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RESEARCH ARTICLE

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From garden city planning to World Heritage property: the cultural significance of the nature–culture relations of Tel Aviv

Adva Matar^{1*} , Daniele Cannatella¹ and Ana Pereira Roders¹

Abstract

This paper identifies how the cultural significance attributed to nature–culture relations evolves over time and among institutions, using the White City of Tel Aviv as a case study. It compares how nature–culture relations, conceptualised as valued attributes in Patrick Geddes' 1925 Town-Planning Report, were subsequently recognised or reframed in ICOMOS (the International Council on Monuments and Sites) evaluation and the UNESCO (United Nations Educational, Scientific and Cultural Organisation) decision text that led to the property's inscription on the World Heritage List in 2003. The research employs a comparative content analysis of these three documents, adapting an established framework for heritage attributes to code natural, built, and relational attributes as well as their interconnections systematically. The coded data were analysed through code counting, a general co-occurrence analysis, and a targeted nature–culture co-occurrence analysis using Atlas.ti. The results reveal a progressive shift in how cultural significance is articulated across the three documents. Geddes' plan articulated a multiscalar, integrated vision in which built and natural attributes were equally prominent and functionally interdependent. The ICOMOS evaluation and UNESCO decision text foregrounded architectural concepts and built form, whereas natural attributes were articulated at a broader, more generic level than architectural attributes were. This shift is likely shaped both by the inclusion of a second group of heritage attributes in the inscription, the International Style architecture built within Geddes' framework from the 1930s onwards, and by the evaluative scope of the inscription process. The analytical approach is transferable beyond this case and beyond World Heritage properties to any governance level to identify how cultural significance is attributed to nature–culture relations. These findings have implications for how heritage management understands the cultural significance of nature–culture relations in planned urban landscapes and for how World Heritage management is further related to urban-planning policies.

Keywords Heritage planning, Nature–culture, World heritage, Cultural significance, Content analysis, Garden City

1 Introduction

Cultural significance is a central concept in heritage studies and practice. It refers to the justification, often defined by experts, for designating or listing places as cultural or natural heritage, on the basis of the values they represent

and the attributes that embody those values (Zancheti et al. 2009; Sánchez-Carretero 2013; De la Torre 2013). Cultural significance is not inherent to a place but is socially and culturally constructed. Urban heritage is therefore not a static urban area but a reflexive, value-laden construct of narratives and meanings shaped by collective interpretations and negotiated through time and across communities (Zancheti et al. 2009). Therefore, how cultural significance is defined matters: the definition determines which attributes receive recognition,

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legal protection, and management attention as well as which are diminished or overlooked.

At the international level, cultural significance and its justification, Outstanding Universal Value, are key to the 1972 World Heritage Convention (UNESCO; United Nations Educational, Scientific and Cultural Organisation), which was conceived to combine natural and cultural heritage under a single framework for global recognition and protection (Tarrafa Silva and Pereira Roders 2010). However, the Operational Guidelines have been further defined with separate assessment procedures, criteria, and Advisory Bodies: ICOMOS (International Council on Monuments and Sites) for cultural heritage and IUCN (International Union for Conservation of Nature) for natural heritage since the first World Heritage properties were listed in 1978 (UNESCO 1972; UNESCO 2025). World Heritage properties nominated as mixed heritage properties, which convey both cultural and natural significance, require evaluation by both Advisory Bodies, a process that may delay and/or reduce the chances for inscription. As a result, very few mixed-heritage properties are inscribed on the World Heritage List (UNESCO 2014; Palacio and Goli 2025), even though many cultural properties convey values through natural attributes, and vice versa (Labadi and Logan 2015).

This sectoral approach to heritage management and conservation also shapes the research field. Although the number and scope of heritage studies have increased significantly, most studies focus on either cultural or natural heritage (Ginzarly et al. 2018; Balcan et al. 2024; De la Torre 2013; Labadi et al. 2021). The cultural landscape research is among the exceptions, confirming that landscapes carry cultural and natural values and calling for their better integration in spatial governance (Taylor and Lennon 2011; Kyvelou and Gourgiotis 2019). The concept of biocultural heritage has advanced this agenda further, combining local knowledge, land use practices, and biodiversity into a more integrated framework of nature–culture relations (Bridgewater and Rotherham 2019; Ekblom et al. 2019), although the term is applied differently across sectors, complicating cross-sectoral integration in spatial policy and planning (Bhati and Epstein 2023; Palacio and Goli 2025). Moreover, substantial scholarship advocates the use of nature–culture approaches that integrate ecological and cultural values in heritage policy (Haila 2000; Whatmore 2002; Taylor 2016; Katapidi 2026; Monsivais Montoliu and Zamora Saenz 2025), although limited attention has been given to how such approaches are operationalised in heritage-planning frameworks, especially in metropolitan contexts (Huybrechts 2018).

This knowledge gap is especially acute in cities that were originally planned on the basis of nature–culture

relations. Modernist planning movements, notably the Garden City movement, were among the most explicit modern approaches to embed natural systems within urban form, and many such cities are recognised today for their planning vision at the local, national, or international levels. Patrick Geddes extended the Garden City model through an ecological lens, envisioning cities as living organisms and emphasising regional interconnections between the environment, economy, and civic life (Hysler-Rubin 2013; Allweil and Zemer 2019). However, the integrated logic of these original planning visions is not always retained through the heritage governance frameworks that manage them. Green and natural spaces in these contexts convey diverse cultural significance—ecological, social, and civic—but face mounting pressures from densification and development (Puplampu and Bofo 2021), and when heritage frameworks do not recognise natural attributes as independently significant, those attributes may lack the institutional basis for protection.

International policy frameworks—such as the UNESCO 2011 Recommendation on the Historic Urban Landscape and the United Nations 2015 Sustainable Development Goals, notably Target 11.4—seek to promote a more holistic, landscape-based understanding of heritage, positioning it as a resource for integrated urban sustainability (Veldpaus et al. 2013; Labadi and Logan 2015; Rey-Pérez and Pereira Roders 2020). However, scholars have noted that if they do not link cultural significance to place-specific attributes, such frameworks risk limited influence in professional practices (Taylor 2016). How the inscription process defines cultural significance, and specifically, how natural attributes are articulated as conveyors of the values that define the cultural significance of a World Heritage property, may influence how heritage management addresses nature–culture relations in urban landscapes.

1.1 Case context: Tel Aviv's White City

Tel Aviv, officially Tel Aviv–Yafo, is the main city of the Gush Dan metropolitan area, the largest metropolis in Israel, and is located on the Mediterranean coastline. Founded in 1909 as a small settlement north of the ancient port city of Jaffa, it grew rapidly under the British Mandate in Palestine (1917–1948) (Biger 1992). In 1925, the municipal authorities commissioned Patrick Geddes—a biologist, sociologist, and pioneering urban planner—to prepare a plan for the city's northwards expansion (Geddes 1915; Welter 2002; Hysler-Rubin 2013).

Geddes' plan was only partially implemented. In the decades following 1925, rapid urbanisation and successive waves of immigration modified the relationship

between built and natural attributes. Part of the area developed under Geddes' plan was inscribed as a World Heritage property in 2003 under the name the White City of Tel Aviv (Hysler-Rubin 2013). The inscription addressed a composite heritage of two main aspects: Geddes' plan of 1925 and the International Style architecture of the 1930s and 1940s—constructed by architects who had trained in Europe and emigrated to Palestine—that materialised within Geddes' spatial structure (ICOMOS 2003; Metzger-Szmuk 2004).

Like many other World Heritage properties, the White City was inscribed solely as a cultural heritage property under criteria (ii) and (iv):

- Criterion (ii): 'The White City of Tel Aviv is a synthesis of outstanding significance of the various trends of the Modern Movement in architecture and town planning in the early part of the 20th century. Such influences were adapted to the cultural and climatic conditions of the place and were also integrated with local traditions.'
- Criterion (iv): 'The White City of Tel Aviv is an outstanding example of new town planning and architecture in the early 20th century, adapted to the requirements of a particular cultural and geographic context' (UNESCO 2003).

1.2 Aim and research questions

This paper identifies how the cultural significance attributed to nature–culture relations has evolved over time. Taking the White City of Tel Aviv as a case study, it compares how the natural and built attributes articulated in Geddes' 1925 Town-Planning Report were subsequently highlighted, or reframed, in the ICOMOS evaluation and UNESCO decision text adopted by the World Heritage Committee to justify the World Heritage property's inscription in 2003.

The paper addresses three research questions:

1. How are nature–culture relations defined as valued attributes in Geddes' Town-Planning Report for Tel Aviv?
2. How are these relations recognised as attributes of Outstanding Universal Value in the World Heritage inscription documents?
3. What do the differences between these documents imply for how heritage management safeguards the cultural significance of nature–culture relations in planned urban landscapes?

By decoding the framing of nature–culture relations across these three documents, this research contributes

to a better understanding of how cultural significance is defined and can vary over time and among institutions.

2 Methodology: comparative document analysis of cultural significance

This research employs a comparative content analysis to investigate how nature–culture relations—specifically, built and natural attributes and their interrelations—are articulated and valued across the three documents that define the cultural significance of the White City of Tel Aviv. Prior research has employed content analyses of documents to identify how cultural significance is defined in institutional texts (Labadi 2007, 2013) and to examine how heritage attributes are represented across policy and evaluation documents (Lin et al. 2025; Chen et al. 2024). The present research builds on this tradition by focusing specifically on nature–culture relations and introducing a co-occurrence analysis as a method for revealing relational patterns among attribute categories.

This research has two primary objectives. First, to identify and extract references to the attributes of the built and natural environments, as well as their interrelations, as articulated in each of the three documents. Second, we classify and compare these attributes using an analytical framework based on Veldpaus' (2015) taxonomy. This framework supports a structured coding process carried out with the software package Atlas.ti.

2.1 Document selection

The three documents reflect key moments in the definition of the cultural significance conveyed upon the White City of Tel Aviv (Table 1).

Geddes' Town-Planning Report (1925) is a 62-page document commissioned by the mayor of Tel Aviv and addressed to the municipal authorities and British Mandatory government. The report presents a comprehensive spatial vision, integrating observations of the city's topography, vegetation, climate, and settlement patterns with programmatic proposals for the built, green, and natural infrastructure and civic life (Allweil and Zemer 2019). As a planning document, it articulates what the city should become and how it should be planned and managed across scales, from the building plot to the broader region.

The ICOMOS Advisory Body Evaluation (2003) is a 6-page professional assessment prepared by ICOMOS for the World Heritage Committee, evaluating the White City's nomination for inscription on the World Heritage List. The document addresses both Geddes' plan and the International Style architecture constructed within the White City during the 1930s and 1940s, assessing the property against World Heritage criteria. The document

Table 1 Documents relevant to the cultural significance of the White City of Tel Aviv

No	Document name	Document type	Author	Date	Comments
1	Town-Planning Report—Jaffa and Tel Aviv	Report; plan	Patrick Geddes	1925	/
2	Nomination file 1096	Nomination file	Municipality of Tel Aviv–Yafo	2003	Publication date in the document: January 2002
3	1096–ICOMOS–1274–en_Evaluation	Evaluation file	ICOMOS	2003	Advisory Body evaluation. Publication date in the document: March 2003
4	27COM 8C.23–White City of Tel-Aviv—the Modern Movement (Israel)	Decision file	UNESCO	2003	Publication date in the document: December 2003
5	34COM 8E—Adoption of retrospective Statements of Outstanding Universal Value	Decision file	UNESCO	2010	Publication date in the document: July 2010

is retrospective in character: it evaluates what was built and what merits international recognition.

The UNESCO decision text (2003) is the shortest of the three documents, with approximately one page of operative text, and constitutes the formal act of inscription. It sets out the criteria under which the World Heritage property is inscribed and issues recommendations to the State Party on monitoring, development control, and management. Every word in this document has institutional weight, because the document formalised the status of the World Heritage property prior to the mandatory Statements of Outstanding Universal Value.

The nomination file prepared by the Tel Aviv–Yafo municipality was identified but not included because it reflects a locally produced advocacy document rather than the international perspective on the White City's cultural significance. The Retrospective Statement of Outstanding Universal Value (UNESCO 2010) was also identified but excluded from the analysis because it made no change to the original Statement of Outstanding Universal Value; however, it is referenced in the Discussion section of this research.

2.2 Analytical framework

This research adapts the heritage attribute taxonomy by Veldpaus (2015), which is grounded in supranational heritage policies (Table 2). The taxonomy classifies heritage attributes into 9 tangible categories and 9 intangible categories, as detailed in Table 2.

The distinction between tangible and intangible attribute categories is central to the analytical design. In an integrated planning vision such as Geddes', natural elements may serve simultaneously as physical features (tangible) and as carriers of civic, ecological, or developmental meaning (intangible). If the inscription process preserved this integration, then, in the later documents, natural attributes should co-occur with both tangible and intangible categories. However, if the inscription reframed natural attributes primarily as physical setting,

it would indicate a shift in co-occurrence patterns: natural attributes moving away from intangible associations towards predominantly tangible ones. The tangible/intangible distinction thus provides a diagnostic lens for detecting how the role attributed to nature changes across the documents.

2.3 Procedure

The content analysis unfolded in four stages:

Document preparation and coding: Geddes' report was digitised using optical character recognition (OCR) to enable coding with Atlas.ti. The ICOMOS and UNESCO documents were available in digital format and imported directly into Atlas.ti.

Attribute classification: Each document was coded independently, with segments categorised into tangible and intangible subgroups on the basis of Veldpaus' framework. The coding included both explicit references to built and natural attributes as well as contextually inferred references, in which the wording did not match the coding category directly, but the intended meaning was clear within the text.

Quantitative and co-occurrence analysis: A code-counting analysis identified the frequency of each attribute category across the documents. A general co-occurrence analysis was then performed to identify how the attributes intersected within the text; that is, instances in which text segments were assigned multiple attribute codes, either fully or partially overlapping. This analysis reveals which attributes are discussed together consistently and which are treated as distinct.

Focused natural element co-occurrence analysis: A targeted co-occurrence analysis isolated the pairings of the tangible 'natural element' category from all of the other attribute categories, tangible and intangible. This isolation provides a direct diagnostic for the research question: it reveals not only whether natural

Table 2 Heritage attribute categories used for coding. Source: Veldpaus (2015, 73)

	Category	Attribute	Definition
Tangible	Asset	Building element	Parts of buildings e.g. detail, parcel, facade, roof, material, or colours
		Building	Entire buildings
		Urban element	Man made elements in the urban landscape e.g. a square, bridge, street furniture, quay side, or public art
	Area	Natural element	Natural (or designed) green elements, flora or fauna, water elements, etc.
		Ensemble	A group of buildings or specific urban ensemble or configuration
		Context or setting	The buildings or elements surrounding, supporting, contextualising the actual heritage
	Landscape	Area	A district in a wider (urban) landscape, a specific combination of cultural and/or natural elements, e.g. a neighbourhood, urban fragment, urban structure, townscape, route or park
		(Result of urban or natural) layering	A landscape illustrative of the evolution or development of human society and settlement over time, a diversity of manifestations of the interaction between humankind and its natural environment
Intangible	Asset related	Everything, based on level of significance	Every part of the (urban landscape) is considered to be of value, the attributes get a level of significance
		Concept or artistic trend	The ideas behind the design or place, e.g. period, style, design ideology (often related to, or represented by, a tangible heritage asset)
		Relation context—location	The relation with another connected element, location, place, or environment (relation object – object)
	Societal	Character	The character or image, as supported by specific design, e.g. typology, morphology, layout, composition and proportion, as well as, atmosphere e.g. tranquil, lively, urban, rural
		Use, function	The specific (typical, common, special) use or function of a place or environment
		Knowledge, traditions, customs	The (local) practices, traditions, knowledge, customs of a community or groups (often related to a location or tangible results, tools/instruments)
		Relation context—association	Human associations with a place, element, location, or environment (relation men – object)
	Process	Community/people	A community or society itself (its members, or specific individuals/groups) and/or their cultural identity or diversity
		Management processes	The process of managing, the type of strategy or approach (instead of the result) is what is valuable
		Development or evolution	The process of layering, development, or evolution (instead of the result)

attributes are present in each document but also the other attributes they are associated with, and specifically whether those associations are predominantly with tangible (i.e., spatial correlations or adjacency) or intangible categories (i.e., functional, civic, or developmental attributes).

2.4 Limitations

The selected documents vary significantly in purpose, structure, and tone, from a lengthy visionary planning report to a concise Outstanding Universal Value evaluation and inscription decision. These differences affect the comparability of language, emphasis, and specificity; the code-count analysis addresses this difficulty by reporting proportional as well as absolute frequencies. Moreover, although Veldpaus' taxonomy provides a robust categorisation structure, its categorical nature may

underrepresent the relational and dynamic dimensions of nature–culture interconnections. These methodological constraints and their implications for interpretation are addressed further in the Discussion section.

3 Results

3.1 Coding-category count analysis

The results of the code-count analysis, the number of coded segments per attribute category across all three documents, are presented in Fig. 1. The three distributions visible in Fig. 1 differ not only in magnitude (a function of document length) but also in shape: the spread of attention across categories shifts from relatively even in Geddes' report to increasingly concentrated in the later documents.

In Geddes' report, the two most frequently referenced categories of attributes are the tangible attributes 'urban element' and 'natural element,' each appearing 322 times

and each representing 15% of the coded results. This parity is a defining feature of the document's coding profile: the two joint-highest categories, one tangible–built and the other tangible–natural, share identical frequencies. Streets, housing blocks, and port areas receive the same quantitative attention as orchards, topography, and public gardens do. The third most frequently referenced category is the intangible attribute ‘use, function’ (231 instances, approximately 11%), followed by the tangible attribute ‘building’ (176 instances) and ‘area’ (162 instances), and the intangible attribute ‘development or evolution’ (161 instances). The leading categories thus span both spatial and functional attributes, with process-related categories (‘use, function’ and ‘development or evolution’) ranking alongside physical ones (‘urban element’, ‘natural element’, or ‘building’). Overall, tangible attributes account for 58% of the coded results, with all 18 attribute categories represented.

In the ICOMOS evaluation, the most frequently coded attribute is the intangible attribute ‘concept or artistic trend’ (59 instances, 15% of coded results), followed by the tangible attribute ‘building element’ (40 instances) and ‘area’ (39 instances), each representing approximately 10%. The balance between tangible and intangible attributes is nearly equal (51:49). Two shifts relative to Geddes’ report are notable. First, the leading category changes from spatial and functional attributes to a conceptual one: ‘concept or artistic trend’. Second, ‘natural element’ shifts from being the joint-most frequently coded category in the report to occupying a marginal position. This is not a proportional reduction explained by the evaluation’s shorter length; as a share of total coded segments, ‘natural element’ decreases from 15% to approximately 6%. All 18 attribute categories remain represented, but the hierarchy among them has shifted substantially towards conceptual and architectural concerns.

As the shortest and most formulaic of the three documents, the UNESCO decision text presents the most concentrated profile. The intangible attribute ‘concept or artistic trend’ and the tangible attribute ‘area’ are the most frequently coded (4 instances each, 15% of the coded results), followed by the intangible attribute ‘knowledge, traditions, customs’ and the tangible attribute ‘landscape: everything’ (3 times each, 11%). Tangible attributes constitute a slight majority, representing 56%

of the coded results. Four attribute categories present in both earlier documents are entirely absent: three intangible and one tangible. The categories that remain are ‘concept or artistic trend’; ‘area’; ‘knowledge, traditions, customs’; and ‘landscape: everything’. The categories that disappear include those relating to function, use, and ecological and developmental processes.

Across the three documents, the code-count analysis reveals a consistent directional shift. In Geddes’ report, built and natural attributes receive equal prominence alongside strong attention to societal use and function. In the ICOMOS evaluation, conceptual and built-related attributes (i.e., ‘building elements’, ‘building’, and ‘ensemble’) increase in dominance, whereas natural attributes decrease markedly. The evaluation of the attribute ‘concept or artistic trend’ focuses on the plan’s conceptual qualities and architectural elements, echoing Geddes’ attention to urban and building systems but through a more abstract lens. The UNESCO decision text consolidates this reorientation: the range of represented categories contracts; functional and ecological categories disappear entirely; and the dominant attributes are those relating to concept, area, and landscape at an abstract level. The decision text assigns the greatest importance to the conceptual and spatial structure of the White City area while expressing concern that development may endanger the integrity of the area, a concern framed entirely in terms of built and spatial attributes. In both inscription documents, the cultural significance of the natural attributes as standalone components is diminished substantially relative to their position in Geddes’ report.

3.2 Co-occurrence analysis results

The co-occurrence analysis examines instances in which text segments were assigned multiple attribute codes, either fully or partially overlapping. Whereas the code-count analysis (3.1) established the relative prominence of individual attribute categories, the co-occurrence analysis reveals how attributes are relationally positioned within each document: which attributes are discussed together consistently and which are treated as separate or unrelated. The results are presented in two stages: first across all attribute categories (3.2.1) and then focused

(See figure on next page.)

Fig. 1 Attribute frequency distribution across three documents, shown as within-document proportions by category (Source: the authors). Each node represents one attribute category; node size corresponds to the category’s share of total coded segments within that document. Tangible attributes are shown in amber, and intangible attributes are shown in blue. Categories with zero coded segments are not displayed. Document totals: Geddes’ report ($n = 2,129$), the ICOMOS evaluation ($n = 377$), and the UNESCO decision ($n = 27$). The proportional representation enables comparison of attribute hierarchies across documents of different lengths

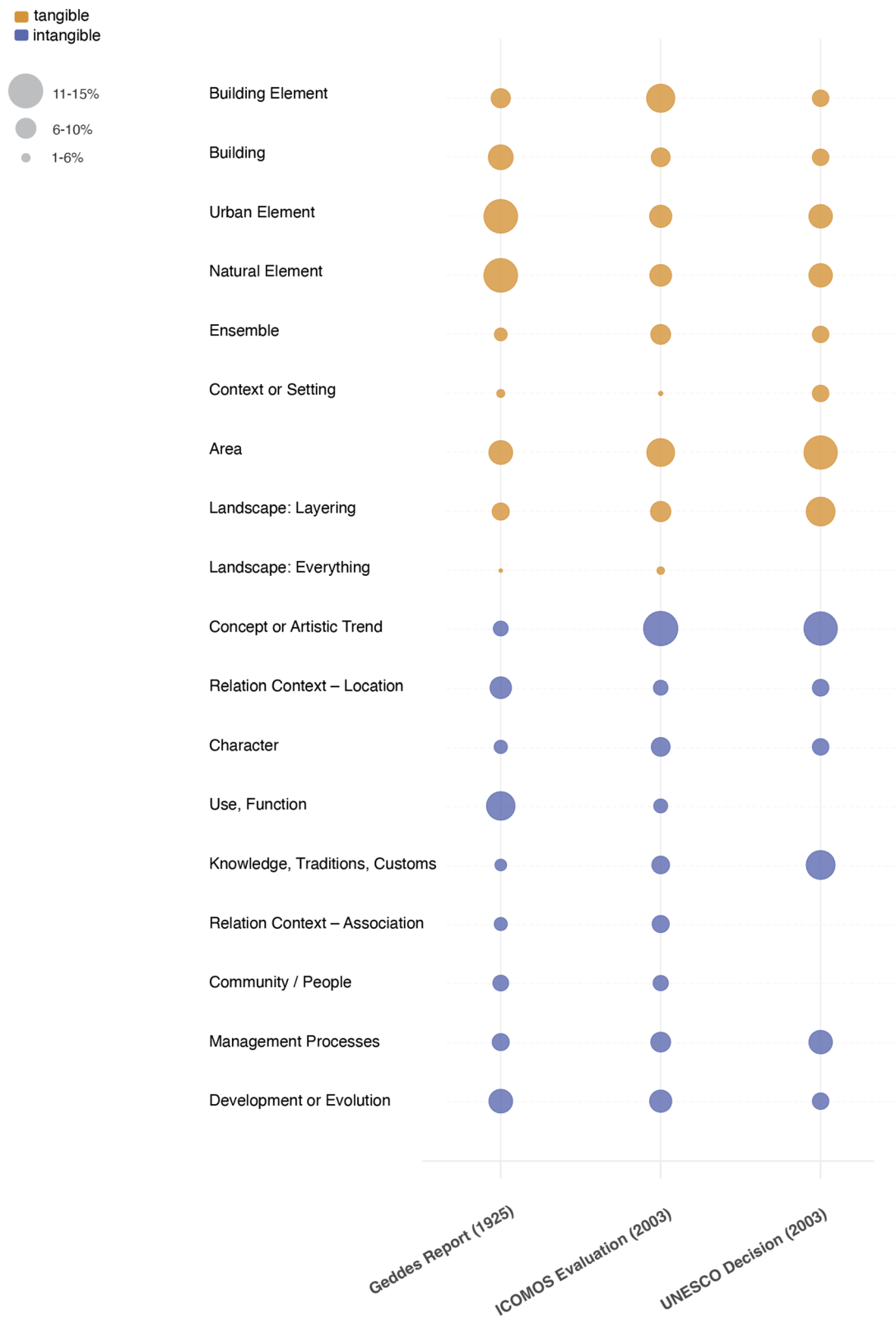


Fig. 1 (See legend on previous page.)

specifically on the pairings of ‘natural element’ with all of the other categories (3.2.2).

3.2.1 Co-occurrence across all categories

In Geddes’ report, the most frequent co-occurrence was observed between ‘natural element’ and ‘relation context—location’ (73 instances), followed by ‘urban element’ and ‘natural element’ (60 instances). The first pairing indicates that natural attributes are discussed consistently in relation to specific sites and spatial positions within the planned city. The second indicates that natural and built-environment attributes are treated together throughout the document rather than as separate topics. Further significant co-occurrences link ‘urban element’ and ‘building’ each to ‘relation context—location’ (47 and 46 instances, respectively) and ‘natural element’ to ‘development or evolution’ (41 instances). Below this threshold, the frequency decreases substantially to 27 co-occurrences and below. The resulting co-occurrence pattern is dense, with ‘natural element’ appearing across multiple pairings and attribute types (Fig. 2).

In the ICOMOS evaluation, the co-occurrence pattern is considerably sparser. The two highest incidences of co-occurrence pairings each appear 9 times: ‘natural element’ with ‘urban element’ and ‘ensemble’ with ‘building’. The latter pairing appears among the leading co-occurrences in the ICOMOS evaluation but is absent from those in Geddes’ report. The next most frequent co-occurrence, appearing 4 times, is between ‘natural element’ and ‘building element’. Three further pairings each appear three times: ‘urban element’ with ‘use, function’; ‘landscape: layering’ with ‘relation context—location’; and ‘management processes’ with ‘development or evolution’. The remaining co-occurrences appear either one or two times. Both the density and the range of interconnections are reduced substantially compared with those in Geddes’ report, and the co-occurrence network no longer centres on natural attributes. Notably, although ‘natural element’ ranks low in the code-count analysis (3.1), it appears in the highest incidence of a co-occurrence pairing, indicating that where it does occur in the ICOMOS evaluation, it tends to overlap with other attributes rather than appearing independently.

In the UNESCO decision text, the highest incidence of co-occurrence is between ‘landscape: layering’ and ‘concept or artistic trend’ (5 instances). Three pairings each appear 3 times: ‘urban element’ with intangible attribute ‘concept or artistic trend’; ‘urban element’ with ‘landscape: layering’; and ‘area’ with ‘landscape: layering’. The remaining co-occurrences appear either one or two times. The dominant pairings link tangible categories to each other or to the intangible attribute ‘concept or artistic trend’, with no strong co-occurrences involving natural elements.

3.2.2 Co-occurrence of ‘natural element’ with other attribute categories

The analysis below focuses on the co-occurrences between ‘natural element’ and all of the other attribute categories, as presented visually in Fig. 3.

In Geddes’ report, the most frequent co-occurrence of ‘natural element’ is with the intangible attribute ‘relation context—location’ (73 instances), followed by the tangible attribute ‘urban element’ (60 instances) and the intangible attribute ‘development or evolution’ (41 instances). Co-occurrences that occur less often but that remain notable include ‘management processes’ (29 instances); ‘use, function’ (15 instances); and both ‘area’ and ‘landscape: layering’ (12 instances each). Lower co-occurrences appear with ‘character’ (7 instances); ‘relation context—association’ (5 instances); ‘building’ (5 instances); ‘concept or artistic trend’ (4 instances); ‘knowledge, traditions, customs’ (3 instances); ‘context or setting’ (3 instances); ‘building element’ (2 instances); and ‘ensemble’ (2 instances). Overall, ‘natural element’ co-occurs more frequently with intangible attributes (177 instances) than it does with tangible attributes (96 instances).

In the ICOMOS evaluation, the co-occurrence pattern is inverted. The most frequent co-occurrence of ‘natural element’ is with the tangible attribute ‘urban element’ (9 instances), followed by ‘building element’ (4 instances) and ‘area’ (2 instances). Additional co-occurrences—with ‘building’; ‘ensemble’; ‘use, function’; and ‘relation context—location’—each appear once. No co-occurrences are recorded with

(See figure on next page.)

Fig. 2 Co-occurrence patterns across all attribute categories in the three documents are shown as network diagrams. (Source: The authors).

Each node represents one attribute category; node size corresponds to the absolute frequency of that category in the document (see Fig. 1 for proportional values). Line thickness represents the co-occurrence frequency between two categories, scaled by the square root to preserve legibility across documents with different co-occurrence volumes. Tangible attributes are shown in amber, and intangible attributes are shown in blue. Node abbreviations: Tangible—BE (building element), BU (building), UE (urban element), NE (natural element), EN (ensemble), CS (context or setting), AR (area), LL (landscape: Layering), LE (landscape: Everything); Intangible—CA (concept or artistic trend), RL (relation context—Location), CH (character), UF (use, function), KN (knowledge, traditions, customs), RA (relation context—Association), CO (community/people), MP (management processes), DE (development or evolution). Node positions are fixed across all three panels to enable visual comparison

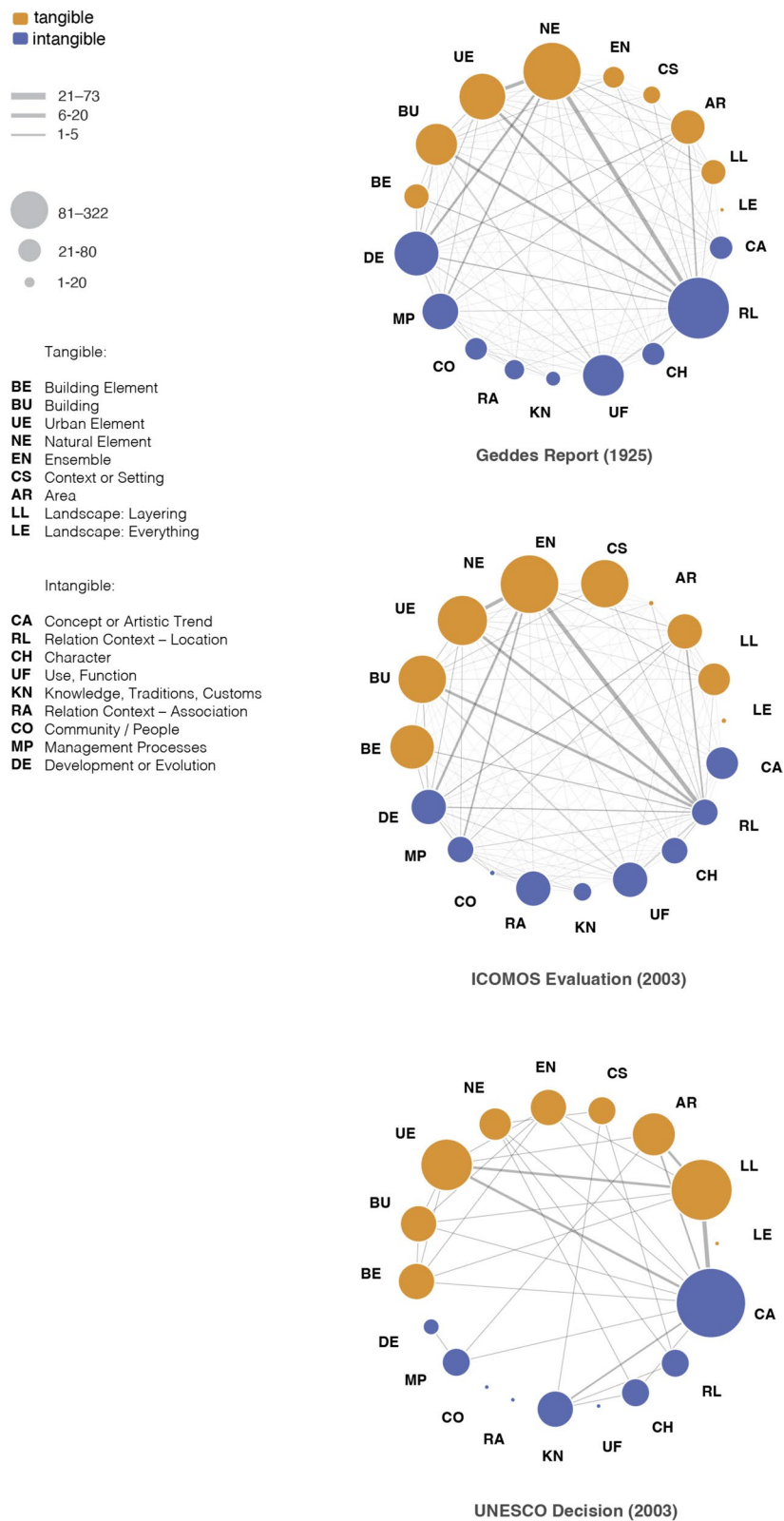


Fig. 2 (See legend on previous page.)

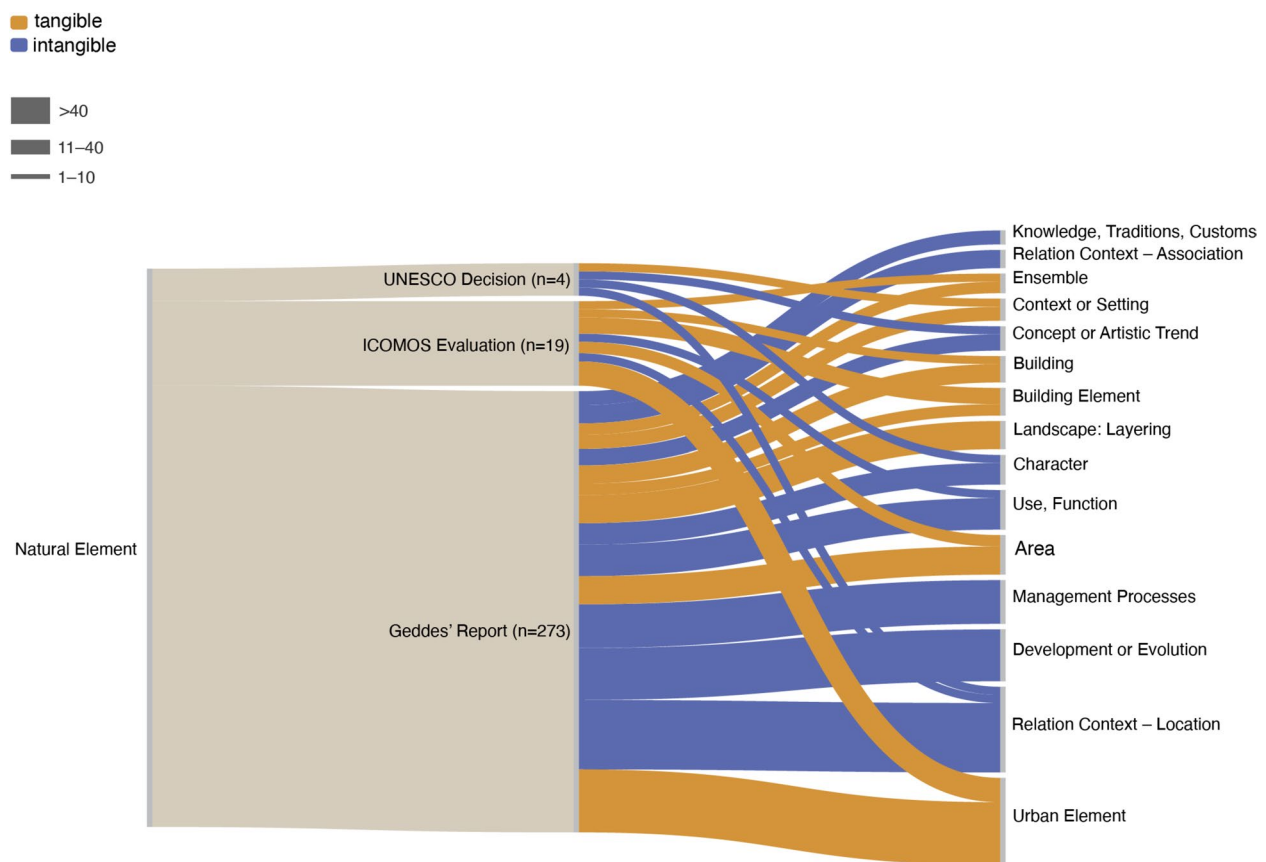


Fig. 3 Co-occurrences of natural elements with other attribute categories across the three documents are shown as an alluvial diagram. (Source: the authors). Flow widths represent the co-occurrence frequency between natural elements and each attribute category, scaled by a square root to preserve legibility across documents of different lengths. Absolute co-occurrence totals are shown in parentheses: Geddes' report ($n = 273$), the ICOMOS evaluation ($n = 19$), and the UNESCO decision ($n = 4$). Tangible attributes are shown in amber; intangible attributes are shown in blue. In Geddes' report, 65% of occurrences link natural element to intangible categories; in the ICOMOS evaluation, this relationship reverses to 89% tangible; in the UNESCO decision, 75% of the natural elements are intangible, although these results are derived from only four co-occurrences. The diagram reads chronologically from the bottom (1925) to the top (2003)

'development or evolution'; 'management processes'; 'character'; 'knowledge, traditions, customs'; 'relation context–association'; or 'community/people'. In Geddes' report, these categories accounted for 85 of the 177 intangible attribute co-occurrences with 'natural element'. Overall, 'natural element' co-occurs with tangible attributes 17 times and with intangible attributes only twice. The ratio reversed from 177:96 in favour of intangible attribute co-occurrences in Geddes' report to 17:2 in favour of tangible ones in the ICOMOS evaluation.

The UNESCO decision text has four co-occurrences of 'natural element', each appearing once. Three have intangible attributes ('concept or artistic trend', 'relation context–location') and one has a tangible

attribute ('context or setting'). This ratio favours intangible attribute co-occurrences (3:1), although with a total of four co-occurrences, the sample is substantially smaller than that in either preceding document.

4 Discussion

The code-count and co-occurrence analyses presented in Sect. 3 document two patterns: a decline in the prominence of 'natural element' across the three documents and a shift in its co-occurrence from predominantly intangible to predominantly tangible associations. This section interprets these patterns and situates them within the broader context of World Heritage inscription and nature–culture management.

The differences among the three documents can be explained partly by the distinct purposes and institutional contexts in which they were produced (Labadi 2007; Jokilehto 2006). In addition, the extent to which Geddes' plan was implemented likely influenced how its attributes were interpreted. Although the street layout and block structure were substantially realised, the green infrastructure was implemented only partially and, in several cases, eroded by subsequent development (Hysler-Rubin 2013; Mualam 2017). Therefore, the World Heritage inscription documents may reflect not only a different evaluative approach but also a different physical reality: one in which the architectural attributes were documented more prominently, whereas the natural attributes received less specific attention.

The analysis reveals that the World Heritage inscription documents articulate cultural significance at two scales: architectural attributes are mentioned with specificity, whereas nature–culture relations are articulated at a macro scale, more generally through references to town planning, climatic conditions, and geographic context. This difference matters because the attributes Geddes linked to nature–culture relations align with those that contemporary sustainability discourse and the UNESCO Historic Urban Landscape recommendation identify as governance priorities (UNESCO 2011; Bandarin and van Oers 2015). Some scholars argue that when natural attributes are not recognised as independently significant within Outstanding Universal Value, such attributes may lack legal and policy protection afforded to built attributes (Stovel 2007; Rössler 2006). Future research could examine whether these different specificity levels affect the effectiveness of heritage management for the protection of natural attributes.

The shift in nature–culture relations towards the macro in the co-occurrence analysis also has metropolitan implications. Geddes' planning vision extended beyond what would later become the inscribed property. Future research could examine how the boundaries of both local conservation designations and the World Heritage inscription are related to the broader spatial extent of Geddes' planning vision across the metropolitan area.

The 2003 inscription was evaluated only by ICOMOS, which may hinder the recognition of the cultural significance of nature–culture relations. If the tools afforded by World Heritage status could also be directed towards articulating the dimensions of significance that have been kept generic, the World Heritage inscription process could serve a more active role in heritage management and spatial planning. Future research could examine whether evaluations by both advisory bodies would yield different articulations of the nature–culture significance.

5 Conclusions

This research identified the cultural significance attributed to nature–culture relations across three documents central to the White City of Tel Aviv: Geddes' 1925 Town-Planning Report, the ICOMOS 2003 evaluation, and the UNESCO 2003 decision text.

The analyses point to the same pattern: Nature–culture relations are articulated at a detailed, functionally specific level in Geddes' report and at a more generic, abstract level in the World Heritage inscription documents. This difference can be seen in two ways: First, the prominence of natural attributes declines from the joint-most coded category in Geddes' report (15%) to approximately 6% in the ICOMOS evaluation, with four categories not occurring in the UNESCO decision text. Second, the relational positioning shifts from predominantly intangible attribute co-occurrences in Geddes' report (177:96) to predominantly tangible ones in the ICOMOS evaluation (17:2).

Reading the coded segments in their textual context reveals that the co-occurrence reversal is not merely numerical: In Geddes' report, the specific intangible attribute co-occurrences show that natural elements are embedded programmatically from the building to the landscape scales. In the ICOMOS evaluation, all of the co-occurrences are tangible and appear mainly at the block and the building scales. The intangible categories linked most strongly to 'natural element' in Geddes' report are not present in the ICOMOS evaluation. The UNESCO decision text consolidates this trajectory: natural attributes appear as contextual descriptors that are less detailed than built attributes are, particularly at the architectural level. Although outside the scope of this analysis, the retrospective Statement of Outstanding Universal Value (UNESCO 2010) reinforces this built-centric framing. Together, these results constitute different articulations of nature–culture relations, shifting from detailed and functionally specific to more generic and contextual: more detailed in Geddes' report (micro/meso) and more generic (meso/macro) in the World Heritage inscription process.

Future research should examine whether different levels of specificity, scale, and context (building to landscape) affect the effectiveness of heritage management for the protection of natural attributes. The analysis can be extended by spatially mapping attribute distributions beyond the inscribed property and across the metropolitan region and by engaging participatory assessments with planning and heritage professionals.

The analytical approach developed in this research is transferable beyond this case and beyond World Heritage specifically, enabling further comparative analyses

with similar case studies such as Brasília and Amsterdam, which are World Heritage properties with natural elements as main attributes. More broadly, the findings of this research suggest an opportunity for World Heritage management to expand how it engages with the broader landscape context beyond World Heritage property boundaries: not primarily as a threat to the integrity of the World Heritage property but as areas with similar attributes and perhaps even similar cultural significance. Nature–culture relations offer a particularly productive direction, given that the divide remains structural in heritage planning, whereas integration can contribute to sustainable planning and management in the urban, metropolitan, and urban–rural contexts.

Abbreviations

UNESCO	United Nations Educational, Scientific and Cultural Organisation
ICOMOS	International Council on Monuments and Sites
IUCN	International Union for Conservation of Nature

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Adva Matar designed paper structure, performed analyses and wrote the paper. Daniele Cannatella revised the paper. Ana Pereira Roders proposed the use and implementation of the taxonomy framework and revised the paper. All authors read and approved the final manuscript.

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Data availability

The datasets supporting the conclusions of this article are included within the article. The three source documents analysed—the Geddes 1925 Town-Planning Report, the ICOMOS 2003 Evaluation, and the UNESCO 2003 Decision Text—are publicly accessible.

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