

Article

Building Categorization Strategy Guidance in the Historic Area Renovation Process

Sisi Xia ^{1,*} , Bomin Liu ^{1,2} and Haobing Wang ³

¹ School of Architecture, Southeast University, Nanjing 210096, China; bmlu@126.com

² Nanjing Urban Planning & Design Institute of SEU, Nanjing 210005, China

³ School of Civil Engineering and Architecture, Jiangsu University of Science and Technology, Zhenjiang 212100, China; 202300000202@just.edu.cn

* Correspondence: seu_xiasisi@outlook.com

Abstract: Under the fast development of city economy and environment, building heritage helps to preserve the cultural identity and history of a place and its people, providing a sense of connection to the past. Historic area renovation is a multifaceted endeavor, combining aspects of culture, architecture, economics, and community engagement. After the outbreak of the COVID-19 epidemic in 2020, three new challenges have been faced by historic area regeneration. First, if the renovation has not been implemented yet, how should building attribute types be classified at the very beginning? Second, if the renovation has stopped due to the epidemic, how should the process be restarted and how should accurate suggestions be given based on previous implementation? Third, when the historic area contains a variety of different styles of buildings, how should the stage of conservation renovation be judged and how should overall guidelines on area conservation be given? A dynamic methodological approach based on the management of three-dimensional information has been proposed by our research team to help monitor changes in building attributes during implementation. A case study was analyzed using the proposed model but paying attention to new aspects of model application. By comparing the buildings represented in three historic areas of Taizhou Old City, buildings before renovation often face problems more on a material level. During the process of renovation, it is necessary to pay more attention to the spiritual level of building problems. Renovation guided by a different subject would lead to different problems in the update process. It is also important to categorize guides based on the proportion of different building types and the prominent conflicts in the area.

Keywords: building categorization strategy guidance; historic area; renovation process; dynamic evaluation



Citation: Xia, S.; Liu, B.; Wang, H. Building Categorization Strategy Guidance in the Historic Area Renovation Process. *Sustainability* **2024**, *16*, 1576. <https://doi.org/10.3390/su16041576>

Academic Editor: Asterios Bakolas

Received: 19 January 2024

Revised: 8 February 2024

Accepted: 9 February 2024

Published: 13 February 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Historic area renovation is an eternal topic in urban development. It helps to activate new urban vitality while inheriting the city's history and culture. The historic area, as a section containing a city's historically important historical buildings, undertakes the majority of protection by, and dissemination of the history among, generations of the urban population [1]. Most of China's historic areas are located in the center part of urban development. They are characterized by a high density of buildings, rich in historical, cultural, scientific, and aesthetic values, which have accompanied the development of the city throughout its history [2]. In 2020, the COVID-19 pandemic posed a huge challenge to cities around the world in all aspects, including economic, social, and healthcare services [3]. Affected by the epidemic, the development of the city has begun to shift from externally oriented to internally oriented, roughly oriented to precisely oriented, and static blueprints to dynamic adjustments. As a result, the regeneration of historic areas in China's cities is currently slowing down and there are three urgent issues that need to be addressed. Firstly, because of the reduction in government spending, there is a need for more precise

and targeted planning for the regeneration of buildings in historic areas. More precise guidance on specific buildings could avoid the unnecessary cost of large-scale renovation and accomplish the improvement of neighborhoods' appearance with less effort. Secondly, as the regeneration of many historic areas has not yet been implemented or is on hold due to the pandemic, it is of great value to define accurate strategies for the conservation of buildings at the outset or restart of the renovation process. The moratorium on renewal activities gives more time for historical and cultural excavations, ensuring the renovation is actioned more effectively and rationally under scientific research. Thirdly, endless urban expansion is not desirable for the sustainable development of most cities [4], so urban regeneration has become crucial [5].

How to propose a conservation strategy and orientation for the district as a whole when renewing buildings in historic areas is particularly important. Moreover, the renovation should not be static but should be iteratively validated and adjusted during the process to ensure the sustainability of the renovation. According to article 12 of Urban Planning Organization Approaches in China (2006), the current renovation planning process follows four steps, which are status investigation, problems proposing, goals formulating, and planning completed [6]. This paradigm starts with a status investigation and ends with a renovation planning proposal. It presents an obvious static and linear dominant concept. It is difficult to extend to the development stage after the implementation of planning. As a one-time organization behavior, conservation planning makes it hard to cope with the long-term sustainable renovation of the region. The characteristic of the historic areas and buildings in the city plays a decisive role in the conservation and regeneration design of the old city. Therefore, in addition to the discussion on the classification of the properties of the buildings in the area, it is also important to classify the types of areas and to propose a strategy for their overall guidance.

2. Literature Review

2.1. Historic Area Renovation

Historic area renovation, often referred to as heritage conservation or preservation, is a multifaceted topic that encompasses the restoration, rehabilitation, and adaptive reuse of historical buildings and districts. Francesco emphasized the significance of heritage conservation in an increasingly urbanized world, arguing that preserving historic areas contributes to the social, economic, and environmental sustainability of cities [7]. Principles for the conservation of heritage sites in China propose that the purpose of preservation is to preserve and perpetuate the site's historical information and its full value authentically and comprehensively. Cultural relics should be used reasonably. Utilization must adhere to social benefits as a criterion and should not damage the value of cultural relics and historic sites for current needs [8].

Historic areas usually contain several historical or heritage buildings that have certain regional characteristics. Historical buildings are media connecting the past with the future. They present the historical and cultural symbols of the city and country [9]. Furthermore, historical buildings are material carriers of human behavior and ideological values on the timeline [10]. They are recognized as integral components of contemporary society [11]. Heritage Buildings inherited from the past are a crucial component in our modern society. They are historically, aesthetically, and architecturally significant, including buildings, structures, artifacts, and areas [12]. Hewison proposed that urban context can bridge the present and the past as a visible instance of history [13]. Urban furniture as an adjustment method for microscopic environmental components could help shape the identity of the city [14]. From a macro perspective, building style is another means to maintain regional history and culture during the renovation process.

Historic areas are often repositories of a community's cultural heritage. They offer a glimpse into the past, showcasing the architectural, social, and economic history of a particular time and place. By renovating and preserving these areas, we can ensure that future generations have the opportunity to connect with their roots and learn from

the past. The purpose of heritage conservation is now more than ever focused on the continuity of socioeconomic functionality [15], recognizing change as an inherent element of continuity [16]. Arguing for a living heritage approach, Poullos stresses that the continuity of local community culture and heritage sites should be the main purpose of inheritance conservation [17,18]. This can be achieved by ensuring the following points: functional continuity of a site, continuity of the process of maintenance of the space, and continuity of the physical presence of a site's community [19]. Additionally, the ways heritage values are perceived and identified are impacted by different stakeholders, decision-making processes, transformational forces, and the economy [20].

It is necessary to preserve historic areas and buildings because they are beginning to be judged as having external values or a significance that exceeds their own functionality as produced by society. The terms “historic buildings” and “areas preservation”, or more generally, “heritage conservation”, refer to the legal measures, practical conservation methods, and philosophies that underpin these goals and facilitate their implementation [21].

Historic area renovation typically involves several important steps to ensure that the historic character of the area is preserved while adequately updating it, including identification and evaluation, assessment of current condition, planning, creating a design proposal, conservation and rehabilitation work, project implementation, review, and maintenance. It is a delicate balancing act that aims to modernize without erasing history.

2.2. Traditional Historic Area Renovation in China

In China, a heritage site or historic area is accepted as “the immovable physical remains that were created during the history of humankind and that have significance”; these include archaeological sites and ruins, tombs, traditional architecture, cave temples, and historic villages and towns [22]. The process of traditional historic area renovation is an important aspect of cultural preservation and often follows these general steps: preparation and investigation, conservation planning, intervention proposal, renovation works, review, and maintenance.

The historical and cultural heritage conservation or renovation system in China has gone through three important historical stages [23]. The first stage is the formation of a single system centered on the protection of cultural relics [24,25]. The second stage, the developing stage, is to add the protection of historical and cultural cities as an important component of the two-level protection system [26]. The third stage is to shift the focus to the multi-level protection system of historical and cultural reserves, which is the mature stage [27]. At present, it has formed a three-level conservation framework from historic buildings to historic areas and to historical and cultural cities [28].

In this framework of the system, the conservation of historic areas is in the middle level and plays an important bridging role. On the one hand, the area is composed of historical and other buildings, and every single building in the area needs to be deeply investigated and carefully treated. On the other hand, several historic areas constitute the overall historical characteristics of the historical and cultural city, and categorization guidance of the areas plays an important leading role in the protection of the whole city. The architectural analysis of material relics is the foundation of the current conservation plan. According to the requirements of the “Guidelines for the Preparation of the Protection planning of Historical and Cultural District in Jiangsu Province (2008) [29]”, there are five graphics that need to be drawn by law, separately named building structure, building quality, building age, building layers, and building types. On the superimposed and comprehensive basis of these five graphics, the specific methods and measures of physical relics in historical and cultural districts could be determined. Professor Zhu Guangya proposed the “Five graphics and one table” (added the table of existing historical and cultural relics) as the basic platform for historic area conservation planning in the report “The conservation plan for historical area is the basic work to effectively protect urban architectural heritage [30]” This established the evaluation method of building value in the historical and cultural district of Jiangsu Province. Firstly, the weight of the five indicators

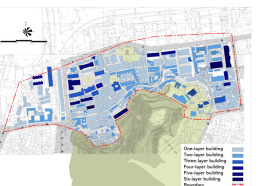
is determined through expert scoring, and then, the comprehensive value of each building is obtained after weighted calculations. Based on this, the scope of the conservation area and the control area outside the historical district are determined.

The advantage of this evaluation method is that it can directly divide the scope of the core protection area according to the scores. However, the defects are also obvious. Although the evaluation standard distinguishes different building attribute elements, the five elements are simply weighted and overlay calculations during comprehensive evaluation. Its scores make it difficult to illustrate the characteristics of the building in a certain aspect and cannot distinguish the type of conservation of the building. Moreover, because the elements of building status are only evaluated at the beginning stage of conservation planning, further evaluation and feedback will no longer be made. Corresponding pictures will not be evaluated or rated during the renovation process. Not to mention, observing the changing trends of building properties during the dynamic process will not be undertaken. It can be seen that the guiding ideology of the current renovation process emphasized static and blueprint guiding goals. It is rough and difficult to deal with a large number of historical and other buildings with fine guidance in the practice. At the same time, there are problems such as short research time, insufficient research, and difficulty in reaching the goal during the process [31,32].

In the current evaluation process, there are several terms that need to be explained which could be helpful in this research:

The evaluation standards of the five graphics of buildings in the traditional conservation plan adopted a five-point scoring method. It could be seen in the Xijindu Ancient District Conservation Plan as an example in Table 1.

Table 1. Five graphs of building from “Xijindu Ancient District Conservation Plan (1998)”.

Building Structure Graph	Building Quality Graph	Building Age Graph	Building Layers Graph	Building Types Graph
				

“Building structure graph”. This refers to a scoring diagram based on the structure of the building status. A wooden structure is 5 points, a brick and wood structure is 4 points, a brick-connected structure is 3 points, and a steel concrete structure is 2 points.

“Building quality graph”. This means a scoring diagram based on the quality of the building status. Excellent is 5 points, good is 4 points, average is 3 points, fair is 2 points, and poor is 1 point.

“Building age graph”. This is a segmented scoring diagram based on the establishment of a built-up age. Buildings built in the Qing Dynasty and before receive 5 points. Buildings of the Republic of China score 4 points. Buildings before 1950 receive 3 points. Buildings between 1950 and 2000 score 2 points. And buildings after 2000 receive 1 point.

“Building layers graph”. This refers to a scoring diagram based on the status layer of buildings. The score of one- and two-layer buildings is 5 points. Three-story buildings receive 4 points. Four-story buildings receive 3 points. Five-story buildings receive 2 points. Six-story and above buildings receive 1 point.

“Building type graph”. This is a scoring diagram based on the existing style of buildings. Excellent style receives 5 points. Good style receives 4 points. Average style receives 3 points. Fair style receives 2 points. Poor style receives 1 point.

2.3. International New Trend of Historic Area Renovation

One of the primary challenges in historic area renovation is striking a balance between preservation and modernization. Maintaining the integrity of historical buildings and streetscapes while meeting the needs of contemporary society is a complex endeavor. New international trends in historic area renovation are emerging, reflecting a more comprehensive approach to preservation and adaptive reuse. Conceptually, more and more researchers are emphasizing the importance of sustainability. Methodologically, recent trends emphasize the integration of digital technologies.

Jean Carroon addresses the integration of sustainable practices into heritage conservation, including energy-efficient retrofits, materials sourcing, and the overall environmental impact of preservation projects [33]. Sustainability means preserving every historical phase of the building, not a frozen image of the past but carefully and wisely adding more suitable element expression in the current historical period [34]. Sustainability and heritage conservation are interrelated concepts that share a common goal of preserving resources and cultural values for future generations. The conservation and renovation of heritage buildings is one way to assure the well-being of the population. It helps to develop sustainable cities and communities due to society's sense of belonging, guarantees a quality education, creates opportunities for communal life, and contributes to the resilience and adaptability of the community by serving as a psychological shelter when facing a disaster [35,36]. Sustainability practices, such as the use of local materials and techniques, can help to reinforce this cultural identity and contribute to the overall sustainability of the community. Both sustainability and conservation involve taking a systematic approach to resource management and cultural preservation. This means considering all aspects of the system, including social, economic, and environmental factors, and developing strategies that are integrated and holistic. Moreover, it is complex to evaluate the environmental and energy performance of historical buildings, which requires dedicated tools, sophisticated diagnostic procedures, and an interdisciplinary approach [37–39].

Data analytics and Geographic Information Systems (GIS) are used to analyze historical data and assess the condition of structures, aiding in the decision-making process. GIS mapping technology is used to further investigate historic trends and their role in current identity making [40]. The presented methods and results can also be integrated into multi-dimensional GIS as comprehensive planning, scenario, and regulatory tools [41]. Utilizing digital technologies, historic areas are equipped with interactive digital interpretation tools, making history more accessible to visitors, and enhancing the visitor experience [42]. Green Building Council Italy proposed a new LEED (R) rating system, the GBC Historic Building (TM) protocol based on Italian historical heritage. It was applied to the High School "A. Canova" in Treviso [43]. Ioannis Vardopoulos has proposed a multivariate linear regression analysis method of public perceptions of adaptive reuse for sustainable development and land use [44]. An innovative compensation-based evaluation model was defined to support the determination of building rights that guarantee the financial conveniences of public and private subjects involved in cultural enhancement interventions, as well as the reduction of natural soil consumption [45]. From a sustainability point of view, there are many existing rating systems developed to assess the performance of buildings [46]. In the design of new buildings, numerous sustainability rating systems have been developed to deal with broader sustainability objectives such as LEED, BREEAM, DGNB, etc. However, they are not an adequate intervention in historic buildings [47].

The objective of this study is to establish methods and a theoretical basis for the sustainable renovation process of historic areas. Additionally, it aims to verify the feasibility of a dynamic evaluation model proposed by our research team based on sustainability analysis. We will also use the methodology to divide building types during the renovation process and put forward relatively reasonable value-oriented strategy guidance.

3. Methodology

3.1. Introduce a Dynamic Evaluation Model

Our research team proposes a dynamic methodological approach based on the management of three-dimensional information on building attributes [48]. This model combined the current conservation assessment method for historic areas in China with comprehensive sustainability-rating systems. In order to intuitively observe and scientifically analyze the distribution and change of building attributes, corresponding evaluation dimensions have been summarized; namely, “Economy of construction dimension, Cultural of form dimension, and Social of benefit dimension”, which, respectively, are in accordance with the economic, cultural, and social aspects of buildings sustainable attributes. The five building-related graphs become elements under different dimensions.

The economy of construction dimension indicates the solidity of the building structure, which contains the building structure and quality as elements. The cultural form dimension indicates the historical and cultural characteristics of the building form. In this dimension, judging criteria are revised. The concept of “target historical style” is proposed, which refers to clarifying the amount of historical information that can be conveyed by different patches in the historical area based on regional historical data. By sorting out the history of regional development, the historical characteristics that should be prominent in different plaques are selected. Combined with the building age and style elements, the closer the building status is to the “target historical style”, the higher the score. Also, the building layers are considered in this dimension. The social benefit dimension indicates the functional benefits of a space through a comprehensive judgment of building types and functions. The three dimensions are converted into three axes in the space in Figure 1 [48].

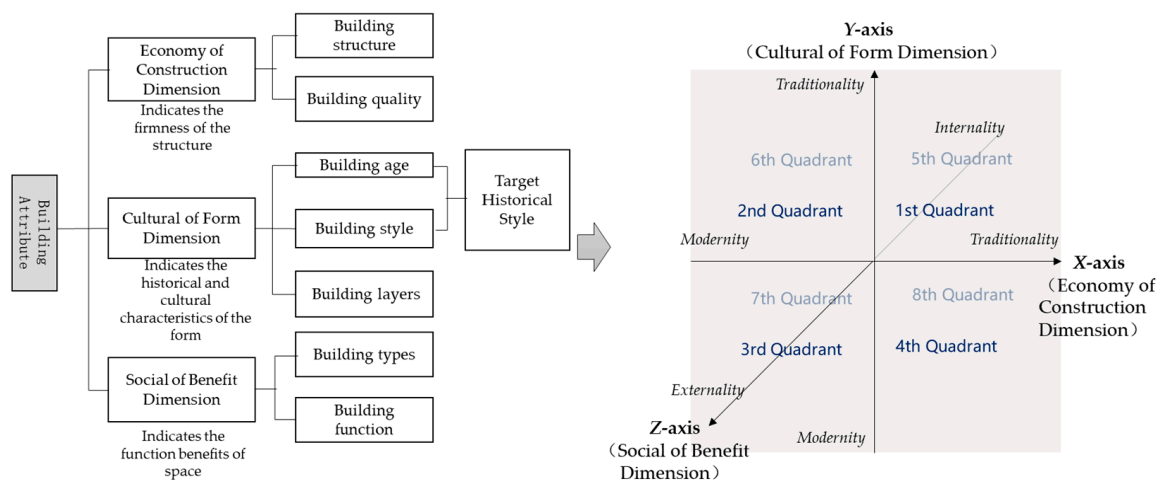


Figure 1. The dynamic evaluation methodological approach.

One highlight of the model is proposed the “Target Historical Style”. It does not simply refer to the unified style of the region but puts forward the most representative complex styles by parts. That corresponds with the Athens Charter for the Restoration of Historic Monuments, which recommended that when, as the result of decay or destruction, restoration appears to be indispensable, all the historic and artistic work of the past should be respected, without excluding the style of any given period [49]. The preservation of these historic styles is not only necessary for individual buildings but also nonnegligible for setting the identity of certain urban areas [50]. Another highlight is to summarize the classification and rating of building attributes into three aspects, which can not only help to evaluate the level of property score but also comprehensively show the clustering situation of buildings during the renovation process.

To include elements under each dimension, consider the two different types of historical and other buildings, analyze the bipolar value orientation of buildings in historic areas, and place the attribute changing on the timeline; thus, a three-dimensional space–time

coordinate system has been obtained. A revised classification attribute scoring standard is shown in Figure 2 [48].

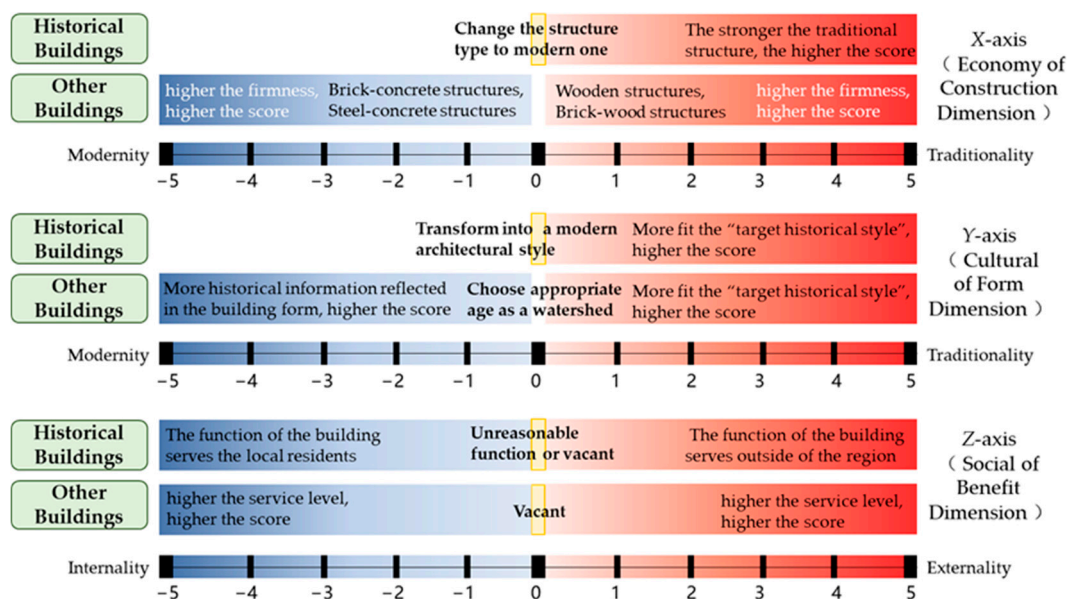


Figure 2. Building classification attribute scoring standard.

In the model, by abstracting the three characteristics dimensions of building attributes into particles, their trajectory, targeting, and timely correction of deviations can be observed dynamically. It offers effective guidance for comparison before and after renovation, a more informed prediction of possible trends in building attributes, and a timely corrective action plan for sustainable conservation.

To make it clearer, an abstract diagram of the movement of a building attribute particle is drawn. In Figure 3, the light grey dot represents the building attribute particle before renovation. The dark grey dot represents the building attribute particle after the implementation of renovation. Without external intervention, the building attribute particle will be very likely to continue moving along the direction of the gray dotted line. However, under the sustainable assessment of building attributes based on value, the target particle is the red dot, which is not on the developing trend line. Using the simplified abstract model could help in discovering the gap between the movement direction and the sustainable value target in a timely manner. External intervention could be undertaken to correct the movement trajectory of the attribute particle. The red arrow arc represents the direction of external intervention. Therefore, through the real-time monitoring and dynamic assessment of the changes in building attribute particles in the model, the final building attribute cluster in the historic area would be closer to the value target of sustainable conservation, the red dot.

In former research, by analyzing a typical project case named Xijindu in Zhenjiang City, China, which has undergone a relatively successful conservation practice from 2000 to 2008 and won the UNESCO Award for Excellence in Historical and Cultural Heritage Conservation in the Asia-Pacific region, building attribute changing trends were classified and sustainable conservation value orientations were summarized. There are five changing trends of building attributes fitting the sustainable conservation value orientation, respectively called Authenticity-oriented type, Image-display type, Cultural-oriented Reconstruction type, Reproduction type, and Deductive type. The corresponding attribute targeting score is (5, 5, 5), (5, -5, ±5) or (-5, 5, ±5), (-5, -5, ≠0), (-5, -5, -5), and (-5, -5, 5) in turn [48].

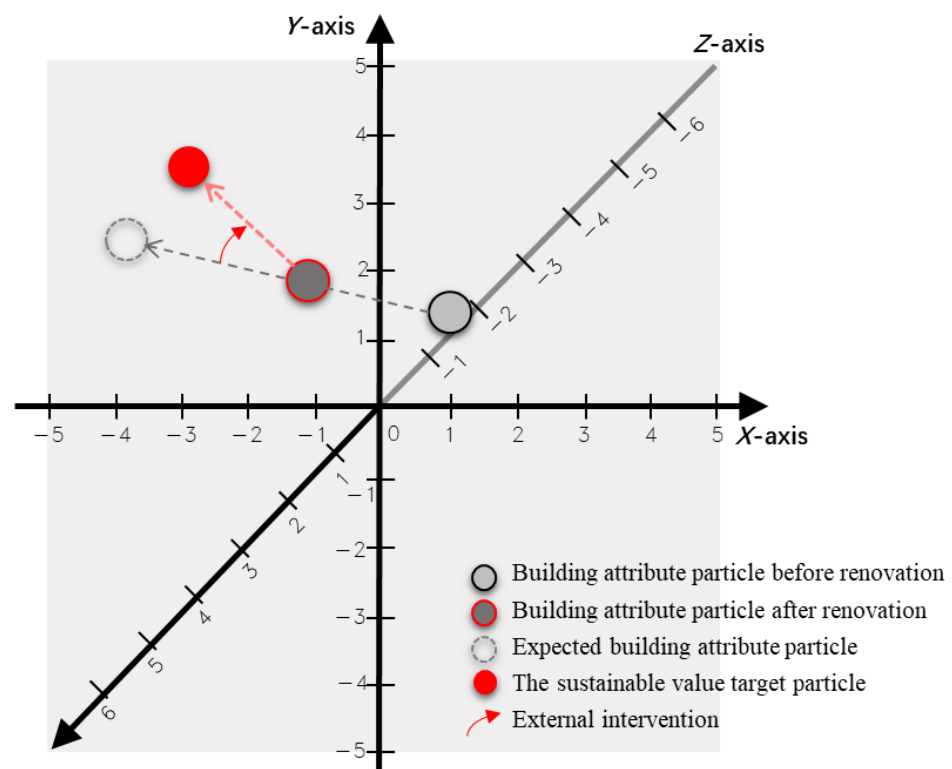


Figure 3. Diagram of interventions for moving trends in building attributes.

3.2. Deepening the Application of the Dynamic Evaluation Model

Since the COVID-19 pandemic in 2020, the regeneration practice of historic areas in China is currently slowing down. In this process, many regenerations or protection practices of historic areas were either canceled or temporarily stopped. With the unblocking of COVID-19 virus control policies at the end of 2022 in China, more and more regeneration or conservation planning of historic areas has been restarted now. Affected by the pandemic, the development of cities has begun to shift from externally oriented to internally oriented, roughly oriented to precisely oriented, and static blueprints to dynamic adjustments. The government would like to spend less money and improve the overall quality of historic areas more effectively. Therefore, three important issues needed to be addressed urgently in the research help to achieve more precise guidance for historic areas. First, if the renovation has not been implemented yet, how can we classify building attribute types at the very beginning? Second, if the renovation has stopped due to the pandemic, how can we restart the process and provide accurate suggestions based on previous implementation? Third, historic areas contain a variety of different styles of buildings, how should we judge the stage of conservation renovation and give overall guidelines on area conservation?

For the first question, by analyzing the characterization of building attributes before renovation, it is possible to classify the original building types. By comparing them with the classifications of attribute particles from the typical case in the previous study, it could provide a reasonable goal orientation for renovation. For example, in Figure 4, several light grey dots are concentrated within the blue dashed circle, where the point bordered by the solid black line represents a typical location, which is similar to that before renovation in Figure 3. Then, direct intervention could be provided for guiding the building attribute particle following the red line towards the red dot. That shows reasonable correspondence with the sustainable value orientation.

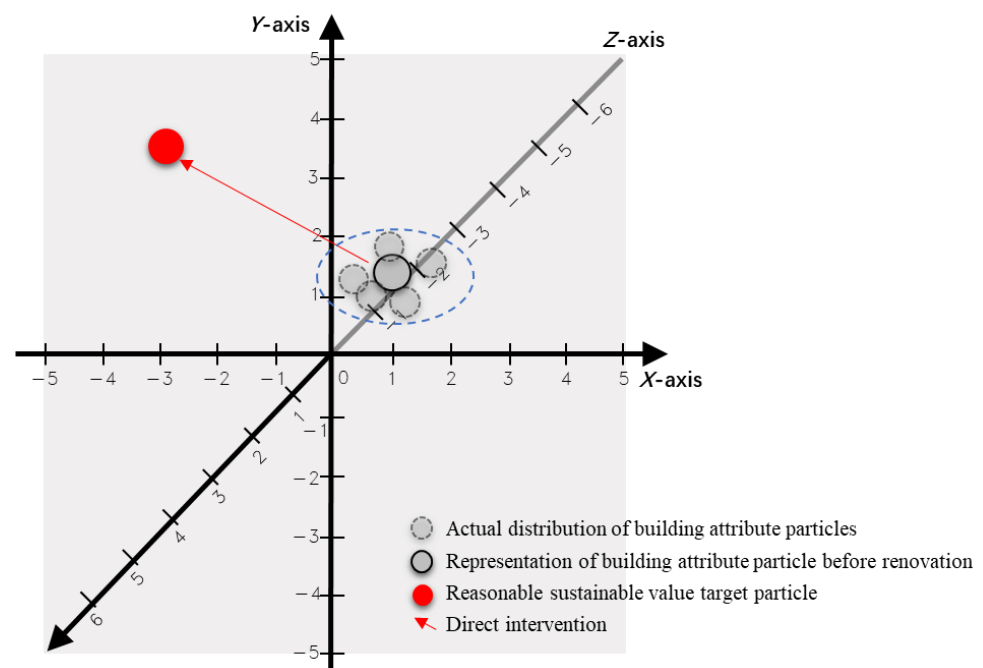


Figure 4. Diagram of direct intervention guiding.

For the second question, the building attributes captured now are those already present during the renovation process, not the original ones. Classifications of building attributes need to be compared with particles along the possible renovation lines or after the first step of renovation. By comparing them with the classifications in the previous study, suitable recommendations on deeper updates or timely external intervention could be provided. To make it clearer, in Figure 5, several light grey dots with a red dotted border represent the distribution of building attribute points in the actual retrofit pause. They are concentrated around the point bordered by the solid red line, not along the direct intervention line. By finding the typical classification of attribute particles, the next step for renovation is to provide suitable suggestions matching the sustainable value target.

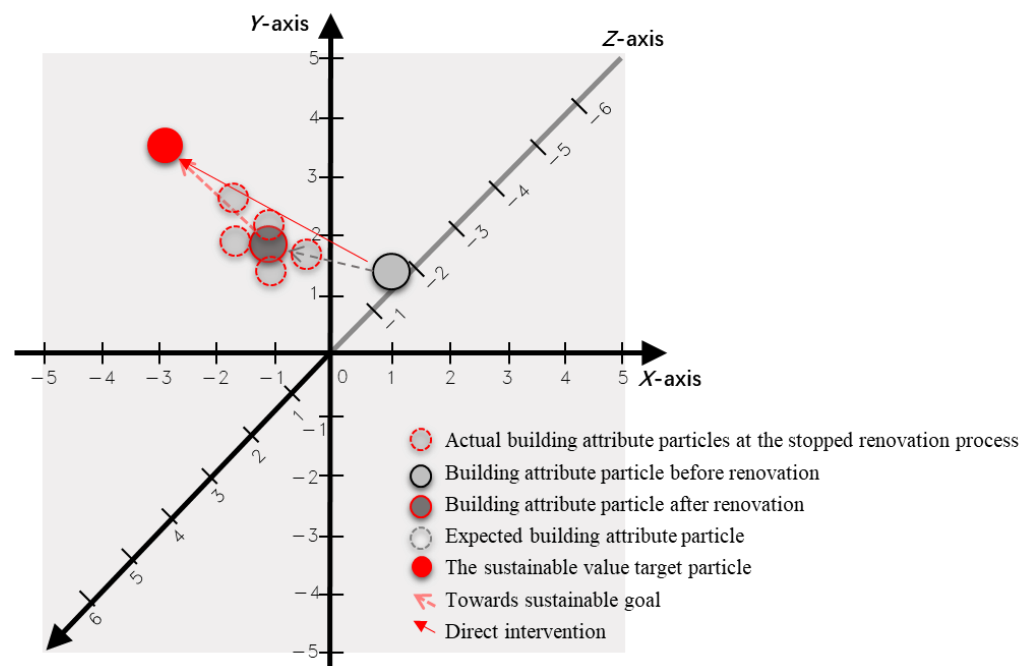


Figure 5. Diagram of intervention guiding during the paused renovation process.

For the overall types of areas, which are mainly based on the different clusters of changing trends in building attribute points, case studies need to be introduced to illustrate the research.

4. Case Study

4.1. Project Background

Taizhou City, located in the middle and lower reaches of the Yangtze River, has a similar geographical location to Zhenjiang City in the previous study (Figure 6). The development and scale of the city are relatively analogous. As the old city of Taizhou is currently preparing for master conservation planning, there is an urgent need to analyze and provide categorization strategy guidance in the historic area renovation process.

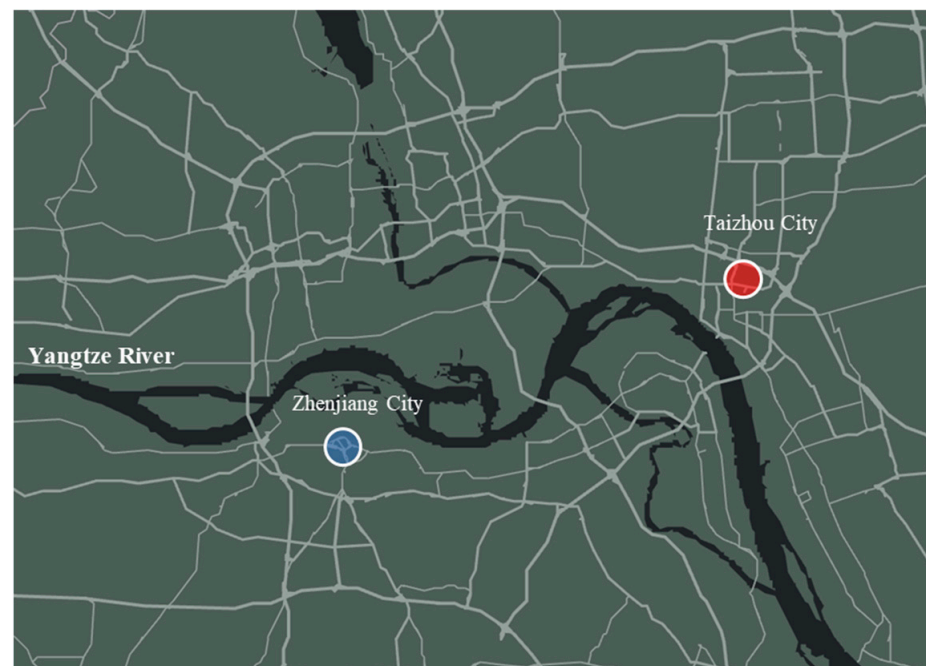


Figure 6. Location of Taizhou City.

The Taizhou Old City includes urban construction achievements from both ancient and modern times. The core area could centrally reflect the historical and cultural values of the city. Three historic areas are selected for the study, respectively named, “City Central Historic Area”, “Five Alleys to Han Xi Street Historic Area”, and “Bell and Drum Tower Historic Area”. They are all within the boundaries of the Taizhou Old City shown in Figure 7. As the three areas are at different stages of the conservation process, it is worth great value to perform a horizontal comparison. The area of Five Alleys to Han Xi Street Historic Area is 12.45 hectares. It has undergone a round of renovation practice by the local government and the city investment corporation but is suspended currently. A conservation plan for the City Central Historic Area has been completed but has not yet been implemented. Buildings in the area still remain in their original condition. The total area is 5.73 hectares. The Bell and Drum Tower Historic Area, with an area of 2.88 hectares, is a controlling zone around a historic and cultural district. Since 2014, it has undergone a round of spontaneous, bottom-up evaluation by local people. Nowadays, most of the buildings have been renewed or replaced, the existing state of which needs to be further evaluated.

4.2. Classification before Renovation

As the conservation planning for the City Central Historic Area has not been implemented, buildings in the area remain in the condition of original ones. They could represent the classification analysis before renovation. The scoring standards of each dimension

shown in Table A1 in Appendix A are adjusted to the characteristics of Taizhou City based on that of Figure 2. After site investigation, the scores of a total of 1210 buildings were presented in Table A2 in Appendix A. According to the scores of three dimensions, the distribution of building attribute characteristics is abstracted in Figure 8. Red points represent historical buildings while blue points represent other ones. The distribution of historic buildings and other buildings is obviously different, the former being concentrated in the fifth quadrant and the latter mainly in the seventh quadrant.



Figure 7. Three case areas within Taizhou Old City.

Hierarchical cluster analysis was carried out on the building attribute points. Details can be found in Appendix B from Tables A3–A5. For historical buildings, the coordinate points are (4, 5, −1), (3, 4, −1), and (2, 0, −1), with 153, 39, and 9 points in each cluster in Table A4. For other buildings, the coordinate points are (−1, −1, 5), (−2, −2, −2), and (3, 4, −2), and the number in each cluster is 31, 821, and 157 in Table A5. Among them, the 9-point set is ignored because of the small quantity. Table 2, compares the remaining five collections of points with typical particle coordinates before renovation. Clusters of coordinate points (4, 5, −1), (3, 4, −1), and (3, 4, −2) are all near the original attribute zone ($\geq 3, \geq 3, -1$), which are suitable for increasing authenticity type, aiming at the coordinate (5, 5, 5). This type of historical building needs the traditional building structure to be reinforced, the original scale and number of layers to be maintained, and to show enough historical information on the style. It is also necessary to introduce appropriate functions to ensure the activation of the building. The cluster around (−1, −1, 5) is similar to that of ($<0, <0, 5$), easily guiding to the goal of (−5, −5, 5) deductive ones. As the Z-axis score is close to 5, these buildings have high external display functions, but the structure and style conditions are not good. To maintain the external display effect, it is urgent to

improve the quality of the structure and traditional style. Collection near point $(-2, -2, -2)$ fits the original coordinate of $(<0, <0, <0)$, targeting the coordinate $(-5, -5, -5)$, for the reproduction or reconstruction of buildings. The three-dimensional scores are all low, meaning these buildings have less historical and cultural value and could be rebuilt in the original location.

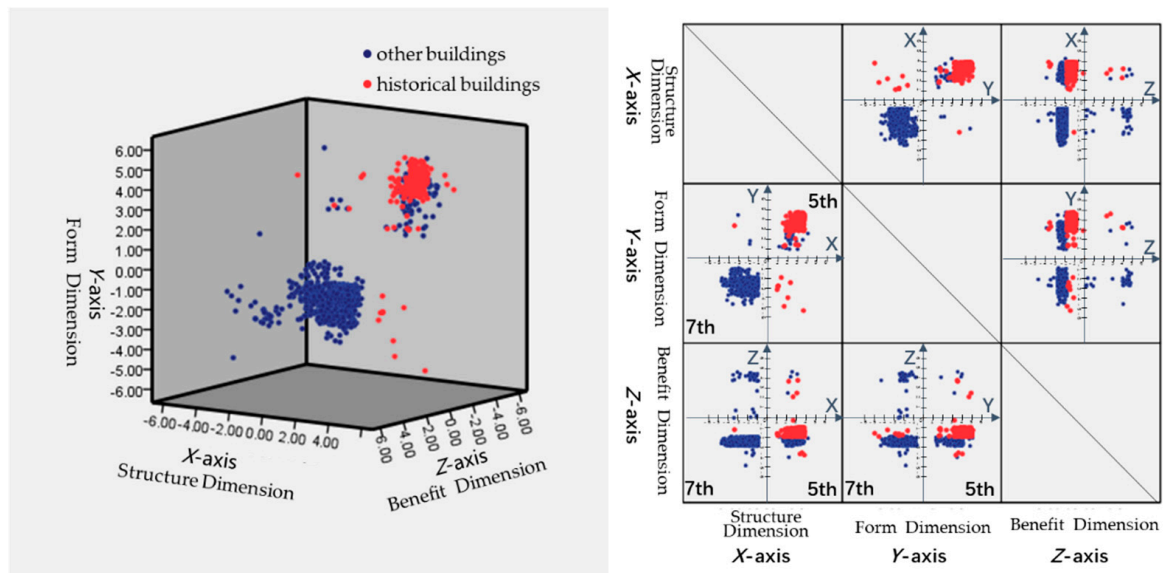


Figure 8. Distribution of building attribute points in the City Central Historic Area.

Table 2. Classification of building attributes before renovation.

Cluster Coordinate	Number of Points	Comparing Coordinate before Renovation	Target Coordinate Point	Building Type
$(2, 0, -1)$	9	Ignored	Ignored	Ignored
$(4, 5, -1)$	153	$(\geq 3, \geq 3, -1)$	$(5, 5, 5)$	Authenticity type
$(3, 4, -1)$	39			
$(3, 4, -2)$	157	$(<0, <0, 5)$	$(-5, -5, 5)$	Deductive type
$(-1, -1, 5)$	31			
$(-2, -2, -2)$	821	$(<0, <0, <0)$	$(-5, -5, -5)$	Reproduction/reconstruction type



4.3. Classification during the Renovation Process

The renovation practice of the Five Alleys to Han Xi Street Historic Area has been paused, and several buildings have been renewed in the Bell and Drum Tower Historic Area. Thus, both these areas could be chosen for the interpretation of classification analysis during the renovation process. Using the dynamic evaluation methodological approach, all scores of buildings' three-dimensional attributes could be obtained in Table A2 in Appendix A. To abstract building attribute particles in Figures 9 and 10, the distribution could be observed visually. By comparing the intuitive scattered points distribution charts, building attribute points during the renovation process are more decentralized than those before renovation. Historical buildings in the Five Alleys to Han Xi Street Historic Area are mostly concentrated in the first quadrant, while in the Bell and Drum Tower Historic Area, they are mainly in the fifth quadrant. The distribution of attribute points of other buildings is relatively wide, including the third, fourth, seventh, and eighth quadrants, meaning a variety of types of properties.

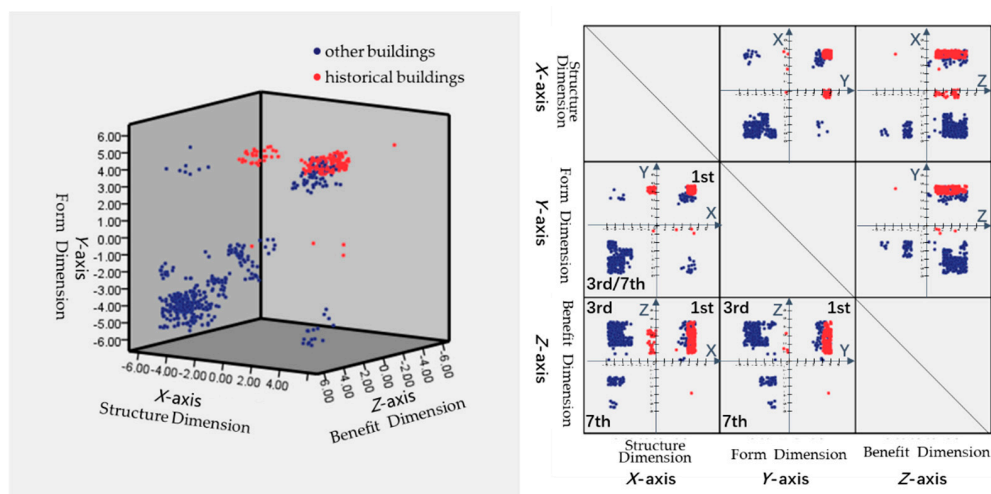


Figure 9. Distribution of building attribute points in the Five Alleys to Han Xi Street Historic Area.

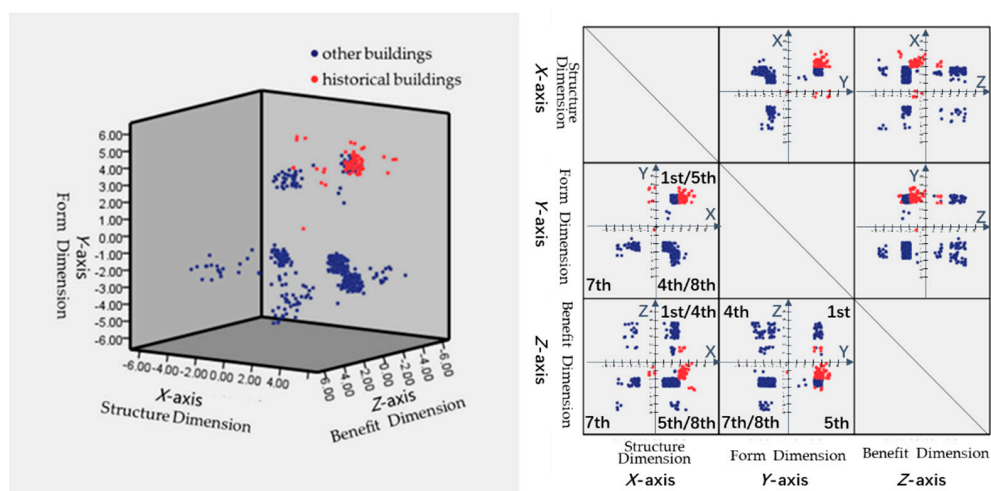


Figure 10. Distribution of building attribute points in the Bell and Drum Tower Historic Area.

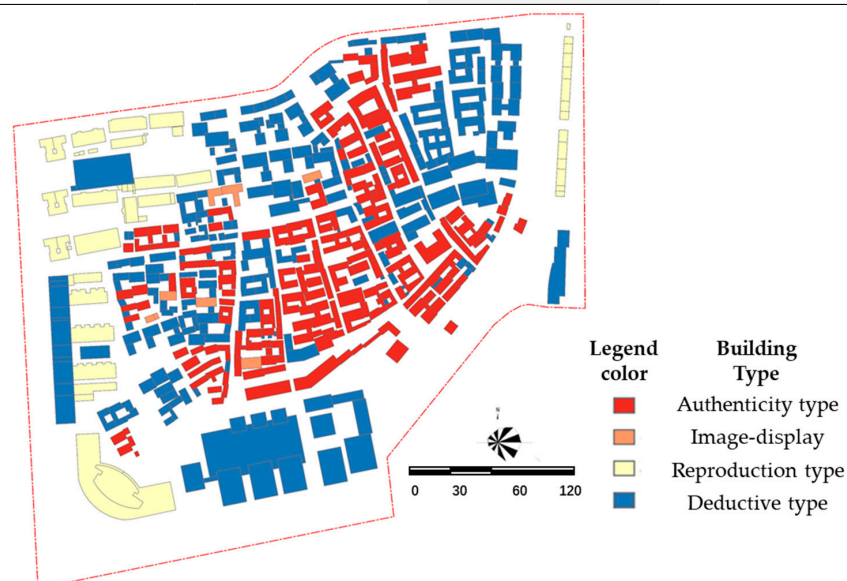
After hierarchical cluster analysis, coordinate points of different clusters could be obtained. Details can be found in Appendix B from Tables A6–A11.

In the Five Alleys to Han Xi Street Historic Area, historical building attributes are concentrated near three coordinate points of (5, 5, −4), (5, 5, 2), and (3, 5, 4). The number in each cluster is 1, 72, and 89 in Table A7. For other buildings, four clusters with coor-

ordinate points $(-5, -2, -2)$, $(-4, 4, 4)$, $(5, 3, 4)$, and $(-4, -4, 4)$ are classified, the number of which is 52, 8, 91, and 277, respectively, in Table A8. The only one-point set could be ignored. Comparative analysis would focus on the remaining six types with typical particle coordinates during renovation in Table 3. The cluster of $(5, 5, 2)$ of historical buildings could be led to the targeting point $(5, 5, 5)$, representing authentic building property. Coordinate point $(3, 5, 4)$ is along the intervention line from $(3, 3, 3)$ to point $(5, 5, 5)$. These two clusters both need to introduce suitable functions for building conservation, the difference is the latter one also needs to strengthen traditional construction. The cluster around coordinate point $(-5, -2, -2)$ is near the particle $(-5, -3, -3)$, which could be led to $(-5, -5, -5)$. This kind of building maintains good conditions of traditional construction, but the style and façade need to be reproduced and contribute more functional benefits to the community. Other buildings with a coordinate cluster of $(-4, 4, 4)$ are close to the middle state of $(-3, 3, 3)$, targeting $(-5, 5, 5)$. This type, called image-display, usually refers to antique buildings built with a modern structure. This is common in the regeneration practice led by city investment companies. To show the effects of renovation or to display regional culture, large space buildings are often required. As it is difficult for traditional small-scale buildings to meet such requirements, antique buildings with modern structures are built. The building attributes cluster of $(5, 3, 4)$ is similar to historical buildings of $(3, 5, 4)$, along the line from $(3, 3, 3)$ to point $(5, 5, 5)$, which is oriented towards authenticity improvement. The last $(-4, -4, 4)$ cluster is close to the targeting point of $(-5, -5, 5)$, which shows that good effects have been seen in the reinforcing construction and form dimensions. On that basis, three dimensions of deductive buildings could be further improved to show the historical and cultural significance of the area.

Table 3. Classification of building attributes during the renovation process (one).

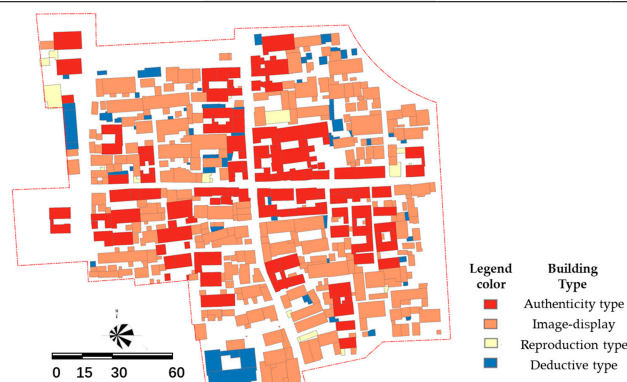
Cluster Coordinate	Number of Points	Coordinate before Renovation	Comparing Coordinate during Renovation	Target Coordinate Point	Building Type
$(5, 5, -4)$	1	Ignored	Ignored	Ignored	Ignored
$(5, 5, 2)$	72	$(>0, >0, >0)$	$(3, 3, 3)$	$(5, 5, 5)$	Authenticity type
$(3, 5, 4)$	89		$(-5, -3, -3)$	$(-5, -5, -5)$	Reproduction type
$(-5, -2, -2)$	52	$(<0, <0, <0)$	$(-3, 3, 3)$	$(-5, 5, 5)$	Image-display
$(-4, 4, 4)$	8	$(<0, >0, >0)$	$(3, 3, 3)$	$(5, 5, 5)$	Authenticity type
$(5, 3, 4)$	91	$(>0, >0, >0)$	$(-3, -3, 3)$	$(-5, -5, 5)$	Deductive type
$(-4, -4, 4)$	277	$(<0, <0, >0)$			



In the Bell and Drum Tower Historic Area, more clusters of building attributes are calculated in Table A9. The coordinate points for historical buildings are (4, 4, 1), (0, 5, −1), (4, 4, −1), and (0, 0, −1), containing a number of 13, 5, 42, and 1 in order, shown in Table A10. For other buildings, the coordinate points are (3, −3, −2), (3, −3, 4), (3, 4, 4), (−2, −2, 4), (−2, −2, −2), and (3, 4, −2), totaling six clusters. The number of buildings in every cluster is 282, 44, 39, 17, 60, and 49, listed in Table A11. The separated distribution of building attributes during the renovation process shows that spontaneous, bottom-up transformation behavior would cause more diverse and rich characteristics in building attributes. The cluster with only one and five points could be ignored. In Table 4, the remaining two sets of historical buildings are around coordinates (4, 4, 1) and (4, 4, −1), meaning that the construction and form dimensions are in good condition after the first round of regeneration. Therefore, both sections could be guided to authenticity type, the only difference is that the function of the former serves the city or an even larger scope while the latter mainly serves the interior of the community. For other buildings, the cluster of (3, −3, −2) is close to the middle path of (3, −3, −3), targeting (5, −5, −5). The traditional structure of this kind of image-display building is usually preserved not badly and under some appropriate reinforcement during renovation. However, the traditional structure and modern form show an inconsistency in mixing. This situation is common in the process of renovation in that the old building façade has been transformed unconsciously, leading to a display of the changed building style. The cluster of (3, −3, 4) is near (3, −3, 3), aiming at (5, −5, 5), which is also an image-display one. Other building attribute coordinates close to (3, 4, 4) and (3, 4, −2) are all authenticity type. The cluster of (−2, −2, 4) is along the line from (<0, <0, 3) to (−5, −5, 5), to interpret regional culture through modern architectural methods and style. It could play the role of displaying culture externally, the so-called deductive type. Collection near point (−2, −2, −2) fits the original coordinate of (<0, <0, <0), targeting the coordinate (−5, −5, −5), reproduction or reconstruction buildings. The three-dimensional scores are all low, meaning these buildings have less historical and cultural value and could be rebuilt in the original location.

Table 4. Classification of building attributes during the renovation process (two).

Cluster Coordinate	Number of Points	Coordinate before Renovation	Comparing Coordinate during Renovation	Target Coordinate Point	Building Type
(0, 5, −1)	5	Ignored	Ignored	Ignored	Ignored
(0, 0, −1)	1	Ignored	Ignored	Ignored	Ignored
(4, 4, 1)	13	(>0, >0, >0)	(3, 3, 1)	(5, 5, 5)	Authenticity type
(4, 4, −1)	42	(>0, >0, <0)	(3, 3, −1)	(5, 5, −5)	
(3, −3, −2)	282	(>0, <0, <0)	(3, −3, −3)	(5, −5, −5)	Image-display
(3, −3, 4)	44	(>0, <0, >0)	(3, −3, 3)	(5, −5, 5)	
(3, 4, 4)	39	(>0, >0, >0)	(3, 3, 3)	(5, 5, 5)	Authenticity type
(3, 4, −2)	49	(>0, >0, <0)	(3, 3, −3)	(5, 5, −5)	
(−2, −2, 4)	17	(<0, <0, >0)	(−3, −3, 3)	(−5, −5, 5)	Deductive type
(−2, −2, −2)	60	(<0, <0, <0)	(−3, −3, −3)	(−5, −5, −5)	Reproduction/reconstruction type

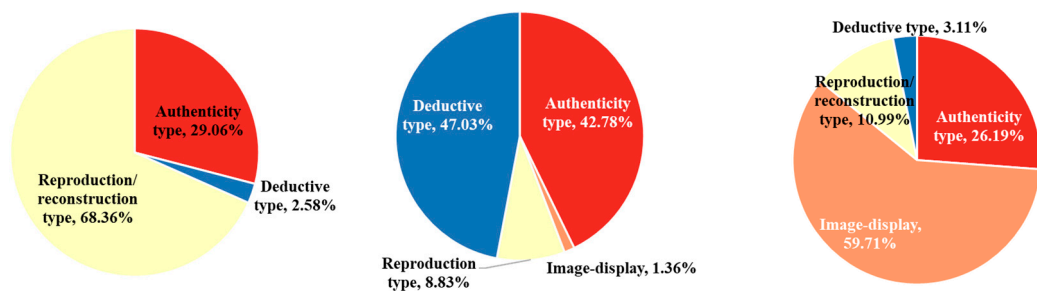


4.4. Classification of the Areas

The classification of area types is performed mainly according to the number and proportion of different types of buildings and the prominent conflicts in the area. In Table 5, the number and proportion of buildings in three areas are calculated separately. In the City Central Historic Area, reproduction and reconstruction buildings account for the highest percentage of 68.36%, which guides the improvement of cultural diversity. In the Five Alleys to Han Xi Street Historic Area, deductive buildings have the highest percentage of 47.03% and the proportion of authenticity buildings reached 42.78%. This means that in this area, the first round of renovation preserved historic buildings properly and tried to add cultural diversity. In the Bell and Drum Tower Historic Area, image-display buildings occupy the highest percentage of 59.71%, oriented towards improving the appearance of buildings. It is worth noting that the proportion of authentic buildings in every region exceeds a quarter. It can be seen that no matter in what way the historic area is renovated or at which stage, it is quite necessary to preserve a considerable number of original historic buildings.

Table 5. Number and proportion of building classifications in three areas.

	City Central Historic Area		Five Alleys to Han Xi Street Historic Area		Bell and Drum Tower Historic Area	
Authenticity type	349	29.06%	252	42.78%	143	26.19%
Image-display	—	—	8	1.36%	326	59.71%
Reproduction type	821	68.36%	52	8.83%	60	10.99%
Deductive type	31	2.58%	277	47.03%	17	3.11%



It can be concluded that the City Central Historic Area is the cultural-oriented type, the Five Alleys to Han Xi Street Historic Area is a deductive and authentic cultural mixture type, and the Bell and Drum Tower Historic Area belongs to the image-display-oriented type.

5. Categorization Strategy Guidance

5.1. Guidance for Buildings before Renovation

For buildings before renovation, most scores of the three-dimensional attributes are low, near $(-2, -2, -2)$. The maintained building structure is not very solid, the style and form are poor, and the usage benefit is low. Therefore, the most urgent demand for such buildings is to reinforce the structure and improve the condition of the building's style. On that basis, reasonable function should be introduced to help maintain vitality. Besides that, some authenticity buildings with good preservation conditions have contributed to the original cultural display of the region. In addition to reinforcing structure and maintaining the preservation status, appropriate function should be considered, helping to maintain the building in use for longer periods of time.

For example, the building at the east entrance of South Ruan Lane (Figure 11, left) in the City Central Historic Area is a typical one with an attribute score of $(-2, -2, -2)$. As the situation of this building is not good, the recommendation is to reconstruct or reproduce the building. Controlling elements include that the scale and form should be close to the original building, while the façade and internal form show as much as possible

the characteristic elements of the Qing Dynasty residential style or modern residential style. The building should be in harmony with the overall appearance of South Ruan Lane and add appropriate landscape features to the lane entrance. The residential building at the entrance to West Chenjiaqiao Street (Figure 11, right), with an attribute score of (4, 4, -2), is an authentic one. This building needs to retain the Qing Dynasty residential style in the original form. Guiding elements include the reinforcement of the brick and timber structure without changing the scale or number of stories. The character elements of the residential and community service style of the Qing Dynasty should be increased. The use function should be appropriately increased in the number of public exhibitions based on the current residential function.



Figure 11. Typical buildings before renovation in the City Central Historic Area.

5.2. Guidance for Buildings during the Renovation Process

For buildings during the renovation process, their attribute coordinate points are relatively scattered, so there are more types than before renovation. Deductive buildings with cluster coordinate points at $(-4, -4, 4)$ may be new antique buildings. As they have experienced a round of regeneration practice, the overall situation of buildings is relatively good, and the three-dimensional score of attributes is not low. Further guidance suggestions are just to frame the appropriate target style of the building and restrict proper use functions. The image-display type of building around the coordinate $(3, -3, -3)$ is usually in a situation where the update practice is not organized by the government but spontaneously by the residents. Therefore, the regeneration behavior has not been restrained during the process, resulting in the conflict between traditional structure and modern style. This is usually because the introduced function requires a more novel building appearance. Of course, a considerable number of authentic buildings are of great value in the process. They are the root cause of the particularity of historic areas in the city.

The building Haidilao located at the entrance to the Five Alleys to Han Xi Street Historic Area (Figure 12, left) is typical of a new antique one. Its attribute point is at $(-4, -5, 4)$, which is nearly identical to $(-5, -5, 5)$. Although this building has tried its best to imitate the style of the surroundings, the huge scale is significantly different from the traditional small-scale buildings. Guiding elements include the flexibility of scale and number of stories of the building, using modern techniques to interpret the commercial style along the river of the Qing Dynasty on the building's façade. Other cultural elements could also be incorporated according to its function as a restaurant. The building at the west end of Bell Tower Lane (Figure 12, right) belongs to the image-display type, with a coordinate point at $(3, -2, -4)$. It has undergone a spontaneous transformation, with minor changes to the internal structure but major changes to the external form. The form is currently incompatible with the original historical landscape of the area. Controlling elements include

the reinforcement of the traditional structure, the integration of the building plane, and slight adjustment of the scale and number of stories according to requirements. The façade and appearance of the building should be significantly modified to show the characteristics of the Qing Dynasty residential style or at least the modern residential style. Landscape vignettes should be set up at the entrance to the lane which match with the building facades and demonstrate the history and culture of Bell Tower Lane.



Figure 12. Typical buildings during the renovation process.

5.3. Categorization Strategy for the Whole Area

The overall planning strategies for the area are proposed based on the key problems and different dominant classification building types. The landscape under the overall control strategies of the three areas is shown in Figure 13.



Figure 13. Exhibition of the overall strategy control of three areas.

The City Central Historic Area represents the cultural-oriented type, emphasizing cultural diversity promotion. As it has not undergone the regeneration practice, most of the buildings in the area are in a poor state of conservation, but generally have a reasonable degree of cultural value. The most urgent problem in the area is to improve the general building conditions and strengthen the solidity of building structures. Some of the other buildings with special historical value could be reconstructed appropriately. As this area is located in the heart of Taizhou Old City, close to the city's ancient developing axis, it is an important node in the transformation of city development. The historical and cultural characteristics of the area need to be explored to enhance the spatial benefits. With the convenient transportation and good surrounding environment, buildings peripheral to the neighborhood should have attention paid to the display function of the area in the city. For buildings inside the district, improvement of building quality should be focused. The area could be considered for renovation through the collaboration of property developers, government departments, and civic organizations.

The Five Alleys to Han Xi Street Historic Area is a deductive and authentic cultural mixture type, aiming to enhance cultural diversity. In the first round of regeneration, some buildings with unsolid structures or low cultural value were demolished. New antique buildings now occupy certain parts of the area, which need to be considered in the next step of renovation. As this area is close to the famous business street in Taizhou Old City, which has been a prosperous place for urban development since ancient times, it is a good example of a residential area affected by city commerce. Also, building along the river is another characteristic of this area. The guideline focus of the orientation is to showcase the unique Qing Dynasty residential character along the river. Based on the existing new antique buildings, the cultural traditions of this area should be interpreted and highlighted. The buildings in the area need to be continuously maintained and organically renovated. At the same time, it is necessary to reconcile the shaping of cultural character with the living preservation of the area. Appropriate consideration may be given to the introduction of private organizations or local people to participate in the conservation practices of the area.

The Bell and Drum Tower Historic Area belongs to the image-display-oriented type, which could become a typical traditional landscape of Taizhou City. After the last renovation practice organized by the local people, due to the lack of governmental control, the appearances of several buildings show an inappropriate mixture. Therefore, it is important to clarify the overall development style goal of this region. As this area has a history of over 700 years, it is a typical traditional settlement in the heart of Taizhou Old City. The whole area should display a Qing Dynasty residential style settlement. A suggestion for the next regeneration step is to maintain the bottom-up approach of public participation in the conservation process, with appropriate intervention by the government and the city investment corporation. On the one hand, conservation and renovation of buildings should be regulated in the area, rectifying some of the behaviors which only focus on economic benefits at the expense of cultural and historical value. On the other hand, the building image of Qing Dynasty residential settlements should be created in a holistic manner, strengthening the links between the interior of the area and the exterior of the city. The modern building facades along the streets need to be appropriately renovated to showcase the historical character to the public.

6. Discussion

By comparing the buildings represented in three historic areas of Taizhou Old City, buildings before renovation often face problems more on a material level. Insufficient architectural structure and poor preservation of the building façade usually aroused the insufficiency of building function benefits. Buildings during the process of renovation need to have more attention paid to the spiritual level of problems. This means the creation of the cultural atmosphere of the overall community in the neighborhood. Patches in the region need to be as close to the “Target Historical Style” to show the historical and cultural characteristics of the area. This can be achieved by revising the façade to display sufficient historical style to the external environment or using the function to bring sufficient cultural benefits to the region. Renovation guided by different subjects would lead to different problems in the update process. The government-led renewal behavior is more focused on the formulation of standardized and uniform renewal methods. The regional overall appearance control is more stringent in contrast, as it lacks the differentiated development of cultural diversity. The renewal operation dominated by the local community is more focused on actual operability. The renewal methods and regeneration times are different, showing a variety of building facades and community cultures. The disadvantage of this process is the lack of control over the overall features of the region. Some owners have difficulty grasping the degree of style change, resulting in the inappropriate transformation of some buildings far from the original style.

Building renovation in historic areas is not a matter of generalization. The actual conditions and dominant problems of each problem are different, so various modification methods and measures need to be taken. The history and culture could be displayed

diversely because of the differences in each building. However, if there is a lack of overall categorization strategies, every historic area would lack the theme of control. Excessive transformation methods and styles may cause chaos in regional historical and cultural displays, making it difficult for people to understand the differences in development in different areas, and different specific historical styles should be displayed in different locations. Therefore, the control of elements or overall style is necessary. It is also important to categorize guides based on the proportion of different building types and the prominent conflicts in the area.

Through the deepening application of the dynamic evaluation model, the advantage of this paradigm is that the differences between each building in the region and the diversification of the historical development have been truly displayed and evaluated. The setting of "Target Historical Style" makes the building style in the plaque have a certain coordination. The dynamic evaluation method can be used in the follow-up for the further renovation process of the area and to continuously propose value-targeted adjustments. The limitation is that the judgment of the overall type of the area is only based on the percentage of different types of buildings and few other relative elements are considered. For the three cases in the research, because they are about to carry out urban planning and renovation design, categorization strategies are proposed partly based on the urban design. In subsequent research, the important extent of the regional impact on the city, the convenience of traffic, and the role of external display should also be included.

7. Conclusions

This study solved three issues as follows: firstly, for buildings before the renovation practice, by analyzing the distribution characteristics of building attribute points, the main types of building could be clarified. In the case area, the City Central Historic Area in Taizhou Old City, the dominant types are reproduction and authenticity buildings. The former needs the structure reinforced and the style condition improved urgently, while the latter needs to introduce appropriate use functions to maintain the building's use for longer periods of time.

Secondly, for buildings that were undergoing a renovation process that has stopped due to the pandemic, classifications of building attributes need to be compared with particles along the possible renovation lines or after the first step of renovation. There are two case areas analyzed in this study, the Five Alleys to Han Xi Street Historic Area and the Bell and Drum Tower Historic Area. The main types of buildings during renovation are deductive type and image-display type. For the former, it is necessary to frame the appropriate target style of the building and restrict proper use functions. For the latter, controlling elements include the reinforcement of the traditional structure, the integration of the building plane, and slight adjustment of the scale and number of stories according to requirements. The façade and appearance of the building should be significantly modified to show the characteristics of the target historical style.

Thirdly, as historic areas may be at different stages of the renovation process and may have undergone different regeneration practices, how is it possible to provide classification strategies for the whole region? Based on the analysis of three case areas, the area before renovation represents the cultural-oriented type, emphasizing cultural diversity promotion. The most urgent problem in this area is to improve the general building conditions and strengthen the solidity of building structures. Buildings peripheral to the neighborhood should have attention paid to the display function of the area to the city. At the same time, buildings in the area need to be continuously maintained and organically renovated. The area that has undergone a round of renovation by the local government and the city investment corporation is a deductive and authentic cultural mixture type. This type aims to enhance cultural diversity through further digging into the historical and cultural value of the area. Based on the existing new antique buildings, the cultural traditions of this area should be interpreted and highlighted. Meanwhile, it is necessary to reconcile the shaping of cultural character with the living preservation of the area. The region that has undergone

a round of spontaneous, bottom-up regeneration by local people belongs to the image-display-oriented type. The suggestion for the next regeneration step is to maintain the bottom-up approach of public participation in the conservation process, with appropriate intervention by the government and the city investment corporation. On the one hand, conservation and renovation of buildings should be regulated in the area, rectifying some of the behaviors that only focus on economic benefits at the expense of cultural and historical value. On the other hand, the target historical building image should be created in a holistic manner, strengthening the links between the interior of the area and the exterior of the city.

The shortcoming of this study is that this analysis is an intervention evaluation prior to the overall urban planning and design of Taizhou Old City. Therefore, it is uncertain whether the project would ultimately achieve the desired results under the assessment and guidance. The post-implementation effects would need to be verified after a period of time when the renovation practice has been implemented. In the future, more case samples could be used to analyze the sustainability of building attributes in different conservation processes. Meanwhile, if it is possible to adopt this methodology in the renovation planning process in China, more historic areas could have the renovation process dynamically evaluated, their building types classified, and their regional type and viable categorization strategy guidance made accordingly.

Author Contributions: Conceptualization, S.X. and B.L.; methodology, S.X. and B.L.; software, S.X. and H.W.; validation, S.X., H.W. and B.L.; formal analysis, S.X. and H.W.; investigation, S.X. and H.W.; resources, S.X. and B.L.; data curation, S.X. and H.W.; writing—original draft preparation, S.X. and H.W.; writing—review and editing, S.X. and H.W.; visualization, S.X. and H.W.; supervision, B.L.; project administration, B.L.; funding acquisition, S.X. and B.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data used to support the findings of this study are included in the article.

Acknowledgments: The authors are grateful to the anonymous reviewers for their valuable comments.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Scoring Standards of Each Dimension of building attributes.

Economy of construction dimension												
Historical buildings	Standard	—	—	—	—	—	Modern construction	Traditional construction including wood structure, brick and wood structure.				
	Score	—	—	—	—	—		Collapse	Unsteady	Some problem	Average	Steady
	Legend color	—	—	—	—	—						
Other buildings	Standard	Modern construction including Brick -concrete structure, steel concrete structure.					—	Traditional construction including wood structure, brick and wood structure.				
		Steady	Average	Some problem	Unsteady	Collapse	—	Collapse	Unsteady	Some problem	Average	Steady
	Score	−5	−4	−3	−2	−1	—	1	2	3	4	5
	Legend color						—					
Cultural of form dimension												
Historical buildings	Standard	—	—	—	—	—	Modern Form	The degree of fit between trditional building form with “Target Historical Style Di-agram”				
	Score	—	—	—	—	—		Not fit	Low degree	Average degree	High degree	Totally fit
	Legend color	—	—	—	—	—						
Other buildings	Standard	Modern building form conveys suitable historical information					—	The degree of fit between trditional building form with “Target Historical Style Di-agram”				
		Most	More	General	Less	Least	—	Not fit	Low degree	Average degree	High degree	Totally fit
	Score	−5	−4	−3	−2	−1	—	1	2	3	4	5
	Legend color						—					

Table A1. Cont.

Social of benefit dimension												
Historical buildings	Standard	Internal functions					Empty/ Industrial/ Garbage treatment/ public toilet	External functions				
		—	Educational building	Administrative office	Medical building	Local Residence		Business office	Catering bar/ Entertainment Leisure	Commercial re- tail/creative office	Hotel	Public service building/ Cultural commemorative
	Score	—	−4	−3	−2	−1	0	1	2	3	4	5
Other buildings	Legend color	—										
	Standard	Internal functions					Empty	External functions				
		Educational building	Administrative office	Medical building	Local Residence	Industrial/ Garbage treatment/ public toilet		Business office	creative office	Hotel	Catering bar/ Entertainment Leisure	Public service building/ Cultural commemorative/ Commercial retail
Other buildings	Score	−5	−4	—	−2	−1	0	1	2	3	4	5
	Legend color			—								

About the score chart of the three dimensions of building attributes shown in Table A2, it is based on the detailed investigation of 1210 buildings in the City Central Historic Area, 590 buildings in the Five Alleys to Han Xi Street Historic Area, and 492 buildings in the Bell and Drum Tower Historic Area. Among them, the Target Historical Style Diagram is based on a detailed compilation of the development history and cultural characteristics of the three areas.

Table A2. Building Attribute Dimensions Score Chart.

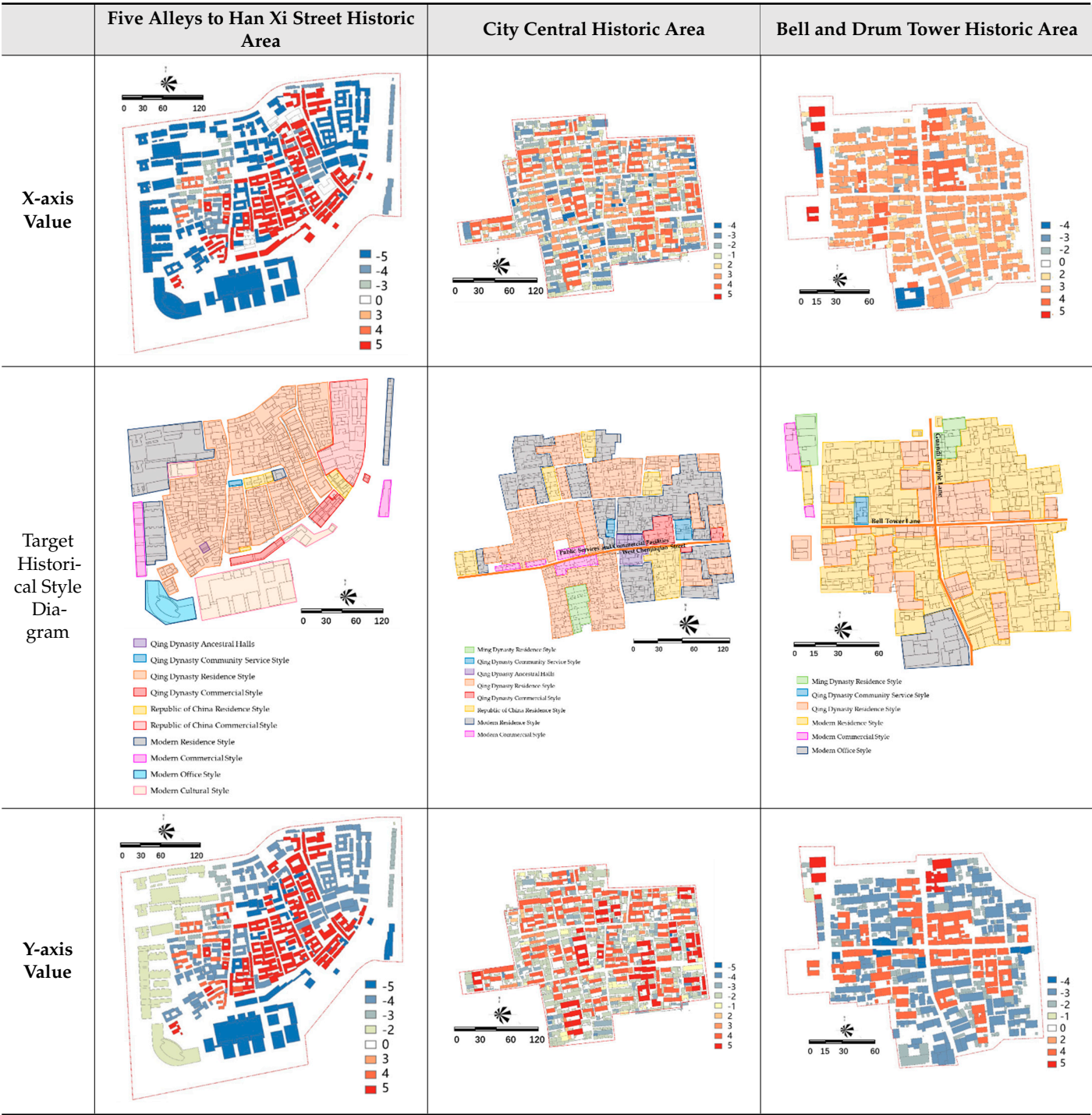
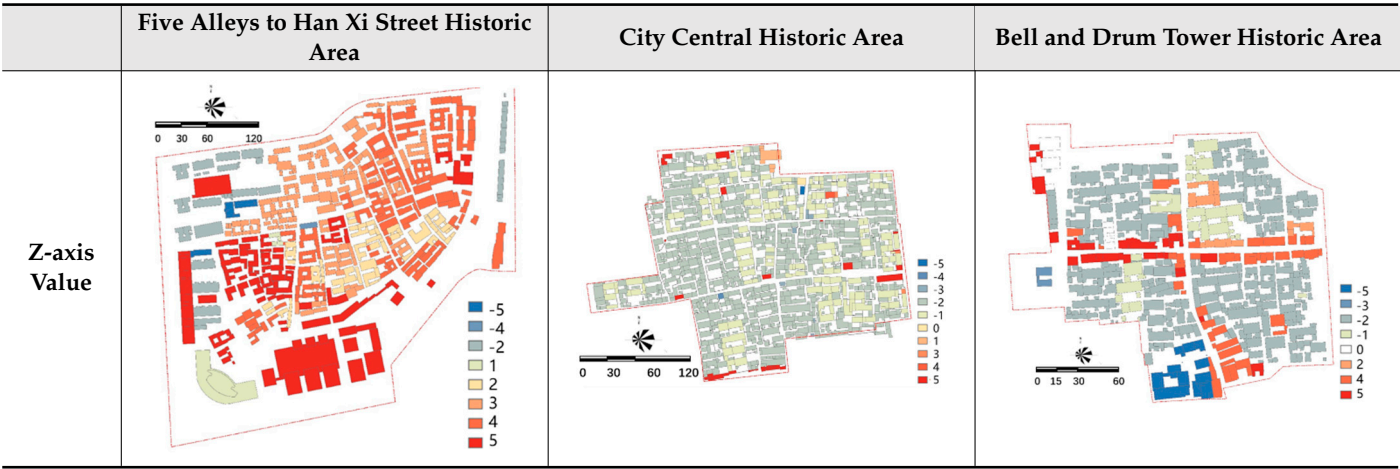


Table A2. Cont.



Appendix B

To analyze the aggregation distribution and changes of building attribute points quantitatively and rationally, a scientific analysis using the cluster analysis method in statistics is required. In the analysis of building attribute scatter, the number of clusters of building attribute points was first analyzed using the hierarchical clustering method. When performing the analysis of the systematic clustering method, there are a variety of methods provided in the SPSS software (PASW Statistics 18) to measure the closeness of distance between individuals and subclasses and subclasses and subclasses, including intergroup linkage, intragroup linkage, nearest-neighbor element, farthest-neighbor element, center-of-mass clustering method, median clustering method, and Ward’s method. In general, the results of clustering using different methods are not completely consistent. In order to make the clustering results relatively objective, all the above seven clustering methods were tested to extract the commonality results. The interval metric is selected to be analyzed by the sum of squared deviations method, which is the most commonly used and most practical in statistics. After determining the number of clusters of building attribute points, the K-means rapid clustering method is used to analyze the coordinates of the center point of each cluster, which represents the common attributes of buildings in each cluster. The convergence criterion is used for clustering with a default of 0.02, which indicates that any new class generated by this iteration has a small change in the location of the centers, with the largest change rate being less than 2%.

Table A3. Seven cluster analysis of buildings in the City Central Historic Area.

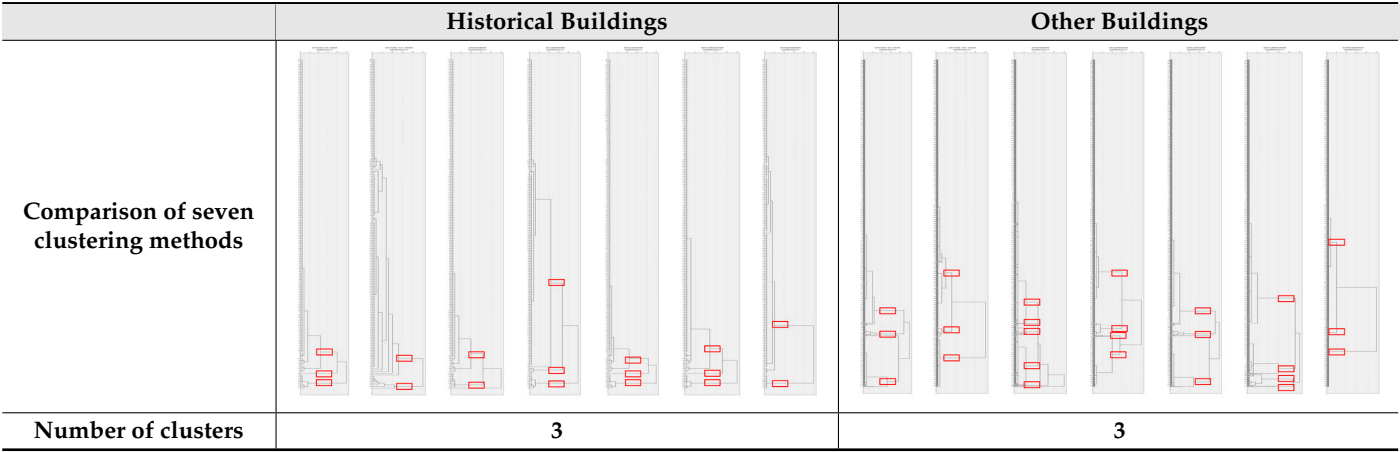


Table A4. K-means cluster analysis of historical buildings in the City Central Historic Area.

Cluster Center			
Cluster Type	1	2	3
Structure	4	3	2
Form	5	4	-3
Benefit	-1	-1	-1
Number of cases in each cluster			
Cluster	1		153
	2		39
	3		9
Efficient			201
Missing			0
Distance between the cluster centers			
Cluster	1	2	3
1		1.382	7.737
2	1.382		6.687
3	7.737	6.687	

Table A5. K-means cluster analysis of other buildings in the City Central Historic Area.

Cluster Center			
Cluster Type	1	2	3
Structure	-1	-2	3
Form	-1	-2	4
Benefit	5	-2	-2
Number of cases in each cluster			
Cluster	1		31
	2		821
	3		157
Efficient			1009
Missing			0
Distance between the cluster centers			
Cluster	1	2	3
1		6.972	9.550
2	6.972		7.476
3	9.550	7.476	

Table A6. Seven cluster analysis of buildings in the Five Alleys to Han Xi Street Historic Area.

	Historical Buildings							Other Buildings						
Comparison of seven clustering methods														
Number of clusters	3							4						

Table A7. K-means cluster analysis of historical buildings in the Five Alleys to Han Xi Street Historic Area.

Cluster Center			
Cluster Type	1	2	3
Structure	5	5	3
Form	5	5	5
Benefit	−4	2	4
Number of cases in each cluster			
Cluster	1		1
	2		72
	3		89
Efficient			162
Missing			0
Distance between the cluster centers			
Cluster	1	2	3
1		6.281	8.099
2	6.281		2.339
3	8.099	2.339	

Table A8. K-means cluster analysis of other buildings in the Five Alleys to Han Xi Street Historic Area.

Cluster Center				
Cluster Type	1	2	3	4
Structure	−5	−4	5	−4
Form	−2	4	3	−4
Benefit	−2	4	4	4
Number of cases in each cluster				
Cluster	1		52	
	2		8	
	3		91	
	4		277	
Efficient			428	
Missing			0	
Distance between the cluster centers				
Cluster	1	2	3	4
1		9.145	12.398	6.411
2	9.145		9.044	8.092
3	12.398	9.044		11.427
4	6.411	8.092	11.427	

Table A9. Seven cluster analysis of buildings in the Bell and Drum Tower Historic Area.

	Historical Buildings							Other Buildings						
Comparison of seven clustering methods														
Number of clusters	4							6						

Table A10. K-means cluster analysis of historical buildings in the Bell and Drum Tower Historic Area.

Cluster Center				
Cluster Type	1	2	3	4
Structure	4	0	4	0
Form	4	5	4	0
Benefit	1	−1	−1	−1
Number of cases in each cluster				
Cluster	1		13	
	2		5	
	3		42	
	4		1	
Efficient			61	
Missing			0	
Distance between the cluster centers				
Cluster	1	2	3	4
1		4.527	1.964	6.239
2	4.527		4.132	4.604
3	1.964	4.132		5.879
4	6.239	4.604	5.879	

Table A11. K-means cluster analysis of other buildings in the Bell and Drum Tower Historic Area.

Cluster Center						
Cluster Type	1	2	3	4	5	6
Structure	3	3	3	−2	−2	3
Form	−3	−3	4	−2	−2	4
Benefit	−2	4	4	4	−2	−2
Number of cases in each cluster						
Cluster	1			282		
	2			44		
	3			39		
	4			17		
	5			60		
	6			49		
Efficient				491		
Missing				0		
Distance between the cluster centers						
Cluster	1	2	3	4	5	6
1		6.179	9.141	7.874	4.816	6.403
2	6.179		7.073	5.324	8.142	9.178
3	9.141	7.073		7.960	10.287	6.258
4	7.874	5.324	7.960		6.260	9.897
5	4.816	8.142	10.287	6.260		7.879
6	6.403	9.178	6.258	9.897	7.879	

References

1. Sun, C.; Zhou, Y.; Han, Y. Automatic generation of architecture facade for historical urban renovation using generative adversarial network. *Build. Environ.* **2022**, *212*, 108781. [\[CrossRef\]](#)
2. Gai, Q.; Li, Z.; Hu, H. Strategies for China's Historic Districts Regeneration in Responding to Public Health Emergencies. *Sustainability* **2022**, *14*, 14020. [\[CrossRef\]](#)
3. Singh, J.; Singh, J. COVID-19 and its impact on society. *Electron. Res. J. Soc. Sci. Humanit.* **2020**, *2*, 5.

4. Pérez, M.G.R.; Laprise, M.; Rey, E. Fostering sustainable urban renewal at the neighborhood scale with a spatial decision support system. *Sustain. Cities Soc.* **2018**, *38*, 440–451. [CrossRef]
5. Manupati, V.K.; Ramkumar, M.; Samanta, D. A multi-criteria decision making approach for the urban renewal in Southern India. *Sustain. Cities Soc.* **2018**, *42*, 471–481. [CrossRef]
6. Urban Planning Organization Approaches in China. 2006. Available online: https://www.gov.cn/ziliao/flfg/2006-02/15/content_191969.htm (accessed on 4 February 2024).
7. Bandarin, F.; van Oers, R. *The Historic Urban Landscape: Managing Heritage in an Urban Century*, 1st ed.; Wiley: Hoboken, NJ, USA, 2012.
8. China ICOMOS. Principles for the Conservation of Heritage Sites in China. China ICOMOS. 2002. Available online: https://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/china_prin_1chinese.pdf (accessed on 19 January 2024).
9. Ragni, M.; Maurano, A.; Scoppola, F.; Soragni, U.; Baraldi, M.; D’Amico, S.; Mercalli, M.; Banchini, R.; Bellisario, M.G.; Rubino, C.; et al. *Linee di Indirizzo per il Miglioramento Dell’efficienza Energetica nel Patrimonio Culturale*; Architettura Centri e Nuclei Storici ed Urbani. Ministero dei Beni Culturali: Roma, Italy, 2013; pp. 1–200. Available online: <https://certifico.com/component/attachments/download/13558> (accessed on 19 January 2024).
10. Charter, K. *Principles for Conservation and Restoration of Built Heritage*; Marsilio: Venice, Italy, 2000. Available online: http://icomosubih.ba/pdf/medjunarodni_dokumenti/2000%20Krakovska%20povelja.pdf (accessed on 19 January 2024).
11. Di Giovine, M.A. The heritage scape: Origins, theoretical interventions, and critical reception of a model for understanding UNESCO’s World Heritage Program. *Tour. Rev.* **2018**, *13*, 185–197. [CrossRef]
12. Al-Sakkaf, A.; Zayed, T.; Bagchi, A. A Review of Definition and Classification of Heritage Buildings and Framework for their Evaluation. In Proceedings of the 2nd International Conference on New Horizons in Green Civil Engineering (NHICE-02), Victoria, BC, Canada, 24–27 August 2020; pp. 1–5. Available online: https://www.researchgate.net/publication/341160581_A_Review_of_Definition_and_Classification_of_Heritage_Buildings_and_Framework_for_their_Evaluation#fullTextFileContent (accessed on 19 January 2024).
13. Hewison, R. *The Heritage Industry: Britain in a Climate of Decline*, 1st ed.; Routledge: London, UK, 1987. [CrossRef]
14. Bulut, Y.; Atabeyoğlu, Ö. Fountains as urban furniture in historical urban structure and usage culture: Erzurum city case. *Build. Environ.* **2007**, *42*, 2432–2438. [CrossRef]
15. Rodwell, D. *Conservation and Sustainability in Historic Cities*; Blackwell: Oxford, UK, 2007; p. 59.
16. Poullos, I. Is Every Heritage Site a ‘Living’ One? Linking Conservation to Communities’ Association with Sites. *Hist. Environ. Policy Pract.* **2011**, *2*, 144–156. [CrossRef]
17. Poullos, I. *The Past in the Present: A Living Heritage Approach—Meteora, Greece*; Ubiquity Press: London, UK, 2014.
18. Poullos, I. Discussing Strategy in Heritage Conservation: Living Heritage Approach as an Example of Strategic Innovation. *J. Cult. Herit. Manag. Sustain. Dev.* **2014**, *4*, 16–34. [CrossRef]
19. Poullos, I. Moving Beyond a Values-Based Approach to Heritage Conservation. *Conserv. Manag. Archaeol. Sites* **2010**, *12*, 170–185. [CrossRef]
20. Zancheti, S.M.; Jokilehto, J. Values and urban conservation planning: Some reflections on principles and definitions. *J. Archit. Conserv.* **1997**, *3*, 37–51. [CrossRef]
21. Schávelzon, D. Historic Site and Historic Building Preservation: Overview. In *Encyclopedia of Global Archaeology*; Smith, C., Ed.; Springer: Berlin/Heidelberg, Germany, 2020; pp. 3385–3388. Available online: https://link.springer.com/referenceworkentry/10.1007/978-3-030-30018-0_1378 (accessed on 19 January 2024).
22. Akande, O.K. Factors Influencing Operational Energy Performance and Refurbishment of UK Listed Church Buildings: Towards a Strategic Management Framework. Ph.D. Thesis, Anglia Ruskin University, Cambridge, UK, 2015.
23. Rong, X.; Li, C. A Brief Analysis of the Improvement of the Law of the People’s Republic of China on the Protection of Cultural Relics. *Sci. Soc. Res.* **2023**, *5*, 18–23. [CrossRef]
24. The Provisional Regulations on the Protection and Management of Cultural Relics. 1961. Available online: https://en.unesco.org/sites/default/files/china_law_1961_chin_orof.pdf (accessed on 8 February 2024).
25. The Law of the People’s Republic of China on Protection of Cultural Relics. 1982. Available online: https://english.www.gov.cn/archive/laws_regulations/2014/08/23/content_281474982987444.htm (accessed on 19 January 2024).
26. Regulations on the Protection of Famous Historical and Cultural Cities, Towns, and Villages. 1994. Available online: <https://www.cecc.gov/resources/legal-provisions/regulation-on-the-protection-of-famous-historic-and-cultural-cities-towns> (accessed on 19 January 2024).
27. The Temporary Measure on the Conservation and Management of Tunxi Old Street in Huangshan. 1997. Available online: <https://www.163.com/dy/article/HS2PLCFK05346KFL.html> (accessed on 8 February 2024).
28. Jin, X. Strategy and Practice for the Adaptive Renovation to the Multiple Historic Sites of Modern Times. Ph.D. Thesis, Dalian University of Technology, Dalian, China, 2010.
29. Guidelines for the Preparation of the Protection Planning of Historical and Cultural District in Jiangsu Province. 2008. Available online: <https://www.docin.com/p-2439895684.html> (accessed on 4 February 2024).
30. Guidelines for the Preparation of Conservation Planning for Historic District in Jiangsu Province. Available online: <https://www.taodocs.com/p-438816124.html> (accessed on 4 February 2024).

31. Qiu, B. Situation & Problem of and Counter Measure for the Conservation of the Historical and Cultural Cities in China. *China Anc. City* **2012**, *12*, 4–9.
32. Ruan, Y. Thinking on the Protection of Historical Cultural Heritage. *Shanghai Urban Plan. Rev.* **2011**, *4*, 3–6.
33. Carroon, J.; Moe, R. *Sustainable Preservation: Greening Existing Buildings*, 1st ed.; Wiley: Hoboken, NJ, USA, 2010.
34. Onecha, B.; Dotor, A.; Marmolejo-Duarte, C. Beyond Cultural and Historic Values, Sustainability as a New Kind of Value for Historic Buildings. *Sustainability* **2021**, *13*, 8248. [\[CrossRef\]](#)
35. ICOMOS. *Heritage and Sustainable Development Goals: Policy Guidance for Heritage and Development Actors*; ICOMOS: Paris, France, 2021. Available online: <https://openarchive.icomos.org/id/eprint/2453/> (accessed on 19 January 2024).
36. UN. Transforming Our World: The 2030 Agenda for Sustainable Development, A/RES/70/1 Resolution. Available online: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf> (accessed on 19 January 2024).
37. Roberti, F.; Oberegger, U.F.; Gasparella, A. Calibrating historic building energy models to hourly indoor air and surface temperatures: Methodology and case study. *Energy Build.* **2015**, *108*, 236–243. [\[CrossRef\]](#)
38. Lucchi, E.; Pracchi, V. *Efficienza Energetica e Patrimonio Costruito: La Sfida del Miglioramento Delle Prestazioni Nell'edilizia Storica*; Ed. Maggioli: Milano, Italy, 2013.
39. Ma, Z.; Cooper, P.; Daly, D.; Ledo, L. Existing building retrofits: Methodology and state-of-the-art. *Energy Build.* **2012**, *55*, 889–902. [\[CrossRef\]](#)
40. Ward, A.R. Echoes in a Changing Urban Landscape: Memories and Place identity in Durham, North Carolina. Ph.D. Thesis, The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA, 2012.
41. Aksözen, M.; Hassler, U.; Kohler, N. Reconstitution of the dynamics of an urban building stock. *Build. Res. Inf.* **2017**, *45*, 239–258. [\[CrossRef\]](#)
42. Han, Y.; Qiao, X.; Sun, W.C.; Zhang, L.T. Application of virtual reality GIS in urban planning—An example in Huangdao district. In Proceedings of the 15th International Conference on Geoinformatics, Seattle, WA, USA, 7–9 November 2007; Volume 6754. Part 1–2. [\[CrossRef\]](#)
43. Baggio, M.; Tinterri, C.; Dalla Mora, T.; Righi, A.; Peron, F.; Romagnoni, P. Sustainability of a historical building renovation design through the application of LEED® rating system. *Int. Sci. Conf. Environ. Clim. Technol. (CONNECT)* **2017**, *113*, 382–389. [\[CrossRef\]](#)
44. Vardopoulos, I. Adaptive Reuse for Sustainable Development and Land Use: A Multivariate Linear Regression Analysis Estimating Key Determinants of Public Perceptions. *Heritage* **2023**, *6*, 809–828. [\[CrossRef\]](#)
45. Anelli, D.; Tajani, F. Valorization of cultural heritage and land take reduction: An urban compensation model for the replacement of unsuitable buildings in an Italian UNESCO site. *J. Cult. Herit.* **2022**, *57*, 165–172. [\[CrossRef\]](#)
46. Al-Sakkaf, A.; Zayed, T.; Bagchi, A. A Sustainability Based Framework for Evaluating the Heritage Buildings. *IJEOE* **2020**, *9*, 49–73. [\[CrossRef\]](#)
47. Karimi, F.; Valibeig, N.; Memarian, G.; Kamari, A. Sustainability Rating Systems for Historic Buildings: A Systematic Review. *Sustainability* **2022**, *14*, 12448. [\[CrossRef\]](#)
48. Xia, S.; Liu, B.; Wang, H. Construction of a Sustainability-Based Building Attribute Conservation Assessment Model in Historic Areas. *Buildings* **2022**, *12*, 1346. [\[CrossRef\]](#)
49. The Athens Charter for the Restoration of Historic Monuments—1931 Written on 11 November 2011. Available online: <https://www.icomos.org/en/charters-and-texts/179-articles-en-francais/ressources/charters-and-standards/167-the-athens-charter-for-the-restoration-of-historic-monuments> (accessed on 19 January 2024).
50. Adamus-Matuszyńska, A.; Michnik, J.; Polok, G. A systemic approach to city image building. The case of Katowice city. *Sustainability* **2019**, *11*, 4470. [\[CrossRef\]](#)

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.