Hindawi
Mathematical Problems in Engineering
Volume 2022, Article ID 6049677, 21 pages
https://doi.org/10.1155/2022/6049677

*Research Article*

# The Planning and Construction Path of Innovative and Intelligent Park Cities Based on Big Data Technology

**Tao Hong, Lulu Li, and Bing Wang**

*School of Architecture and Planning, Anhui Jianzhu University, Hefei 230601, China*

Correspondence should be addressed to Tao Hong; hongtao79@ahjzu.edu.cn

Received 6 February 2022; Accepted 17 March 2022; Published 13 April 2022

Academic Editor: Muhammad Faisal Nadeem



By analyzing the historical background of the times and summarizing the current situation of urban development research at home and abroad, we find that there is a lack of theoretical and practical research related to intelligent park cities. Therefore, this paper first starts with the connotation of park city theory, focuses on the improvement of planning methods, and studies the application paths of big data technology in the planning and construction of park cities. Taking Jinzhai Country as the research object, this paper further illustrates the applicability of this research method at the macrolevel. In the context of the park city, we analyze the problems of the current status of city construction in general and explore the path of "planning concept first, big data-assisted design" for innovative and intelligent city construction. According to the study, the overlook corridor control has an impact on the building height. In terms of landscape protection, overlook system simulation is the other key factor. In addition, the analytic hierarchy process is the basis for development intensity control. The results show that big data technology can assist in the landscape conservation, morphology formation, and efficient operation of Jinzhai Country Park City. Our aim is to achieve the protection and utilization of its ecological environment and natural resources and thus to comprehensively coordinate the multidimensional urban spaces and build a park city model. As an urban development model that meets the requirements of being "people-oriented, efficient, green, and aesthetic" in the new stage, park cities need to be faced by researchers in order to further realize the overall city goal and vision for the whole society to be smart. It also provides relevant design ideas and methods for the planning and construction of park cities in other similar cities or regions.

## 1. Introduction

In the nineteenth century, Howard's Garden City theory advocated the development model of urban clusters and the use of large "green belts" to improve the urban environment [1]. In addition, the United Nations Conference on the Human Environment proposed the sustainable city as "the planning and management of human settlements for environmental quality" [2]. In the 1970s, the ecocity was seen as "a city in nature." Since the twenty-first century, the level of urbanization has further increased globally. "We are living in the First Urban Century, where half of the world's population has lived in metropolitan areas throughout human history." At this stage, China's urbanization rate has reached 60.6%. The unbalanced social development, "urban disease," and human living environment problems are conspicuous, and the "reinforced concrete jungle" cities are full of "glass boxes," while the phenomenon of "one city in a thousand" is sticking out, and the urban transformation needs a scientific theoretical system for the application proof [3]. At the same time, the city's leisure and green public space are advocated to be increased, but the priority is low. People are eager to return to the natural life of leisure, but the fragmentation phenomenon is serious and the public's openness is insufficient. However, the current era of ecological civilization and new urbanization calls for the establishment of "innovative, coordinated, shared, green, open, and polycentric cities."

The park city is proposed to combine "humanism embodiment," "urban efficiency enhancement," "ecological environmental protection," and "beautiful China construction." In February 2018, relevant policy calls were made: "we should highlight the characteristics of park cities, take ecological values into account, strive to build new growth poles, and construct an inland open economic highland." Among them, the "new growth pole" is the economic goal to be achieved on the premise of "taking the 'ecological value' into account" [4]. It is an aspiration for the future city and the embodiment of governing ideology in urban governance, ushering in a new direction for urban planning as well. As an antidote in urban planning and construction as well as an important natural space for residents' leisure and recreation, parks can be developed into systematic urban open spaces, thus promoting the integration of urban aesthetic, ecological, and humanistic values. Furthermore, park cities advocate fully exploiting the special topographical features, native plants, ecological landscapes, folk customs, and other urban characteristic elements; finding the trait genes; shaping regional characteristics and contemporary style through urban design; and promoting urban construction. In order to maximize these benefits, the primary goal of current urban research is to clarify the planning and construction ideas and highlights of park cities.

The ideal form of park city has gradually become clear due to the exploration of experts and scholars. Many theoretical studies have focused on connotation summary, feature analysis, and concept comparison. In the academic field, early Cao believed that park city "integrates landscape gardening and the city, i.e., naturalism and idealism, and is the ideal city paradigm in the twenty-first century" [5]. Cheng et al. outlined the four major components of park cities from the perspective of connotation composition, including the establishment of the "ecological civilization-led" development view, the "life community" ecological concept, and "humanistic" values [6]. It is worth noting that Shi et al. divided the "green" urban development forms into two categories: goal-oriented and path-oriented, and proposed that the park city, as the latest breakthrough in urban development forms, is more systematic, scientific, and clear; its construction path should focus on the value of "urban intelligence" at the technical level and use the Internet of Things (IoT) wisdom technology as a means of park city governance; the final city goal is to achieve deep integration to jointly create a beautiful realm of "unity of heaven and man" in park cities [7].

However, current studies on park city are not innovative enough due to the challenges posed by information barriers. Many studies have explored the role of big data for park functions [8], open space effectiveness improvement [9], landscape planning and design improvement [10, 11], and mobile user experience analysis [12]. However, few have focused on and tested the mutual coupling performance of different urban development models to improve urban planning efficiency and coordinate operations [13]. Referring to the research on urban ecological wisdom, the design-assisted approach of technological tools should be considered in the process of development model formation [14]. This is the current development trend in the related research field, which also provides the research direction and focuses for this paper; that is, the improvement of park city operation efficiency can be shaped by tapping into the wisdom of technological means to assist in the design of multilevel open space systems and shape the multidimensional great beauty city form. The research object is Jinzhai Country, a small city, to seek planning and construction methods at the macro-scale overall urban design level. The results of the study will provide a practical basis and reference for the green, efficient, aesthetic, and sustainable development of the city and eventually realize the ideal vision of a park city with a localized layout. At the same time, it will offer some informative values for other city constructions. The rest of this paper is structured as follows: Section 2 is devoted for the theoretical connotation of park city and the design path with big data; Section 3 explains general application idea of park cities and the specific practice path; Section 4 concretizes the argumentative methodology to verify the correctness of the theory; Section 5 shows the park city design construction results; Section 6 points out the future research direction. The flowchart of this paper is shown in Figure 1.

## 2. Study Theoretical Contribution

The ideal city development model of park city is the first of its kind in China and originates from Qian Xuesen's concept of Landscape City, which reflects the organic combination of nature, ecology, and humanity in the city [15]. The essence of the Garden City is the combination of city and countryside, while the park city focuses on the economic development of the city on the basis of harmony between humans and nature. The ecocity is an urban relationship based on the principles of ecological theory that establishes the harmonious development of nature, economy, and society, and park city promotes the harmony between people and nature while focusing on synergistic integration with humanistic meanings. Compared with Landscape City and Sponge City, park city focuses on the water ecological system and resource management of cities and emphasizes the concept of "landscape, forest, field, lake, and grass" as a community of life with a stronger natural meaning. Compared with Forest City, park city adopts a systematic and complete concept of urban green development. It is to view the development laws of the city and nature from a higher station and better reflect the humanistic significance, natural flavor, and urban value.

At present, there are many different opinions about the planning and construction of park cities from various experts and researchers. In fact, some cities at home and abroad have taken the core meaning of park cities as their development goals. Foreign practices regarding the importance of public space in parks, the embodiment of multidimensional values, the highlighting of social equity, and the green sustainable urban development model of related cities have been covered [16–19]. Olmsted planned and built the first modern New York Central Park, which formed the basis of the park system theory [20]. The Boston ecosystem is considered as an international prototype of the park city. Singapore insists on environmental improvement and ecological greening as a long-term basic national policy and proposes a city where people live, work, and play in gardens: a beautiful and striking Garden City. Recent studies have also shown that adequate parkland and effective actions by residents and city authorities are prerequisites for the construction of garden cities [21]. However, domestic

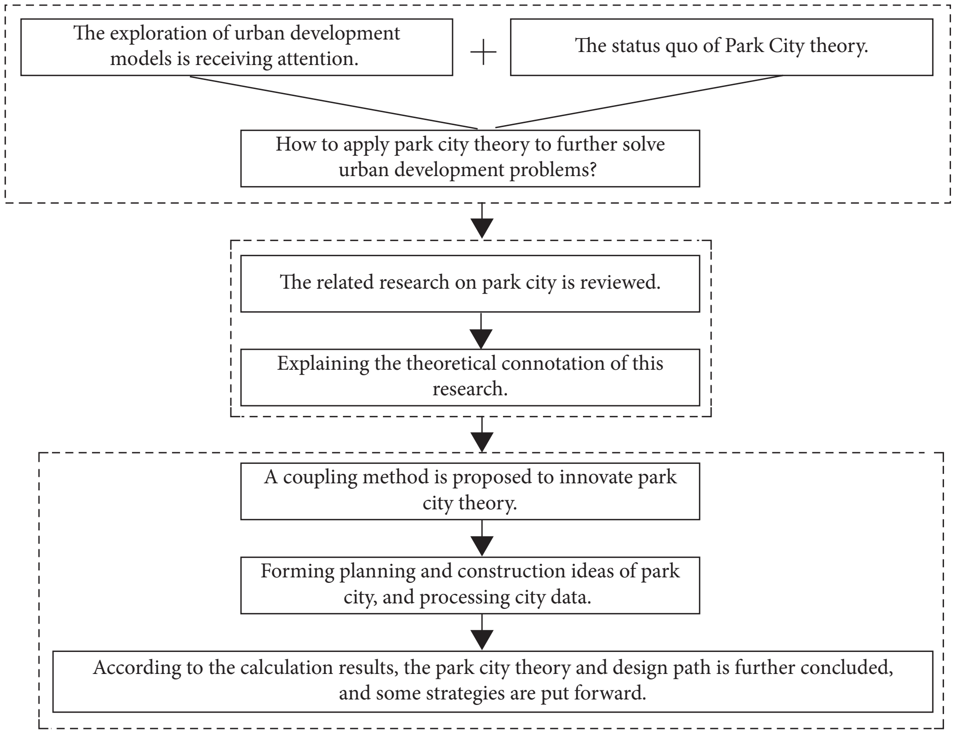



Figure 1: Flowchart for conducting this research.

practical explorations have mainly focused on large- and medium-sized cities or regions, mostly at the medium, microurban, and rural scales, or on a specific urban design element [22]. The case of park city construction in Chengdu was selected in the Special Edition of the China National Human Development Report as the most representative and typical successful case of urban development in China. And as a sample, there has been a recent study on the standard construction of related guideline system [23]. In Chengdu Tianfu New Area, the ecological skeleton of the whole area in the core is "300 m to the green, 500 m to the water, and 1000 m to the garden," which has become a model for urban development in China. It is also proposed to build a new ecological creator park born under the convergence from park city and Smart City, as a large space for creators with "park+" "greenway+" and "ecology+" IPs. These are all successful cases of park city construction.

In general, it seems that the basis of this paper is the park city theory, which focuses on determining the basic and antecedent construction configuration elements of urban and rural development, i.e., the planning and positioning of park green space system and park-like style and pattern [24]. In other words, the theoretical framework of urban design is constructed with a humanistic vision of habitat, while ensuring the premise of green water and mountains and promoting the highly harmonious unity of "people, city, environment, and industry" [25]. The research direction of this paper: big data has the characteristics of high efficiency, accuracy, sustainability, and volume and speed diversity [26]. It often includes smart device real-time information in social networks [27, 28], point of interest (POI) [29], massive high-resolution aerial pictures, and image parameterization, in addition to the conventional built environment types data [30], etc. The research aims to explore "park city design based on big data technology," i.e., "intelligent park city," a new urban theory and paradigm which will further develop the theory of park city and prospectively use the concept of ecological wisdom to guide healthy urban development. Our specific goal is to combine the two major cities' development strategies, smart city and park city, to focus on the coordinated and innovative development of "Smart Ecology, Smart Life, and Smart Production." Among them, "Smart Ecology" is the precise allocation of urban ecological resources to achieve efficient utilization; "Smart Life" is a convenient and efficient public life service system formed by intelligent big data; "Smart Production" is the shaping of diversified urban industries, business types, and scenes through urban socioeconomic development; and finally, "smart city" is the establishment of an efficient social data-sharing network that will allow urban "Smart Sharing." As the core basis of the research, the "Smart Ecology" planning and construction of park cities is used to achieve the effective management, construction, and operation of urban parks with innovative technologies, to promote the competitiveness of cities and to create branded and smart park cities.

## 3. Research Methods

*3.1. The General Application Idea and Focus of Big Data Technology in Park City Planning and Construction.* By monitoring, collecting, and analyzing the information required for planning, we can build urban thematic databases such as urban environment, residents' activities, and facility operations, thus providing data support. Use a variety of urban data analysis methods such as overlooking systems, analytic hierarchy processes, spatial-temporal trajectory analysis, and overlooking corridor simulation to identify urban problems, complete feature analysis, influence mechanism formulation, and then propose targeted measures. Specifically, it simulates and analyzes the planning and construction scheme, optimizes the facility combination, scale, and plane layout, and then visually displays the effect of each scheme and finally carries out the design process, such as scheme optimization and selection.

### *3.2. The Specific Practice Path of "Smart Ecology" in Park Cities*

*3.2.1. Establishing an Overlook System to Control Building Height.* The "Smart Ecology" design of the park city chooses the public nature of the landscape environment, rather than all the high points, to realize the construction of an intelligent ecosystem information platform. We can create the park city's multifaceted charm by using the static data from the city to build the city view model and shape the three-dimensional form of the building. Furthermore, building height control helps to solve the obstruction of urban buildings to the landscape environment and improve the openness, visibility, and accessibility of the landscape resource space.

The use of GIS software as a technological platform is an emerging field of geospatial technology that combines geographic features and attribute data for mapping, analysis, and evaluation of real-world problems [31, 32]. Accurate calculation of building heights is achieved by methods such as 3D visual analysis to establish park city overlook models.

This model of "mountains and hills seeing each other" is shown in Figure 2(a); i.e., mountains looking at each other ensure that 20% of the height of the opposite mountain is not blocked when viewing from important hilltop viewpoints by defining the view corridor; the model of "view within the city" shown in Figure 2(b), i.e., the view between the mountain and the city, ensures that the mountain is not blocked by 20% of its height when viewed from the open space viewpoint of the city. The results of the observation point analysis are superimposed to ensure that the overlap is minimized [33].

*3.2.2. Limiting the Development Intensity Based on Hierarchical Analysis.* The static big data of this study is accurate to the building space baseline model and provides a rational analysis framework for the "Smart Ecology" design process of the park city [34]. By collecting the data of urban physical and spatial information, the big model of urban space can be superimposed and analyzed, so as to optimize the urban pattern in the plan layout and carry out the simulation analysis of urban three-dimensional spatial form [35]. The development intensity is guided by the need to protect the ecological pattern of the city, using building heights as a starting point for analysis, so as to create a multidimensional urban form and to continue urban development and construction.

Traffic location (the most accessible area of the city), service location (the main and secondary commercial centers of the city), and environmental location (such as the main public green areas of the city) are the three most important factors affecting the distribution of urban development intensity. Among them, the development intensity of urban land use affects traffic demand and trip distribution while it is limited by traffic capacity [36].

Therefore, through parameter assignment, the weight values of each influencing condition are calculated by using the analytic hierarchy process (AHP) method in this study, and the parameter values of different development intensity areas under the influence of the weights can be found by overlay analysis in the GIS environment so that the urban development intensity zoning can be established. The corresponding calculation formula is shown in

$$\begin{aligned} r_i &= \sum_{j=1}^{J} r_{ij}^{*} \times W_j, \\ \sum_{j=1}^{J} W_j &= 1, \end{aligned} \quad (1)$$

where $r_{ij}$ denotes the score of the $i$th plot under the $j$th influencing factor $W_j$ denotes the weight of the $j$th resounding factor, and $r_i$ denotes the final score of the $i$th plot under the influence of the weight.

Take the calculation of the volume ratio index in the development intensity control index system as an example, which has the greatest influence on urban development and construction. Suppose the total urban construction is $S$, the number of development intensity zones is $n$, and the plot area of the $i$th zoning plot is $A_i$, from which the formula for calculating the total urban construction area can be derived, as shown in

$$S = \sum_{i=1}^{n} A_i \times R_i \times K\,(= 1, 2, 3, \ldots, n), \quad (2)$$

where $K$ is a constant i.e., the ratio of the volume ratio of the $i$th zoned plot to the corresponding fraction $r_i$ of that volume ratio. The value of $K$ can be derived from the total urban construction $S$ and equation (2), and then the floor area ratio of the parcels in different development intensity zones and finally the development intensity zoning model under the principle of efficiency can be established.

*3.2.3. Simulation of the Landscape Interface by Constructing an Overlook Corridor.* The "Smart Ecology" design uses static data from the park city to map the ecological background of the city, simulate the natural space, control the landscape features, and enhance the appeal of the environment. Overlook image control is conducive to the formation of a "red, green, and blue" urban form and the promotion of the urban pattern of "city in the park, city-park connection." Via the analysis of the city profile, colourful urban data such as green, red, and blue are extracted as design elements. Core landscape areas are identified as catalytic points, and then the landscape interface is

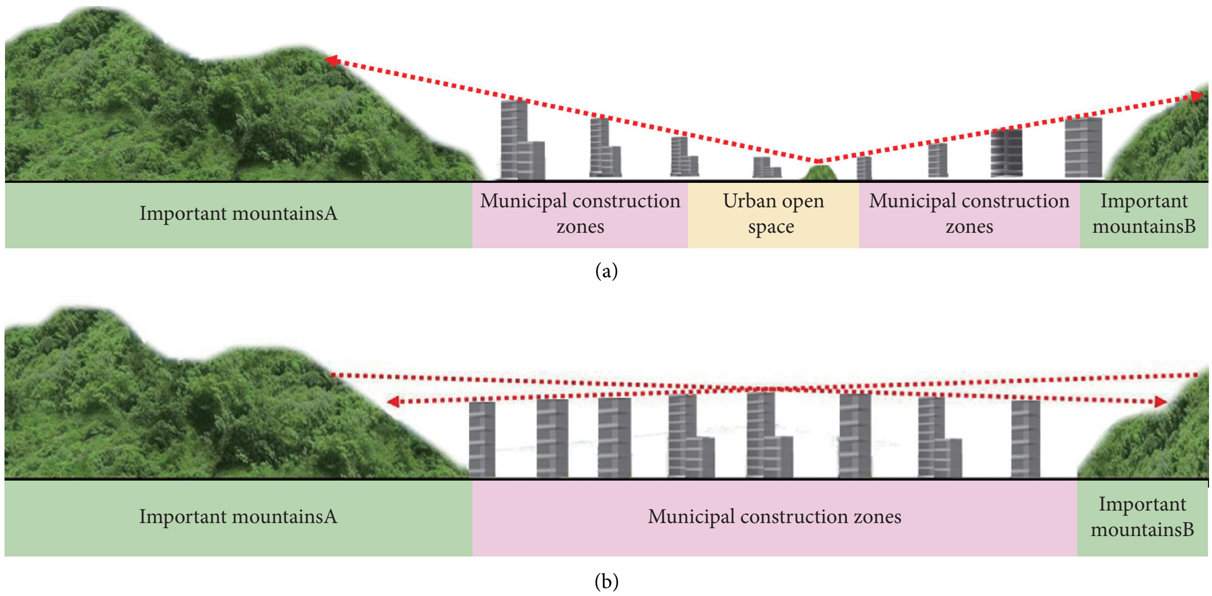



Figure 2: Overlook models of park city. (a) The model of "mountains and hills seeing each other." (b) The model of "view within the city."

dynamically simulated. Through the method of "expanding the surface with points and weaving the surface into a network," the city system will be created to enhance the spirit of urban places and their cultural charm.

The overlook system in this study focuses on controlling and guiding three elements: the overlook view point, the overlook view target, and the overlook corridor axis. The view corridor focuses on the control of three elements: the view corridor control area, the near view design control area, and the long view design coordination area, as shown in Figure 3.

The view corridor control area refers to the corridor control area of 500 m on each side of the centerline of the view corridor and prohibits construction behavior that obviously interferes with the view landscape; close-range design control area refers to the near-range from the scenic spot to the landscape target, with a radius of 500 m and an angle of 45° on either side of the corridor centerline, for a total of 90°, prohibiting construction that significantly interferes with the visual landscape; the visual design coordination zone is the area within a radius of 500 metres from the sightline target, starting from the centerline of the sightline corridor, 22.5° on each side and 45° in total. In the image impact area of the landscape target object, there should not be buildings and structures that have a negative impact on the landscape target object. Where necessary, the exact extent of the sightline design coordination zone needs to be determined through relevant planning and design analysis and research, but the good ecological environment and landscape image of the near-sightline zone needs architectural control to ensure this, including stylistic design, style guidance, and colour control, etc.

## 4. Methodological Argumentation

*4.1. Analysis of Current Problems in Jinzhai.* As illustrated in Figure 4, Jinzhai Country is located in the Lu'an city of Anhui province. It is an important part of the Dabie Mountain tourism, which is rich in red-hot tourism resources, as illustrated in Figure 5. As an important historical memory and geographical coordinates of the Yangtze River Delta Red Culture Tourism Regional Alliance, the Red Army Square in the old city is the deserved starting point of the Lu'an Line, with the Shi River running through the city and part of it surrounded by mountains. Its ecological conditions, urban quality, and livability have been ranked among the top in China. In general, Jinzhai Country has excellent basic conditions, which can provide excellent support for the planning and construction of park cities and effectively play its good demonstration role. In the context of Jinzhai Country Park City planning, the following problems are identified at the overall urban design level from the perspective of the four core construction aspects of "people," "city," "environment," and "industry," as shown in Figure 6.

*4.1.1. "People": Poor Accessibility of the Landscape.* The accessibility of the landscape is low, and there is a lack of interaction between the two sides of the water body. The number of public facilities near the Red Army Plaza and the density is too high. The blue water space is mainly in the form of linear and natural barges, lacking resting places and landscape corridors. The green network is poorly connected, and the open space and the existing landscape pattern are not sufficiently connected.

*4.1.2. "City": Inadequate Guidance on the Environment.* The polarization effect of urban development is obvious, and the function and layout are unbalanced in favor of red-bellied city elements. The lack of control and guidance in urban landscape zoning and high-rise building has led to the blockage of the view corridor between the city and the mountain, which negates the original landscape-scale relationship and overall image. The visibility of the urban overlook system is poor, with poor landscape conditions

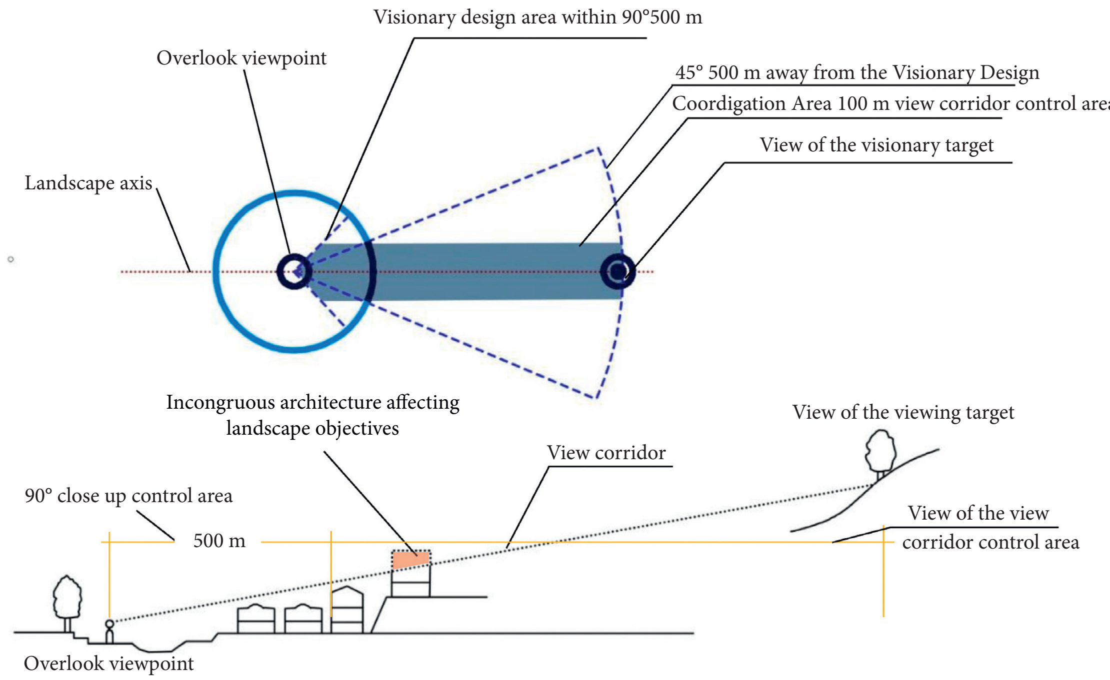



Figure 3: Control schematic diagram.

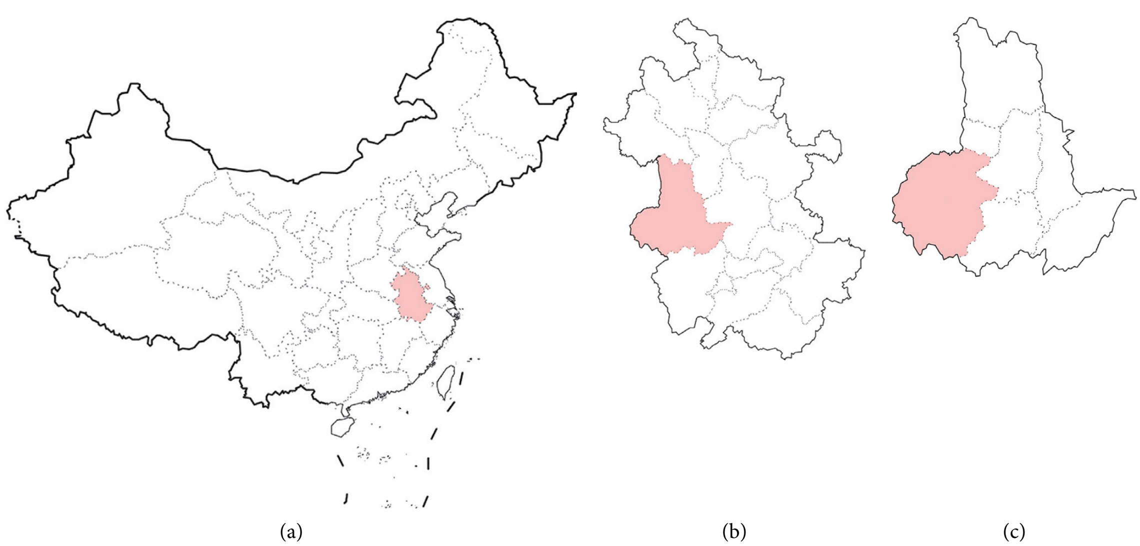



Figure 4: Location map of Jinzhai Country. (a) China. (b) Anhui province. (c) Lu'an city.

within sight and a confusing fifth elevation. For example, the Red Army Square in the old city is a symbol of the city as a landmark space, but it is impossible to get a good viewing experience in the city.

*4.1.3. "Realm": Low Utilization of Resources.* The ecological background of the city is superior, but the utilization rate of landscape resources is insufficient. The red elements of the city are more influential in the city's image formation, and the related facilities take up a larger proportion, but the quality is not high. The blue space along the city's rivers is underused and poorly experienced and has outdated facilities that need to be improved. The urban green space lacks a sense of design and attractiveness and is dominated by a single type of Countryside Green Park with an undefined system of green corridors and axes. For instance, the old town currently has small green areas, a low green space ratio, and little rooftop and vertical greenery.

*4.1.4. "Industry": Low Balance of Development.* Near the hillside, water resources endowed with a good lot are cut off by the city in a disorderly manner; the buildings are not built according to the trend. The distant hillside lots have poor sight lines, and the waterfront view corridor is destroyed.

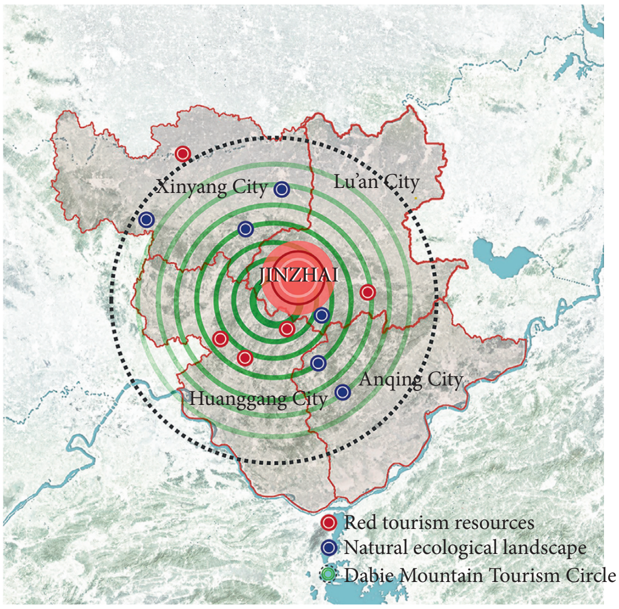



Figure 5: Regional tourism resources in the Dabie Mountains.

The scale of waterfront space is not large, and the grade is low. As in the current situation in the old city, there is no centralized commercial and business center along the riverfront. The industry mainly revolves around commercial service facilities, and there is a lack of consumer industries such as experience space, supporting service space, and high-end resort space.

*4.2. Planning and Construction Ideas for Jinzhai Country Park City.* In view of the current urban problems, the overall urban design ideas of Jinzhai Country are proposed under the guidance of the park city concept after research and analysis.

*4.2.1. Concept First: People-Oriented, Ecological Leading, Systematic Thinking.* The overall urban design of Jinzhai Country is guided by the park city theory, while insisting on innovation as the engine of urban development and promoting the development and construction of urban security with systematic park thinking. The scope of this design includes the entire Jinzhai County with the total area of approximately 197.9 $km^2$, as shown in Figure 7. Through the analysis of the multidimensional resource endowment of the whole scope, a systematic study and judgment are conducted, and the overall urban design level theme positioning is proposed. A slow city with "mountain and water, red rhythm": a park city with "red, green, and blue" intertwined and spread. The networked and uneven park system is regarded as a green rivet anchoring the urban form and is used as urban living rooms for public activities to promote social governance and good social management. In this way, an ideological and theoretical framework is laid down for the determination of the urban ecological patterns, the protection of the three living spaces, the system-wide planning of the urban structure, and the shaping of the urban landscape environment. The urban design of Jinzhai Country Park reorganizes the relationship between the value of the three urban spaces and the development of the city's three industries, focusing on the design process of "Smart Ecology" and "Smart Life" to make an innovative basis for promoting "Smart Production."

*4.2.2. Planning Leading: Building the City with Shape, Embellishing the City with Greenery, and Prospering the City with Industry.* Based on current urban issues and ecological patterns, a "human" shaped urban landscape park skeleton has been constructed to form a transitional space for the integration of the landscape and the city, elevating the city, the fields, and the landscape into a living community, as shown in Figure 8(a). In order to achieve the improvement of street style, vitality, and order, and to further create a park city with a characteristic living room place, a comprehensive, cultural, gateway, and wisdom "four-hall" public space layout system was formed, and then a subregional targeted enhancement strategy was made; the "ten-view" public space layout system was designed to guide the control of landscape design focus, location, and control requirements, respectively, as shown in Figure 8(b). On the one hand, with the red culture of the old city as the core, the balance of land use ratio at the level of master planning is paid attention to and a functional layout of the three major cities of "history, present, and future" is created, as shown in Figure 8(c). With inheritance and innovation as the path, a basic smart city model is formed with a focus on future technological enhancements. On the other hand, external transportation is planned to weave a "dynamic and diversified" recreational experience network and build eight major landscape corridors into the city, sorting out current traffic problems and proposing targeted traffic optimization measures. Figure 8(d) depicts the excavation and configuration of parking facilities, the construction of three-tier service stations, and the planning of a "four main and five secondary" bus corridor networks.

*4.2.3. Value Embodiment: Green Ecology, Urban Livability, Innovation, and Integration.* The overall urban design of Jinzhai Country under the goal of park city is based on the subjective initiative of people to promote ecological value, the gathering of people, and the enhancement of vitality, mainly reflected in "Kinship can reach" of the green landscape system, from watching the water to hydrophilic enhance water system landscape, from watching mountains to mountain landscape activation. The basic service model of "living in a slow city and remembering nostalgia" is shaped to achieve the configuration of public service facilities in a graded, zoned, and classified manner, with a focus on improving and upgrading the living environment of communities such as the old city village of Meishan. The overall urban landscape of "showing the mountains and rivers with eight charms" controls the building height and development intensity as a whole, guides the overall landscape, architectural colour, style, and form by zoning, and completes the key guidance and control of the plot through urban design guidelines [35]. Innovation and integration of the new economy, new business mode, consumption, scene, and

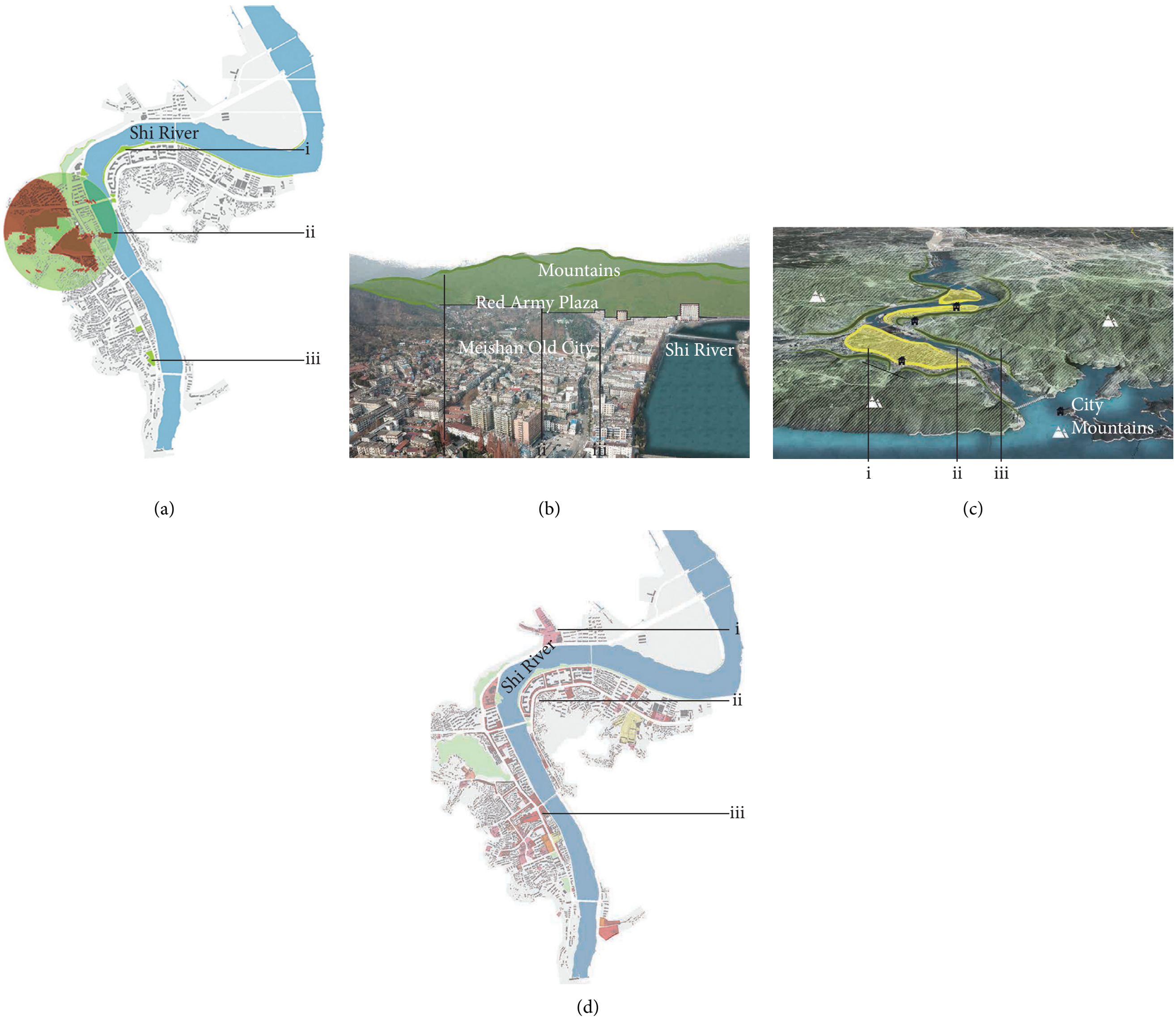



Figure 6: Current urban problems in Jinzhai Country. (a) Distancing of "human" scenery through (i) linearization of blue water space, (ii) overcentralization of Red Army Plaza facilities, and (iii) poor green network connectivity. (b) The muddled "city" state, which includes (i) cluttered landscape zoning, (ii) a poor Red Army Plaza overlook experience, and (iii) a poor view of the view corridor. (c) Many low-quality "realms" with (i) a high proportion of low-quality red facilities, (ii) low utilization of blue space along the river, and (iii) a single type of green space. (d) City "industry" fusion weakness with (i) single industry, (ii) uneven urban development, and (iii) underutilization of waterfront space.

system can realize the multidimensional value integration of urban ecology, recreation, aesthetics, equity, and culture and further enhance the happiness and satisfaction of urban residents.

### 4.3. The Application Path of "Intelligent Ecology" in Jinzhai Country Park City Is Based on Big Data Technology

*4.3.1. Limiting the Height of Buildings.* First of all, the main content of this study forms a control guide table for overlook corridors, which includes 8 viewing targets, 13 overlook viewing points, and 12 overlook corridors, aiming to realize the reasonable and effective use of ecological resources, as shown in Figure 9 and Table 1. Firstly, the design is based on the viewing surfaces determined by the urban overlook system and landscape corridors, and the basic building height control results are determined and translated into specific construction land parcels to form a preliminary building height control zoning base model. Secondly, the building heights around the mountains, water bodies, and cultural centers are controlled by superimposing important node control elements, as shown in Figure 10. In addition, the building height limit is gradually increased around these core elements from the inside to the outside to obtain the height zoning results, as shown in Figure 11. Finally, the model is modified to determine the high-rise clusters and optimize the height zoning by combining the existing

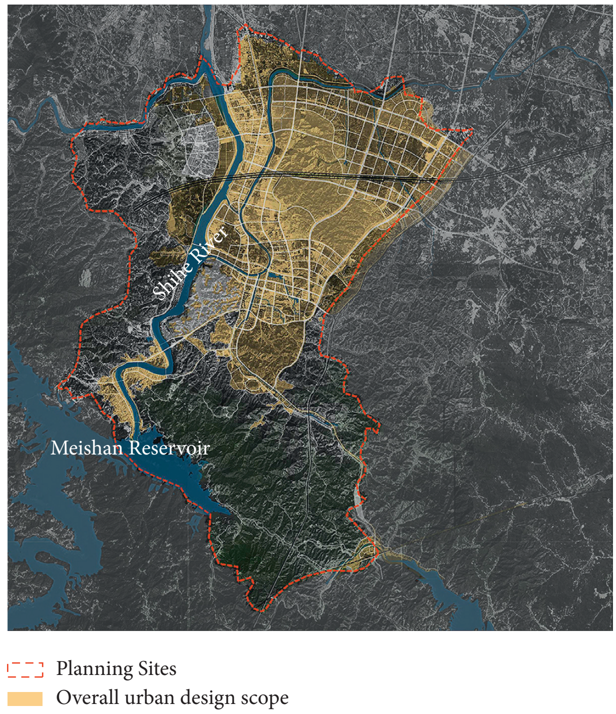



Figure 7: Planning the area scope.

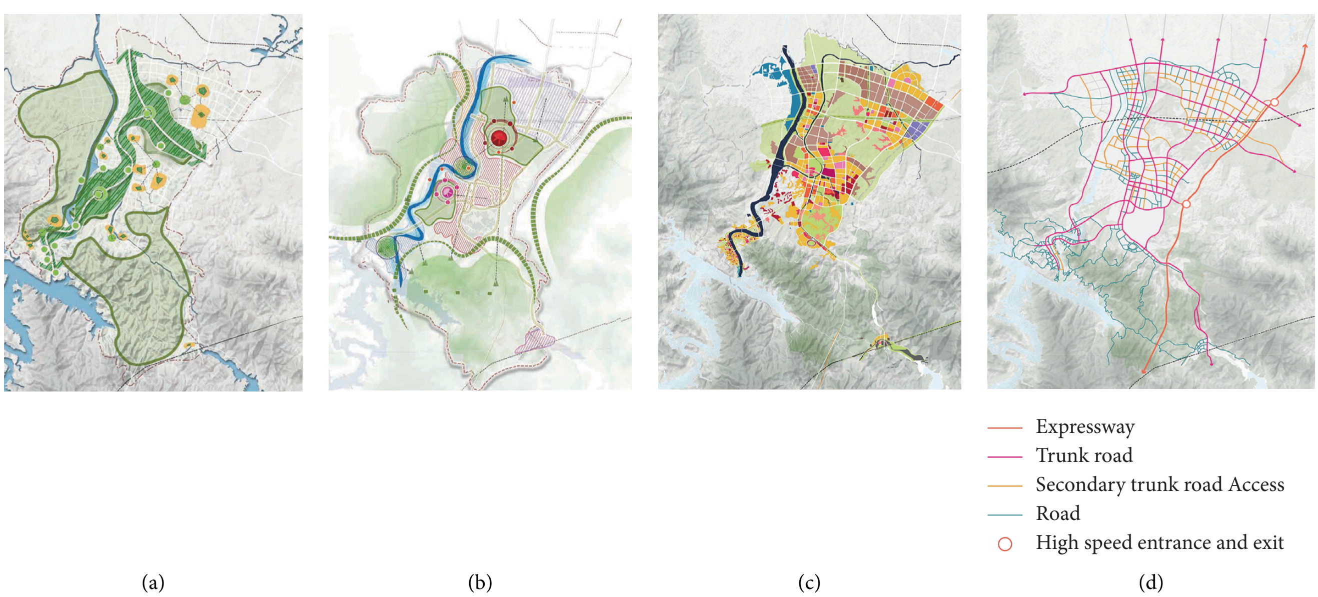



Figure 8: The overall design assumption resources. (a) "Human" shaped urban landscape park skeleton. (b) A layout system for public spaces. (c) Land use ratio balance. (d) A mode of transportation system.

building heights and public space system layout to obtain the final height control zoning results, as shown in Figure 12.

*4.3.2. Control of Development Intensity.* The park city construction in Jinzhai Country can be based on the unique landscape pattern and the building height zoning model in Figure 12 and follow the technical route of development intensity control, as shown in Figure 13. First, the development intensity correction model is obtained in Figures 14 and 15 by designing and constructing the base models of land nature, slope factor, land value factor, and distance from the city center, which greatly influence the economic interests of the land parcels. After that, OD analysis, traffic carrying capacity simulation, and traffic model correction are carried out in Figure 16, and the final development intensity control results were obtained, as shown in Figure 17.

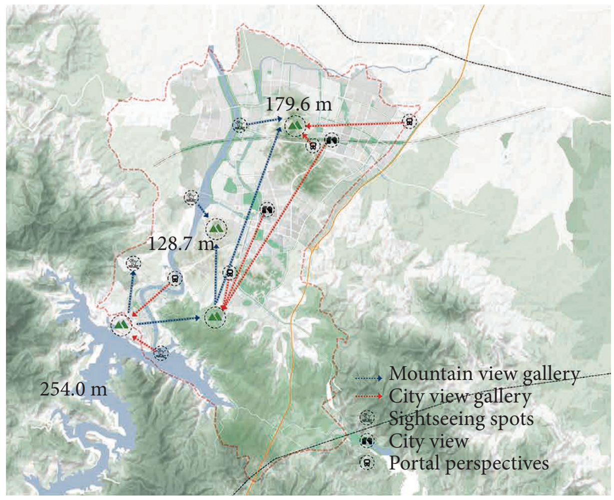



Figure 9: Mountain city interactive landscape.

Table 1: Overlook corridor control guidance.

| Elements | | Control requirements |
|---|---|---|
| Landscape objectives | Major landscape targets in the city | The landmark building forms a coordinated and unified landscape feature with the surrounding area. |
| | Mountain overlook target | The main mountain overlook landscape targets should maintain their natural landscape features, and the surrounding urban landscape and mountain landscape should form a harmonious and unified landscape feature. |
| | | Landmark buildings should be set up to enhance the aesthetics of the mountain, not to be too large, not to overwhelm the audience, not to change the shape of the mountain on a large scale, and not to contradict the humanistic and historical characteristics of the mountain itself. |
| | Waterfront Overlook landscape objective | The buildings along the river in the old city pay attention to the coordination with the waterscape to create a high and low staggered landscape appearance on the riverbank, while the new city and the development park pay attention to the reasonable control of buildings, leaving enough open space along the river to create a water-friendly spatial landscape environment. |
| Viewing points | Mountain overlook viewpoint | The overlapping view range of the three mountains can basically overlook the entire Jinzhai Country. Forming the core viewing area of the overlook view. Constructing viewing platforms and creating three main viewing platforms. |
| | Dam viewpoint | The view system of the old city of Meishan is built to form a staggered style of mountain architecture. |
| | Waterfront viewpoints | From the riverfront overlook to the mountain and other landscape nodes, along the space to form a coordinated and unified landscape feature of the whole. |
| Overlook corridor | | Landmark buildings or mountains that are quiet with the water system or the road, and the built environment or green landscape along the road should ensure harmony and unity. |
| | | Buildings along the area within the view corridor should be lower than the control height to ensure an open view of the landscape. |

*4.3.3. Simulation of the Landscape Interface.* In the design process of "intelligent ecology" in Jinzhai Country, the three major design elements of red, green, and blue are emphasized. On the one hand, 40% of the surrounding mountains can be seen along the river walk, and 40% of the mountains can be seen at important nodes, so as to show the sense of mountain city. The results are shown in Figure 18. At the same time, the waterfront interface is restored, such as through strict control of the 200-metre building height along the Shi River. On the other hand, the plan highlights the Red Army Square, the Red Army Mountain is visible at important nodes around the guide control, and 60% of the surrounding mountains are visible from the Red Army Square. The results are shown in Figure 19. Finally, the height superposition analysis of the view corridor control was carried out, and the translation was optimized with the actual situation to form the height superposition control results, as shown in Figure 20. For example, in a view corridor design control guide for the Red Army Plaza, three viewpoints on the

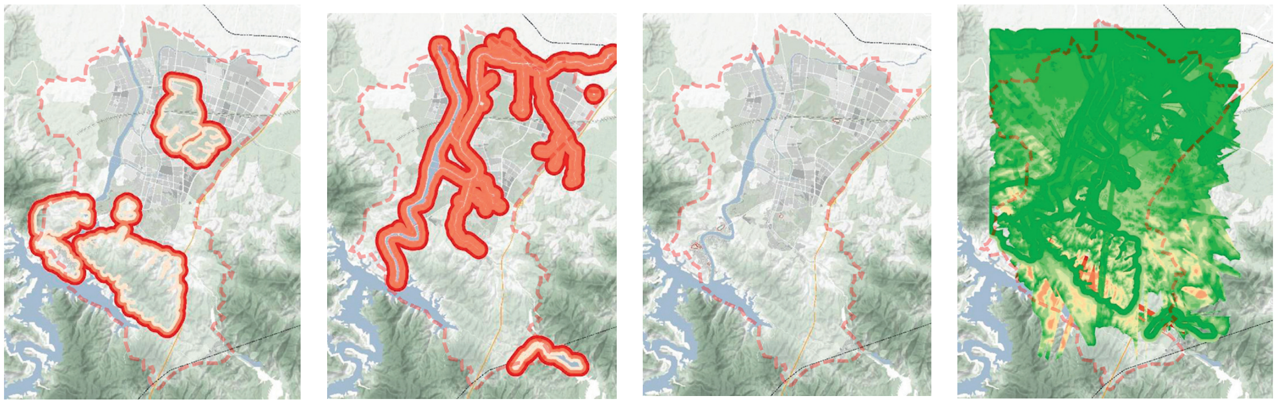



Figure 10: Design element overlay. (a) Superimposition of mountains. (b) Superimposition of water bodies. (c) Overlay cultural center. (d) A model for overlay correction.

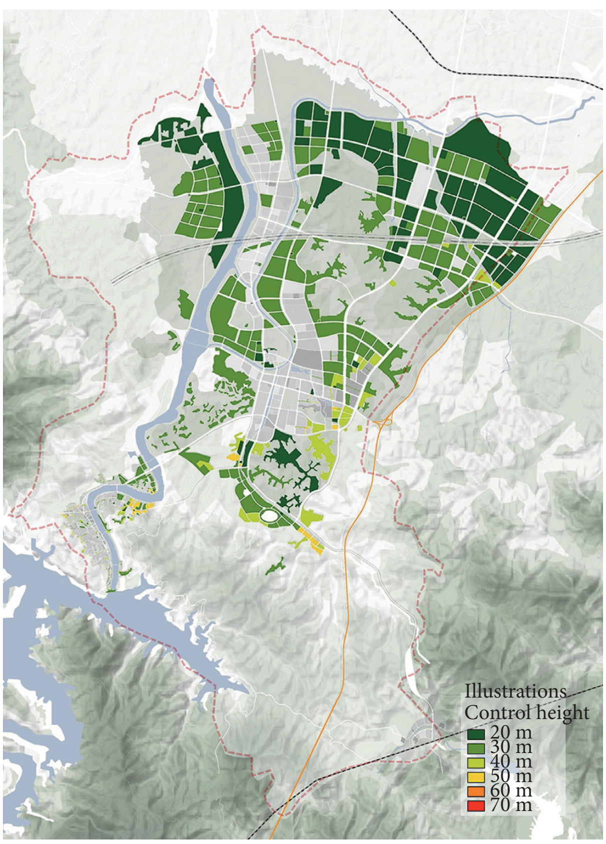



Figure 11: The height zoning effect of element overlay.

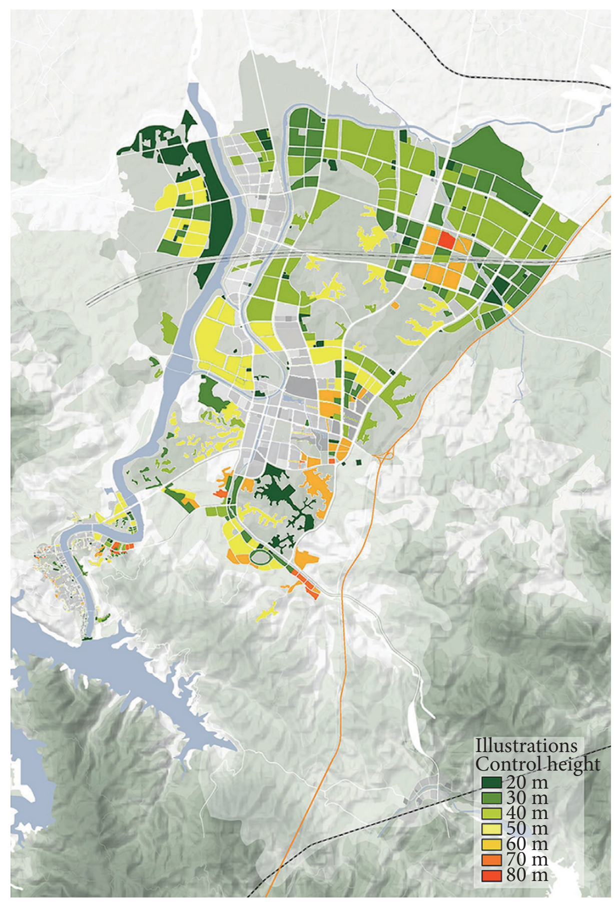



Figure 12: Building height model for final zoning.

east side of the Shi River were selected at the technical level. First, the control range of the view corridor was determined by GIS as the analysis tool. Meanwhile, the current block buildings were removed to highlight the core position of the Red Army Plaza, and three east-west open spaces were planned to be shaped by the building spacing. Secondly, on the sight paths of the remaining three viewpoints, three leisure platforms are shaped on each side of the Shi River to restore the view corridor east of the Red Army Plaza.

*4.4. Expansion of the Jinzhai Country Park City Application Based on Big Data Technology.* In addition to the above "Smart Ecology" design analysis, Jinzhai Country Park City design also focuses on the "Smart Life" design process. Using big data capture as a status analysis support, the two main processes are big data intention capture to extract relevant data to identify the current area; dovetail with the master

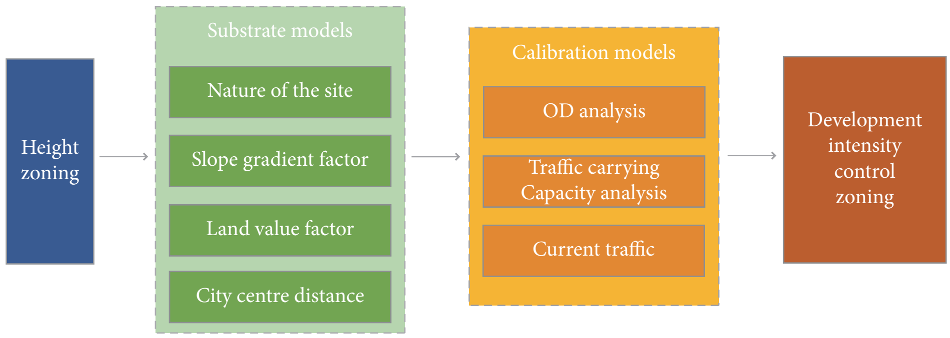



FIGURE 13: The technology route of development intensity control.

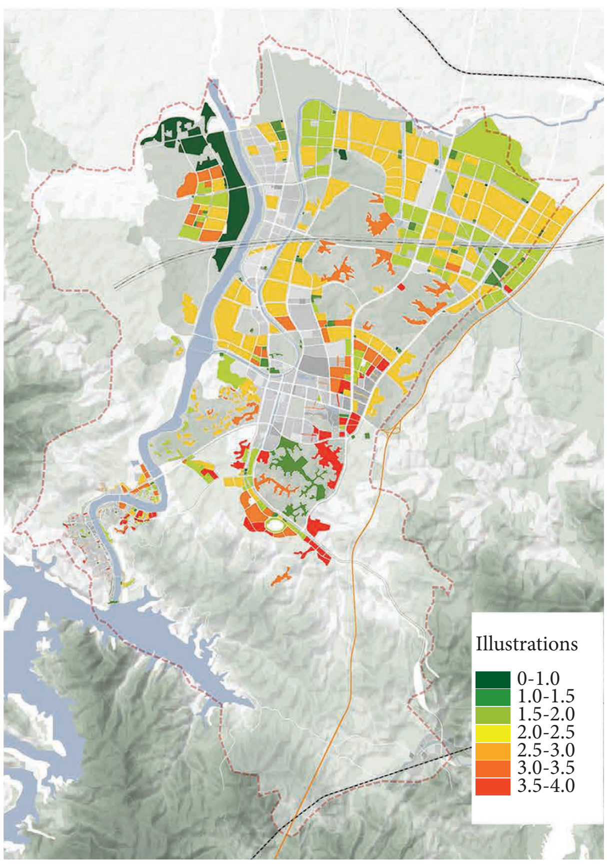



FIGURE 14: Development of an intensity calibration model.

plan, and consider it comprehensively from the perspective of the overall urban structure.

On the basis of Gaode Map, the POI data is divided into six main types: commercial (nonwholesale), leisure and entertainment, catering, finance, administrative office, culture, and education. The spatial layout of these six types of merchants is analyzed and overlaid with the calculation, and a heat map of the distribution of the current public service facilities is obtained. The three main public service facilities centers in Jinzhai Country in the future, as shown in Figure 21(a), will be Meishan Old City, Jiangdian New City, and Eastern New City Area, according to the Jinzhai Country City Master Plan (2013–2030), and the current situation is largely consistent with the master plan. As a result, as shown in Figure 21(b), we design a public space network layout and cultivate new consumption patterns and spatial scenes.

## 5. Results and Discussion

The above research process and the final result drawings (Figures 7–21) define the urban plan and three-dimensional pattern basically and set up a good foundation for the presentation of the results of the next urban landscape and environmental design. The natural solution advocated in this paper, i.e., the integration of parks and other blue-green spaces into the city, contributes to the health and well-being of residents and is helpful to the efficient use of space [37] and urban livability [38–40].

*5.1. "People" Are Relatable.* In connection with recent virtual geographic information research [41], a big data approach based on massive image recognition was used to confirm the public's cognitive bias toward the urban landscape of the central city of Jinzhai. The image recognition method of a deep neural network is used to classify the urban landscape recorded in images into five major intentions: green space intention (the main view is a green park), waterfront intention (the main view is a water system and waterfront shoreline), architectural intention (the main view is a building), and mountain intention and activity intention (the main view is a crowd). To verify the big data of urban intention, the results are shown in Figure 22.

*5.2. "City" Can Be Felt.* Based on the current situation of the city and the abovementioned big data technology-assisted design process, the general urban layout and overall appearance of Jinzhai Country were finally obtained by following the planning and construction ideas, as shown in Figure 23.

*5.3. "Realm" Can Be Reached.* In the course of our research, we further refined the design of the landscape nodes to achieve a landscape effect that is "red to feel, green to see, and blue to approach." Cultural Living Room demolishes low-quality buildings in the vicinity of Red Army Square that detract from the landscape, removing the current blocking building, opening up the view corridor to the outside, and

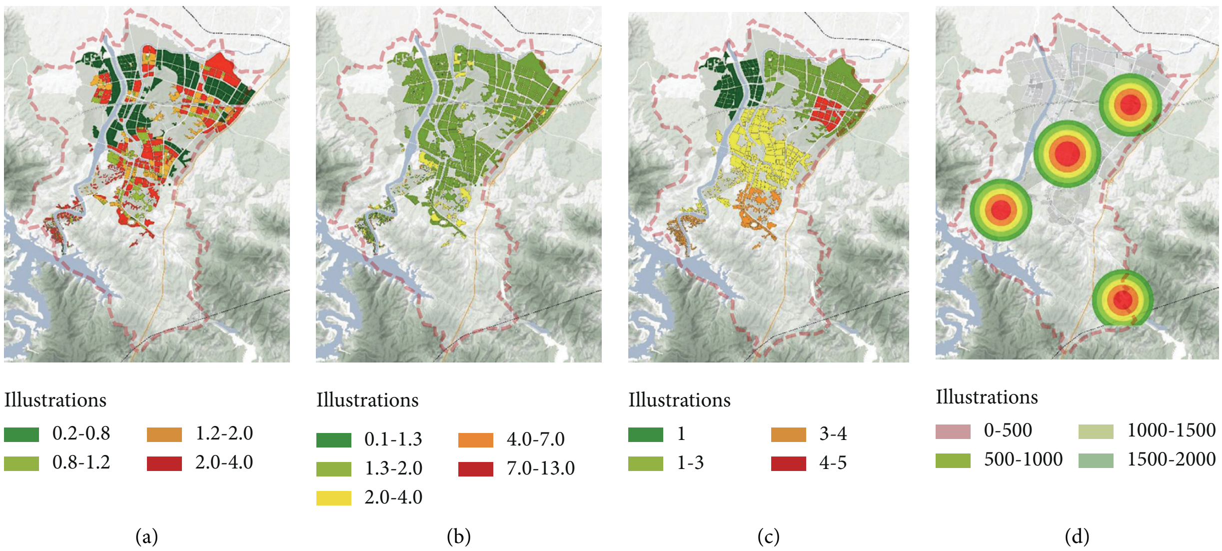



Figure 15: Base position model factor sub.

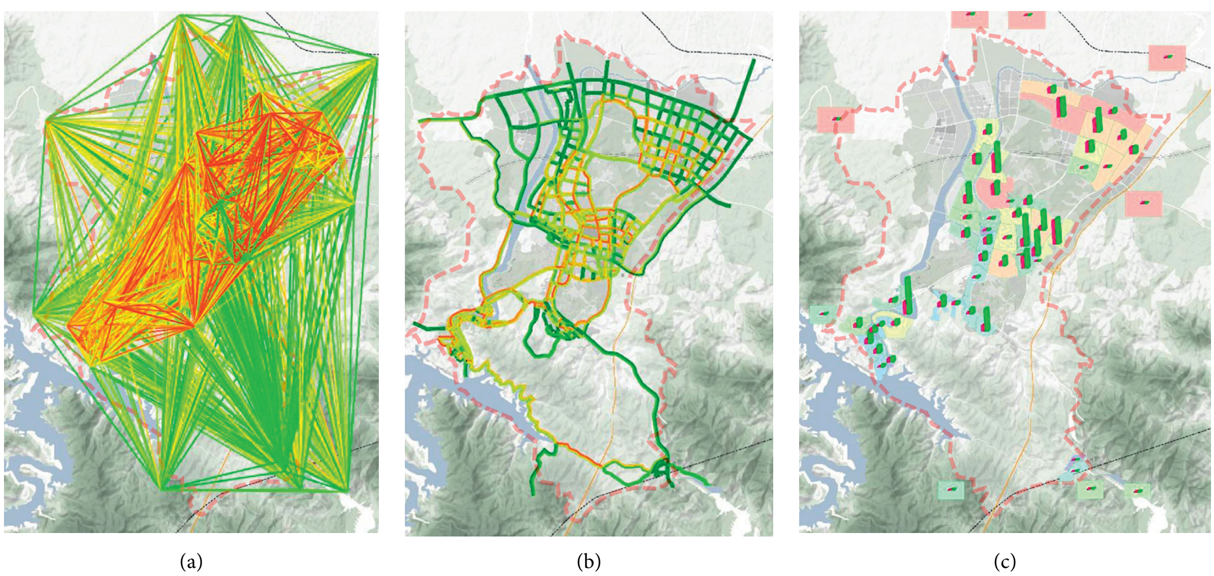



Figure 16: Control results from traffic simulation validation diagram. (a) OD analysis. (b) Traffic carrying capacity forecast. (c) Volume forecast for traffic cells A and P.

ensuring the proximity to the water is also water-friendly, aggregating the surrounding public service functions and creating a commercial pedestrian street centered on the Red Army Square, integrating the square into the city, and highlighting its node role. In turn, the overall layout of Red Army Plaza has been planned, with the waterfront interface highlighting its premium landscape pattern with a backdrop of hills and water. As shown in Figure 24, the design of the waterfront park, which can see the mountains from afar, can be close to the water and is suitable for amusement and living.

In addition, park cities need modern creativity for the integration of ecology, culture, and economy to give rise to new business forms. Businesses in the city can generate new scenarios through connectivity, perception, and technological empowerment. On the basis of grasping the traditional cultural pulse of the city, virtual reality and Internet of Things technologies are used to empower traditional business forms (architecture, medicine, education, etc.) and establish management mechanisms for ecologically oriented consumption [24]. However, the above study only analyzes the site layout plan and proposes three major urban circles without a specific layout of industries and proportions. Therefore, based on the results of the study, the following recommendations in terms of urban industry are proposed for Jinzhai Country Park City.

The overall urban design level considers the balance of land ratio, rather than the land and index determination scale. The study was able to determine the business development patterns of the three major circles. Cultural classics

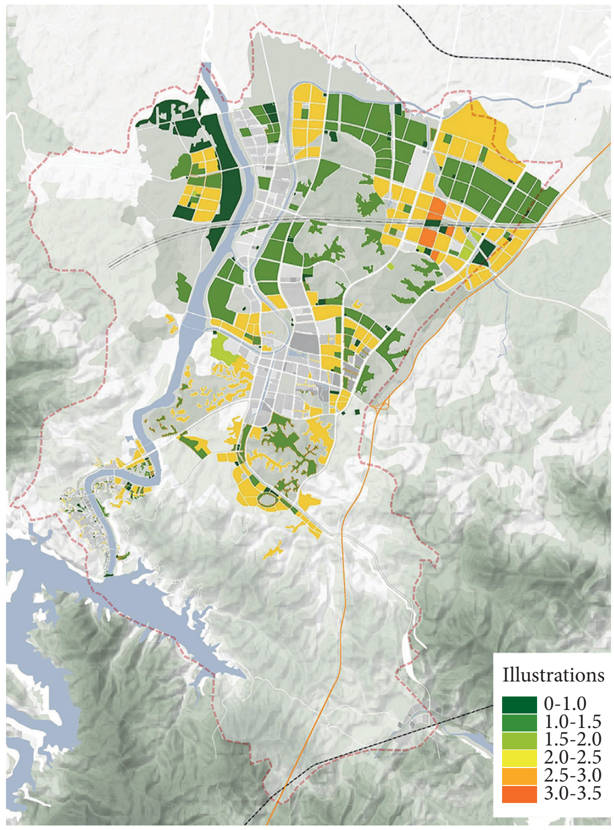
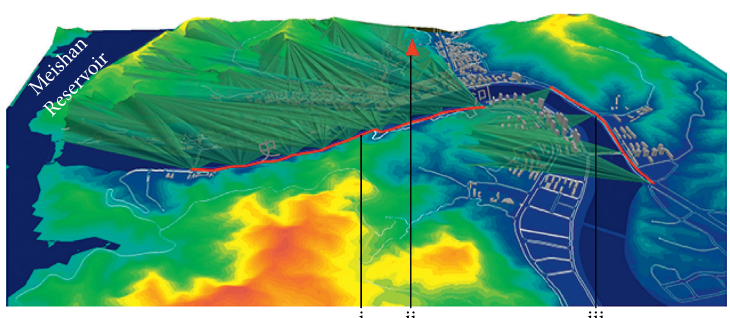
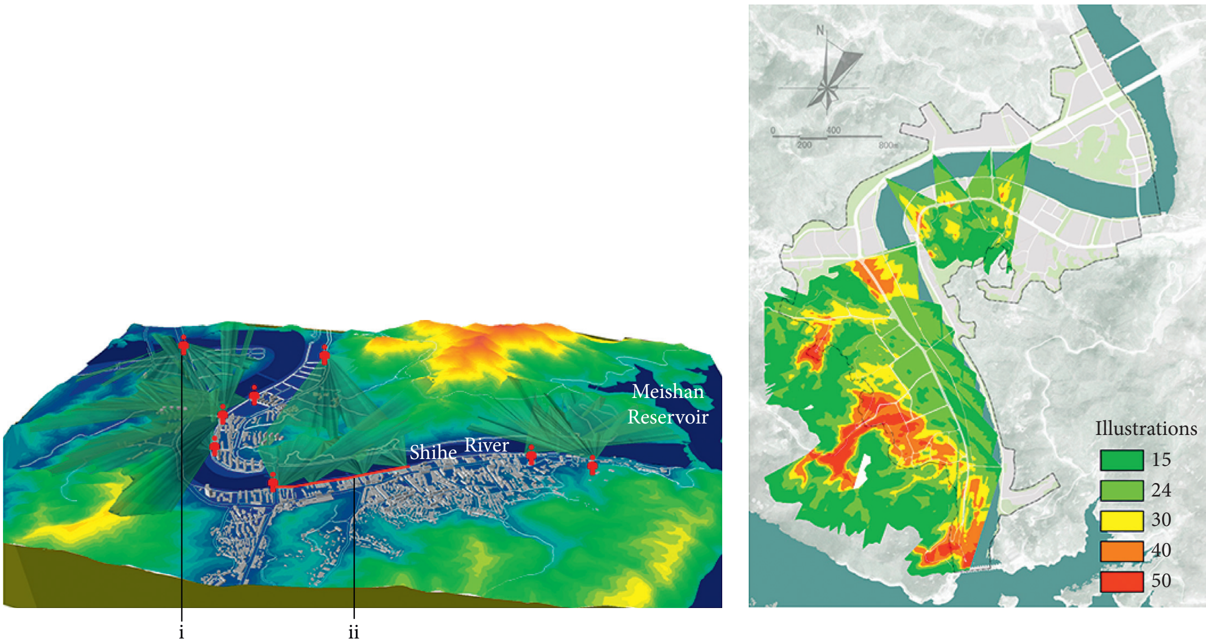



FIGURE 17: Final development intensity.



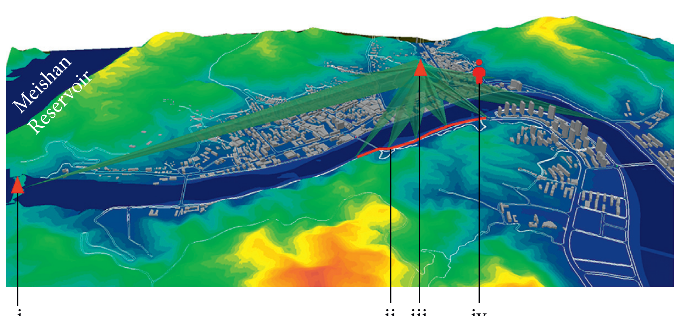

(a)

FIGURE 18: Continued.




(b) (c)

Figure 18: Restoration of waterfront interface. (a) Key nodes along the river walk in the surrounding mountain, including (i) Meijiang Road, Riverside Drive Trail, (ii) Red Army Square, and (iii) the South Xinhe Road Interface. (b) 40% of the mountain is visible at key nodes, such as (i) the entrance to the Red Mountain Avenue and (ii) youth path trail interface node. (c) Control results for Shi River height superposition.




(a)

Figure 19: Continued.

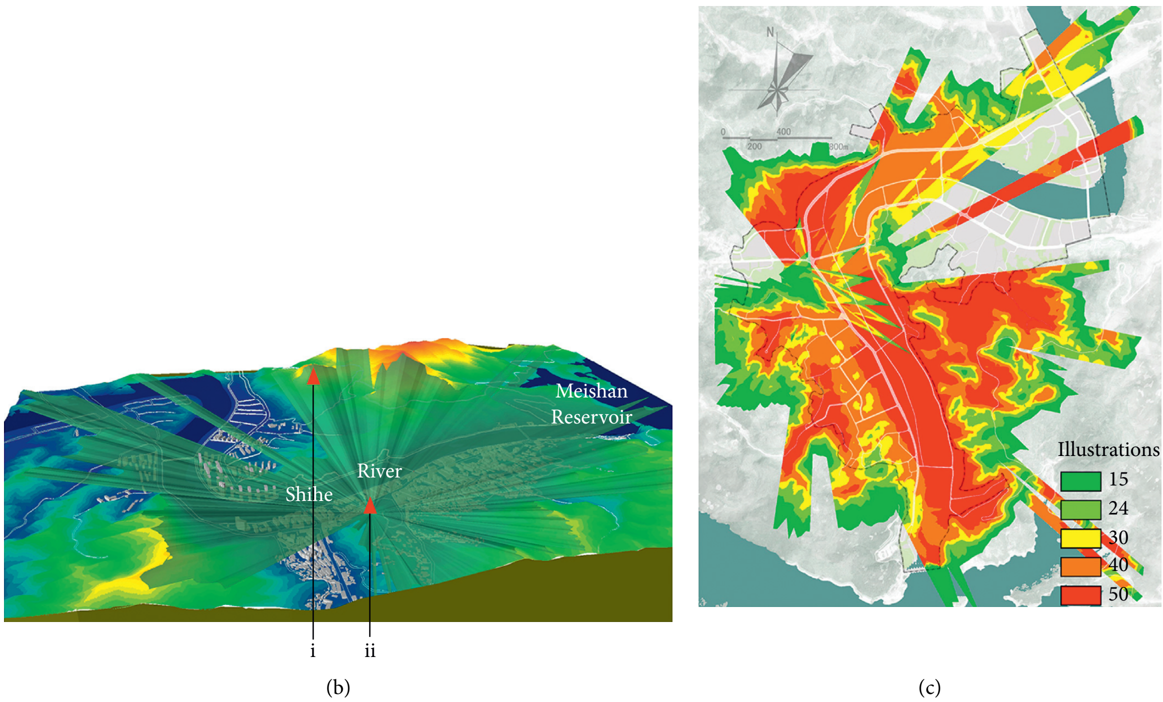



Figure 19: Showing the sense of a mountain city. (a) Red Army Square is visible at key points in the surrounding area, such as (i) Meishan Reservoir Dam viewpoint, (ii) Meijiang Road, Riverside Drive Trail viewpoint, (iii) Red Army Square, and (iv) South Xinhe Road, Jinzhai People's Hospital viewpoint. (b) Red Army Square, along with (i) Da Gongling and (ii) Red Army Plaza, provides views of 60% of the surrounding hills. (c) Red Army Square height superposition control results.

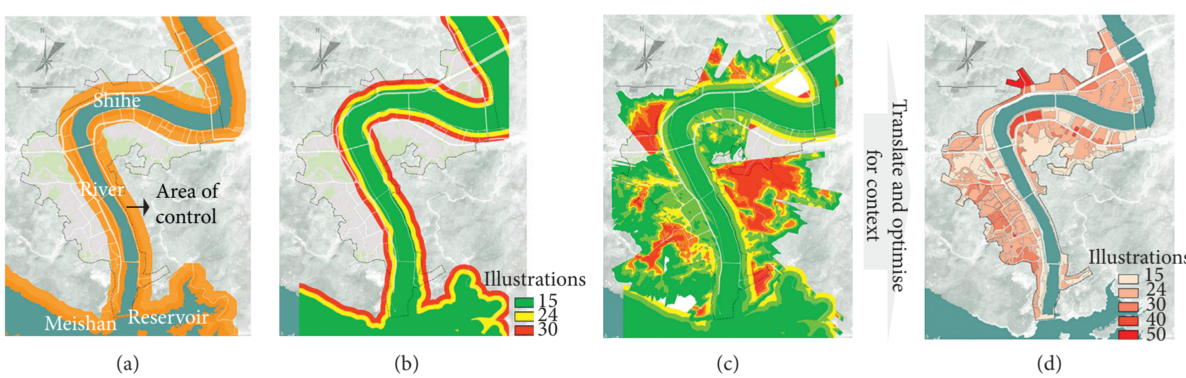



Figure 20: Highlighting the status of the Red Army Plaza. (a) Strict control of building heights of up to 200 metres along the Shi River. (b) Area control results. (c) The height overlay results of view corridor control. (d) Plot height control results.

are the basic circle with the old city as the main one. The main emphasis, as shown in Figure 25(a), is on slow city life and tourism reception. Quality inheritance is the consolidation of the circle, mainly near Jiangdian New Town and Huanglin Station, representing the present. As illustrated in Figure 25(b), the primary emphasis is on high-quality residences and integrated services. The promotion circle is times innovation, with the eastern new town as the main focus, representing the new tomorrow. The gateway display and green industries are the main focus to showcase the new era of innovative Jinzhai, as showing in Figure 25(c).

Guided by the existing problems of park city construction in Jinzhai Country, the analysis focused on the construction ideas within the city and country area. The innovation of the research lies in the technical means of big data such as GIS, POI, overlook system, view corridor, and analytic hierarchy process to realize the applied research in the process of building height control, development intensity guidance, and landscape interface simulation. The conclusion of the study shows that, through the technical means, the park city construction in Jinzhai Country can be carried out, highlighting the intelligent green protection of the urban ecological environment, thus coordinating the living and production space and promoting the efficient and coordinated development of "people, city, environment, and industry." In this way, it also solves the common problems of urban and environmental development, such as the lack of attention to the planning and development of public space

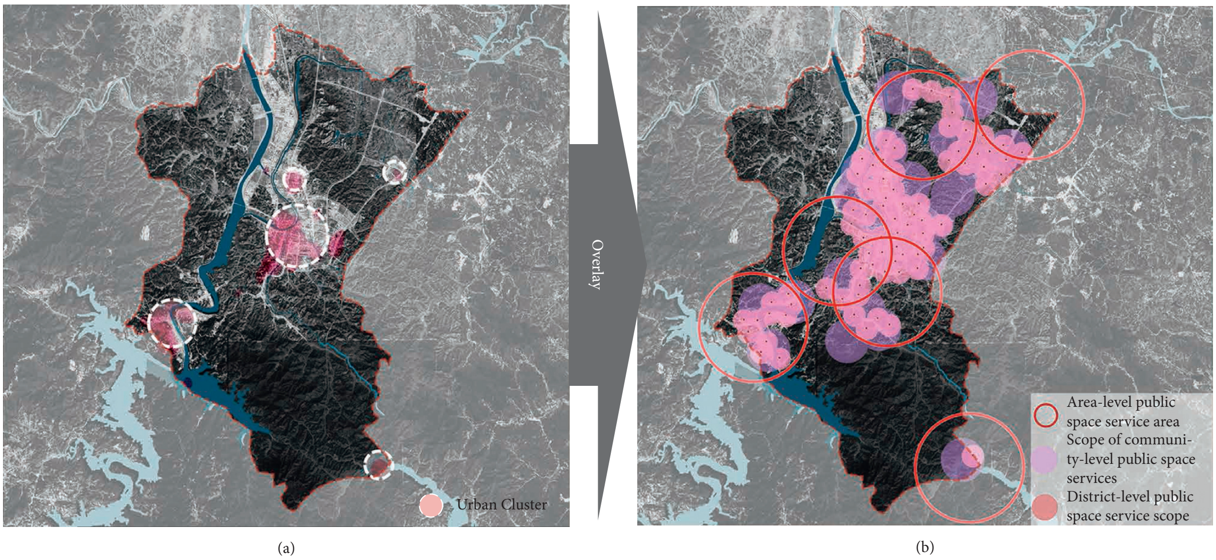



Figure 21: Thermal analysis of public service facilities. (a) A heat map of current public service facility distribution. (b) Public space layout network: "15 minutes by bike to the mountains, 15 minutes by foot to the water and parks."

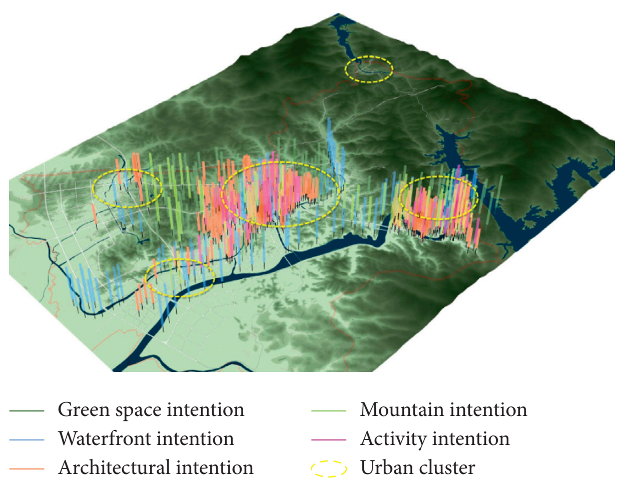
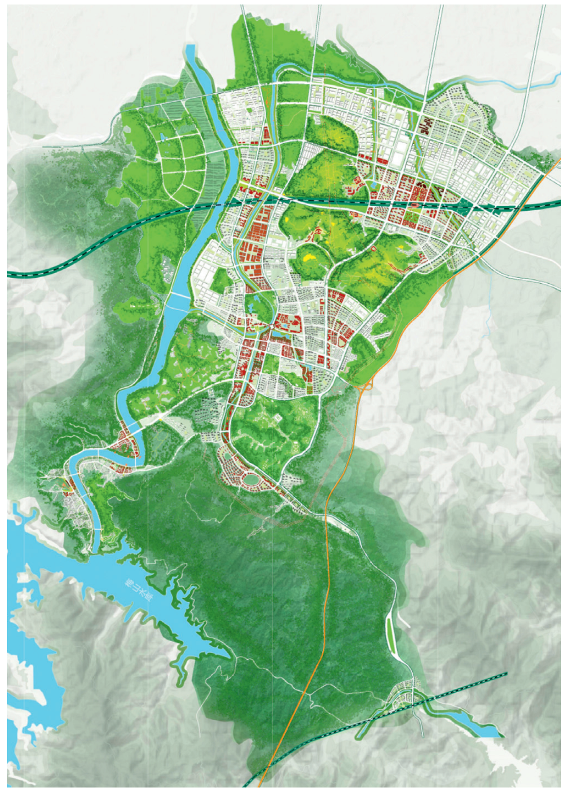



Figure 22: Analysis of style recognition in the central urban area of Jinzhai.

such as parks, the lack of systemic urban patterns that hinder development, and the uncoordinated closure of urban businesses, which are difficult to solve in most cities at this stage. Based on this, it provides a macrolevel design path and scientific reference experience for similar cities or regions to carry out the intelligent construction of park cities.



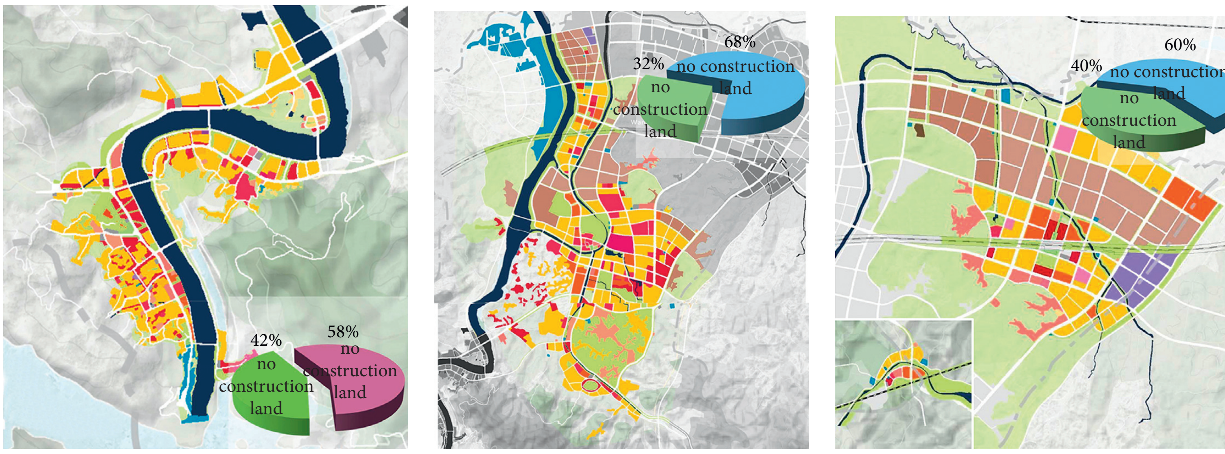
(a)

(b)

(c)

Figure 23: Jinzhai Country's overall planning. (a) The outcomes of urban planning. (b) Renderings of urban design. (c) Night scene renderings.

Figure 24: A partial aerial view of the planning and design of Red Army Square.




(a) (b) (c)

Figure 25: The layout of business types in Jinzhai Country. (a) The foundation circle of the old city. (b) Service consolidation circle. (c) Promotion circle for New Town.

## 6. Conclusions

The abovementioned studies focus on the three urban living spaces, design concepts, and technical means as the core of park city design. In the authors' opinion, the key words of park city construction include "ecology," "integration," "innovation," "wisdom," and "harmony." Specifically, the main connotations include shaping "ecological" type three living spaces, urban business mode, and urban form; "integration" multidimensional scenes, multidirectional disciplines, and multilevel development stages; "innovation" design concepts, value forms, and institutional mechanisms; and "wisdom" technology, urban operation, and management. Our aim is to realize a "harmonious" coexistence among people, cities, and nature. Among them, "ecology" is the basis of park city planning and construction, "integration" is the means, "innovation" is the core, "wisdom" is the focus, and "harmony" is the goal. The research concept of "park city" in this paper innovatively couples and coordinates the two urban development modes of smart city and park city, combining the four urban development requirements of "efficiency, aesthetics, green, and humanism," which can play a better role in city development. The planning and design focus is the intelligent park city, using the analysis of the core content of big data technology as the starting point of the design and talking about the intelligent planning and construction ideas and path methods. We complete urban analysis, simulation, monitoring, adjustment, and optimization by establishing a database and using data analysis methods. This paper assumes that the wisdom technology means can assist in realizing the ideal park city vision and meet the new requirements of the urban development model in the new era. And the results show that the above hypothesis is valid.

In the process of park city construction in other cities in China, the core "Smart Ecology" design methods and processes can be used to guide the formation of multidimensional urban space in the form of diagrams, charts, and textual language. Starting from the most basic ecological design elements of park city, it is beneficial to apply big data to the "Smart Living" design process to achieve higher dimensional urban design and the optimization of planning and construction in the future [15]. Other studies have also confirmed that the final goal of park cities is to achieve precise protection of urban ecology, efficient and accurate use of natural resources, and harmonious and beautiful image shaping, which can better lay the foundation for the design, implementation, operation, and maintenance processes of "Smart Production." During application, it remains to be noted that, firstly, GIS technology can link spatial and nonspatial data, visualize big data, overlay operations, compare results, and simulate scenarios [42]. But the GIS research method is not sufficient to consider public demands. The fourth-generation digital urban design paradigm proposed in recent years can be used to promote bottom-up urban planning and design with big data through relevant research [43]. Participatory pilot mapping approaches such as public participation geographic information system (PPGIS) technology have emerged as a new technical concept and means to complete the assessment of cultural and ecological values [44]. It further indicates the future research focus and direction for park cities to achieve smart construction. Secondly, smart park cities are essentially related urban governance contents, which can further build smart park systems according to the city's own conditions, use Internet + technology on a large scale in the process of smart management and service of green park spaces, realize everyone's participation in park city construction actions through active public interaction, and improve the management mechanism for the common creation of a beautiful home. Finally, the recent round of "city check-ups" work has provided objective data collection, analysis, and diagnosis of cities for indicator systems such as livable, green, resilient, smart, and humanistic cities: finding evaluation criteria, calculating and analyzing indicators, benchmarking to find problems, and finally developing policies for the relevant urban development departments in a categorized, zoned, and phased manner [45]. The cities can also combine to further strengthen the policy implications of the theoretical research.

## Data Availability

The data used to support the findings of this study are currently under embargo while the research findings are commercialized. Requests for data [6/12 months], after publication of this article, will be considered by the corresponding author.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

## Acknowledgments

The authors extend their appreciation to Dr. Jia-Bao Liu of Anhui Jianzhu University for the guidance of this paper. This study was supported by the Incubation Subjects of Peak Disciplines in Anhui Province: A Study on Urban Renewal Strategies in the Old City Centre under the Perspective of Inventory Planning.

## References

[1] E. D. Richert and M. B. Lapping, "Ebenezer howard and the garden city," *Journal of the American Planning Association*, vol. 64, no. 2, pp. 125–127, 1998.

[2] L. Gao, S. Cui, Q. Guo, and L. Shi, "Some points on the sustainable cities research," *Progress in Geography*, vol. 29, no. 10, pp. 61–68, 2010.

[3] J. Liu and J. Diamond, "China's environment in a globalizing world," *Nature*, vol. 435, no. 7046, pp. 1179–1186, 2005.

[4] W. W. Li and P. T. Yi, "Assessment of city sustainability-coupling coordinated development among economy, society and environment," *Journal of Cleaner Production*, vol. 256, Article ID 120453, 10 pages, 2020.

[5] S. Cao and Z. Liu, "Landscape architecture and integration with city: the proposal for future park city," *Chinese Landscape Architecture*, vol. 26, no. 4, pp. 54–56, 2010.

[6] S. Cheng and Y. Cheng, "From garden city to park city design-the dialectic relationship between urban ecology and morphology," *Chinese Landscape Architecture*, vol. 34, no. 12, pp. 41–45, 2018.

[7] Y. Shi and Q. Liu, "Park city: connotation, logic and path of green governance," *Journal of Renmin University of China*, vol. 33, no. 5, pp. 48–56, 2019.

[8] Y. Song, J. Fernandez, and T. Wang, "Understanding perceived site qualities and experiences of urban public spaces: a case study of social media reviews in Bryant Park, New York city," *Sustainability*, vol. 12, no. 19, pp. 1–15, 2020.

[9] F. Li, F. Li, S. Li, and Y. Long, "Deciphering the recreational use of urban parks: experiments using multi-source big data for all Chinese cities," *The Science of the Total Environment*, vol. 701, Article ID 134896, 14 pages, 2020.

[10] W. Yang, X. Xi, L. Guo, Z. Chen, Y. Ma, and S.-B. Tsai, "Guangzhou digital city landscape planning based on spatial information from the perspective of smart city," *Mathematical Problems in Engineering*, vol. 2021, Article ID 5572652, 11 pages, 2021.

[11] A. Jia and Z. Lv, "Intelligent garden planning and design based on agricultural internet of things," *Complexity*, vol. 2021, Article ID 9970160, 10 pages, 2021.

[12] F. Burini, N. Cortesi, K. Gotti, and G. Psaila, "The urban nexus approach for analyzing mobility in the smart city: towards the identification of city users networking," *Mobile Information Systems*, vol. 2018, Article ID 6294872, 17 pages, 2018.

[13] N. Akbar, I. R. Abubakar, and A. S. Bouregh, "Fostering urban sustainability through the ecological wisdom of traditional settlements," *Sustainability*, vol. 12, no. 23, pp. 1–19, 2020.

[14] K. Ding and Y. Zhang, "Practical research on the application of sponge city reconstruction in pocket parks based on the analytic hierarchy process," *Complexity*, vol. 2021, Article ID 5531935, 10 pages, 2021.

[15] S. Kakoty, "Ecology, sustainability and traditional wisdom," *Journal of Cleaner Production*, vol. 172, pp. 3215–3224, 2018.

[16] X. Chu, S. Nazir, K. Wang, Z. Leng, W. Khalil, and Z. Xiao, "Big data and its *V*'s with IoT to develop sustainability," *Scientific Programming*, vol. 2021, Article ID 3780594, 16 pages, 2021.

[17] D. G. Janelle, "Space-adjusting technologies and the social ecologies of place: review and research agenda," *International Journal of Geographical Information Science*, vol. 26, no. 12, pp. 2239–2251, 2012.

[18] H. Yu, X. Liu, B. Kong, R. Li, and G. Wang, "Landscape ecology development supported by geospatial technologies: a review," *Ecological Informatics*, vol. 51, pp. 185–192, 2019.

[19] A. J. Jia and C. F. Xu, "Smart city image landscape design based on wireless sensors," *Microprocessors and Microsystems*, vol. 83, Article ID 104022, 7 pages, 2021.

[20] M. Ignatieva, G. H. Stewart, and C. Meurk, "Planning and design of ecological networks in urban areas," *Landscape and Ecological Engineering*, vol. 7, no. 1, pp. 17–25, 2011.

[21] S. N. Narh, S. A. Takyi, M. O. Asibey, and O. Amponsah, "Garden city without parks: an assessment of the availability and conditions of parks in Kumasi," *Urban Forestry and Urban Greening*, vol. 55, pp. 1–11, Article ID 126819, 2020.

[22] X. Fei and B. Mao, "Study on the strategy of urban small public space planning based on the concept of park city-take the old town of Jiangling county in Jingzhou as an example," *Current Urban Studies*, vol. 8, no. 1, pp. 107–114, 2020.

[23] K. H. M. Mansur, Y. Chen, W. Cai et al., "Index system establishment of 'guidelines for the construction of park city' referring to international experience," *E3S Web of Conferences*, vol. 251, pp. 1–9, Article ID 02081, 2021.

[24] X. Li, C. Wu, H. Wang, and W. Li, "Urban park: a new model of urban construction," *City Planning Review*, vol. 43, no. 3, pp. 50–58, 2019.

[25] B. Liu, "Methodology of park city research and construction," *Chinese Landscape Architecture*, vol. 34, no. 10, pp. 10–15, 2018.

[26] G. D'Amico, P. L'Abbate, W. J. Liao, T. Yigitcanlar, and G. Ioppolo, "Understanding sensor cities: insights from technology giant company driven smart urbanism practices," *Sensors*, vol. 20, no. 16, pp. 1–24, 2020.

[27] A. Paul, A. Ahmad, M. M. Rathore, and S. Jabbar, "Smartbuddy: defining human behaviors using big data analytics in social internet of things," *IEEE Wireless Communications*, vol. 23, no. 5, pp. 68–74, 2016.

[28] J. Liu, R. Guo, Z. Cai, W. Liu, and W. Du, "Assessing the complexity of intelligent parks' internet of things big data system," *Complexity*, vol. 2021, pp. 1–12, 2021.

[29] J. L. Zhong, Z. G. Li, Z. S. Sun, Y. J. Tian, and F. Yang, "The spatial equilibrium analysis of urban green space and human

activity in Chengdu, China," *Journal of Cleaner Production*, vol. 259, pp. 1–11, 2020.

[30] M. Buyukdemircioglu and S. Kocaman, "Reconstruction and efficient visualization of heterogeneous 3D city models," *Remote Sensing*, vol. 12, no. 13, pp. 1–26, 2020.

[31] A. Rahman, S. P. Aggarwal, M. Netzband, and S. Fazal, "Monitoring urban sprawl using remote sensing and GIS techniques of a fast growing urban centre, India," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 4, no. 1, pp. 56–64, 2011.

[32] S. K. Nuhu, Z. A. Manan, S. R. Wan Alwi, and M. N. Md Reba, "Roles of geospatial technology in eco-industrial park site selection: state-of-the-art review," *Journal of Cleaner Production*, vol. 309, Article ID 127361, 14 pages, 2021.

[33] S. Chona, W. Jennifer and W. John, "Got green? addressing environmental justice in park provision," *GeoJournal*, vol. 75, no. 3, pp. 229–248, 2010.

[34] F. Biljecki, J. Stoter, H. Ledoux, S. Zlatanova, and A. Çöltekin, "Applications of 3D city models: state of the art review," *ISPRS International Journal of Geo-Information*, vol. 4, no. 4, pp. 2842–2889, 2015.

[35] Y. Wang, Q. Ding, and D. Zhuang, "An eco-city evaluation method based on spatial analysis technology: a case study of Jiangsu province, China," *Ecological Indicators*, vol. 58, pp. 37–46, 2015.

[36] Z. Li and B. Peng, "Theoretical and practical research on land arrangement in Wujiang city of Jiangsu province," *Resources Science*, vol. 3, pp. 70–73, 2000.

[37] J. Ahern, "Urban landscape sustainability and resilience: the promise and challenges of integrating ecology with urban planning and design," *Landscape Ecology*, vol. 28, no. 6, pp. 1203–1212, 2013.

[38] X. Zhang, S. Yan, and Q. QuanQi, "Virtual reality design and realization of interactive garden landscape," *Complexity*, vol. 2021, Article ID 6083655, 10 pages, 2021.

[39] R. Reyes-Riveros, A. Altamirano, F. De La Barrera, D. Rozas-Vásquez, L. Vieli, and P. Meli, "Linking public urban green spaces and human well-being: a systematic review," *Urban Forestry and Urban Greening*, vol. 61, pp. 1–15, Article ID 127105, 2021.

[40] D. Kolokotsa, A. A Lilli, and M. A. Lilli, "On the impact of nature-based solutions on citizens' health & well-being," *Energy and Buildings*, vol. 229, pp. 1–31, Article ID 110527, 2020.

[41] N. Cui, N. Malleson, V. Houlden, and A. Comber, "Using VGI and social media data to understand urban green space: a narrative literature review," *ISPRS International Journal of Geo-Information*, vol. 10, no. 7, pp. 1–23, 2021.

[42] Z. Yuan, X. Zheng, L. Lv, and C. Xue, "From design to digital model: a quantitative analysis approach to garden cities theory," *Ecological Modelling*, vol. 289, pp. 26–35, 2014.

[43] J. Yang, "From digital design to digital control: exploration of the 4th-generation urban design paradigm from Weihai experience," *Urban Planning Forum*, vol. 256, no. 2, pp. 109–118, 2020.

[44] G. Brown, J. Rhodes, and M. Dade, "An evaluation of participatory mapping methods to assess urban park benefits," *Landscape and Urban Planning*, vol. 178, pp. 18–31, 2018.

[45] H. Li, H. Xv, J. Zhai, and Y. Geng, "City examination assessment towards urban human settlement with high-quality: based on the practice of Haikou," *Urban Development Studies*, vol. 28, no. 5, pp. 70–76+101, 2021.