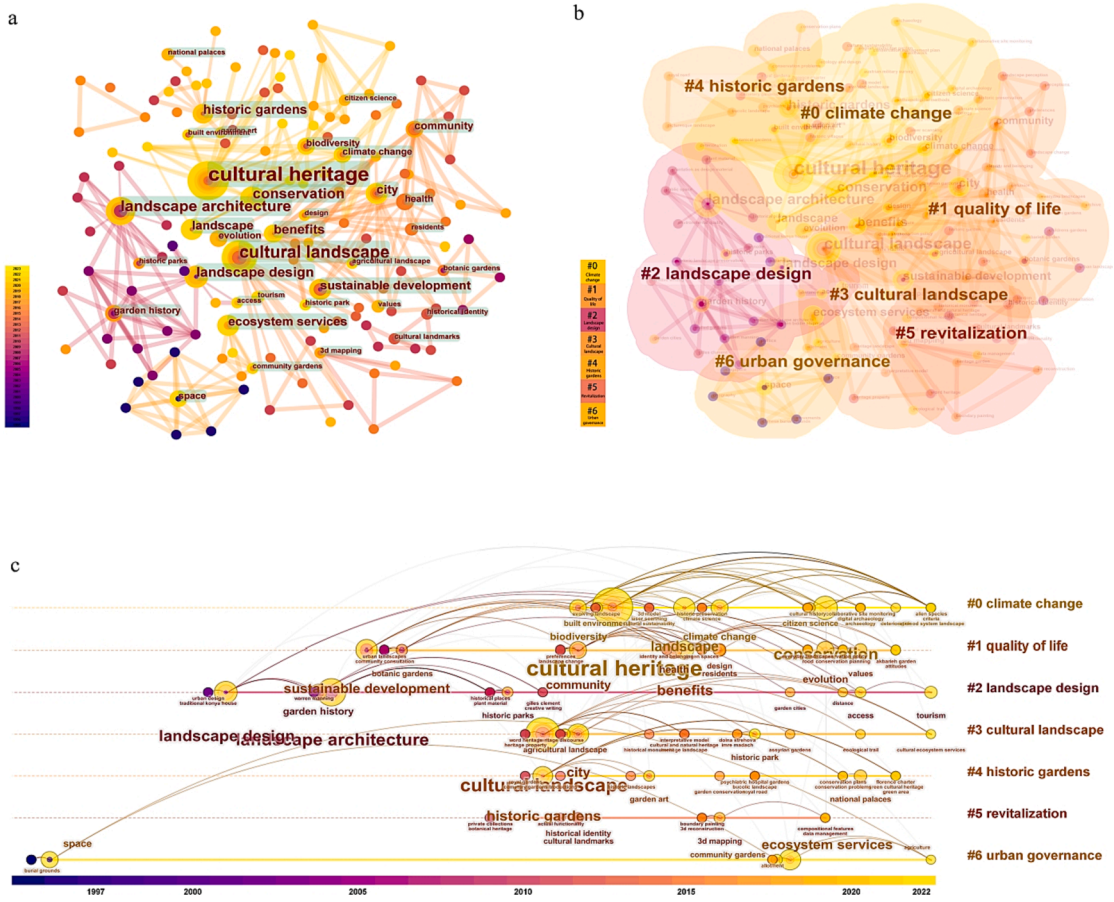

Fig. 7. **[a]** Connectivity of keyword co-occurrence frequency; **[b]** keyword cluster ranking; **[c]** chronological distribution of keyword co-occurrence frequencies processed in Citespace 6.2.R1.

3.2. Discourses in the conservation and development of the historic garden

We entered all the conservation and development principles and tactics found in each document as coded references in the NVivo program to extract the key discourses (Table 1).

Overall, **landscape mapping (LM)** focuses on the acquisition and interpretation of various human-nature interactive forms of information related to surface spatial characteristics (Lilley, 2018; Soini, 2001). Utilizing the advantages of this approach, we clustered papers related to the analysis of the historic garden characteristics and attempted to form Group A. Von Haaren et al. (2014) compared **landscape planning (LP)** and **landscape design (LD)** in terms of their responses to the substantive and process values facing landscape change. He noted that LP is more capable of providing systematic support for the protection of multiscale spaces (more substantive value), while LD contributes more to offering innovative interventions based on development for specific issues (more process value). As a result, we attempted to establish the connection between LP and historic garden conservation (Group B), as well as the connection between LD and historic garden development (Group C). These three relationships are in sequential order of different phases of the whole conservation and development process of the historic garden (Fig. 9).

First, for Group A, a series of international conventions and charters have defined the conservation of the historic garden as being based on the core of pluralistic values, while the determination of these values requires the identification of heritage characteristics (De la Torre, 2013). Although LM originated from geography and ecology, its practical application has gradually proven advantageous in precisely categorizing surface patterns and demonstrated a close association with characterization (Blasi et al., 2014). It provides advanced technical support and comprehensive application tools for identifying, visualizing, synthesizing, interpreting, and understanding the spatial characteristics of a special site and has been used in historic garden research for many years (Liu & Nijhuis, 2020). This constitutes the key reason for clustering our first discourse. The subgroups have been commonly applied from LM to identify the heritage values of the historic garden, including basic research on the historical materials (A1, 22 %), various digital techniques utilization for recording values (A2, 10 %), landscape assessment modeling (A3, 7 %), and landscape indicators for capturing changes (A4, 12.5 %).

Secondly, for Group B, the conservation of the historic garden is essentially a regional concept concerned with the protection of the integrity of the territory environment (Scazzosi, 2004), and inclusion of integrity is one of the most crucial criteria employed by UNESCO to determine the value of cultural heritage. Meanwhile, LP involves the comprehensive formulation of territorial management strategies in a long-term vision, emphasizing the multifaceted attributes of the site, with the primary goal of promoting sustainable land use practices (Von Haaren, 2002). This aligns with the purpose of the historic garden serving the integrative values for future generations. Additionally, regarding the social aspect, LP is the result of collective efforts involving multiple stakeholders to address multifunctional issues. This facilitates the achievement of consensus among various interested parties and helps resolve conflicts that may arise during the implementation of conservation agreements (Ryan, 2011). These subgroups are methods used to conserve the integrity of the historic garden with LP, including policymaking and legislation (B1, 3 %), territorial management (B2, 10.5 %), multiple stakeholders (B3, 3 %), and using a holistic toolbox to analyze conservation status (B4, 10 %).

Third, for Group C, the development and reuse of historic gardens

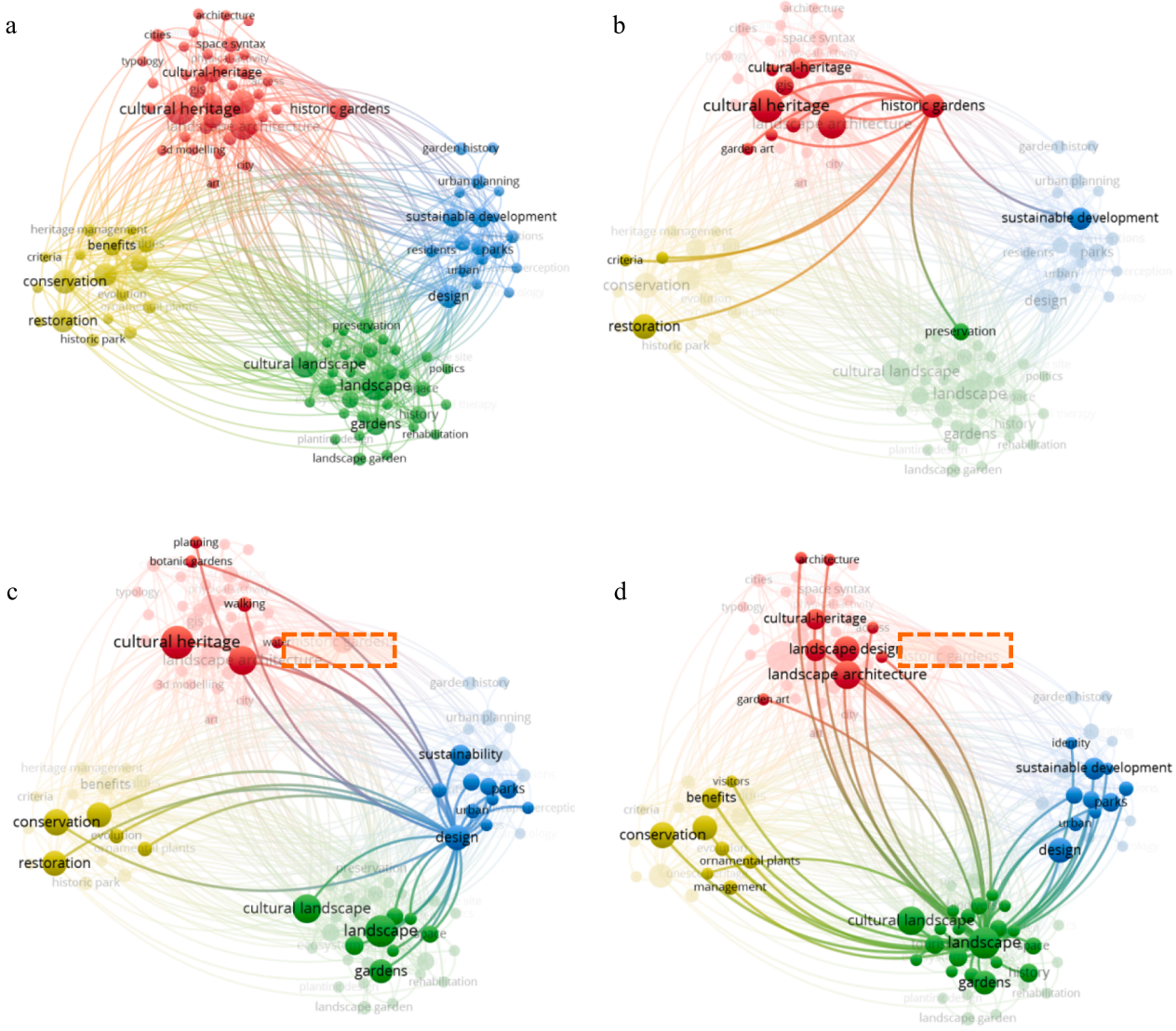

Fig. 8. Connectivity of keyword co-occurrence frequency processed in VOS-viewer. [a] keyword co-occurrence clustering; [b] related research links for 'historic garden'; [c] Historic Garden is vacant in the 'Design'related literature link; [d] Historic Garden is vacant in the 'Landscape approach' related literature link.

mean retaining their original values while opening up new possibilities for their sustainable enhancement, thereby bringing heritage with fresh life that is distinct from (or greater than) its original purpose (Hotimah et al., 2015). Unlike "conservation" methods that have matured paradigms, given that the historic garden is a fragile type of cultural heritage, their development and reuse require timely updates and consideration of new intervention methods (Sharma, 2007). The significance of LD lies in seeking spatial language that can reveal deeper and richer meanings for a specific *"place,"* creating new visions and values within various scales of ecological or social-cultural processes (Von Haaren et al., 2014). It is considered an intentionally and newly crafted and envisioned "built intervention" to foster and enhance the existing experiences of a place (Treib, 2001). Indeed, the enduring visibility and practicality of LD are beneficial in establishing harmony between the essence of the historic garden and its future users. These subgroups are methods used to develop and reuse the historic garden with LD, including establishing intervention standards of design (C1, 8.5 %), a sustainable development protocol connecting conservation and reuse (C2, 8.5 %), and a pluralistic tourism model (C3, 5 %).

However, compared to Group C (22 %), Group A (51.5 %) and Group B (26.5 %) clearly dominate with a larger proportion, which indicates a more pronounced focus from the academic community on the identification of historic garden characteristics, rather than development and reuse. This imbalance can be considered a gap in the current academic field, and the future development and reuse of the historic garden has a lot of potential for exploration.

3.3. Studies to identify the historic garden's characteristics using LM (Group A)

Historical research is the starting point for the historic garden's conservation and development. This is due to the rearrangement and comparison of historical materials that will contribute to determining the degree of conservation, restoration, and maintenance of heritage elements and compositional linkages in historic gardens **(A1)** (Baster, 2022; Szilágyi et al., 2020). The objective of conducting historical research on primary and secondary sources, such as archives, museum documents, map and library collections, specialized bibliography reviews, and internet sources, is to gain a comprehensive understanding of the construction and evolution of gardens (Gullino et al., 2019; Halbrooks, 2005; Shojae & Zarei, 2016). Additionally, landscape archeology is an interdisciplinary field that provides many insights into how to

Table 1
Eleven guidelines involved by historic gardens studies on landscape-oriented approach.

Application of landscape approach	Number of studies	Referenced studies (See Appendix A)	Previous related approach & concept
A. Studies to identify the historic gardens' characteristics using Landscape mapping			
A1. Historical research and achieves organization of historic gardens	36	10; 15; 16; 18; 23; 33; 39; 40; 41; 46; 53; 56; 61; 62; 67; 69; 76; 78; 81; 82; 87; 99; 104; 108; 115; 122; 125; 126; 129; 132; 144; 146; 153; 156; 159; 162	Landscape archeology; Cultural landscape
A2. Digital techniques to capture and record the heritage data	16	01; 16; 22; 37; 44; 70; 75; 84; 97; 102; 103; 116; 120; 121; 139; 145	Digital landscape modeling (DLM); Landscape information model (LIM)
A3. Using the landscape assessment model to evaluate the heritage status	11	21; 32; 35; 55; 64; 80; 91; 92; 114; 123; 124	Landscape character assessment
A4. Landscape indicators used for monitoring the changes in heritage landscape mapping	20	09; 354; 38; 45; 47; 51; 66; 83; 90; 95; 100; 112; 117; 128; 135; 137; 147; 151; 155; 157	Landscape biography;
B. Studies demonstrating historic gardens' conservation based on landscape planning			
B1. Elaborated landscape inclusion in policy-making and legislation	5	19; 24; 30; 59; 113	the Florence Charter, European landscape convention (ELC)
B2. Landscape as territorial management of heritage site	17	06; 27; 48; 54; 57; 71; 85; 86; 93; 96; 130; 131; 136; 141; 150; 152; 161	European landscape convention (ELC)
B3. Promoting multiple stakeholder participation in the conservation process	5	05; 11; 25; 29; 74	Historic urban landscape (HUL)
B4. Landscape as a holistic toolbox to analyze the conservation status	16	03; 08; 20; 26; 31; 42; 58; 60; 63; 88; 89; 98; 106; 142; 149; 160	Landscape management; landscape planning
C. Studies exploring potentials of development and reuse by means of landscape design			
C1. Establishing landscape-centered intervention standards of design	14	04; 12; 17; 36; 49; 72; 79; 110; 111; 118; 119; 133; 140; 143	Cultural landscape
C2. A sustainable development protocol connecting conservation and reuse	14	02; 07; 14; 43; 52; 65; 77; 94; 101; 107; 127; 134; 148; 154	Landscape suitability evaluation LSE)
C3. Designing a pluralistic tourism model to convert the heritage values	8	28; 50; 68; 73; 105; 109; 138; 158	Landscape tourism

apply LM to the study and analysis of historic gardens (Kluiving & Guttmann-Bond, 2012). Many studied cases involving historic gardens show that landscape archeology is conducted for the restoration-based purpose of revealing the cultural forces and ideologies behind each phase of development (Jacques, 1997; Klagyivik, 2011).

Digital technology is becoming increasingly important in historic garden research and practice **(A2)** (Counsell, 2001; P. Gullino et al., 2020). Its rapid development has improved how heritage information is recorded, stored, and disseminated, leading to significant advances in the representation of integrative landscape environment information (Liang et al., 2018; C. Yang, 2015). The London Charter (2012) proposes that digital recording research for specific heritage types is currently the focus of this field and, in recent years, digital research on the historic garden has increased (Denard, 2016). Capturing the combination of fundamental man-made elements, natural elements, and other social or cognitive properties in historic gardens is the core of landscape heritage recording work (Alberta Cazzani et al., 2022; Malinverni et al., 2019). Even though most of these scanning and mapping methods are carried out with GIS as the core of the database, many auxiliary technologies and plug-in functions have been derived (Malinverni et al., 2019; Shevlyakova & Atkina, 2019). This mainly reflects the recording of information on the dynamic evolution of historic gardens. Based on the records, some studies have attempted to simulate and reproduce the historical-spatial features of historic gardens based on mathematical models with parametric systems (Li & Li, 2016; Yu et al., 2018), which are more challenging because the natural elements in historic gardens are more dynamic—even though many heritage features have been destroyed and no longer exist.

In the identification of landscape values, landscape character assessment (LCA) has been increasingly used in many studies to discuss historic garden conservation as a perceived entity in recent years **(A3)** (Gkoltsiou & Paraskevopoulou, 2021). LCA is seen as essential to implementing the ELC and as a highly useful instrument for researchers to assess the landscape character of historic gardens (Tudor, 2014). It emphasizes achieving an overall assessment of the historic garden's geographic-physical and social-perception condition through issue definition (Fairclough et al., 2018; Swanwick, 2002), setting criteria, building a conceptual framework for documenting the spatial particularities to address all stakeholders' needs and interests, and identify the threats to both heritage and users. On the one hand, it is necessary to conduct a field survey to record environmental information on the surface of the land and assign specific indicators to the different zones according to their internal components (i.e. landscape character type (LCT)). On the other hand, after the information is obtained, different levels of the strengths or sensitivity vulnerabilities of each heritage type are analyzed (S. Turner, 2018).

The dynamic concept of the landscape approach is used to monitor changes in the heritage elements of historic gardens **(A4)** (Carneiro, 2012; Malinverni et al., 2019; Morar et al., 2019). Several studies have shown that a multifaceted study of the species in historic gardens can aid in the introduction of more precise conservation and development guidelines as well as technical office action (Del Curto et al., 2022). Notably, it seems that more research attention is being given to the growth state and community succession of historical vegetation, hydrological studies related to changes in the water system, as well as the distribution and alignment of routes (Carrari et al., 2022; P. Gullino et al., 2020; Hüttl et al., 2019). The purpose of employing landscape

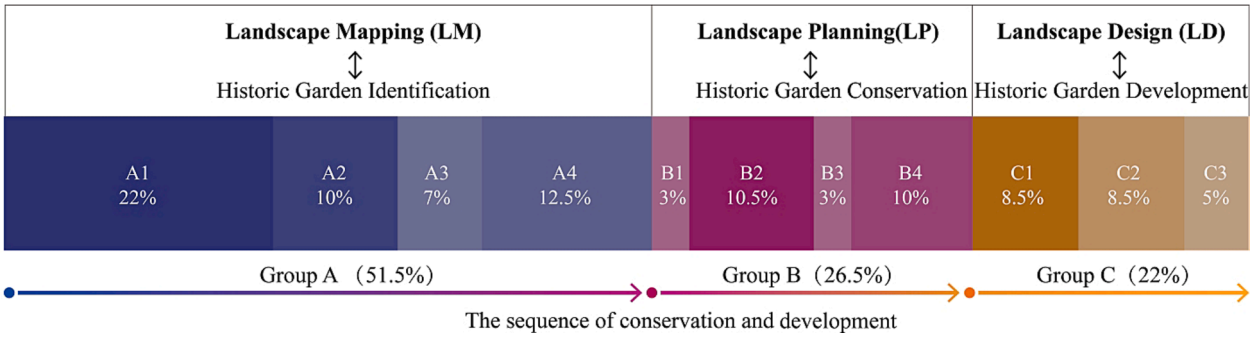

Fig. 9. Distribution of the percentage of each category of landscape-oriented research in the historic garden conservation-development sequence.

monitoring is to sustain its existing integrity, with emphasis on the continual maintenance and restoration of historical materials (Halbrooks, 2005). We can also identify a close correlation between the internal logic of landscape monitoring in historic gardens and landscape biography theory (Sánchez et al., 2020). This concept promotes a wide chronological analysis of the single remnant and their relationship, which contributes to placing the historic garden within a framework that has spatial and temporal coherence (Kolen and Renes, 2014; Roymans et al., 2009). In this way, the landscape monitoring tools are not only for the control of the physical environment but also to reinforce the local identity of the site.

3.4. Studies demonstrating the historic garden's conservation based on LP (Group B)

Many countries inevitably invoke references to the Florence Charter and other international conventions when developing legislation or policies regarding the conservation of their historic gardens. Although it does not represent a legal act but only a series of recommendations, the Charter has had a profound impact on the conservation activities performed in historic gardens **(B1)** (Araoz, 2013; Jagiełło, 2021). Despite its principles being adopted by a large number of countries, only a few countries have attempted to progressively incorporate those universal guidelines with very specific considerations (Athanasiadou, 2019). On the contrary, most other nations arbitrarily adopt them without comprehensive thinking due to static, independent, and conventional heritage conservation concepts, which unavoidably causes excessive commercial development and tourism encroachment on local communities (Caust & Vecco, 2017; Pyykkönen, 2012).

The application of the landscape approach to the conservation phase of historic gardens is reflected in territorial management **(B2)** (Del Curto et al., 2022; Funsten et al., 2020). Specifically, the overall conservation of historic gardens can be seen as managing the territory's various special resources based on ecological considerations, which can lead to beneficial value cycles (Carneiro, 2012). However, it has been noted that unjustified and loose territorial management aimed at economic exploitation leads to the degradation of natural resources, even causing them to disappear (Cianci, 2013). This can particularly be seen in the conflict between protected zones and newly developed alteration areas in terms of ecology, sight lines, aesthetic atmosphere, as well as changes in topography and river banks (Nagpal & Sinha, 2009). In this respect, the U.S. national park management system is experienced in managing such large-scale historic gardens—which is seen as a service system—namely to make the different sociocultural and natural contexts better understood and utilized with full respect for their historical and environmental values (Catron & Eaddy, 2018). In the European context, ELC also advocates an integrated landscape management approach based on territorial governance, which is also very applicable to the conservation of historic gardens in a holistic and integrated manner (Scazzosi, 2004).

The landscape approach facilitates the participation of multiple stakeholders in the conservation of the historic garden through participatory behavior and raising awareness, which is based on the community as the main organizational unit **(B3)** (Muir, 1999; Wahurwagh & Dongre, 2015; Wang, 2023). Some scholars have noted that the historic garden is a social space where the interaction between different interested parties and users occurs, thus satisfying the capacity of individuals to include physical activity in their daily routines (Khalilnezhad et al., 2021). To better utilize the public social value of historic gardens, scholars advocate establishing precise behavioral measures and guidelines, which implies that a highly efficient communication network should be established among knowledgeable gardeners, civic organizations, environmentally conscious residents, relevant institutions, and local authorities (Andrianou and Papaioannou, 2019; Minelli et al., 2016). Some scholars have highlighted that the strength of the landscape narrative concept can be used to enhance residents' sense of empowerment to achieve the preservation of heritage (Guilfoyle et al., 2019; Guimarães et al., 2015), and will also work toward the realization of this common vision. This concept harmoniously integrates a bottom-up approach rooted in landscape-related perspectives, with expert scientific knowledge facilitating the cultivation of a culture founded on mutual trust and collaboration concerning the historic garden. Reflecting the form-related concept of HUL, it also fosters a collective commitment to engage the public in the practice of promoting conflict resolution through deliberation (Sikora & Kaczynska, 2022; Feng et al., 2021; Nurme et al., 2014).

The landscape is not only an object of study and perspective, but it also provides a holistic toolbox for analyzing the conservation status of historic gardens **(B4)** (Aşur & Alp, 2020; Dobrescu & Raducu-Lefter, 2012; Lassus, 1998; Muir, 1999). The primary application scenario entails the integration of historic garden preservation within their environs, thus elucidating the interconnections between the internal constituents of these gardens and their immediate surroundings. Since a historic garden is a representation of place attachment, coherence, and a withheld identity in the collective unconscious of the area's inhabitants (Carneiro, 2012; Garcia et al., 2017), they have been proven to effectively tackle the social-ecological challenges of locality posed by the processes of globalization (Jakobsson & Dewaelheyns, 2018). This relationship is often projected onto the integrated connections between the various elements within historic gardens and the external natural and cultural environments, such as the use of water, path accessibility, plant composition, productive areas, and building views, to analyze and test whether these factors are in a harmonious cohesion (Gullino et al., 2019; Nagpal & Sinha, 2009; Vanni Accarigi & Crosby, 2019). For related concepts, "LP" and "landscape management" have established a complete system at the level of geography, ecology, and social science, providing a reference and foundation for creating a toolbox for historic garden conservation (Sánchez et al., 2020).

3.5. Studies exploring the potentials of development and reuse by means of LD (Group C)

LD is an important method for bridging conservation and

development, as well as placing appropriate interventions into the historic garden site to activate its potential, which simultaneously prioritizes compatible conservation and development **(C1)** (Fekete & Kollanyi, 2019; Motloch, 2000). The concept of intervention was born out of a discussion in the cultural heritage community regarding the appropriate way to maximize heritage preservation (Ornelas et al., 2016), and was later introduced to the existing landscape and historic gardens in conjunction with the concept of design practice (Lassus, 1998). It now considers every situation as an opportunity, as if fixing certain problems might improve the heritage environment as a whole (Olivadese & Dindo, 2022). They play a constructive role by providing valuable guidance for designers, enabling them to introduce changes that align with cultural heritage and cater to the demands of the present era (Baster, 2022; Garcia et al., 2017).

This means of intervention emphasizes the implantation of new functions of the site, for the economy, and for public service. This approach partly overlaps with certain concepts of "revitalization" or "regeneration" (Nagpal & Sinha, 2009). This type of intervention is mainly reflected in the installation of infrastructure, equipment, and facilities such as guided wayfinding, lighting, audio commentary, parking, entrances and exits, retail, exhibitions, sculpture, bins, toilets, etc. (Edensor & Bille, 2019; Rostami et al., 2016). The methodology of this aspect of the papers mainly employs a qualitative study with questionnaires and a mathematical statistical model to analyze the data, intending to test the environmental impact of intervention in the historic garden sites, including popularity, perceptibility, distribution rationality, public acceptability, and environmental hazards. On this basis, it is possible to optimize the design and planning of interventions (Andrianou and Papaioannou, 2019; Romero, 2011; Rostami et al., 2016). In terms of the related concept, the historic garden is an important component of cultural landscapes. From this perspective, scholars have argued that landscape architectonic intervention (Indira, 2017), as an LD approach, is an important means to promote the conservation and development of the historic garden, which is based on adaptability to ecological, social, economic, and human environments (Page et al., 1998). They have proposed various alternative solutions to address site-specific issues to maintain the characteristics of the cultural landscape (Parsizadeh et al., 2015).

A sustainable conservation and development protocol is particularly important for the conservation of historic gardens and essentially proposes a collaborative and shared governance model of work **(C2)** (Andrianou & Papaioannou, 2019; Gullino et al., 2018). This serves a pivotal role in the sustainable revitalization of landscapes since it is intricately connected to environmental preservation, economic viability, and the availability of resources for both current and future generations (Wahurwagh & Dongre, 2015). Many case studies have shown that conservation and development projects in historic gardens must be integrated into a planning and design framework of public open space or green infrastructure to create a cultural and physical environment that promotes social interaction and good health (Cameron et al., 2012; Connell, 2005; Paraskevopoulou et al., 2020). Given the intricacy involved in this undertaking, it becomes imperative to adopt a regional standpoint to fully grasp the interconnections among distinct heritage sites, thereby establishing a unified foundation for collaborative endeavors (Nijhuis, 2021). This approach actively preserves the traditional landscape by integrating productive functions with ethical, artistic, historical, educational, and recreational functions (Cilona & Ala, 2018). From a conceptual perspective, the landscape suitability assessment based on multicriteria evaluation proposes clarifying the value rating of the heritage site and the crisis it faces. Through overlaying various suitability maps, combined with AHP analysis, an optimal protocol will be generated that considers the balance between the conservation and development of the historic garden (Bunruamkaew & Murayam, 2011; Lan-Ling et al., 2016).

Designing a multifaceted and pluralistic landscape tourism model can effectively convert the heritage value of historic gardens **(C3)** (Benfield, 2013; Czałczyńska-Podolska, 2014; Hristov et al., 2018). Notably, the demand for visiting gardens and landscapes has witnessed a notable upswing (Backhaus & Murungi, 2009). Given this context, there has been a growing trend to actively promote "heritage experiences" and emphasize the significance of engaging the senses and emotions as essential components of the tourism product (Hristov et al., 2018). This call for the adoption of new approaches to interpreting values to visitors through mixed media of text, images, and audio commentary aims to highlight the reproduction of "site memory" (Cheng et al., 2014), through which ancient and historical material culture is reshaped, reproduced, and reused in historic gardens of very different scales and functions (Williams, 2014). In some cases, maximizing visitor engagement was accomplished by integrating a variety of alleys, guided tours, routes, and pathways while continually altering angles and visual perspectives and dynamically adjusting the distribution of natural elements (e.g., plants and waterscapes) to align with specific visibility objectives (Badami, 2021; Fornaris et al., 2011; Korotun et al., 2021). Some studies have focused on the types of visitor activity compared to the historical designer's original design intent, which facilitates the assessment of historic garden changes in tourism development and reflects the mutual influence of garden elements and visitors (Connell, 2005; Zhu et al., 2022).

However, most historic gardens were initially designed as private spaces and later transitioned to public areas; therefore, the development of measures to address the issue of damage to heritage features due to excessive visitor carrying capacity has received attention (Yoon & Kwon, 2010). In terms of related concepts, although "landscape tourism" is not yet a recognized term, it has recently been heavily discussed in both the geography and tourism fields. This mode of temporary movement of subjects in the landscape is considered to serve an important role in preserving the stability of ecosystems, cross-cultural exchange, sustainable economic growth, and the cognitive construction of local identity (Burger, 2000; Knudsen, 2008).

4. Discussion

4.1. Trending themes in current research and research frontiers

The results presented by CiteSpace, which reflect a conventional research paradigm, treated historic gardens as mere "historical landmark" artifacts. However, a noticeable shift from 2000 onwards, as evidenced by the emergence of "communities," "residents," and "identity" as prominent research themes, suggests a growing interest in exploring the role of historic gardens in urban development. This signifies a heightened recognition of the contribution of historic gardens in fostering community development and providing essential services for urban residents, thus underscoring the importance of studying the historic garden within the broader urban development context. It also attests to the fact that contemporary habitat life concepts have served a significant role in shaping research efforts related to the historic garden. Moreover, the existence of "landscape architecture" spans a long period, which is a testament to the applicability and usefulness of landscape as an approach.

4.2. Research gap: A vacancy in applying LD for conservation and development

Indeed, LD is considered an essential practice to link the physical systems and immaterial characteristics of heritage sites in a more integrative landscape spectrum from an external perspective (Dobrescu, 2013; Fekete & Kollanyi, 2019). Nevertheless, few studies have demonstrated how the landscape approach can be used to identify the pluralistic values of the historic garden in the context of specific cases and application scenarios (see vacant positions in Fig. 8c, 8d).

Additionally, the term "historic garden" shows a stronger connection to "preservation" and "restoration," which implies that current research

mainly focuses on conserving the garden heritage based on historical methods. Although this historical study is the starting point for heritage research, we also need regard for on-site values that can be used for development and reuse (Dobrescu & Raducu-Lefter, 2012; Hosseini & Caneva, 2022). As many case studies have indicated, historic gardens are increasingly treated as parts of urban public green spaces (Rostami et al., 2016); however, due to the lack of effective interpretation, their on-site values in social and cultural aspects are not recognized by visitors at the same level as other more visible and substantial values, such as aesthetics. In response to this issue, many studies have proven that the landscape approach, especially LD, has this particular "interpretation" attribute (Meinig, 1979), making the landscape a widely used tool that can provide planners and designers with an overview of site continuity and entity on one hand, and simultaneously reveal the complexity for users and visitors with special purposes (e.g., perception and education) on the other (Motloch, 2000). While the historic garden is not an exception to this approach, further and more detailed research on how to take advantage of landscape interpretation to equally conserve and

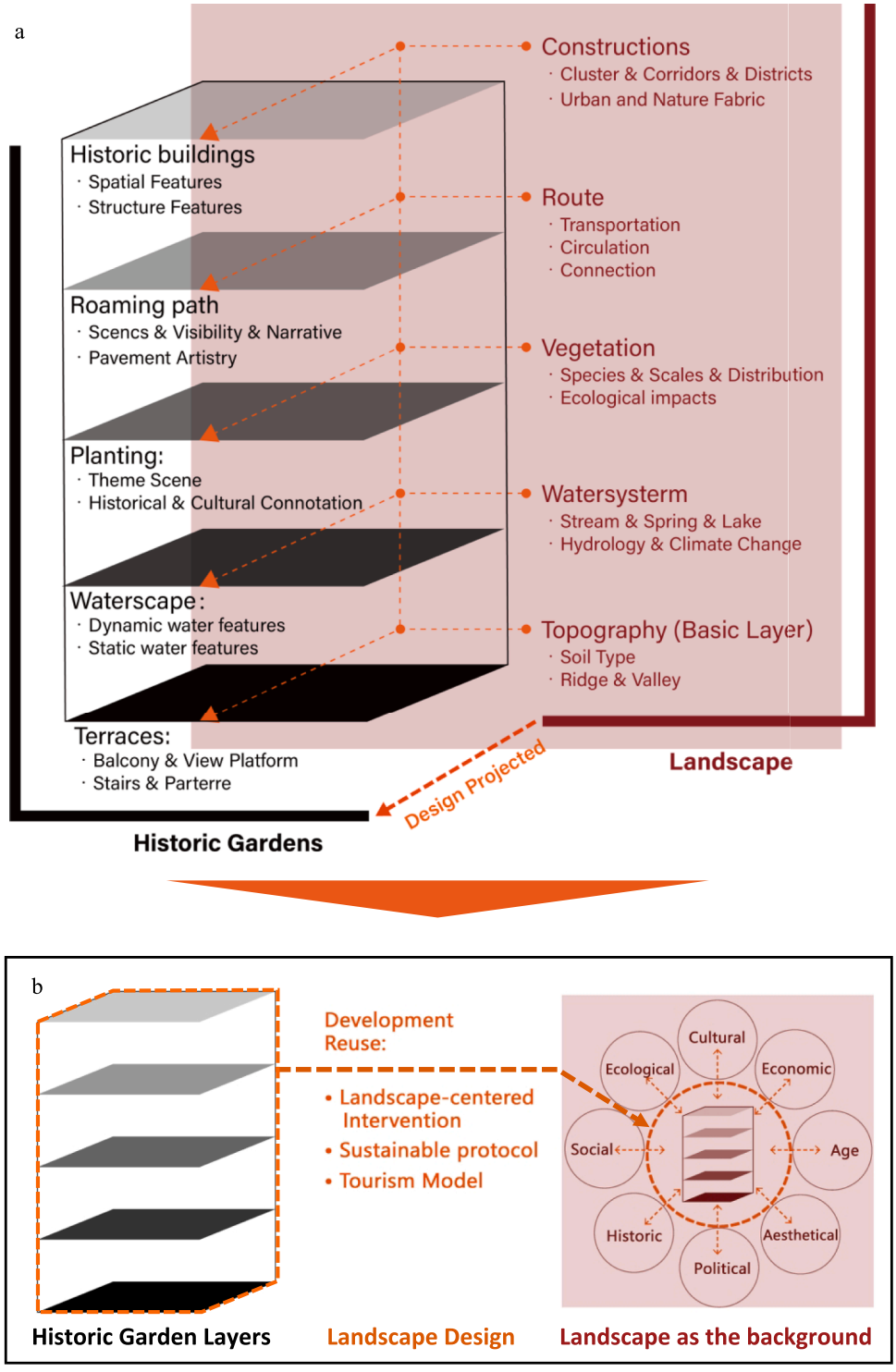

Fig. 10. **[a]** Design projection relationship between landscape elements and the historic garden's layers. **[b]** Three operational guidelines of landscape design to be applied for the development and reuse of the historic garden.

develop the historic garden remains lacking (Hristov et al., 2018).

4.3. Toward an LD-based framework of development-oriented conservation

Based on the literature review and paper analysis, it can be observed that there is limited research on the application of LD methods in the conservation and development of the historic garden. Consequently, we propose assumptions and basic concepts related to building a framework to establish a linkage between the landscape and the historic garden to address and/or resolve these gaps.

We found that the potential for applying LD in the development and reuse of historic gardens is only realized when they are considered integral parts of the overall cultural landscape (Dobrescu, 2013; Fekete & Kollanyi, 2019). This subordinate relationship can be recognized through the determination of "layers" that convey various heritage elements (Antrop, 1998; Crofts, 1975). Therefore, in the framework presented below:

On the one hand, we attempted to establish the closely connected projected relationship that historic gardens have from multiple types of related elements of the landscape background through "layers" to identify the LD origin possessed by historic gardens (Fig. 10a). Previous research has established a comprehensive spatial-analytical model for landscape architecture through "layers," thereby providing a more intuitive and reliable research framework (Motloch, 2000; Gazvoda, 2002), especially for the study of LD (Booth,1989; Nijhuis, 2016). In these cases, based on the dissection and reassembly of layers, it is possible to technically and functionally generate redesigned principles from the broader landscape scope for each independent architectonic element of historic gardens in the vertical dimension (Fig. 10a). They struck a balance between "restoration," "reconstruction," and "renewal" to enhance the authenticity of the intrinsic structure for conservation and promoted sustainable solutions for historic gardens' development (Altincekic et al., 2016; Fekete, 2021; Bálint & Nagy, 2022; Kuśmierski, 2022).

On the other hand, by utilizing this projected relationship, we have proposed and compared three landscape design-based approaches (C1, C2, C3) to foster positive interaction, collaboration, and symbiosis of the historic garden's development and reuse in a higher-dimensional landscape context (Fig. 10b).

4.3.1. Landscape-centered intervention.

Compared to the other two operational guidelines (C2, C3), this is a more concrete approach that explores the design logic and ideology behind the original landscape heritage by reproducing the diachrony of ancient imagination, characteristics, and phenomena (Zhang & Chen, 2014; Abdel-Rahman, 2016). Specifically, the objective is to transform diverse heritage layers (Fig. 10a) and values by employing appropriate and precisely graded interventions to achieve the adaptability of the historic garden to ecological, cultural, social, economic, and human environments (Page et al., 1998; Indira, 2017).

4.3.2. A sustainable protocol

Compared to the other two operational guidelines (C1, C3), this approach focuses more on the application of LD to establish a systematically collaborative model for the development and reuse of historic gardens within multilevel surroundings (Gullino et al., 2018; Andrianou & Papaioannou, 2019). This broader-scope design framework serves as a significant effort to achieve a balance between land use changes and specific heritage functions (Nijhuis, 2021). Positioning historic gardens as the core of broader landscape development and reuse, this sustainable conservation protocol, based on the concept of "design," more effectively breaks free from the constraints of static and singular preservation management (Cilona & Ala, 2018).

4.3.3. Landscape tourism model

Compared to the other two operational guidelines (C1, C2), the landscape tourism model emphasizes the importance of the role of the "user," which revolves around the subjective perspective rather than the objective historic garden heritage itself (C1) (Hristov et al., 2018). The modern user is one of the key factors in the development and reuse of the historic garden heritage (Connell, 2005). Therefore, applying LD enhances visitors' interpretation, engagement, and experience of the value of historic garden heritage, encompassing both tangible and intangible aspects (Cheng et al., 2014; Korotun et al., 2021; Ana & Vladimir, 2022), which can help to promote the development and reuse of historic gardens from the perspective of the general public.

Finally, Silva and Roders (2012) proposed eight dimensions based on UNESCO's classification of heritage values and impact. We used this as a reference for assessing the relationship between historic gardens and cultural landscapes (Fig. 10b).

Additionally, since it places more emphasis on the processual analysis of "landscape" (Muir, 1999), the landscape approach will focus on natural systems overlayed by human-conscious activities (Lowenthal, 1993). Therefore, the consistent process of the landscape offers a chronological pattern as a spectrum containing the historic garden's evolution (Antrop, 1998). In terms of timeline, a coordinate is built with time (x-axis), values (y-axis), and layers (z-axis) (Fig. 11). Firstly, when we look backward and reconstruct the historic garden's layers from different historical periods, various principles in relation to the heritage values (Silva and Roders, 2012) could be recognized by comparative analysis, reflecting the remaining logic behind the spatial changes (Bell, 2012; Motloch, 2000). Moreover, previous research applied typology to classify heritage values closely linked to distinct attributes, which can be considered as architectonic elements in the framework (Fig. 10a), indicating the key cultural significance (Mason, 2002; Silva and Roders, 2012). This makes it more operational, practical, and straightforward to develop the value-based management and social impact assessment of heritage by identifying heritage characteristics (Pereira, 2011). In contrast, if we look forward to following the positive sequence, we can identify many potential ways to make use of those heritage values relying on the understanding of the progressive changes of the landscape pattern, thereby ensuring the optimum conservation and development of these historic gardens for future generations (Dreija, 2012).

4.4. Limitations

Admittedly, the main limitation of this study is the potential inaccuracies related to using visualization-based literature analysis software. The literature clustering used to identify research gaps is automatically generated by the software's built-in algorithm and lacks sufficient subjective selection and intervention, which may result in revealing major contradictions but lacking specificity. Apart from that, some of the data on "landscape architecture" are presented in the form of project reports and other types of printed materials that were published in the early portion of the study period and not in English. They are important for the scope of this research but often not included in the core dataset of WOS, which may result in data sample sizes that are not very adequate.

5. Conclusion

This study involved conducting a systematic review of the literature in the historic garden field to tackle concerns linked to employing landscape as a study approach, with an emphasis on the contributions of knowledge to conservation and development. Bibliometric visualization was performed to affirm the potential inherent in the relationship between the historic garden and the landscape approach. This paper strongly emphasizes the importance of establishing integrative operational frameworks, wherein studies on the historic garden from various disciplines—which are influenced by their respective landscape approaches and theoretical foundations—can mutually support their

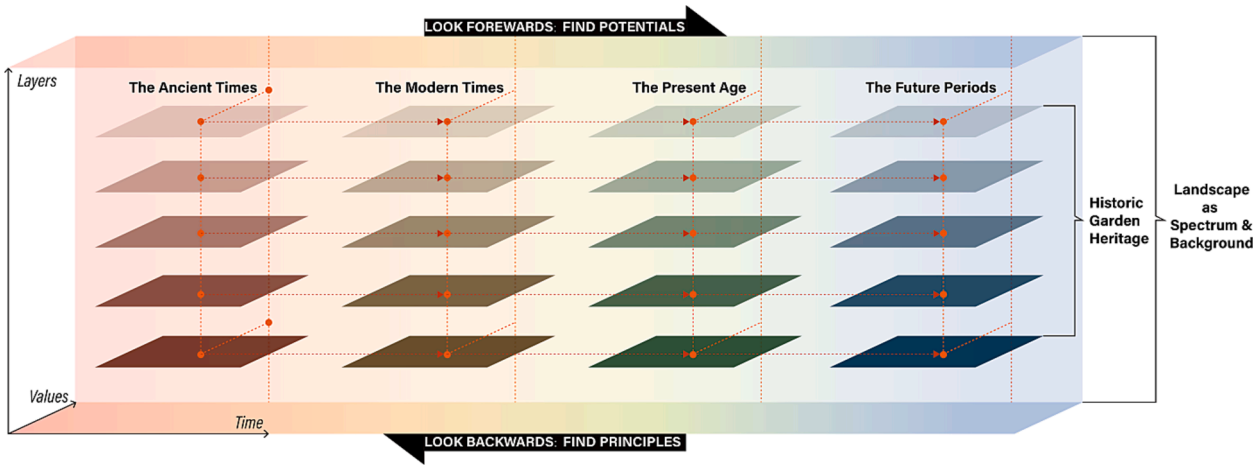

Fig. 11. Landscape as spectrum and background of historic garden heritage in a chronological evolution.

conservation and development efforts.

All the papers were grouped into three different research discussion categories: heritage characteristics identification based on LM; heritage integrative conservation based on LP; heritage development and reuse based on LD. These three subgroups correspond to the pre-, middle-, and post-phases of the entire conservation and development process of the historic garden. Thereafter, we summarized the research gap in applying LD for conservation and development. Given that research gap, we proposed a landscape design-based framework to establish a closely projected connection between the landscape background and the historic garden through the "layers." Consequently, we also compared the three operational guidelines discussed in Group C on different specific scenarios to deeply elaborate their strength in the implementation aspect and articulate their heritage value impact in different dimensions. Additionally, the continuity of the historic garden is derived from the evolution of the landscape spectrum and background through the reconstruction and comparative analysis of the "layers," based on which we further proposed the intention of conservation and development of heritage values in two chronological directions. The main goal of this paper is to provide a landscape approach as a foundational concept and method that can contribute to the sustainable conservation and development of historic gardens, thus enabling the better recognition and reuse of their heritage value.

CRediT authorship contribution statement

Jingsen Lian: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft. **Steffen Nijhuis:** Supervision. **Gregory Bracken:** Writing – review & editing. **Xiangyan Wu:** Writing – review & editing. **Xiaomin Wu:** Conceptualization, Writing – review & editing. **Dong Chen:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.landurbplan.2024.105027.

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