

Research on Public Facility Renewal Design System Under the Background of Future Community Construction

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Abstract: Under the background of future communities construction, this article analyzes the systematic update path to construct future community public facilities by taking the renewal design of the community public facilities as the breakthrough point on the basis of interpretation of the future communities in Zhejiang Province, with humanization, compounding and ecologicalization taken as the value orientation. In view of the problems that it is difficult to achieve breakthrough changes in the living environment space of old residential areas, such as single functional structure, outdated public facilities and lack of systematic design, With the collaborative analysis of the three major factors of “people, environment, and facilities”, a SWOT strategy model is established to clarify the advantages, disadvantages, opportunities and threats in updates in future community public facilities; Combining the renewal path of necessary, selective, adaptive and interventional facilities, this article updates the design of practical cases to derive the correlation between the needs of the crowd and different types of public facilities in order to build a public facility system that contains complex spatial model, diverse humanities and green communities ecology.

Keywords: Public Facility, Future Community, System Analysis, Optimization Design

1. Introduction

With the rapid development of China's economy and the expansion of urbanization, new paths and ideas for the renewal of different communities have emerged in different stages throughout the country. At present, in the context of urban renewal, new communities characterized by “fragmentation” have emerged in various regions [1, 2]. At present, although the overall renewal design of residential communities is relatively uniform, the update of community public facilities in the third space is relatively lack of systematic research. In the theory of the third space, American urban sociologist Ray Oldenburg believes that the third space has the function of accumulating resources and popularity and promoting urban development. It can increase the diversity and richness of the city. A city can best reflect its diversity and vitality in the third space [3-5].

In summary, this article focuses on the system design of public facilities. Through scientific observation and system analysis, this article studies the systemic design of public

facilities in the context of future communities construction, so as to conduct a hierarchically morphological analysis of public facilities from the overall construction of future communities.

2. Research on the Relationship Between Future Communities and Public Facility Renewal

With the acceleration of urbanization, people's needs for residential communities are also changing. At present, the development of old and new communities is uneven. In the process of urban renewal, Zhejiang Province took the lead in proposing to build a system based on “one center with three dimensions and nine scenarios”, that is, centering on the people's aspiration for a better life with human-oriented, ecological and digital dimensions, to create the nine major communities life scenarios of neighborhoods, education, health, entrepreneurship, construction, transportation, low-carbon, service, and governance, which can meet people's

living and social needs. This system is not only the renewal of residential functions, but also the place that the city's health, humanity, and spirit belong to.

As a new type of urban functional unit first proposed under the new situation, the type will be more inclined to build a unified value standard. That makes it necessary to include two aspects, namely, respecting differences and reaching consensus in the "plurality" characteristics of the future communities. Therefore, how to stimulate communities strength, reach communities consensus, and solve the problems of relatively closed urban construction models and weak risk response capabilities are the main significance of future communities research [6]. Therefore, in order to reflect the effectiveness of future communities scenes, it is necessary to focus on the design of the relevance of public facilities in the scene. Public facilities, as a complex of public and living facilities in communities, play a vital role in solving fragmentation and cultural simplification in current community public facilities. Analysis and design of spatial differences based on different communities will effectively promote the systematization, refinement and high quality community public facilities in the future. This article strives to establish a new design path to improve the quality of community public facilities and gather vitality, thereby realizing the multi-dimensional combination.

3. The Existing Problems of Community Public Facilities and the Need for Renewal

3.1. Analysis of the Status Quo of Community Public Facilities

(1) Functional fragmentation

In the past, the design of public facilities in residential areas is often in the final stage, causing them to become an independent individual. However, as facilities with a public function attribute, community public facilities must form a symbiotic relationship with users in form and function. At present, the form of public facilities is single. Most of public facilities in communities, such as trash cans and street lamps exist in the form of rigid demand. Some entertainment facilities are mostly purchased as finished products, lacking the personalized design needed in communities; besides, rooms for office activities in communities, communities service and facilities are mostly provided for service personnel, which not only lack of cultural heritage, but also are frequently abandoned due to improper maintenance in the later period. In the process of urban renewal, fragmentation of community public facilities has become increasingly prominent. How can the fragmented function distribution systematically integrate resources and space through reasonable planning and design to form a communities vitality unit, so that life, use and sharing function can be combined is an issue that needs to be discussed urgently.

(2) Participation in fragmentation

Community public facilities, as a carrier of human activities, should satisfy people's psychological and physical demands at the same time. For traditional old communities, these facilities should carry more life functions and urban vitality. However, the construction of a large number of community public facilities in China has not been properly planned and integrated. For example, in modern society, the public space on the roads in communities is occupied by cars, and the small-scale streets on both sides of the building are also full of vehicles. The roads and streets of the communities are divided into two systems and become fragmented streets. Due to the remaining problems of the old communities, the fitness and entertainment public facilities are aging, losing their original functions, and gradually becoming a place for debris; The lack of human management in public service centers is almost in a state of disuse; these problems have caused residents to be unable to participate in communities life together. With the generation of cognitive surplus in modern people, the popular public facilities brought by common communities activities can no longer meet the needs of humans and machines carried by the communities, resulting in the lack of communities facilities for residents to participate, and it is difficult to highlight communities identity.

(3) Cultural simplification

Cultural changes are related to the communities environment, and they are also in dynamic changes. The problems caused by the standardized design of communities housing in the 20th century made the communities facilities culture single, and the design of community public facilities could not highlight the cultural connotation of the city and the communities. The design of each communities is also gradually becoming the same. The same cultural landscape wall, unified paving pattern, standardized seat design, and unified and reproducible template design cause the ignorance of the exploration of culture in communities. The communities design of the new era should fully reflect the cultural diversity, going beyond the infrastructure of the communities. It is necessary to pay more attention to the high cultural connotation of the culture after self-growth within local communities, thereby highlighting the cultural characteristics of communities.

3.2. Systematic Analysis of Renewal of Community Public Facilities

Based on the analysis of the above-mentioned functional fragmentation, participation fragmentation, and cultural simplification, the author conducts a systematic analysis of the renewal of community public facilities on the basis of composite, humanistic, and ecological principles in communities construction in the future (Figure 1). According to relevant investigation and research, the author will explore people, environment, and facilities at different levels. Besides, under the guidance of the composite principle of modern digital technology, people-oriented humanization, and ecological principle, the author will guide the research of public circle system.

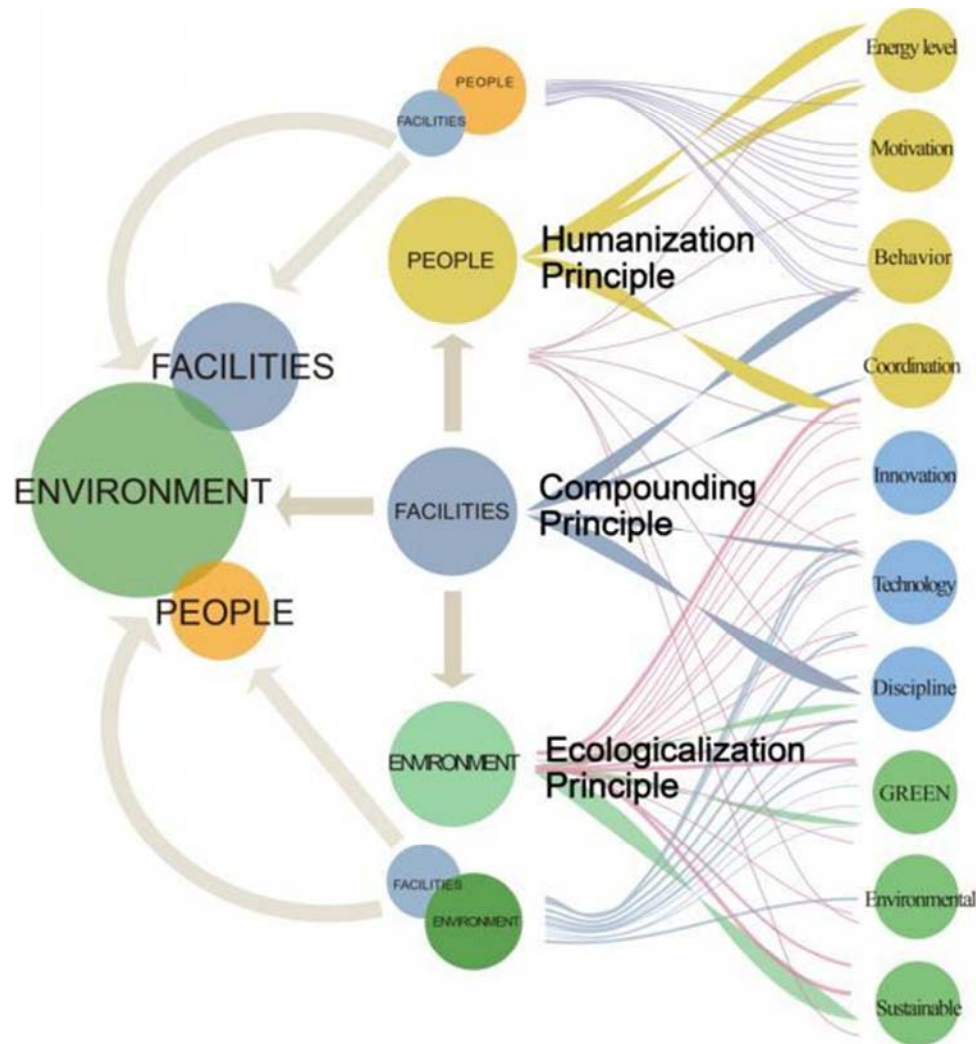


Figure 1. Humanized, composite, and ecological multiple value dimension diagram.

3.2.1. The Principle of Compounding: From the Perspective of the Integration of Public Space Resources, a Systematic Review Is Carried out

In terms of the requirements for the establishment of “three principles and nine scenes” of humanization, ecologicalization and compounding in the future communities, compounding refers to the combination of two or more objects using certain methods under certain conditions or order. [7] The compounding of communities include spatial compounding, functional compounding and human activities. In the renewal of public facilities, full consideration should be given to the connection of each function and space, so as to improve the efficiency of composite objects, reduce resource waste, and increase utilization rate and space vitality. In addition to meeting people’s multi-level needs for life, it is also necessary conduct a systematic analysis by using the communities information platform CIM and Alibaba Cloud with innovative, coordinated, green, open, and shared design concepts combined from the perspective of resource integration.

3.2.2. The Principle of Ecologicalization: Constructing Public Space from the Concept of an Integrated Ecological Life

It is necessary to analyze the functionality of public facilities from the perspectives of the relationship between the landscape features of public facilities and residential high performance, the relationship between the transportation function and the ecological function of public facilities, and the green construction of the communities’ outdoor activity spaces. The design of public facilities is integrated into the overall environment of the future communities, becoming an organic compound ecological facility.

Based on sustainable, environmentally friendly and green design concepts and the existing low-carbon and energy-saving demonstration system in communities, the design of public spaces and facilities are combined to make it possible to achieve the systematic design of external spaces in future communities. For example, the resource recycling system can be implemented by means of increasing revenue and reducing expenditure. The first is to use digital technology to build a communities-level energy management platform in

the future communities neighborhood center to comprehensively improve ecological resource management. The recycling of garbage can be implemented, including installing smart kitchen waste recycling equipment and recycling the produced water for green irrigation [8]; Besides, three-dimensional greening can be used to plant and cultivate plants in residential areas, so as to create three-dimensional greening hobby activity rooms [9]. Communities also encourage residents to take part in three-dimensional greening gardening and planting; entertainment, health and exhibition centers are also established with three-dimensional green plants to serve users. In this way, greening is combined with residential facilities to integrate ecological life.

3.2.3. The Principle of Humanism: The Establishment of a Harmonious and Inclusive Life Circle from Human Behavior and Psychology

Human-oriented design requires us to further analyze the behavior of the residents in communities on the basis of meeting the rigid needs of the residents. Then, in terms of behavioral, interpersonal and social relations of main research objects, this article combines knowledge and emotion to apply the principle of human-oriented design to the public environment and facilities of future communities

to analyze residents' lifestyles, living security, comfort, and belonging. In this way, the vitality of communities residents can be re-motivated and a pleasant future community public space environment can be created.

4. Research on the Systematic Renewal Path of Community Public Facilities in the Future

4.1. Analysis of the Types of People Using Public Facilities

The future renewal of residential areas is an endogenous self-innovation of communities. At present, lack of systematic planning of soft environment such as the use of public facilities, aesthetic needs, and cultural connotation expansion in communities is becoming increasingly prominent.

According to the existing research background and current issues, it is necessary to infer the corresponding public facility type by simple incidence matrix method by forming a matrix through the combination of several major elements of the renewal design of related public facilities, namely, users, demand, and characteristics (Figure 2).

Users	Demand Usage	Characteristics Usage	Corresponding Public Facilities
Children	In the children's stage, physical and psychological immaturity, the need for guardian care, activity area settings need to fully consider the scope of the area.	1.Daily travel security. 2.Extensive outdoor activities. 3.Medical education care. 4.Basic cultural studies.	1.Public transportation safety facilities. 2.Activity centers. 3.Kindergartens, primary schools, health stations. 4.Cultural bulletin boards.
Middle-aged	The middle-aged and young people are more focused on functionality and opening up their social networks in the community. Creative highlight facilities are also a major criterion for middle-aged youth to consider.	1.Safe and convenient for daily travel. 2.Shopping, fitness, socializing and entrepreneurship in one. 3.Medical education care; 4.Creative activities.	1.Public transportation safety facilities. 2.Commercial assemblies. 3.Health stations. 4.Fitness centers, ecological planting, public meeting rooms, public recreation facilities.
Seniors	The senior citizens have different physiological and psychological characteristics and need certain assistance from public facilities in terms of behavioral cognition, while taking into account the psychological health of the elderly and breaking the anxiety of the elderly and other problems.	1.Daily travel security. 2.Accessibility to daily shopping, fitness and communication. 3.Medical care and retirement. 4. Interest cultivation. 5.Aging-appropriateness.	1.Public transportation safety facilities and special roads, green lanes, and auxiliary facilities. 2.Commercial assemblies. 3.Health stations, senior service centers, volunteer stations. 4.Activity centers, interest centers.
Special Populations	Due to the physical and psychological defects in the design of public facilities need to increase the social possibilities, additional auxiliary facilities, psychological defects in the population to enhance the emotional identity.	1.Daily travel security. 2.Daily socialization. 3.Medical treatment and rehabilitation.	1.Public transportation safety facilities and special roads. 2.Activity centers. 3.Health stations, volunteer stations, rehabilitation centers.

Figure 2. Matrix analysis of characteristics of communities residents.

Different from the street function of the general communities, Qingnian Road communities in Hangzhou City,

which is taken as an example, defines its street functions based on the age structure and the correlation analysis of the

living area and the characteristics and needs of the users (Figure 3). The communities can provide a basis and reference for the specific optimization design of public facilities. The systematic analysis of communities fitness equipment, entertainment facilities, rest facilities, landscapes,

lighting and other facilities can provide services for local residents and migrant groups [10]. Besides, the above method is applied to the public facility system update design plan of the future community of Qingnian Road, Hangzhou City, Zhejiang Province.

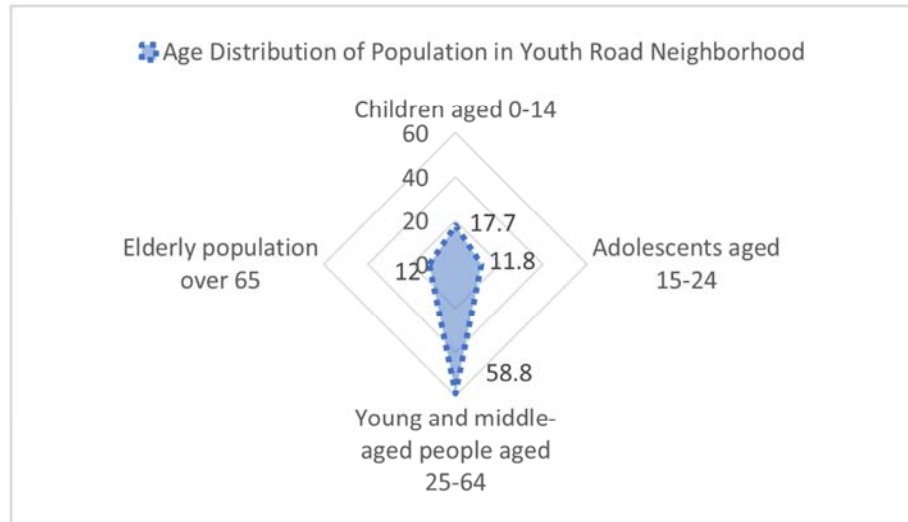


Figure 3. Questionnaire on Age Distribution of Residents in Qingnian Road Communities, Hangzhou.

From the analysis of age population structure:

- (1) The physical limitations of children aged 0-14 should be taken into consideration. This age group includes three types: toddlers, preschoolers, and growing-age children. This group of people usually needs guardians to carry out daily activities in communities. Besides, most of activities are concentrated in surrounding open areas of houses, streets, parks, etc. According to data analysis, school-age children at this stage need to increase necessary learning activities and outdoor social contacts, including children's activity centers, service facilities and necessary educational facilities. Besides, more attention should be paid to safety and convenience and the significance of general education in use. Therefore, corresponding necessary public spaces and facilities are planned for this group of people.
- (2) The biggest characteristic of people aged 25-64 is that most of them have adapted to various group activities in society and they are also the largest group of people in the entire communities. This group of people spend most of their time on office work, leaving the demand for community public facilities mainly in special time periods such as holidays, weekends, and nights. However, the survey also found that there are more and more self-employed entrepreneurs and freelancers. To meet the social and life needs of this group of people, the design of public facilities should cover shopping, social networking, fitness, entertainment, and work exchanges to redefine the future scene of communities youth activities.
- (3) In terms of different physiological functions, the

elderly over the age of 65 are simply divided into three categories: self-care type, assisted type and nursing-cared type. For self-care elders, communities activities, as the most important daily activities, should also pay more attention to the living psychology of them, besides providing them with necessary facilities such as safe travel, simple fitness, medical care, services, shopping and entertainment. The requirements for the landscape beautification and service interventional function correspondingly increase, thereby enhancing the overall quality of the future communities. In addition, for special groups of people, it is necessary to take into consideration limited social activities and limited scope of activities with a certain amount of communities care and social respect. It is also necessary to set up certain rehabilitation facilities in communities.

4.2. SWOT Strategy Analysis of Future Community Public Space Construction

The renewal design of community public facilities is a complete manifestation of urban functions and emotions. Taking the current planning of the future communities in Hangzhou, Zhejiang Province as a reference, under the guidance of future communities, the renewal of community public facilities should divide communities into different open spaces in accordance with composite, humanistic and ecological principles instead of former fragmented and unitary principles, so as to meet the forward-looking needs of the above-mentioned people. Based on this, the author draws the SWOT table according to the actual situation and comes up with a conclusion based on the analysis (Figure 4).

















Strength				Weakness							
 Economic Advantages Diversified and rapid development of Hangzhou's urban industries, with clear economic advantages in the Yangtze River Delta.	 Culture Advantages Hangzhou's unique urban culture has deep implications and wide influence.	 Life Advantages Diverse demographics, accessible roadways and good commercial development.	 Environment Advantages The landscape is well-maintained, with a dense water network.	 Demand issues Survival requirements are no longer the main issue and communities need higher level facilities.	 Aesthetic issues The public facilities are homogeneous and lack of cultural exploration.	 Environmental issues Symbiosis of ecological landscape and human combination.	 Emotional issues The Lack of Emotional Attributions in Future Communities.				
Opportunity				Threat							
 Economic Development The development of new industries is dominated by the flourishing of the Internet economy.	 Policy Formulation The Future Community Program is proposed by Zhejiang Province, and many policies are supported.	 Social Life The demand of community residents is gradually crossing over to a more sophisticated life pursuit due to urban development.	 Self-actualisation The development of innovation and entrepreneurship, the requirements of outstanding talents for the self-actualization of value.	 Economic Budget The design and construction of public facilities in the community requires the co-operation of many parties and the gradual advancement of policies.	 Culture Establishment Future communities need to explore the unique culture of different areas in different cities.	 Post Maintenance Community Services Management should be multi-disciplinary and grid-based.	 Future Planning The design should be adapted to the requirements based on the principles of Humanism, Ecology and Complexity.				
SWOT Strategic Model				Strength				Weakness			
Opportunity				SO Strategy: Strengths and Opportunities Strategy Model - Analyzing Strengths and Seizing Opportunities. Use the principle of humanization of future community construction planning to promote the transformation and design of community public facilities, take advantage of policies, innovate the pilot construction of future community co-housing, and use Internet technology as technical support for compounding design according to the characteristics of regional development to meet the pursuit of better life in the community and realize the self-renewal and value enhancement of the community.				WO Strategy: Disadvantage and Opportunity Strategy Model - Using opportunities to eliminate disadvantages. Take advantage of talent policy to promote the discovery of multi-level community needs, gradually internalize and endogenize the construction of public facilities and public activities in the community and incorporate them into the long-term planning of the future community, take advantage of the unique ecological environment to design caring facilities based on the transformation of community public facilities, and encourage the healthy development of community activities in the direction of ecology, cooperation and integration.			
Threat				ST Strategy: Strengths and Threats Strategic Model - Using Strengths to Eliminate Threats. Based on the concept and practical experience of Singapore's future city construction and planning, a hierarchical theory of needs is conducted for areas suitable for future community development as a data base for threat factor analysis, and three major design principles are used as theoretical support for local design to take advantage of population diversity in design and establish public facilities that are fully adapted to future development.				WT Strategy: Disadvantage and Threat Strategy Model - Eliminate disadvantages to avoid threats. Lead the various types of communities such as society, families, enterprises and services to participate in the construction and participation of community public facilities in a diversified manner, promote the significance of the government's future community planning and cooperate with social capital in the region, play to the advantages of both sides, provide a way for the maintenance of the facilities and the establishment of humanistic emotions in the community at a later stage, and truly achieve the realization of the nine living scenarios.			

Figure 4. SWOT strategy analysis table for the future communities.

It can be seen from the SWOT analysis that changes in external factors bring very different opportunities and challenges to communities with different geographical environments and resource capabilities. However, the opportunities and challenges in external factors are closely interconnected [11]. That is to say, the greater the existing problems and threats are in communities, the better the design opportunities will be created by the communities in the future. Therefore, the analysis of future diversified communities strategies should focus on the following aspects.

(1) SO advantages and opportunity strategy model

The establishment of composite functional communities with the production capacity advantage of the digital economy.

As the core development area of the Yangtze River Delta Economic Zone, Hangzhou City in Zhejiang Province is in a leading position in China for economic growth and digital technology. In the future, the communities will use its production capacity advantages to achieve the transformation of a complex communities of technological and economic empowerment.

With the advantages of digital technology empowerment, Alibaba Cloud has launched a smart city solution for ET City Brain, and NetEase has formed a scene-based solution in areas such as education big data [12]. In the future, communities complex management will introduce the emerging CIM technology in the field of big data into the communities digital platform. In terms of supervision, intelligent analysis and three-dimensional visualization can be adapted to realize dynamic management of indicators such as air quality, energy consumption, and waste disposal. At the same time, it is helpful to innovate the cross-age interaction mechanism for young people, carry out quality development activities such as science surveys and outdoor sports [13]. By creating a comprehensive energy smart service platform, the function condition in each building and multi-dimensional space in public areas can be indiscriminately sensed, which is conducive to realizing digital transformation in design and management.

With the advantages of economic empowerment, companies such as Alibaba, NetEase, Hikvision, Zhejiang Dahua, etc., while promoting the economy, also bring talents

to urban communities. Complex functional communities try to combine work and residence, including mixing work scene with social and entertainment functions. In addition, the first floor of buildings is used as a cultural and creative shop or public space to create more opportunities.

(2) WO Disadvantages and Opportunity Strategy Model

Exploring the change of crowd thinking and creating human-oriented space value.

Public facilities meet the needs of people to improve the space. Starting from the needs of people, the design is designed with humanization, special relations and interpersonalization. It requires to improve the layout of facilities and beautify the visual landscape to improve the accessibility of communities actions and the ability of risk control in accordance with the needs of the crowd; Through the interaction between people and landscapes, behavioral landscape design can be upgraded to achieve emotional resonance; cultural cohesion can be paid attention to to innovate humanistic shaping and inherit the urban culture.

In the design, it is required to fully match the diverse values of the space with the diverse needs of people, with the refined design of scene and experience paid attention to; the integration of the public space and culture can make the cultural atmosphere and characteristics more obvious; by increasing people's participation in activities, the commonality between people and the communities environment can be enhanced to promote the formation of people's emotional identity [14]. After all these attempts, necessary activities can be introduced into the communities, thereby fundamentally improving the social life circle and achieving co-existence in communities.

(3) ST advantage and threat strategy model

With reference to the urban renewal concepts of foreign countries, ecological community public spaces can be constructed.

Based on the characteristics and functions of the environment and climate resources of different cities, the author analyzes the comprehensive application of the three ecological system models, including low-carbon and energy-saving demonstration system, the resource recycling system and the human ecological system.

At present, as far as Zhejiang Province is concerned, low-carbon communities have been constructed in Hangzhou on a pilot basis, which includes low-carbon energy saving, green health, and resource recycling. These communities use solar photovoltaic power generation systems and water source heat pump cooling and heating source systems to form a three-dimensional renewable energy supply. These communities emphasize the combination between public facilities and ecological landscapes, thereby eliminating problems such as the single function of public facilities in communities at this stage.

In addition to the natural ecology, the humane ecosystem of the future communities will be based on the humanities, emphasizing bottom-up social justice and democratic participation. Besides, the system, taking the construction of communities culture as the guide, pays attention to the

allocation and integration of communities resources, and the optimization of living environment [15]. Besides promoting hierarchically diversified service facilities, selective activity spaces for residents are established from different perspectives of different groups of people, constructing selective communication spaces and adaptive diversified spaces, to reflect the ecological value system of future communities from different dimensions.

(4) WT's disadvantages and threat strategy model

In accordance with complex, humanistic and ecological development, carrying out collaborative design to share results.

Actively guiding the market, society, and families to participate in communities construction from the perspective of composite development and improving actual needs from the perspective of residents can promote economic empowerment and technological empowerment to play a role in creating a harmonious communities environment in future scenarios. It is necessary to think about how to make public facilities more in line with people's needs in high-density space from the perspective of humanism; it is also required to combine public space, semi-public space and private space to help communities build a shared living circle; attention should also be paid to the combination of landscape ecology and human ecology from the perspective of ecology; while implanting the concept of "zero carbon" in communities, attention should also be paid to the cultivation and exploration of culture, achieving more tolerant humanities, more reliable environment, and greener and smarter construction and operation. These three value systems need to be developed collaboratively in design to jointly create innovative forms of future communities.

4.3. Analysis of the Optimal Design of Public Facilities from a Multiple and Composite Perspective

Based on the above analysis of SWOT optimization strategy, the author studies the design and application of future community public facilities renewal from composite space, humanized space, and ecological space with the factors that affect public facilities integrated into; the research abandons the homogenization facility settings of former communities. Analysis of the population structure and density of the specific space from the perspective of humanization is carried out; Analysis of the spatial layout and the status quo of the facilities from composite and ecological perspectives is also carried out; it is also required to provide differentiated designs for public facilities to meet the needs of future communities. Meanwhile, public facilities under the construction of the future communities are classified, with necessary activity space, selective communication space, adaptive multiple space, and intervention improvement space set up. The content includes activities in nine major scenes of future communities. These communities provide necessary, communication, adaptation and intervention facilities in terms of recreation, transportation, services, landscape and barrier-free (Figure 5).

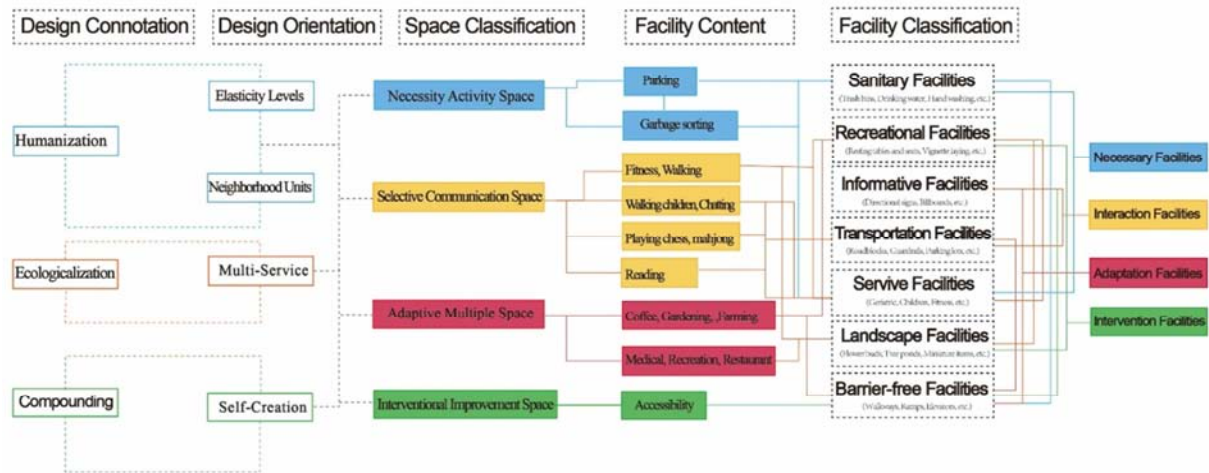


Figure 5. Analytical diagram of optimization design of public facilities from a multiple perspective.

5. Design and Application of Systematic Renewal of Public Facilities in Future Communities

5.1. Analysis of Examples of Public Space Design in Future Communities

Taking Qingnian Road Communities in Hangzhou City, Zhejiang Province as an example, the first is to determine the

overall space utilization of future communities based on the actual land use of the research project. Considering that these communities are located in the center of Xihu District and is near to Dingjia Garden, Guangfu Road Community and Yongjinmen Community and Sishui New Village, it is necessary to emphasize the life link between these future communities and the surrounding neighborhoods. Therefore, these communities can use multiple “circle” forms to deconstruct the “life circle” of future communities and create a future community life scene (Figure 6).



Figure 6. Location map of the concept of “life circle” in future communities.

It can be seen from the above analysis that the behavior pattern of residents determines the composite relationship of various functional facilities. The composite design of public facilities can effectively guide residents to care for and participate in the construction of the community life circle. The actual plan is creative in the form of a central vitality core, with housing, entrepreneurship, retail, community

services, and leisure and entertainment mixed. In this way, future communities with a theme of “diverse principles and multiple circles guarantee the diversity of community spaces and cultural types by intersecting the traffic in different old communities and the functional composite of public spaces; at the same time, these communities can also provide opportunities for different groups to interact, thereby

reinvigorating communities' vitality.

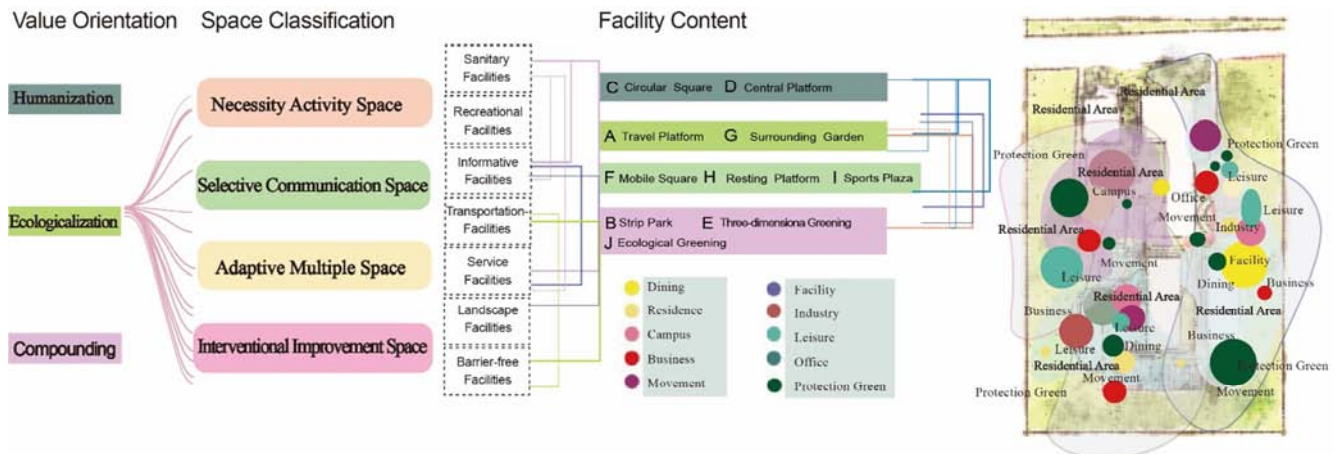


Figure 7. Design analysis diagram of some landscape nodes in Qingnian Road communities in the future.

The design focuses on the communities landscape and public facilities. According to actual research and analysis, the community public space is divided into 10 design nodes of A-J. According to the analysis of crowd needs, the nodes are divided into necessary activities, selective activities, For adaptive activities and interventional activities, in terms of the static combination of planes, it mainly considers the comprehensive application layout of the three major value orientations of "humanization, ecologicalization, and compositeization".

The updated design of this area embeds the future scene mode into the design function to the greatest extent from the macro to the micro level and weakens the distinction between

the public area and the private area in the overall transformation. Flexible functional facilities can be chosen according to different people's needs. When residents focus on an certain activity, the public space layout takes the theme as the center and presents circular intersecting growth. The functions of residence, catering, education, commerce, sports, etc. form a circle of symbiosis according to the nature of the space and the relationship between them to promote the development of a healthy model of systematic development (Figure 7).

The following will discuss the specific design path and explore updated designs suitable for future community public spaces.

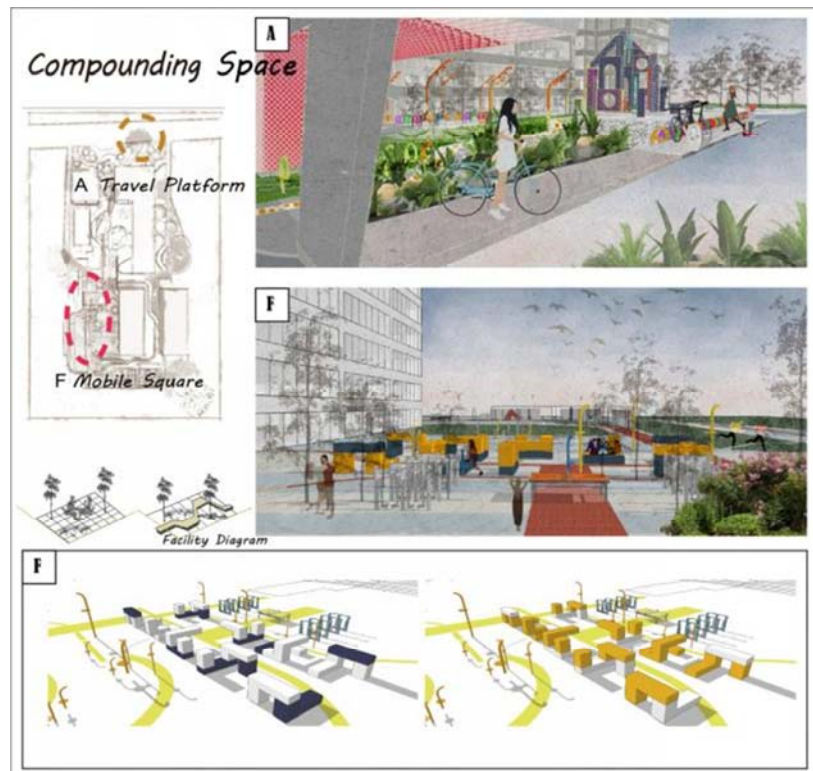


Figure 8. Analysis of composite space nodes in Qingnian Road communities in the future.

5.2. Analysis of Composite Space Design

This area, located between the east and west entrances of the Qingnian Road communities, has a large flow of people and a wide area of activities with complex relationships. In terms of that, it can be equipped with complex public facilities covering transportation, entertainment, leisure and fitness. The composite design of public facilities can carry more behavioral activities of residents. In terms of the site, the design selects the road at point A and the mobile square at point F for key analysis. From the perspective of the static function distribution of the plane, the entrance and exit space is an important node that attracts popularity and is suitable for the distribution of necessary facilities. From the main entrance to the A-point driving platform, people and vehicles in communities can be divided for the first time. The design of the platform area not only satisfies the parking needs of non-motor vehicles, but also functionally

combines the fitness design of leisure and entertainment to enhance the vitality of the space.

Through time-phase research and crowd demand analysis, it is found that the elderly and children have a higher use rate of public space, with the content of their activities similar in time and space, which creates the possibility for the composite design of public spaces for them. Based on this, it is planned to design a construction type mobile facility system design for the F area of the site. The constructed facilities can be divided into different blocks, with the height adjustable according to different construction forms. In this way, people of different ages can choose different block heights and can also choose to use different fitness equipment. The design of this area can demonstrate the possibility of a composite public space from practice (Figure 8).

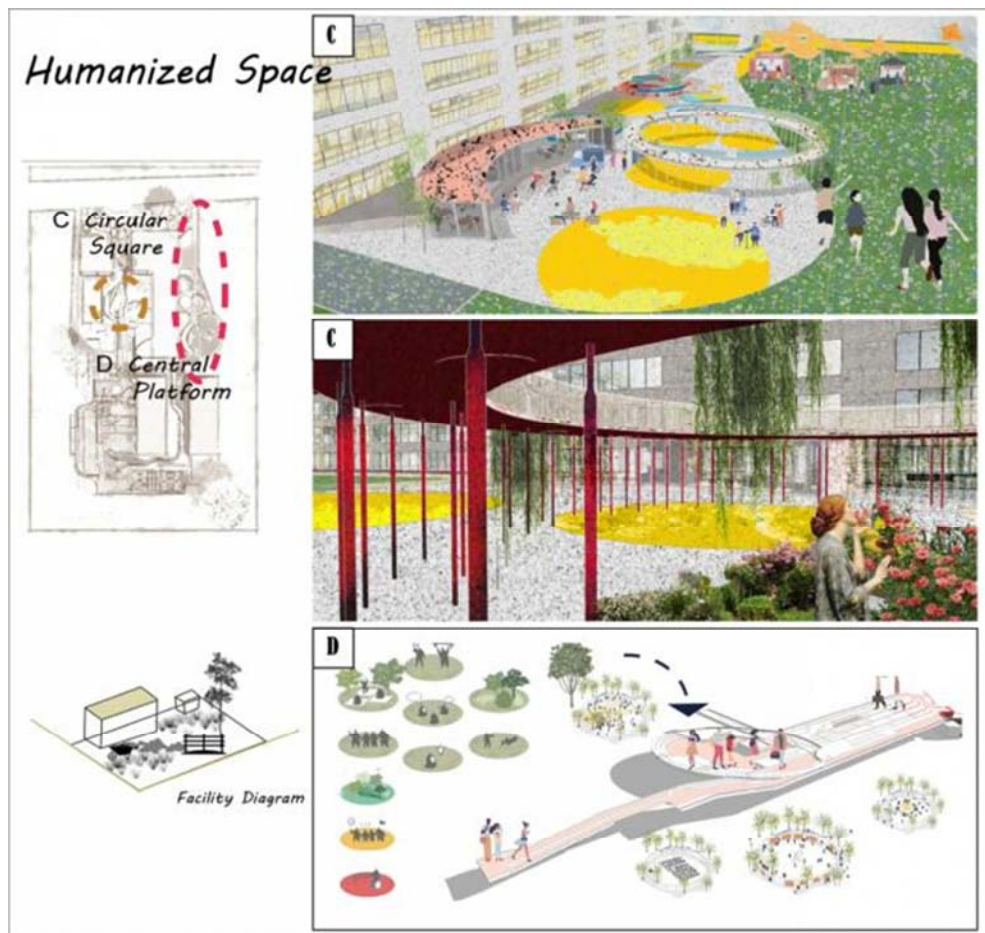


Figure 9. An analysis diagram of the humanized space nodes in Qingnian Road communities in the future.

5.3. Analysis of Humanistic Space Design

This area is located in the center of the Qingnian Road communities, surrounded by residential areas. It is a courtyard and neighborhood center enclosed by houses, which is a semi-private space. This area is the most frequent place for communities residents, and it is also the best place

to realize the neighborhood scene and governance scene, and there are more social relationships. Therefore, the design is based on the fundamental needs of people, and the space design of this area will be based on humanism as the main connotation. In the renewal design with "humanization" as the main space concept, the necessary activity facilities and selective activity facilities are combined for spatial

implantation, and two central nodes of the circular square at point C and the central square at point D are selected for analysis. According to the analysis, it can be seen that the future communities construction is different from traditional real estate development projects. It pays more attention to human behavior and realizes a human-oriented quality of life through the construction of scenes. The design ultimately serves "people". Qingnian Road communities is a mid-to-high-rise residential building, and the neighborhood communication space of the residences is characterized by intensiveness, which brings about problems such as compression of the public space and obstacles to the communication between neighbors.

Based on this, the author puts forward the concept of "Public communication corridor". The central circular

platform at point D is a raised two-floor platform. The overhead platform at point D serves as a necessary activity space for the future community, with sunken squares and three-dimensional greening and other facilities, which makes full use of the height of the standard floor space to realize the form of an aerial corridor, forming an effective social circle; the north-south trails can be used as greening and slow lanes, which is conducive to the use of public space at different periods time by different people.

The circular square at point C serves as the sub-center of the design, with public facilities such as coffee shops, mobile shops, botanical gardens, etc., becoming the largest social, distribution, and entertainment center in the community. In terms of design, an enclosure is used to create a safe and open space to enhance neighborhood communication. (Figure 9).

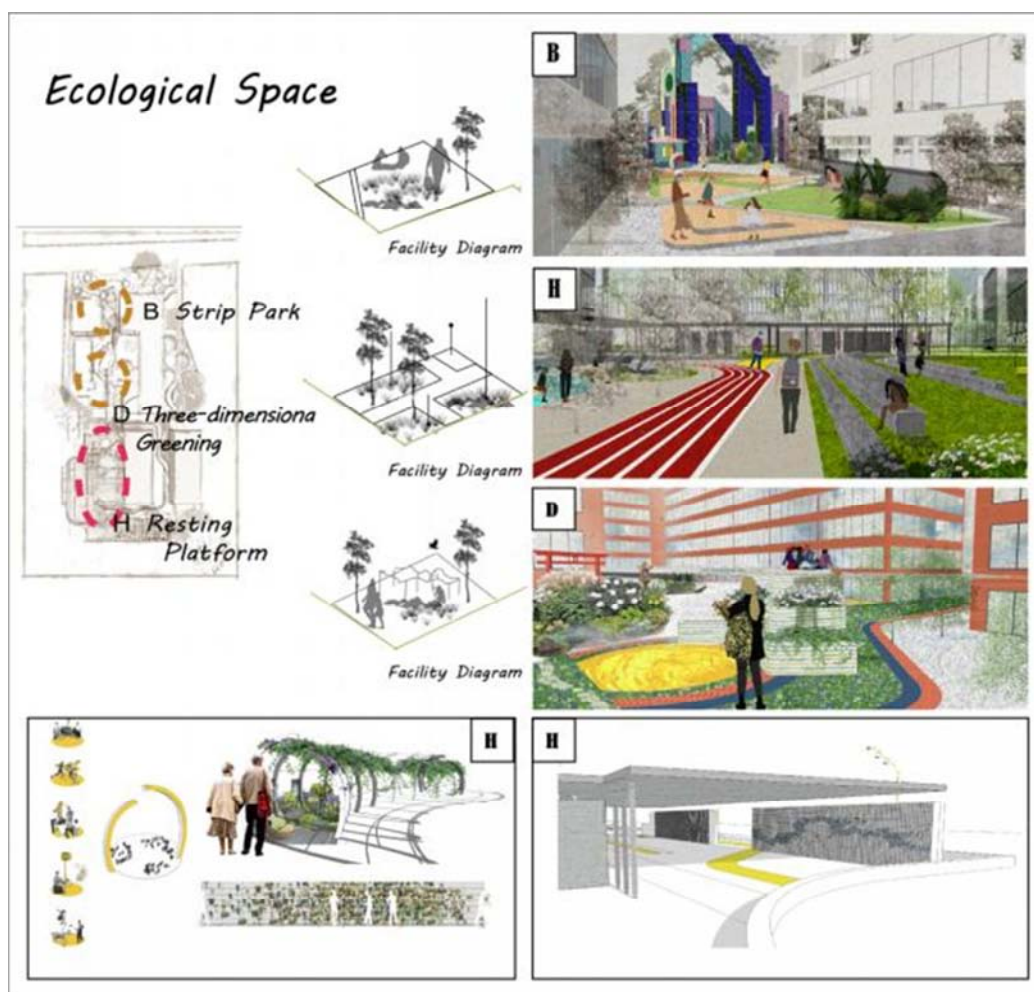


Figure 10. Analysis of the nodes in the ecological space of the Qingnian Road communities in the future.

5.4. Analysis of Ecological Space Design

This area, located in the north of Qingnian Road community, forms a sense of privacy naturally with the long and narrow area. The north of the communities has low noise, good ventilation and light, suitable for plant growth and easy to form a relatively private atmosphere with low building density. Relatively narrow spaces in the

community are chosen to set up three-dimensional greening facilities, so as to improve the environmental quality while saving space. Therefore, the spatial design of this area will be carried out with ecologicalization as the main connotation. For adaptive activity facilities and interventional activity facilities, the strip park at point B, the three-dimensional greening at point D, the surrounding garden at point G, and the resting platform at point H are

selected for analysis. The design combines interventional facilities and the natural ecological environment to realize the ecological construction of the community and create the concept of “zero carbon emission”.

From the perspective of people, the development of sustainable communities needs to be combined with the development of low-carbon life to establish unique functional areas, such as the belt park at point B: a recyclable life state can be formed through the close-range scenes of greening between houses. Close-range scenes can be set up with green communication spaces, such as strip corridors and flower field to form a forest-like space, which can interact with ecological wonders. The surrounding garden design at Point

G is used as an adaptive space for the elderly, aiming to deepen the impression of the elderly and reduce the risk of them getting lost by adding large-scale three-dimensional greenery in front of specific floors.

Starting from the environment itself, this community can combine the relationship among the community, ecology and nature to build the full-age habitability of the future community. The three-dimensional greening at point D uses the overhead of the platform to set the steps into a solid irrigated landscape with high-survival plants used between the crevices of the laminates; This way breaks through the inherent traditional concepts and values the harmonious coexistence of man and nature. (Figure 10).



Figure 11. Bird's-eye view of the landscape node design of Qingnian Road communities in the future.

5.5. Design Summary

Through the design practice of the Qingnian Road future community project, the human-oriented, composite and ecological path of space is applied to the design of public space, preliminarily demonstrating the feasibility of the systematic design path of public space facilities in the future community. The human-oriented, composite, and ecological value orientation, from the determination of the design scope to the classification of public facilities, and then to the design of internal functions, constitutes the basic thinking of the systematic design of public facilities in future communities as a whole. After the practice of this project, the author further proves the feasibility of the humanization based on the actual needs of residents; the compounding of functions and forms; the integrated design of ecological construction have greatly improved the quality of public space (Figure 11).

6. Reference Significance of Systematic Renewal of Public Facilities

Under the background of the overall renewal and construction background of future communities, it is necessary to transform the systematic design thinking into a

number of specific practical design operations for public facilities. In this way, the new superficial meaning of the renewal of the physical environment is achieved. Besides, the renewal connotation of localization, ecologicalization, and compositeization come up with realizes the continuous and systematic renewal and improvement of the long-term development of public space under the framework of the future communities, bridging the boundary between art and technology and breaking the boundary between sensibility and rationality.

6.1. The Composite Construction of Suitable Spatial Elasticity Levels and Neighborhood Units

Under the principle of functional compounding, a suitable spatial elasticity level is required [16] to carry out transformation design. From points to areas, setting up different types of spaces requires consideration of the behavioral rules and privacy of neighbourhood interactions. Public spaces are differentiated from open to private levels according to the range of users. In this way, public facilities can actively and variably adapt to the complex needs of future communities; then, a flexible and hierarchical semi-public space can be formed to be shared by the whole community in the future, with community cognition and belonging formed as well.

6.2. Participation of Residents in the Humanistic Construction of Multiple Collaborative Values

Under the background of the construction of future communities, the loose management of communities in the past has been gradually replaced by the collaborative construction model with the development of the city. People-oriented design is still the most important human settlement needs. However, different from the previous people-oriented concept, “humanization” is not only based on the actual needs of future community residents, but also updates from the highest level of residential psychological needs, that is, the level of self-worth realization; On the basis of visual perception and space accessibility, optimize the relationship between man and nature to achieve the integration of man and nature, and use the natural malleability value of public space to meet the needs of human ecology, and promote the emotion of urban people on the basis of improving the quality of space Going home and building, guide residents to create and form an endogenous way of co-living and sharing. Effectively build a communities ecology and enhance residents' sense of identity and belonging to the communities.

6.3. Strengthening the Ecological Construction of the Three-dimensional Green Environment of the Community

The future community is the basic place to realize the green development of the city. Strengthening the green awareness of community residents and improving the ability of green construction are the keys to future community development. After the transition from building-oriented development to environment-oriented development, the community value after ecological renewal will also rise rapidly [17, 18]. Public facilities can strengthen the management of community greening and improve the setting of green space system to save water supply and treat with solid waste to form a stable state. A vertical organic environment is formed between ecological landscape design and greening. Besides, based on the existing application technology of three-dimensional greening, three-dimensional greening technology of soil, surrounding, and ladder can be used to improve the public service facilities of the residential area [19] to build a sustainable and healthy ecological greening. In cases of emergencies, once the communities is closed and the resources are not circulated, it is necessary to consider how to keep to healthy development under the condition of community independence. The green ecological and recyclable communities demonstrates its advantages in adapting to the rules of future development.

7. Conclusion

In summary, the exploration of future communities is still at an early stage. Synchronous renewal of community public facilities is an unavoidable issue in future community development and the renewal design of public facilities is a systematic long-term plan. Under such a background, it is

necessary to start from the whole and insist on the humanistic, composite, and ecological design principles. Besides, by balancing practicality, system, dynamics, coordination, safety, etc., the form, function and number of public facilities should be enriched to serve communities' residents to the greatest extent, thereby achieving sustainable development and truly bringing constructive meaning to the construction of future communities.

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References

- [1] Li Weifei, Liu Ling, Shao Yinghui, Chen Yang: Research on Communities Awareness: Basic Prerequisites, Main Contents and Future Directions [J], 2018 (06): 75-80.
- [2] Yuan Lei, Sun Qiang: Research on the Group Path of Community Identity [J], 2016 (2): 111-115.
- [3] Wang Shan, Wang Zhijun: Research on Renewal Method of Public Infrastructure in the Old Town——A Case of Kreuzberg in Berlin [J], 2020, 17 (19): 40-46.
- [4] MCMILLAN D W, CHAVIS D M. Sense of Communities: A Definition and Theory [J], 1986, 14 (1): 6-23.
- [5] PERKINS D D, LONG D A. Neighborhood Sense of Communities and Social Capital [M], 2002: 291-318.
- [6] Zeng Zhihong, Chen Yuchao, Zhu Mingjie: Five Challenges of Intelligent Governance in Urban Future Communities and Their Transcendence [J], 2020, 42 (04): 130-136.
- [7] Ji Yameng: Research on the Design of Public Space of Centralized Long Rental Apartment in Wuhan based on Spatial Compound [D], 2019.
- [8] Lin Jie, Yang Qingzhao, Tian Huifeng: The Future Community Ecological Design Practice of Shibei Bridge [J], 2020, (23): 37-41.
- [9] Xie Zhuoya, Liu Yu, Qi Zhiyong: Develop Three-dimensional Greening and Constructing New Ecological Residential Areas [J], 2020, 27 (05): 19-23.
- [10] Zhang Lei: Design and Thinking of Urban community public Facilities System [J], 2018, 39 (06): 248-251.
- [11] Ding Fan, Qiao Zhi, Cao Wenjun: Reconstructing the Public Space and Upgrading Facilities for Aging under the Comprehensive Old-age Pension Model in Industrial Communities [J], 2018, 39 (16): 167-177.

- [12] Fang Bin, Wu Liangxing: Discussion on the Path of Establishing Future Community from the Perspective of Humanism: A Case Study of Yuhang District in Hangzhou [J], 2021 (04): 140-151.
- [13] Meng Guangzhi: Application and Exploration of CIM Technology in the Future Community Construction [J], 2021, 30 (01): 79-84.
- [14] Li He, Yang Peifeng: Humanistic Construction of the Natural Ecological Space: Planning Concept and Path of Urban Renewal under the Background of New Area [J], 2020, 27 (07): 90-96+132.
- [15] Hou Ting: Research on the Construction of Humane Ecologicalization in Urban Residential Communities: Taking X Community in Xincheng District of Xi'an as an Example [J], 2020 (01): 66-68.
- [16] Guo Cheng: Creation and Regeneration——Exploration Based on Designing for Spatial Flexibility [J], 2018 (06): 46-47.
- [17] Zhang Guochao, Yu Xiaofen, Zhang Juanfeng: The Research on Green Gene of Future Communities Based on Meme [J], 2019 (11): 43-44.
- [18] Anthony, D. Neighborhoods and Urban Development [M]. Washington, DC: Brookings Institution Press, 1981: 70-80.
- [19] Hamer, Hardt W. Stadterneuerung Rund UMS Schlesische Tor Entwürfe Für Die Schlesische Strasse 1-8 [M]. Berlin: Bauausstellung Berlin 1980.