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The Formation and Preservation of Urban Heritage Through Urban Landscape Transformation: A Case Study of Pittsburgh

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Abstract: This study examines the potential of urban landscape transformation to generate and develop new heritage and the role of heritage urbanism in an industrial city. It explores whether the changeover of urban heritage districts in Pittsburgh (PA, USA) can give rise to a novel type of urban heritage. Pittsburgh experienced urban development primarily driven by the presence and accessibility of natural resources, rather than favorable geographical conditions: topography characterized by rugged hills, rock formations, rivers, and stream valleys. The integration of the American-style grid within this unique natural environment resulted in intriguing juxtapositions. Consequently, elements such as bridges, viaducts, stairs, tunnels, and historical inclines gained paramount importance in shaping the urban fabric. The city's remaining preserved or transformed urban heritage is protected through historic districts designated by the Department of City Planning, which enforces specific planning and design guidelines. The study employs a multi-faceted approach combining the concepts of historic stratification (urban palimpsest), integrated urban morphology, space syntax (integration analysis), and heritage urbanism. During the personally conducted long-term fieldwork, the selected case studies described herein (historic districts, university campus, and traditional neighborhood) proved to be the most suitable for demonstrating urban heritage formation through urban landscape transformation.



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Keywords: urban heritage; Pittsburgh; integrated urban morphology method; urban palimpsest; space syntax; heritage urbanism approach; historic districts

1. Introduction

This research investigates the potential of urban landscape transformation to generate, create, and develop new heritage. The analyses cover the specific urban elements that make up each area and their combinations (urban morphology), as well as spatial syntax studies. Specifically, it explores whether the transformation of urban heritage districts can give rise to a novel type of urban heritage. Urban landscape transformation is a dynamic process characterized by alterations in the physical, social, and functional dimensions of urban environments. This often involves the redevelopment or reconfiguration of urban spaces, such as changes in or the demolition of the built environment, the construction of new infrastructure, or shifts in land-use patterns. In the current article, development is sporadically used when we are referring to the progressive changes of a city and district through the reuse of previous forms and the addition of new elements—development has a forward-looking undertone. The term urban heritage district is, in US legal terminology, equal to a historic district, which is defined by § 1101.02. The urban heritage district as a notion is an area of significant interconnected urban elements that represent urban heritage as a whole, e.g., urban structures, or built and natural environments. Furthermore, this study examines the role of heritage urbanism in the transformation of an industrial city, focusing on Pittsburgh (PA, USA) as a case study.

Urban heritage is a complex notion composed of interconnected historical, cultural, and architectural elements that define the distinctive character of a town. It includes tangible assets such as buildings, streetscapes, and public spaces, reflecting the historical and cultural legacy of a community. Although it might include intangible elements, in our case, tangible assets are the focus of our study.

“Heritage urbanism considers the revitalization and enhancement of cultural heritage in spatial, urban, and landscape contexts, and it explores models for its inclusion in contemporary life. In search of revitalization and enhancement models, heritage is not viewed as isolated buildings/objects, but rather as part of the immediate and wider environment” [1] (p. 4).

Pittsburgh experienced urban development primarily driven by the presence and accessibility of natural resources, rather than favorable geographical conditions. The city’s topography is characterized by rugged hills, rock formations, and the presence of rivers and stream valleys. The synthesis of the American-style grid within this unique natural environment resulted in intriguing juxtapositions. Consequently, elements such as bridges, viaducts, stairs, tunnels, and historical inclines gained paramount importance, shaping the urban fabric of the city and contributing to the creation of distinctive neighborhoods.

Urban fabric (or urban tissue) is the physical framework of a city, encompassing the arrangement and interconnections of its urban elements, buildings, plots, systems of plots, streets (street network), public spaces, and green spaces. The spatial relationships between urban elements influence the identity of a neighborhood (urban fabric) and a town itself. Urban fabric is the ensemble of urban forms, and its typology is a taxonomic classification of urban form characteristics and their internal relations found in urban places. Character is the concept of physical identity, built up by urban elements that create the town’s patterns through their combination.

A town’s identity is intrinsically linked to its physical structure, including its built and natural environment, as well as its historical and social context. Urban heritage, a product of the past, remains an integral component of contemporary cities. As such, it serves as a defining element of a city’s identity, connecting its inhabitants to the past and the forces that shaped its present. Urban heritage is more than a mere collection of buildings and monuments; it is a dynamic and evolving fabric that contributes significantly to a city’s character and identity.

Spatial syntax studies deal with the current and simulated state of case study areas, and simulated states show a more harmonious spatial integration with less spatial isolation by restoring former historical inclines, as well as closed and transformed areas. Spatial integration refers to the interconnectedness and harmonious relationship between the various urban elements (especially the network of streets, as well as open and green spaces) within a town—in this case, Pittsburgh. Spatial isolation and limited accessibility characterize some of the case study areas, such as the historic neighborhood of Troy Hill.

As aptly stated by Franklin Toker, “(. . .) Pittsburgh neighborhoods and its topography give the city’s eighty-eight neighborhoods the hills, gullies, rivers, bridges, train tracks, and expressway traffic that create borders of striking prominence. (. . .) The architectural glory of Pittsburgh may ultimately rest not in its buildings, but in its neighborhoods” [2] (p. 123).

The city’s remaining urban heritage, both preserved and transformed, is safeguarded through historic districts designated by the Department of City Planning, which enforces specific planning and design guidelines. “The guidelines are designed to help individual property owners formulate plans for the preservation, rehabilitation and continued use of historic buildings (. . .). The guidelines pertain to buildings of all occupancy and construction types. They apply to permanent and temporary construction on the exterior of historic buildings as well as to new construction in the district” [3].

The definitions of historic structure and historic district under current legislation are as follows: “§ 1101.02 (a) HISTORIC STRUCTURE. Anything constructed or erected, the use of which requires directly or indirectly, a permanent location of land, including walks, fences, signs, steps and sidewalks, which meets one (1) or more of the criteria

for designation as listed in § 1101.04. (b) HISTORIC DISTRICT. A defined territorial division of land which shall include more than one (1) contiguous or related parcel of property, specifically identified by separate resolution, which meets one (1) or more of the criteria for designation as listed in § 1101.04.” § 1101.04 states the following criteria: “(b) Designation of Historic Structures, Historic Districts, Historic Sites, and Historic Objects. The Commission shall limit its consideration to the following criteria in making a determination on a nomination of an area, property, site, structure, or object for designation by ordinance as a Historic Structure, Historic District, Historic Site, or Historic Object. (1) Its location as a site of a significant historic or prehistoric event or activity; (2) Its identification with a person or persons who significantly contributed to the cultural, historic, architectural, archaeological, or related aspect of the development of the City of Pittsburgh, State of Pennsylvania, Mid-Atlantic region, or the United States; (3) Its exemplification of an architectural type, style or design distinguished by innovation, rarity, uniqueness, or overall quality of design, detail, materials, or craftsmanship; (4) Its identification as the work of an architect, designer, engineer, or builder whose individual work is significant in the history or development of the City of Pittsburgh, the State of Pennsylvania, the Mid-Atlantic region, or the United States; (5) Its exemplification of important planning and urban design techniques distinguished by innovation, rarity, uniqueness or overall quality of design or detail; (6) Its location as a site of an important archaeological resource; (7) Its association with important cultural or social aspects or events in the history of the City of Pittsburgh, the State of Pennsylvania, the Mid-Atlantic region, or the United States; (8) Its exemplification of a pattern of neighborhood development or settlement significant to the cultural history or traditions of the City, whose components may lack individual distinction. (9) Its representation of a cultural, historic, architectural, archaeological or related theme expressed through distinctive areas, properties, sites, structures or objects that may or may not be contiguous; or (10) Its unique location or distinctive physical appearance or presence representing an established and familiar visual feature of a neighborhood, community, or the City of Pittsburgh” [4].

The urban heritage of Pittsburgh formed and transformed through three distinct eras of the city’s industrial transformation.

The prosperous era was characterized by thriving industries, large-scale industrial estates, and emerging elite districts from the Iron City era to the Steel City period of the 1920s and 1930s (with significant influence of the great flood in 1936 on the urban and economic structure).

The phase of industrial decline and economic struggles resulted in segregated and deteriorating neighborhoods. The era overlaps with the war period and the redefinition phase, from the industrial decline of the 1950s in particular until the late 1980s (1981–1982 recession), and even the beginning of the new century.

The city’s redefinition phase was marked by initiatives such as the development of river trails, the revitalization of the Strip District, and the growing importance of universities, with noteworthy examples like the campus of Chatham University. The phase from the post-war period (1946) to 1973 was marked as Renaissance I. From 1973 (the year of the 1973 oil crisis) to today, the foundation and acts of the Pittsburgh History and Landmarks Foundation (1964) and the efforts in the 1980s have shifted Pittsburgh’s economy from heavy industry to the tertiary industry.

The current study employs a multi-faceted approach to address the research questions, combining the concepts of historical stratification (urban palimpsest), to identify changes in the urban fabric over time; integrated urban morphology and micro-urbanism, to understand the patterns of language and connection between urban structure and the built environment; space syntax (integration analysis), to measure the distance of spaces from the space of origin and to understand the impact of urban landscape transformation on the case study areas; and heritage urbanism, to understand whether the changes could lead to a new heritage revival model. Each of the approaches are explained in Section 2, from Sections 2.1–2.4.

We examine specific areas of interest, including historic districts such as Allegheny West, Allegheny Commons Park, Deutschtown, Manchester, Mexican War Streets, a university campus of Chatham University, and traditional neighborhoods, like Troy Hill.

Each case study area is a specific area of Pittsburgh that provides an urban context from the perspective of urban landscape, urban heritage, geographic segregation, gated communities, urban renewal, urban heritage evaluation, or emerging urban heritage.

Allegheny West, Allegheny Commons Park, Deutschtown, Manchester, and Mexican War Streets are located in the former independent Allegheny City, now Pittsburgh's North Side, in close proximity to each other. Manchester was among the first historic districts (1979), and Allegheny West, along with Allegheny Commons Park, has witnessed an intensive urban renewal program, which caused the revaluation of urban heritage sites. Deutschtown and Mexican War Streets, along with Manchester, contain the city's largest collections of Victorian architecture, with Italianate, Romanesque, Classical, and Colonial Revival styles, and notable architectural pieces. Troy Hill is geographically segregated. A report on the built environment of Troy Hill was completed in 2014 [5], which intended to "Identify and Designate Additional Historic Structures, Districts, Sites, and Objects (City of Pittsburgh Cultural Heritage Plan, 2012)" [5] (p. 3).

"In terms of significance, the potential Troy Hill district is likely to have significance under Criterion A, meaning it is important in association with events that made a significant contribution to the broad patterns of our [Pittsburgh's] history. The neighborhood was developed primarily by immigrants from German-speaking countries of Europe whose ethnic influences were significant in the development of Pittsburgh's North Side" [5] (p. 25).

The present study takes into account the 1962 Urban Renewal Impact Study [6], which, among other related issues, responds to the Allegheny West urban renewal program that changed the neighborhood's structure and urban fabric, and increased social changes. The maps and georeferenced aerial photographs (Pittsburgh Historic Maps 1957 and 1967) [7] show that, over a period of about ten years, beginning in the mid-1950s, the area was completely transformed. The book *Allegheny Center: A History of Pittsburgh's North Side* [8], published in 2014, states that during the urban renewal of the historic Allegheny Diamond area, only a few historic buildings were saved, including the former city's Carnegie Library, Buhl Planetarium, and Post Office, among others. But nearly everything else was erased in 1958, including a historic market house and many other nineteenth- and early-twentieth-century buildings to make way for parking and new commercial space.

"To address the many problems the planning association [Pittsburgh Regional Planning Association] found [in 1951], the study [from 1954] proposed sweeping changes to the lower North Side's land use and transportation corridors. (...) This scheme would eliminate all of the area's 50-to 120-year-old houses, stores, and churches, and almost all of its streets, in favor of high-rise apartments, parking lots, and a shopping plaza. A new limited-access highway just above the redeveloped community would connect California Avenue in Manchester with East Ohio Street, proceeding through northern Manchester, the Mexican War Streets, and Deutschtown, hugging the hillside below Perry Hilltop, Fineview, and Troy Hill" [8] (pp. 206–207).

After the North Side urban renewal, the Urban Renewal Impact Study was published in 1962. The study dealt with the urban renewal processes in Allegheny County, including Pittsburgh. According to the study, "Three major types of change in land use have been continually taking place in Allegheny County's urban areas: 1. Change in size of spatial units without changing the type of use. For example, the division of single-family house into apartments. 2. Change of type of use of particular structures without their demolition. For example, conversion of the Schenley Hotel into a University building [in Pittsburgh, Oakland district]. 3. Demolition, clearance and rebuilding. (...) Until the advent of the formal public renewal program in the late 1940's, these changes occurred almost entirely as the result of variation in private market demand, augmented on occasion by public improvements. Even today, by far the greatest number of changes in land use result from these private forces". [6] (p. A-1).

“The greatest accomplishments of the Pittsburgh Renaissance [clean air and civic revitalization project after the Second World War] are frequently cited, but their impact seems to be imperfectly understood. Effective smoke and flood control have not only changed the basic and immemorial image of Pittsburgh in the eyes of its own citizens and of the world, but they have immeasurably increased the livability of the whole Pittsburgh Region. Their impact is not limited to anyone locality or anyone class of people. It is truly comprehensive” [6] (p. 19).

The transformation of the urban fabric of Allegheny City is total in some areas and partially complete in others, affecting the internal spatial relations of the area and the connection of the neighborhood with other parts of Pittsburgh. Allegheny City was a separate municipality located in the US state of Pennsylvania, just north of downtown Pittsburgh. It was situated across the Allegheny River from Pittsburgh, with its southwestern boundary formed by the Ohio River. Allegheny City existed from 1788 until it was annexed by Pittsburgh in 1907. After the annexation, the waterfront district along the Allegheny and Ohio rivers that was once part of Allegheny City became Pittsburgh’s North Shore neighborhood. Spatial syntax analyses are used to examine two scenarios: the current state, and a simulation in which the urban block system (urban fabric) that disappeared as a result of the urban renewal that began in the late 1950s is still preserved today. From the point of view of spatial communication, the inclines connecting the various hills and valleys of Pittsburgh are also significant, of which only two are in operation nowadays (Duquesne Incline from 1877 and Monongahela Incline from 1870) [9].

Changes in spatial communication and the transformation of the functional syntax and spatial syntax of the area are examined in this study in the case of the Chatham University Shadyside Campus. The area, once ‘open’, was dominated by detached houses, built mainly in the second half of the 19th century and during the 20th century. Among these buildings are those that are part of universal architectural history, such as the Alan I.W. Frank House (1939–1940) designed by Walter Gropius and Marcell Breuer. The building designed by Gropius and Breuer is also interesting to mention because it is located outside the closed campus of Chatham University, but the only road (Woodland Road) that connects it to the city leads through the closed campus.

The selection of case studies was preceded by preliminary research that dealt with (among other things) the historical, geographical, and architectural characteristics of the given areas. The present introduction reveals an interesting segment of that research, i.e., the relationship between urban structure and geographic features, the built environment of the 19th and early 20th centuries, the Pittsburgh Renaissance era (from the 1940s), and the changes that segregated a neighborhood with a spatially open structure.

2. Methods

2.1. Historical Stratification—Urban Palimpsest

The concept of the palimpsest is a method that traces the process by which new forms are created by considering existing ones and inviting further development through the reuse of previous forms. Gerard Genette, a French scholar, pioneered the use of the palimpsest method, particularly in literary research. He focused primarily on poetics and aimed to understand and examine the continuities and transformations of various elements within texts over time [10] (p. 147). The concept of ‘urban palimpsests’ [11] (p. 7) aims to bridge the gap between the ways we analyze and understand the literature and how we perceive urban spaces. Huyssen’s concept is grounded in the belief that the techniques of literary analysis can be applied to our comprehension of urban spaces. The concept of palimpsest is not limited to literary research; it can also be applied to urban development and cities.

As part of the palimpsest approach, historical stratification involves identifying changes in the urban fabric over time, typically accomplished through the examination of historical maps. The principle of historical stratification is used in the analyses of urban structural changes following their evolution over time: “a spatially varied mixture of

different period types and styles in the townscape acquired through the accumulation and selective replacement of forms” [12] (p. 247).

Cities can be seen as palimpsests, with layers of history—physical, spatial, and social—interacting and accumulating over time. This perspective allows for the study of formal diversities in urban development, recognizing the intricate and interconnected nature of cities as they evolve and adapt (morphogenesis). Each layer represents a chapter in a city’s history, and studying them independently reveals the nature of urban growth and transformation. This concept allows for the study of formal diversities in urban development.

Elif Sarihan, a doctoral student of Éva Lovra, in her thesis research on “The Concept of the Urban Palimpsest. The Urban Fabric Transformations in Inherited City image” [13], tested the concept of the palimpsest/layering principle to find hidden values/remains and evidence of their evolutions over time. “Urban fabric emerges from part to whole [14] (p. 165,7) [15] (p. 26) or part to part of urban patterns at different resolutions or different levels of specificity. Therefore, the focus of morphological analysis in the proposed palimpsest concept should be directly observable structural space and cultural habits (type)” [13].

A town can be read and analyzed by its physical attendance, through urban forms, and through the stratification of the physical manifestations of different historical periods and times. The identification of historical morphogenetic structures forms the logical foundation for understanding how formation and transformation patterns coexist. The diverse morphological characteristics of sites, coupled with typo-morphological analysis, provide a basis for delineating units or zones within the historic urban landscape (typo-morphological zoning).

2.2. Integrated Urban Morphology Method and Micro-Urbanism

The integrated urban morphological method, as proposed by Lovra in 2018 [16], draws heavily from the practices of Italian and English urban morphology schools. Saverio Muratori, in his work on morphological practice, focused on typology via four scales (building—district—city—territory) to understand the directions shaping building fabrics, urban organism, and territories [17]. Gianfranco Caniggia further developed the theories of Muratori with a focus on typo-morphology and an understanding of the built form by examining the historical process of its formation. In addition to Caniggia’s take on urban typology and morphology (Italian school), the Conzenian approach (English school of urban morphology) is also applicable. In his 1960 study, Conzen (1969) deals with general aspects of urban morphological analysis; among these, he differentiates the town plan, land utilization pattern, and building fabric within the townscape. M. R. G. Conzen’s town-plan analysis method seeks to trace the character of towns through their elements and development over time. Urban tissue, as discussed by Caniggia and Maffei, or the plan unit in Conzen’s terminology, comprises a diverse combination of streets, plots, and block plans. Conzen’s morphological approach is rooted in the concept of morphological periods that reflect diverse social and cultural histories. Each period is recognizable through historical layering. Morphological regions or townscape units represent areas of homogeneous urban form, encompassing both building and plan types. To evaluate the inherited townscape and spatial pattern, besides the typo-morphological approach, the consideration of Conzenian hierarchy principles [12] is essential. Caniggia took the spatial correlation of built objects (co-presence) into account (building level hierarchy on the level of urban tissue); the other aspect is temporal correlation (derivation). “Co-presence and derivation are none other than historical outcomes in space and time. Co-presence is spatial correlation; derivation is a temporal correlation: an object exists in that it belongs to an identified point of the dual process that can be summed up in the unique concept of history” [17] (p. 65). The components related to spatial correlation are elements, structures of elements, systems of structures, and organisms of systems that can be applied generally to individual buildings and to towns. The hierarchy (town) is as follows: 1. Elements: buildings; 2. Structure of elements: organization/groups of buildings (urban tissue); 3. System of structures: combination of urban fabrics (districts); 4. Organism/nucleus of the town or city. Muratori,

Caniggia, and Maffei referred to the principle of aggregation as the very basic phenomena for the hierarchy of elements.

The work of Karl Kropf has had a significant influence on the development of the integrated methodology. The first author was a student of Karl Kropf, whose theoretical and practical lectures were followed in Norway (NMBU) within the framework of a PhD course in 2016. The lectures were based on his later volume, *The Handbook of Urban Morphology* (2017). According to Kropf [18], examining physical factors is the most efficient way to determine a town's character, since the physical aspects are the most obvious in terms of observation, but it is known that without historical, social, or economic impacts, it is impossible to talk about actual urban development. Peter Larkham [19] suggests that elements of urban fabric can be combined at different levels to create a hierarchy within a town.

The steps of urban tissue analyses, according to urban morphology and the integrated method, are the following: (1) Determining the street network and street network patterns. The street network/system refers to the structural changes of the time period. The identification of urban network schemas (simple tissue) is important in terms of further studies and urban tissue determination. The simple tissue is determined by the examination of areas in different towns on maps and plans that went through structural changes in the research period. (2) This is followed by the determination of plots, buildings, and their relationships with each other and with the street network. The analysis of plots and buildings involves analyzing the nature of the relations of plots and buildings to each other and their relations to the street front (shape of plots, construction, buildings with/without internal courtyards, developments in unbroken rows, floor plan of the buildings, etc.). This is completed with the examination of (3) plot series and (4) related subsidiary spaces (voids and areas belonging to building blocks), green spaces, and open spaces. Plot series (blocks) analysis includes shapes, relationship between the blocks and street network, open spaces, and green areas (green areas have high importance in urban typology. Green spaces in the town include parks and alleys, and location and conditions are analyzed. The elements of the method comprise the following: plot; streets and their systems; urban tissue; zones; morphological regions; and townscape. The method also takes into account the factors of pattern formation and determines the elements according to the factors.

The morphological characteristics of a city are determined by spatial changes and the interactions and spatial relationships between components of the urban fabric (streets, green areas, public spaces, city blocks, plots, and buildings). The process of the formation of a given city, the urban structure, and the architectural context of the urban fabric can be understood by understanding the forces (the natural, social, economic, and historical factors) that form the individual collage structures of cities. These interfaces indicate how the cityscape changes in relation to structure and how this interaction manifests itself in reverse. This interaction is the phenomenon of micro-urbanism [20], which takes the type of urban fabric as the basis for study. Micro-urbanism belongs to typo-morphology, the theoretical aspects of which are related to physical urban characteristics, history, and the architectural elements of a city. Typology is a tangible form of conceptual thinking, where patterns of development can be identified through urban architecture and architectural elements. Elements of micro-urbanism include the representation of the structure of a city (urban fabric, combination of built and natural environment, structure) and its buildings (building structure). The historical aspect refers back to changes in the urban landscape. Caniggia and Maffei conclude that the typological process can be understood as a "succession of changes in time, distinctions and applicable mutual spatial influences (. . .). History is a system of time-space individuation readable through its formation and transformation processes" [17] (p. 56).

2.3. Space Syntax—Integration Analysis

The theoretical and methodological underpinnings of space syntax were established by Hillier and Hanson in their seminal work [21], *The Social Logic of Space* (1984). Space syntax adopts a configurational approach within urban morphology, viewing the city as a configuration wherein the primary focus lies in understanding the interconnections among its constituent elements. The objective of space syntax research is to develop descriptive strategies for inhabited spaces, spanning various levels of complexity from individual buildings to settlements, thereby elucidating the underlying social logic.

In relation to urban morphology, [22] summarizes the usability of space syntax, and the author of the present paper has published a study (as a co-author) on the possibilities of the joint practical application of the two methods in relation to the changing environment from the past (19th century) to the current situation [23] (p. 49). The disciplinary interface between urban history and space syntax historical studies is discussed most profoundly in [24], and the current research follows the direction in the application of integrated thinking [25,26]. “Cartographic sources do not represent past encounter fields in a naive sense, nor are they privileged above other forms of evidence. For the period specialist though, the sustained cross referencing of cartographic sources with other archive material, the exploration of extant built environments, where possible, and the deployment of specialized spatial morphological and urban morphological methods including space syntax analysis [21] and Conzenian town-plan analysis [27], where necessary, enhances the historian’s critical engagement with his or her intuitions about the social patterning of quotidian encounter fields in the past” [25] (p. 106).

Urban structure analysis serves as a key tool for comprehending the identity of a city or its neighborhoods. To this end, the current research employs the space syntax method, which entails analyzing spatial configurations through a two-step process: (1) determining the properties of the space using descriptive techniques, and (2) examining correlations between these properties and social phenomena [28] (pp. 220–221). This approach investigates the spatial manifestation of social patterns, with a particular emphasis on formal architectural characteristics. Urban structures are perceived as graphs of space utilization by society, where street networks, known as simple tissue in urban morphology, manifest traces of human connectivity.

The current research applies methods of street network analysis within the framework of space syntax, including integration and distance. The scope of the analysis can be tailored according to pedestrian, bicycle, or vehicular approaches, with spatial representation conducted either along axial lines, street segments, or within a predetermined distance radius from each segment. Integration serves as a normalized measure quantifying the distance between a given space and the broader system [21]. Notably, distance is conceptualized not in metric terms, but in topological dimensions, as illustrated in axial integration maps. Here, distance refers to the topological distance between elements within the spatial system, represented graphically with spaces denoted as vertices and their connections as edges. The physical boundaries delineating spaces, along with their shapes and interconnections, significantly influence their utilization patterns [28].

In axial integration maps, the degree of integration for each axis is depicted using a color scale, with gradual shifts in color indicating varying levels of integration, where red axes denote the highest integration and dark blue signifies the lowest.

Space Syntax—Pittsburgh Nowadays and the Early 20th Century (Simulation)

The integration analyses for both the current state and for the urban structure of Pittsburgh were completed with the Space Syntax [29] workflow using Space Syntax Toolkit (version 0.3.10) within QGIS (version 3.34) and DepthmapXnet 0.35. The integration measures how integrated a street is to network. The base map (road network) comprised vector layers created from OpenStreetmap. The line layers in both cases, current state (Figure 1) and historic (Figure 2), went through manual “cleaning” (deleting inaccurate lines), and missing lines were added (roads are presented as single lines in the map). The

graph analysis was conducted with an infinite radius to determine the integration value of the road segments [29] in DepthmapX.



Figure 1. Pittsburgh, PA, nowadays—integration map. The degree of integration for each segment line is depicted using a color scale. The red axes denote the highest integration; dark blue signifies the lowest. The levels between the highest and lowest are gradually shifting. Space Syntax analyses by Z. Bereczki, 2023.

The second integration map focuses on the early-20th-century urban structure of the city considering that the analyzed base map (current state) went through significant changes which affected the integration. The second analysis included the original urban structure of the city: inclines (currently only two, Monongahela from 1870 and Duquesne from 1877, are operating; the number of operating inclines at the beginning of the 20th century was about twelve) [30], the urban structure of the neighborhoods that went through revitalization processes (like Allegheny Center), and Shadyside Campus being open to the public (among the others). The early-20th-century map analysis is a simulation: the base map is not a single historic map, but the OpenStreetMap with reversed urban structure changes.



Figure 2. Pittsburgh, PA, at the beginning of the 20th century (simulated situation)—integration map. The degree of integration for each segment line is depicted using a color scale. The red axes denote the highest integration; dark blue signifies the lowest. The levels between the highest and lowest are gradually shifting. Space Syntax analyses by Z. Bereczki, 2023.

2.4. Multi-Faceted Approach as a Tool in the Heritage Urbanism Approach

The heritage urbanism approach was first introduced to the wider public in 2015 at an international conference titled “Cultural Heritage—Possibilities for Spatial and Economic Development.” Among the presenters at the conference was the author of the current research. As for a definition, “Heritage urbanism considers the revitalization and enhancement of cultural heritage in spatial, urban, and landscape contexts, and it explores models for its inclusion in contemporary life. Heritage is not viewed as isolated objects but rather as part of the immediate and wider environment” [1] (p. 2). In the current study, ‘heritage’ is considered tangible: not an isolated urban artifact, but rather an ensemble of buildings and urban structures (urban heritage, by its definition). The ‘wider environment’ is considered as the system of connecting urban elements, with the town itself as the highest structure. The heritage urbanism approach sets three levels, although this study is focused on the first two levels of the approach: 1. Identification: identity factors, factors of effect, and value factors; 2. Criteria: evaluation criteria, enhancement criteria, and criteria for new interventions; 3. Models: revival and enhancement models.

The historic urban landscape approach represents a holistic and interdisciplinary perspective in urban planning. It signifies a new era in urban development by blending territorial and local values, historical layers with contemporary settings, and culture and nature. This approach emphasizes the importance of recognizing and preserving intangible values alongside tangible heritage, while also engaging various urban scales and typologies [30]. Focused primarily on historic cities, the heritage urban landscape approach underscores the vital role of urban and spatial planning in ensuring the survival and future

of heritage. The historic urban landscape is a perspective that regards urban heritage as an integral part of a complex system comprising diverse elements and historical layers, rather than a distinct category of cultural landscape or site type. This perspective emphasizes the interconnectedness of elements (elements of the complex system) as physical or tangible structures, cultural or intangible elements, historical layers (co-presence and derivation), and the connections between different elements and layers within the urban environment. The 2011 Recommendations on the Historic Urban Landscape [31] integrate heritage conservation with urban development plans and processes, viewing urban heritage as a resource for sustainable development and resilience [31].

On the other hand, the heritage urbanism approach acknowledges that the survival and vitality of heritage are intricately linked to urban and spatial planning. It emphasizes the integration of cultural heritage within the broader living space and local community, whether it be a settlement, town, or cultural landscape. This approach is particularly relevant when cultural heritage sites lack a clear purpose or are underutilized. By actively engaging with heritage through meaningful use, its preservation and continued relevance are ensured. This perspective suggests that heritage should not be shielded from people, but rather actively embraced and utilized for the benefit of communities [1].

Garyfalia Palaiologou and Sam Griffiths define the concept of “heritage urbanism syntax” [32]. It is designed to align historical research with modern urban heritage concerns. It delineates three distinct types: (1) conservation areas, (2) street scales, and (3) spatial cultures. These classifications facilitate critical analysis of how this perspective is applied in urban heritage contexts.

The combination of the applied methods (historical stratification, urban morphology, and space syntax) in this way is not a new integrated method, but rather a way to understand the different areas of a town profoundly and how the changes in urban structure and function create a new heritage or identity via the application of the heritage urbanism and heritage urbanism syntax approaches, with the consideration of aspects of the Heritage Urban Landscape Recommendations.

3. Case Study: Pittsburgh (PA, USA)

“Pittsburgh stands out for its site characteristics, rivers, and resource endowment, especially coal; extensive industrialization and massive iron and steel complexes; distinctive history of pollution; attempts at creating a “Renaissance” for the industrial city; and, most recently, sweeping deindustrialization and attempts at redevelopment, which have powerful implications and promise for renewing aspects of the natural environment” [33] (na). Pittsburgh Renaissance, the twenty-year redevelopment program (1946), included various actions to enhance the natural and built environment, including smoke control legislation, new buildings, parks, highways, among others.

Pittsburgh is defined by the two rivers, Monongahela and Allegheny, at the mouth of the Ohio River, located west of the Allegheny Mountains. According to [34,35], when dealing with the (urban and environmental) history of the city, the rather overlapping development periods can be distinguished based on urban, environmental, economic, and industrial aspects: Steel City (1859–1946); Metropolitan Pittsburgh (1870–1920) [36]; and the formation of the current territory of the city with the annexed Allegheny City on the north bank of the Allegheny River (annexed 1907) and smaller towns on the south bank of the Monongahela River (annexed in 1872), nowadays Pittsburgh’s South Side. The period was marked by industrialization, which caused “fragmented urban space” [34] (p. 8), and the early application of urban planning as a result of the 19th century urban reform caused by the World’s Columbian Exposition (1893) and millennial progressivism. “Modernization and rapid urban growth brought a flood of immigrants into the industrial city and its suburban mill towns, differentiating and segregating urban and regional space” [34] (p. 8). Examples of these enclaves will be discussed in the following case studies more profoundly. The seminal era of progressive professional planning was between 1910 and 1940, according to [34]; this period was marked by the prohibition as well (Prohibition era: 1920 to 1933), and

in 1936, Pittsburgh suffered the worst flood in its history [37], marking further development directions [33,38]. “Once the outlines of the industrial metropolis had been established by World War I and many riverfront sites built up, new residential, commercial, and industrial developments from the 1920s to the 1970s most often sought available series served by railroad, and increasingly motor vehicles, which were not oriented toward the rivers” [35] (na). The city’s industrial base continued to expand in the post-war era, leading to the establishment of the urban renewal program known as Renaissance I (1946–1973). The Housing Act of 1949 was introduced during this time, aiming to revitalize American cities through urban redevelopment (urban renewal) [39], and the aforementioned Pittsburgh History and Landmarks Foundation was founded in Manchester (today a historic district on the North Side of Pittsburgh) in 1964.

By 1970, Renaissance I had reached its culmination with the completion the US Steel Tower and Three Rivers Stadium. In 1974, the transformation of Pittsburgh’s urban space was further highlighted with the completion of Point State Park, including the installation of a fountain at the tip of the Golden Triangle. During the ‘Reinvention’ (1973–present), Pittsburgh underwent a significant transformation marked by the collapse of the steel industry. Beginning in the late 1970s and early 1980s, the once-dominant steel industry in Pittsburgh began to decline rapidly, mirroring the broader trend of deindustrialization across the United States. This decline was exacerbated by economic downturns, such as the recession of 1981–1982. As a result, Pittsburgh’s economy underwent a profound shift away from heavy industry towards a more diversified economic base and the city began to focus on more diverse economy sectors, including services and higher education. The higher education institutes in the current study are seen as the new “users” of urban heritage.

3.1. Historic Districts: Allegheny West, Allegheny Commons Park, Deutschtown, Manchester, Mexican War Streets

The historic districts—Allegheny West, Allegheny Commons Park, Deutschtown, Manchester, Mexican War Streets—are situated on Pittsburgh’s North Side (originally the independent municipality of Allegheny City), on the north bank of the Allegheny River. A frontier surveyor, David Redick, surveyed the town in 1788 [8] (p. 2), and Franklin Toker states the following: “The urban grafting worked surprisingly well, however, and the basic square-doughnut shape of Redick’s town can still be made out. The central square carries institutional buildings as Redick planned, among them the Children’s Museum (Figure 3) and a Carnegie Library” [2] (p. 83).

The historic district of Manchester was the pioneering historic district among the others and influenced the protection and preservation of the urban fabric of the neighborhood. The Pittsburgh History and Landmarks Foundation, founded in 1964, significantly influenced the preservation of Manchester’s historic homes. A 1970 study led to the Urban Redevelopment Authority’s recommendation to reallocate federal funds for the rehabilitation of 1407 housing units, a pioneering effort in the U.S. Recognized for its preservation achievements since 1978, Manchester’s experience also inspired the National Trust for Historic Preservation in the 1980s to focus on citizens’ rights in determining their neighborhoods’ futures [40] (p. 184).

In order to understand the formation and preservation of urban heritage through urban landscape transformation, we used a multilayered approach [41] to analyze the urban palimpsests and urban morphology of the historic districts of Mexican War Streets, Allegheny West (Figure 4), Allegheny Commons Park (Figure 5), Deutschtown, and the former Diamond Square (Figure 6) and its surroundings (Allegheny Center).



Figure 3. Children's Museum of Pittsburgh, former Allegheny City Post Office. Built between 1894 and 1897 by architect William Martin Aiken. The new addition (2000–2004, König Eizenberg Architecture and Perking Eastman) linked the former Post Office and the Buhl Planetarium (1939, Ingham & Boyd) and formed the Children's Museum of Pittsburgh of today. Photo by É. Lovra, 2023.



Figure 4. Beech Avenue, Allegheny West (city-designated historic district). In the background is the Calvary United Methodist Church (1892–1895, Vrydaugh and Shepherd, with T. B. Wolfe architects). Photo by É. Lovra, 2023.

Since the 1950s, the area has undergone significant transformation due to the revitalization of Allegheny Center. However, it is here that the city's historic districts are concentrated. Once characterized by a built environment similar to the designated neighboring historic district, Allegheny Center now features the Allegheny Center Mall (Nova Place) and various public buildings, including the Children's Museum. Deeter & Ritchey designed the revitalization plan and the modern center [42].



Figure 5. Allegheny Commons Park (city-designated historic district). The building in the background, the Allegheny General Hospital (1928–1930, York & Sawyer architects), is a national landmark. Photo by É. Lovra, 2023.



Figure 6. One of the Diamond Square Market houses, Pittsburgh, PA, Rutan & Russell architects. Photograph from 1916. Retrieved from the Library of Congress, www.loc.gov/item/2006686205/, accessed on 14 September 2024.

“The center included office buildings, mid-rise apartment slabs, townhouses, and a shopping mall with 2400 parking spaces below. Deeter Ritchey Sippel master planned and designed much of the project. Tasso Katselas added townhouses along the edge (Allegheny Commons East), and the Office of Mies van der Rohe designed an office building (East Commons Professional Building). An international competition chose the design of William Breger, a former employee of Walter Gropius, for the Public Square at the Center’s new heart” [42].

Despite initial success, the complex struggled, as its design isolated it from the surrounding neighborhoods. While the housing remains popular, the commercial space failed, with stores replaced by offices. In 1963, an international competition led to William Breger’s design of the public square, but it was later replaced by Buhl Community Park (design by Andrea Cochran Landscape Architecture) in 2007 due to neglect [42].

3.1.1. Urban Palimpsest Concept

The concept of the “urban palimpsest” in urban morphology refers to the layering of historical changes within the urban landscape. This can be illustrated by the urban revitalization and urban heritage protection processes of an area. This concept illustrates how different periods leave distinct marks on the built environment, contributing to a continuous process of transformation. As cities evolve, their physical forms reflect the influence of various historical eras, with each new phase altering or building upon existing structures [12]. Much like a palimpsest, where earlier writings are partially erased but still have some traces, urban landscapes are continuously reshaped by successive developments [43].

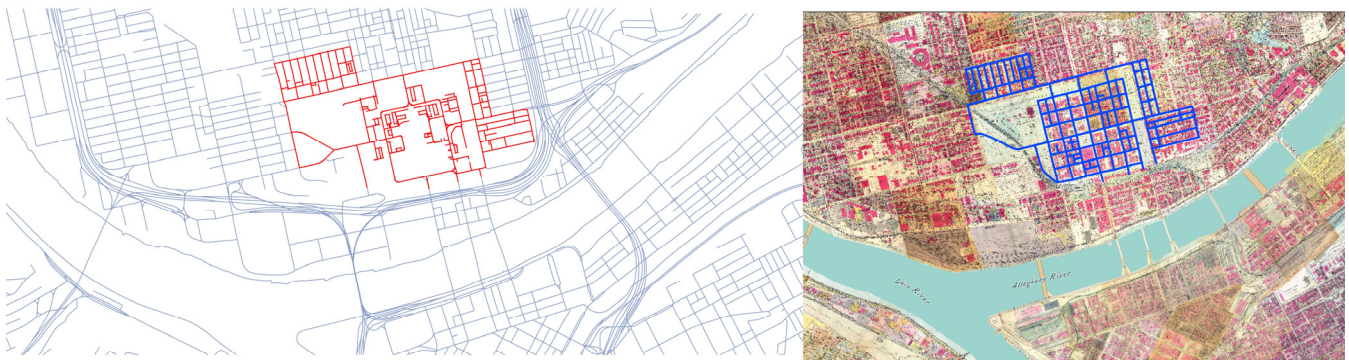
While the urban palimpsest primarily serves as a descriptive concept to explain the temporal layering of urban forms, functions, and patterns, it also captures how traces of earlier urban layers remain visible beneath more recent ones. In this paper, we aim to develop a robust analytical tool by integrating both urban morphology and the urban palimpsest concept. Using a multilevel diagram, which is conceptualized by Karl Kropf [44] (p. 50) [15] (p. 41), we reveal how cities evolve spatially and temporally, capturing the complex interactions between historical processes (temporal) and spatial structures (urban form) across multiple scales. These diagrams offer a powerful method for understanding the space–time relationship, as they allow us to trace how each spatial layer (buildings, streets, blocks, neighborhoods, cities) transforms over time, integrating both spatial hierarchies and temporal stratifications into a coherent scientific framework.

The application of the multilayered model involves three steps (Figure 7). The first step involves temporal layering, i.e., overlapping maps where historical changes are significant, and the transformation of previously established urban forms is inscribed and integrated with newer urban developments within the urban landscape. This temporal layering enables a diachronic analysis (spatiotemporal layering), which is crucial for analyzing structural and historical transformations and continuities. In the case of the selected site, maps from the 1920s serve as reference points to identify the urban heritage and unique natural environment of the heritage districts in Pittsburgh (PA, USA). A contemporary map is used to compare the transformation of the urban landscape, including both natural and built environments, and the integration of bridges and structures with older urban layers while shaping the new urban fabric. These two maps are georeferenced in QGIS [45] to apply the layering principle and enable accurate comparison between the different levels.

Urban morphology is inherently characterized in multiple spatial scales and organized in a spatial hierarchy [46] that includes individual buildings, blocks, streets, urban tissues, neighborhoods, and cities. These spatial structures at different scales are configured in response to historical processes and are subject to temporal layering. Each spatial scale has unique properties embedded within it, corresponding to a particular historical period.

The spatiotemporal layering step (Step 2 in the figure) provides the model characteristics of each layer, showing how earlier and later time steps are interrelated and capturing the unique characteristics of different variables. Each level reveals distinct structural and functional configurations, yet these levels are interconnected. Between the layers, the configurations of buildings, blocks, and streets are the most interlocking variables [15], interacting coherently with co-extensive elements, such as open spaces and street networks. As transformations at one level propagate through to higher levels, changes affect the entire spatial hierarchy. For this purpose, we identified four resolution levels: streets (1), blocks (2), buildings (3), and green spaces (4). The layers in the 1921 map underwent a digitization process to convert the data into a shapefile, while the levels in the contemporary data were sourced from the Pennsylvania Spatial Data Access (PASDA) database [47].

(1) TEMPORAL LAYERING
(map of 1921 and current)



Current - Pennsylvania Spatial Data Access (PASDA)
Allegheny County | Pittsburgh PA

1921 - ESRI | Historic Pittsburgh <http://digital.library.pitt.edu/maps>.
Allegheny County | Pittsburgh PA

(2) SPATIOTEMPORAL LAYERING
(time and variable embeddings)

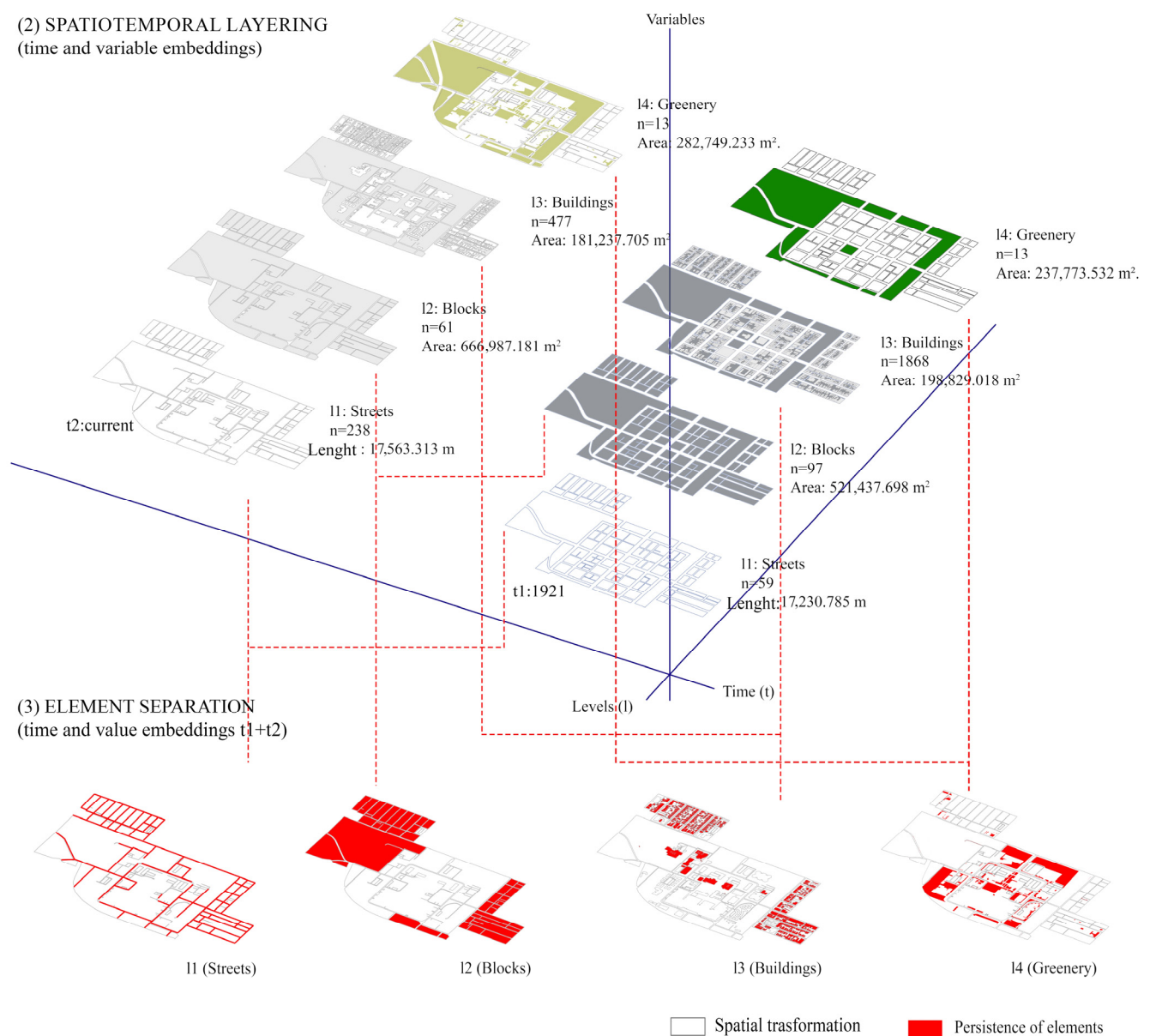


Figure 7. A three-step methodological framework for analyzing urban palimpsests and urban morphology by examining historical stratification. Analysis by E. Sarihan, 2024.

The configuration of these elements (their position within the overall structure) demonstrates a wide range of structural and geometrical variations in the urban landscape over time. The time and value embedding analysis (Step 3 in the diagram) integrates numerical data (values) and their positions within the temporal context, capturing how different spatial transformations and persistent features evolve over time. To evaluate the changes at each step, we integrated GIS methods with statistical analysis.

3.1.2. Urban Palimpsest Concept—Discussion and Conclusion

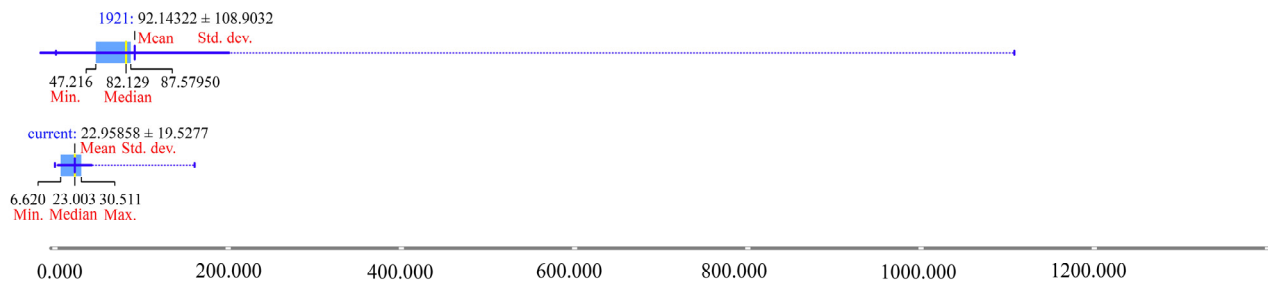
The integration of the urban palimpsest approach with urban morphology provides valuable insight into the transformation of the urban landscape by focusing on its spatial and temporal dimensions, as well as its spatial scales. Moreover, the configurational properties of spatial levels and their measurable variables clarify changes in urban form, enhancing the understanding of structural transformations between the periods. The resulting spatiotemporal layering of different spatial scales—such as streets, blocks, buildings, and green spaces—across different periods reveals significant differentiation (Figure 8).

Our findings demonstrate that changes in configurational parameters are closely related to significant transformations in blocks, which facilitate the emergence of new urban patterns and guide new directions in urban development.

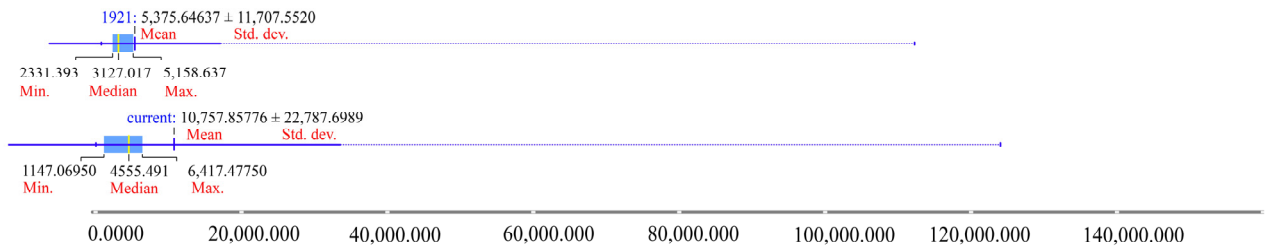
The standard deviation of block areas in the current state has increased significantly compared to 1921, and the distribution of block sizes demonstrates a wider range, with larger values in the current state. Visual analyses further confirm that the centers of these blocks are undergoing extensive urban transformation. This variation is linked to differences between areas: while some areas, focused on transformation, have grown significantly, others, with persistent block structures, have remained relatively preserved since 1921. These changes have contributed to alterations in the external loads on blocks (streets) and the urban fabric, influencing the syntactic transformation of the street network hierarchy within the heritage site. Streets surrounding the centrally transformed area are designated as more accessible roads for vehicles, generally serving as parking lot roads. This primarily aims to enhance the configurational properties of the heritage site by optimizing both pedestrian and parking traffic volumes. Undoubtedly, changes in block structures within the urban area are also related to modifications in the internal layout of the blocks in their current state, providing insight into how these transformations impact the internal loads on the blocks. Analyzing these changes reveals that transformed blocks with larger values often experience significant alterations. Most buildings within these blocks have been demolished, with the blocks being combined to create mega blocks. This has imposed substantial constraints on the urban landscape, influencing the cultural evolutionary process and often leading to gentrification in these areas. Additionally, the transformation of building levels has affected the number of green spaces in the current period. This shift demonstrates a trend toward the increased use of blocks for green areas. However, the average size of green spaces has decreased dramatically compared to 1921, indicating a trend toward smaller green areas, likely due to the densification of spaces, which has resulted in more fragmented green areas.

In conclusion, our results prove that combining historical stratification principles and urban morphology plays a crucial role in defining heritage patterns, which in turn influences the shaping of future urban landscapes.

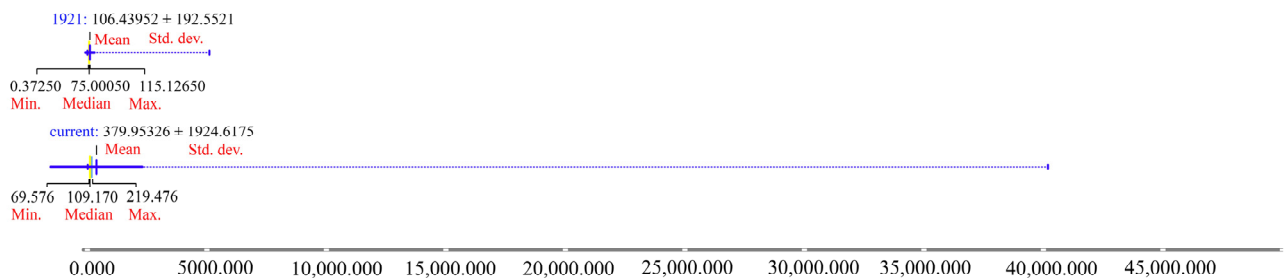
STREET LENGTHS



BLOCKS AREA



BUILDINGS AREA



GREENERY

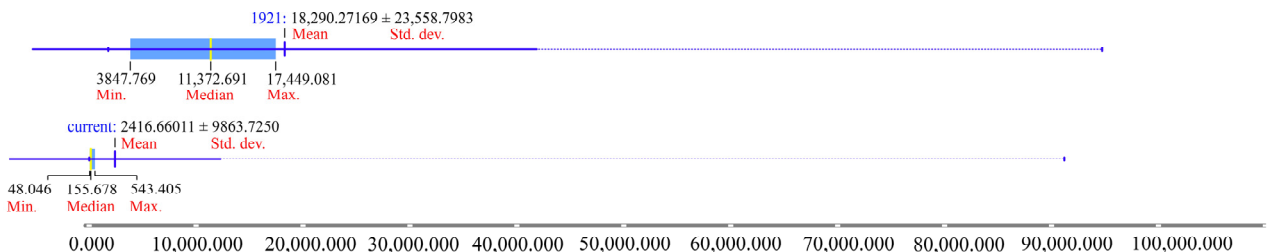


Figure 8. The changes in the distributions of the variables between t1 (1921) and t2 (current). Analysis by E. Sarihan, 2024.

3.2. Shadyside Campus of Chatham University

Chatham University Shadyside Campus used to be part of Woodland Road; in the period of foundation (1869), the university (then college) was situated in the Berry Mansion, Woodland Road, Shadyside neighborhood. The territory is between 5th Avenue, Woodland Road, Wilkins Avenue, and Murray Hill Avenue, and the campus also includes 115 and 126 Woodland Road. Today, it is composed of buildings and lands of former private mansions (including notable personalities from the city, such as Andrew Mellon and Edward Stanton Fickes), and was designated an arboretum in 1998. The area used to be an openly approachable area (streets), with private mansions arising from the second half of the 19th century and during the 20th century. There is a park-like environment nestled within a residential area that stretches across the sloping hills that bridge Squirrel Hill and Shadyside along Fifth Avenue.

The latest institutional master plan of the campus was approved in 2021 [48]. The campus is predominately zoned RM-M (Multi-Unit Residential, Moderate Density), with some R1D-VL (Single-Unit Detached Residential, Very Low Density) sites. The new master plan for the district discusses its perimeter. “The 10-year development envelope builds upon the existing conditions found on the Shadyside Campus and includes both visionary and pragmatic principles and guidelines which support measured growth while allowing flexibility for development in response to campus needs” [48] (p. 39).

Some of the buildings of the territory, including both sides of Woodland Road, are part of the universal architectural history of the 20th century as well, e.g., Alan I. W. Frank House (1939–1940) (Figure 9), designed by Walter Gropius and Marcell Breuer (96 East Woodland Road) [49]. The building is located outside the campus, but the only road (Woodland Road) that connects it to the city leads through the campus. About the building, Barry Bergdoll states the following: “In Pittsburgh they realized their masterpiece of the integration of architecture, furnishings, and landscape” [50].



Figure 9. Photo of Alan I. W. Frank house (1939–1940, Walter Gropius and Marcell Breuer, architects). Photo by É. Lovra, 2023.

The other 20th century masterpiece in the neighborhood is 118A Woodland Road, The Abrams House (Venturi House), designed by Robert Venturi in 1979–1982 [2] (pp. 144–145). The building was nominated as an Individual City Historic Landmark in 2018, but the house was demolished in 2022. As the nomination states, “The Abrams House was the first Postmodern building in Pittsburgh and, as such, represents a unique example of a building style in Pittsburgh. Postmodernism was championed by Robert Venturi” [51].

In the neighborhood, in addition to 118 Woodland Road, there is another architectural masterpiece from the late 1970s in the vicinity of the demolished Venturi House. The Frank A. Giovannitti House (Figure 10), located near Chatham University and designed by architect Richard Meier, was built from 1979 to 1983.

In addition to these 20th century architectural masterpieces, Franklin Toker [2] lists 19th-century buildings “Ranging in style from Tudor and Gothic Revival to Colonial Revival and Shingle style, they are testimony to the sumptuousness of the era” [2] (p. 142).

The closest city-designated historic district is Murray Hill Avenue, which is the next road. The neighborhood is not among the historic districts of Pittsburgh, but some of the individual houses are protected as Individual City Historic Landmarks. Changes in spatial communication and the transformation of the functional syntax and spatial syntax of the area are examined to show that, besides the built environment of individual buildings and artifacts, urban structure—with its spatial changes—can also act as heritage.



Figure 10. Frank A. Giovannitti House (1979–1983, Richard Meier, architect). Photo by É. Lovra, 2023.

3.2.1. Space Syntax—Shadyside Campus and the Surrounding Area

In order to understand the integration differences between the two states of Shadyside Campus (Figure 11), we had to conduct Space Syntax analyses for the entire city of Pittsburgh.



Figure 11. The area of the current Shadyside Campus at the beginning of the 20th century (simulation)—integration map (**left**). Shadyside Campus, PA, nowadays—integration map (**right**). The degree of integration for each segment line is depicted using a color scale. The red axes denote the highest integration; green signifies the lowest. The levels between the highest and lowest are gradually shifting. Space Syntax analyses by Z. Bereczki, 2023.

A comparative analysis of Pittsburgh’s simulated early-20th-century spatial structure and its current state using Space Syntax (Space Syntax Toolkit (version 0.3.10) within QGIS (version 3.34) and DepthmapXnet 0.35) reveals both commonalities and significant changes in the spatial configuration of the urban environment. OpenStreetMap data, which only include public roads, were used for the contemporary analysis. The left-hand map shows that the exclusion of the privately owned Shadyside Campus led to a dramatic increase in road integration in the surrounding area, reaching maximum values (red, orange). In contrast, the right-hand map, representing the earlier period, exhibits a more harmonious distribution of road connections (from green to yellow). The current map does not depict the internal road network of the Shadyside Campus, as these are now private, non-public roads. Consequently, the level of spatial integration between the university campus and its surroundings has been altered. The concept of integration is employed in the spatial

analysis to understand the degree to which the university campus is connected to the rest of the city.

3.2.2. Space Syntax and Urban Morphology—Discussion and Concept

Chatham University Shadyside Campus and its surroundings offer a unique example within the city of a place that, while undergoing transformation, also exemplifies the permanence of spatial, urban, and architectural heritage. This case serves as a model for a multifaceted approach that combines the methods of heritage urbanism and historic urban landscape.

This example focuses on transformation: an open area has become a closed university campus. However, this means that the building and its environment remain, with no change in ownership. A unique urban heritage has emerged that is partly conserved (like a ‘museum’) but is also in active use. The phenomenon ‘museum’ refers to Aldo Rossi’s explanation that “In this respect, permanences present two aspects: on the one hand, they can be considered as propelling elements; on the other, as pathological elements. Artifacts either enable us to understand the city in its totality, or they appear as a series of isolated elements that we can link only tenuously to an urban system” [52] (p. 59). Woodland Road and its surroundings represent a duality, considering the buildings constructed in the 1970s and 1980s, as well as the open system where the architectural elements (artifacts) were “propelling elements” together in the open street system. In the 21st century, however, the campus’s architectural elements have become “pathological elements,” but with active use and in conjunction with the street network. Outside the campus, the “propelling elements” remain with buildings designed by Breuer–Gropius and Meier. This also means that the street network might be in transformation, and buildings of significant architectural value, such as the Venturi building, are being demolished.

“(. . .) a historical or propelling permanence as a form of a past that we still experience and a pathological permanence as some thing that is isolated and aberrant. In large measure the pathological form is identifiable because of a particular context, since context itself can be seen either as the persistence of a function over time or as something isolated from the urban structure, that is, as something which stands outside of technological and social evolution” [52] (p. 60).

The campus is an example of the heritage urbanism approach, which considers not only the enclosed area, but also its surroundings, including the urban tissue (roads, plots, and built and natural environment) and the adjacent historic district.

3.3. *Traditional Neighborhood: Troy Hill*

Troy Hill, a traditional neighborhood, offers a compelling study of the interplay between human agency and the natural environment. Established by successive waves of immigrants, the neighborhood’s built environment is characterized by a rigid American grid system overlaid on a more undulating natural landscape. The urban tissue, including the network of streets and the relationship to neighboring areas, forms Troy Hill’s urban heritage. While the neighborhood has evolved over time, adapting to changing demographics and societal needs, it has retained a cohesive visual identity that reflects its historical development which was shaped by a confluence of factors, including real estate investments, infrastructure improvements, and the influx of diverse immigrant communities.

“Allegheny and the North Side had distinctive neighborhoods. Troy Hill had the atmosphere of a German village while the East North Side, or Deutschtown, grew to have its own thriving commercial center” [53] (p. 362). Deutschtown was recognized by the city as a designated historic district, and the buildings on the hilltop of Troy Hill have great continuity with the adjacent neighborhood of the mentioned Deutschtown in East Allegheny. The Troy Hill district also includes Herr’s Island—redeveloped in the 1990s into upscale housing, parkland, and office space—and the former industrial area on the river flats owned by H. J. Heinz Company Factories (Heinz Lofts from 2003 to 2005) (Figure 12)

and Penn Brewery (Eberhardt and Ober Brewery Company) from the late 19th century [2] (pp. 102–103), both comprising National Register historic districts.



Figure 12. H. J. Heinz Company Factories (currently Heinz Lofts)—view from East Ohio Street. The early-20th-century buildings were converted to housing units between 2003 and 2005 (r). Photo by É. Lovra, 2023.

Troy Hill, initially established as the village of New Troy in 1833, underwent significant transformation in the late 19th century due to real-estate investments and infrastructure development. “In 1887, an incline was constructed on Troy Hill, part of a pattern of development of a «unique hillside system of steps and funicular railways» which sought to conquer the challenges of Pittsburgh’s—and Allegheny’s—steep terrain (Cultural Heritage Plan, «Industrial Period: 1850–1940»). The 370-foot incline opened Troy Hill to more rapid residential development by making the hilltop more accessible for workers and families seeking to move away from the more industrialized flats. The Troy Hill incline operated until 1898” [5] (pp. 13–14). While German immigrants formed the dominant cultural group, Troy Hill also attracted individuals from various other ethnic backgrounds, including Scots, Irish, Croatians, Bohemians, Slovaks, Ukrainians, Greeks, and Carpatho-Russians. These diverse communities established religious institutions. The western sector of Troy Hill, known as ‘Bohemian Hill’, was primarily populated by Czech immigrants in the late 19th and early 20th centuries. At the end of the 19th century, the German newcomers, besides their businesses, also created a cultural hub with various sacral and secular buildings and associations. Giving importance to the local community in the shaping of Troy Hill, it can be concluded that the German and Czech immigrants had the greatest impact on the townscape of the district. The frame houses of the Croatian settlers built on the hillside, together with the manufacturers, disappeared due to flooding and the construction and widening of Route 28 (the St. Nicholas North Side Roman Catholic Church was demolished in 2013) [5]. Troy Hill architecture is dominated by brick and frame-row houses still today. The indirect architectural impact of the immigrant communities can be seen on some of the sacral buildings (the demolished Croatian Roman Catholic Church dedicated to St. Nicolas), but to a lesser extent in the case of secular ones.

The current case study is the traditional neighborhood (hilltop) of Troy Hill in relation to the “Architectural Inventory for the City of Pittsburgh, Allegheny County, Pennsylvania. Planning Sector 1: Troy Hill. Report of Findings and Recommendations” [5]. Based on the report, there are forty-two buildings which are “Listed, Determined Eligible, and Potentially Individually Eligible Resources” [5] (pp. 46–56). Among these, are ten which are determined to be eligible as national-register-listed, national register districts, or city historic landmarks. The following section will evaluate the buildings and ensembles according to micro-urbanism and their spatial context.

“The City’s Cultural Heritage Plan notes, «The greatest opportunities for historic preservation in Sector 1 occur in Troy Hill (Figure 13) . . . particularly along Lowrie Street and Voskamp Street [n.b. Voskamp Street is actually in Spring Garden] where late 1800s

homes and churches with impressive architecture strongly contribute to the character of the neighborhood». There is one City-designated Historic Landmark in Troy Hill, the Shrine of St. Anthony of Padua (1700 Harpster Street), and two National Register listed historic districts: the H. J. Heinz Plant and Eberhardt and Ober Brewery” [5] (p. 18).

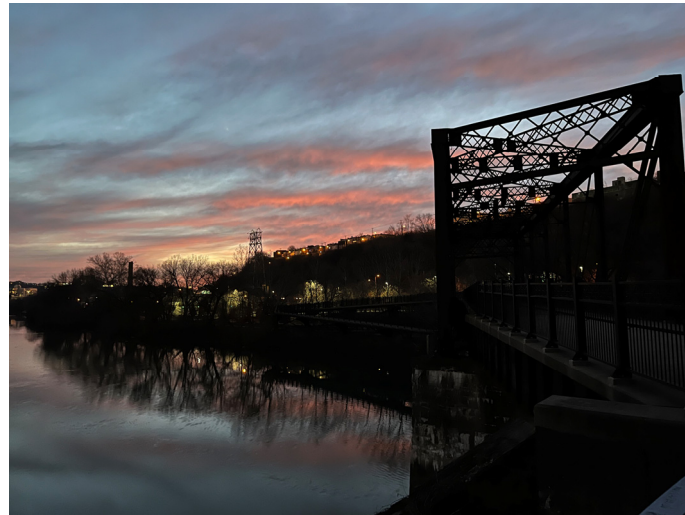


Figure 13. Troy Hill—Washington Landing/Herr’s Island Bridge and Troy Hill hilltop in the background. Along the bridge is the Three River Heritage Trail. Photo by É. Lovra, 2023.

Micro-Urbanism and Spatial Context

Based on [5], the boundaries of the ‘Potential Troy Hill National Registered Historic District’ were set [5], as shown in Appendix b. According to the integrated urban morphological method, the urban tissue type of the area could be determined. (a) Urban tissue is characterized by regular gridiron street networks that enclose regular blocks. The shapes of the blocks are elongated, regular, rectangular, and separated into two parts (yard and garden), with developments in unbroken rows comprising one- or two-story buildings. (b) Regular street networks with grid-like dynamics (oblong grid: gridiron system). The plots blocks are regular, and divided into two or three sections. A building (residential use) is located in the first section; its façade is tightly placed on the street line in an unbroken row of buildings. The development method is equivalent in the plot series: similar layout shape (rectangular central core with one or two extending elements); behind the residential building (multi-dwelling unit), there is a courtyard, an open (green) area/backyard, or a communal courtyard garden. The potentially eligible ensembles for built heritage protection are mostly residential buildings along Harpster Street, Haslage Avenue, Hatteras Street, and Lowrie Street, with religious and public buildings. The other streets accommodate only single buildings. Lowrie Street is the longest street traversing the hilltop of the Troy Hill. The buildings are listed in [5]: Ober-Guehl House (No. 1501) from c. 1885; Adam Reinemann House (No. 1515–1517) from c. 1877; First Adam Reinemann House (No. 1525–1527) from 1864; store and apartments buildings (No. 1800) from 1880; and an array of other houses (No. 1347 from c. 1885; No. 1511 from c. 1880; No. 1531 from c. 1870; No. 1533 from c. 1870; and No. 1829 from c. 1880).

The hillside neighborhood of Troy Hill has historically maintained a degree of isolation from the surrounding urban fabric. While a short-lived incline connected the hilltop to the city below in the late 19th century, stimulating development, the area’s spatial integration has remained relatively unchanged.

A space syntax analysis (Figure 14) reveals that Troy Hill’s connectivity to the broader urban network remains limited. The area’s integration map, characterized by a gradual shift from yellow to green lines, indicates a lower degree of integration; it indicates that the area remains isolated, as integration in space syntax reveals how well a space fits into the urban structure and how easily the area connects with the rest of the environment.

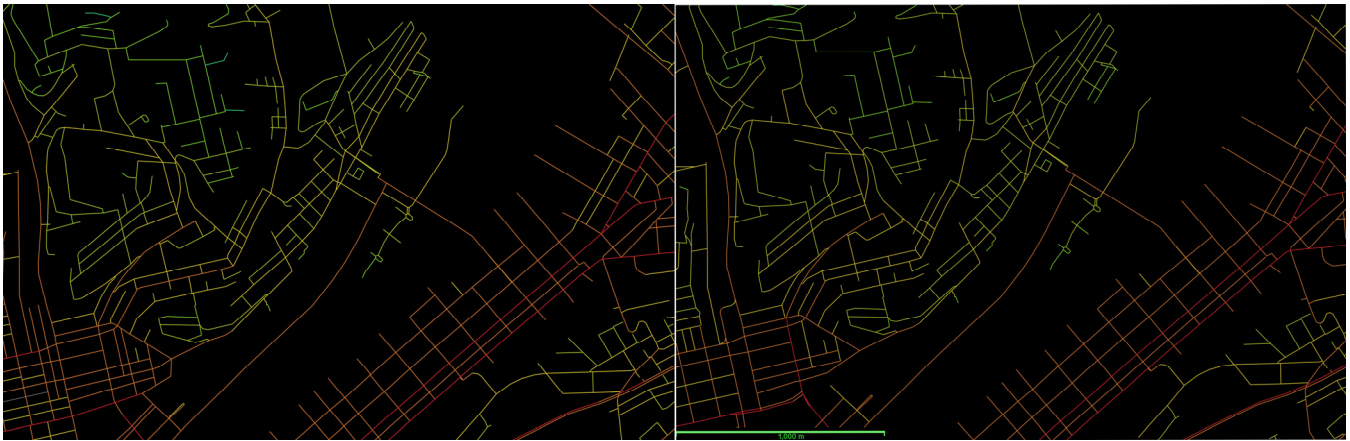


Figure 14. The area of Troy Hill, Allegheny River, and the Strip District at the beginning of the 20th century (simulation)—integration map (**left**). Nowadays—integration map (**right**). The degree of integration for each segment line is depicted using a color scale. The red axes denote the highest integration; green signifies the lowest. The levels between the highest and lowest are gradually shifting. Space Syntax analyses by Z. Bereczki, 2023.

The comparison of the current state and a simulated early 20th-century scenario (simulated map) underscores the enduring nature of Troy Hill's spatial configuration. The persistence of this pattern over time highlights the significance of the urban fabric, including the street network, as a component of the area's urban heritage. Understanding these spatial dynamics (stagnation), it can be concluded that not only is the built environment part of the urban heritage of Troy Hill hilltop, but so is the urban fabric/street network.

The concept of identity is central to the analysis, and it is rooted in visual perception. Beyond this, we argue that a city's identity is primarily shaped by its urban tissue—the intricate interplay of built forms and spaces. The urban tissue of Troy Hill hilltop is a combination of the cityscape, the built environment, and the natural environment. The morphology of the terrain of the street network is regular, almost grid-like. While there is a degree of universalism in the urban landscape of the area (based on the revival architectural styles and the use of building materials) and recurring micro-urbanism patterns, the harmonious interaction between the inherited built environment and contemporary interventions is key factor in maintaining the continuity of urban heritage in the neighborhood. This balance depends on the relationship between the rhythm of traditional (listed in [5]) and contemporary constructions, guided by vertical or horizontal articulations. This interpretation of identity is significant in Troy Hill hilltop because it allows us to see micro-urbanism not only as a reflection of industrial heritage, the role of immigrants in the shaping the built environment, and a specific era, mainly the second part of the 19th century, but also as a tool for shaping contemporary design decisions (the designated historic districts have Historic District Design Guidelines). Rather than replicating the past, we can achieve harmonious infill or rehabilitation by understanding the underlying structural and façade dynamics.

4. Discussion

Heritage urbanism is a concept that focuses on revitalizing and enhancing cultural heritage within spatial, urban, and landscape contexts. This approach is particularly relevant when cultural heritage sites lack clear purposes or are underutilized. By actively engaging with heritage through meaningful use, its preservation and ongoing relevance can be ensured. This perspective advocates for embracing heritage and utilizing it for the benefit of communities, rather than isolating it.

The historic urban landscape perspective views urban heritage as an integral part of a complex system comprising diverse elements and historical layers, rather than as a distinct category of a cultural landscape or site type. This perspective emphasizes the

interconnectedness of physical or tangible structures, cultural or intangible elements, and historical layers within the urban environment.

On the North Side of Pittsburgh (Allegheny West and the surrounding areas), the integration of the urban palimpsest approach with urban morphology provided valuable insights into the transformation of the urban landscape, focusing on its spatial and temporal dimensions, as well as its spatial scales. This approach facilitated an understanding of the structural transformations resulting in new directions of urban development. These heritage patterns, in turn, highlight the development periods of the town. The spatiotemporal layering of different spatial elements—such as streets, blocks, buildings, and green spaces—across different periods revealed significant differentiation, and changes in configurational parameters are closely linked to significant transformations in blocks, facilitating the emergence of new urban patterns and shaping future urban landscapes.

Chatham University Shadyside Campus and its surroundings offer a unique example within the city of a place that, while undergoing transformation, also exemplifies the permanence of spatial, urban, and architectural heritage. This case serves as a model for a multifaceted approach combining the methods of heritage urbanism and the historic urban landscape. The transformation of the open area into a private university campus resulted in the preservation of the buildings and the environment. In the 21st century, a unique urban heritage has emerged: the campus's built environment has been preserved, although it is still actively used in conjunction with the street network. The campus exemplifies the heritage urbanism approach, considering not only the enclosed area, but also its surroundings, including the urban fabric (roads, plots, and built and natural environment) and the adjacent historic district.

The urban fabric of the Troy Hill hilltop is a combination of the cityscape, the built environment, and the natural environment, with a regular street network. The revival architectural styles found here and the use of building materials have created a homogeneous urban landscape with micro-urbanism patterns. A harmonious interaction between the inherited built environment and contemporary interventions is key to maintaining the continuity of the neighborhood's urban heritage.

"Urban heritage cannot be narrowed down to individual buildings or monuments of historic interest, nor can it be interpreted simply as a totality of built parts. Urban heritage exists in the physical attributes of buildings, public spaces and urban morphology" [54] (p. 13).

Combining the applied methods (historical stratification/urban palimpsest, urban morphology/micro-urbanism, and space syntax) creates an effective tool for gaining a deep understanding of different areas of a city and how changes in urban structure and function have created new concepts of heritage or identity.

5. Conclusions

The current research has explored the application of various approaches to understanding and managing urban heritage, including heritage urbanism, historic urban landscape, and urban morphology with a focus on micro-urbanism. The complex relationship between historical stratification (urban palimpsest concept), urban form, and the evolution of urban heritage can be seen in the selected case studies from Pittsburgh (PA, USA).

"The combination of preservation and adaptive reuse is not just the best way forward for our cities. It is in many ways the *only* way forward" [55] (p. 258).

The integration of the urban palimpsest concept and urban morphology provides a comprehensive understanding of the evolving urban landscape of Allegheny City and the stagnating historic districts in the vicinity. By examining the spatial and temporal dimensions of urban transformation, we have identified significant changes in block structures, street networks, and green spaces. While the increased use of blocks for green spaces is a positive development, the reduction in average green space size highlights the need for careful planning to ensure adequate public green areas. The significance of considering historical context by understanding the underlying heritage patterns, as well as urban

morphology when evaluating and guiding urban change, has been proven using the case study of Allegheny City and the city-designated historic districts in the neighborhood.

The case study of Chatham University Shadyside Campus in Pittsburgh exemplifies the ongoing transformation of urban landscapes. The campus embodies the principles of heritage urbanism by integrating both historic preservation and active use within the broader urban fabric. While some elements of the campus have become “pathological”, in Aldo Rossi’s terminology (isolated from the evolving urban system), others remain “propelling” forces, shaping the contemporary streetscape. This example highlights the importance of considering both the enclosed heritage site and its surrounding environment, including the street network, existing buildings, and natural environment.

The case study of the traditional neighborhood on the hilltop of Troy Hill shows the importance of evaluating the temporal evolution of the urban environment and micro-urbanism in understanding and preserving urban heritage, particularly in traditional urban spaces. Micro-urbanism, as a subfield of urban morphology, examines urban tissue types, built environments, and spatial arrangements, which is essential for assessing both historical continuity to understand underlying typologies and contemporary transformation with respect of existing heritage patterns. In Troy Hill, historical, architectural, and social elements are deeply embedded in the urban tissue, acknowledged in the historical and structural layers. These layers (urban palimpsest) have to be preserved by the revitalization of significant buildings and ensembles, as we have seen in the case of the Heinz Lofts. The adaptive reuse of historic buildings demonstrates how urban regeneration can coexist with heritage preservation.

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