

Sustainable Urban Form Based Old Community Regeneration — Taking Jing'anli Community in Tianjin as an Example

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Abstract: Sustainable urban form is an important prerequisite to stimulating urban vitality. Under the current urban regeneration movement in China, the transformation and upgrading of old communities mostly focus on renewing facilities and living and building qualities. Coordinating urban regeneration strategies and the changing urban development model to promote high-quality urban development is an important challenge. This paper believes that using the theory of sustainable urban form could help stimulate the proposal of creative urban design intervention comprehensively and systematically, and promote the refinement and humanism of urban regeneration. Taking the urban micro regeneration planning and design competition of Jing'anli community in Tianjin Binhai New Area as an example, this paper discusses applying sustainable urban form theory to transform old communities. In response to building a "complete community" and "15 mins-community life circle" by the central government, this paper explores the possibility of regeneration design strategies with mixed land use, sustainable transportation organization, high-density regeneration, diversity and passive energetic technologies and green design. This research is willing to guide the contemporary old community regeneration design for achieving sustainable high-quality urbanization in China.

Keywords: Urban Regeneration, Sustainable Urban Form, Old Community

1. Introduction

In July 2020, the general office of the State Council in China issued the guiding opinions on comprehensively promoting the transformation of old urban communities, which pushed the transformation of old urban communities to a new height. In fact, the transformation of old residential areas is also the embodiment of urban sustainable development. The reconstruction of old residential areas tends to be called residential regeneration and emphasizes the concept of sustainable development [1]. Therefore, the two have a strong correlation.

Social sustainability mainly includes meeting basic human

needs, improving the quality of life and ensuring social justice, the government's implementation of the transformation of old residential areas is also to meet the people's needs for a better life, promote the benefit of the people to solve domestic demand, urban regeneration and change the mode of urban development and construction, and promote high-quality economic development [2, 3]. The implementation of old community transformation is very important to achieve sustainable development. Therefore, we discuss the transformation of urban old community from the perspective of sustainable community.

The research on sustainable communities began in Britain at the end of the 20th century. At that time, the suburbs of Britain declined and the trend of suburbanization was serious. The British government issued a series of policy documents to promote sustainable communities [4]. At present, mainstream scholars believe that the characteristics of sustainable communities include the alternation and continuity of functions such as appropriate housing price, cultural inheritance, social communication and economic vitality [5]. At the same time, we can see that in the process of building a sustainable community, cultural inheritance and social communication will promote the establishment of community identity, and the complete community supporting facilities will also promote the generation of economic vitality. Therefore, it will also promote the establishment of a complete community and community life circle [6].

Therefore, taking Jing'anli community in Tianjin Binhai New Area as an example, this paper explores the regeneration of old communities based on the theory of sustainable form, in order to coordinate urban regeneration and urban development from a new perspective and promote high-quality urban development.

2. Transformation of Old Residential Areas Under Sustainable Urban Form

2.1. Problems in the Regeneration of Old Communities

Old communities usually refer to the communities built before the year of 2000, with characteristics of backward facilities and low building status, affecting the quality of life and strong residents' willingness to transform. With the process of urbanization, problems such as lack of supporting facilities, illegal construction and insufficient parking spaces have become increasingly prominent, which restricts the construction of high-quality urbanization [3].

At present, the transformation of old residential areas is facing many problems. Researchers believe that the transformation of old communities has some problems, such as complex property rights, boundary restrictions, fuzzy design schemes, lack of professional methods and so on [7]; Also the old communities have problems such as poverty, backward infrastructure and poor ecological environment [8]; Therefore, in addition to uncontrollable factors such as property rights and funds, the planning and design of space improvement of old community reconstruction is a difficulty generally recognized by scholars.

Most of these studies focus on improving the use of community space, and there is less deliberation on the transformation of old communities from the perspective of sustainable development. Scholars believe that urban form is one of the main causes of urban environmental problems, and urban form is very important for sustainable development [9, 10]. The construction of a healthy city is closely related to sustainable development. Sustainable urban form can improve the urban living environment [11]. Therefore, the in-depth study of the transformation of old communities under

the sustainable form can provide theoretical basis and scientific support for China's urban construction, spatial planning and urban regeneration policies in the new era. At the same time, the transformation of community space pays more attention to the needs and feelings of residents.

2.2. Guidance of Sustainable Form in the Transformation of Old Communities

Sustainable urban form has long been proposed. In 1960, Kevin Lynch's good urban form should be dynamic and diverse, accessible, controllable, easy to feel, flexible and socially equal [12].

Although there is no consensus on the definition of sustainable urban form, it is generally believed that sustainable urban form should include: compact, walkable, high-density, dominated by public transport, mixed land use and housing types, proximity, connectivity, diversity, ecological integration, well-designed space, high standard environmental control and urban management [13-16], the concept of sustainability can be realized through some common elements behind the urban form theory [9]: mixed land use, sustainable transportation system, high-density, compact development, diversity, passive solar energy utilization and green design.

2.2.1. Mixed Land Use

Mixed land use is a necessary condition for realizing the sustainable form of cities. It represents the diversity of functional land use, such as housing, commerce, industry, etc. different functional properties are placed in the same area, reducing the traffic distance between activities [17]; However, in the context of the community, we can understand it as increasing the functional diversity of the community and strengthening the connection between functions. Residents can meet the daily necessary needs in the community and form a self-sufficient community with less traffic behavior, so as to reduce energy consumption [18].

2.2.2. Sustainable Transportation System

Sustainable transportation system, and then sustainable transportation system, the definition of "sustainable transportation" is "transportation services that reflect the full social and environmental costs of their provision. Therefore, the transportation system has a great impact on the spatial environment. A sustainable transportation fully considers mobility, safety, accessibility and environment to support residents' high-quality life [19]; some scholars believe that we should reduce the demand for transportation in urban design [20], some scholars believe that public transport oriented transportation is conducive to sustainable development [21].

2.2.3. High-Density

High density is an important factor determining the urban form. The high-density mode can reduce traffic, create more social opportunities and save land [22]; In a broad sense, sustainable development is a density related Initiative. Density is closely related to public transport. With the increase of density, car travel will be greatly reduced. In

addition, the density of residence will greatly affect people's commuting behavior [23].

2.2.4. Compact Development

Many scholars believe that compactness, density and diversification are the key to the sustainable development of cities [24]. The compact development model is widely regarded as a strategy to achieve sustainability. It can effectively shorten the activity time and increase the building density. It also includes increasing the development on the basis of the original city, which is very suitable for the transformation of old communities [25].

2.2.5. Diversity

Jane Jacobs first proposed diversified urban construction, which was later applied by many planning methods, such as new urbanism and sustainable development [26]; Diversity is an important way to avoid monotonous urban form. In addition to the diversity of spatial form, it also includes the diversity of society and culture [27]; Although it has some similarities with mixed land use, it is more inclined to such as housing type, building density, culture, income, etc. [28].

2.2.6. Passive Solar Energy Utilization

The purpose of passive solar energy utilization is to reduce human demand for energy. Through reasonable site selection and building orientation control, layout, greening, etc., it uses the microclimate environment to reduce the demand for heating or cooling of building space. It is an important

content to achieve sustainability [29].

2.2.7. Green Design

Finally, green design is an important design factor, which emphasizes the relationship between man and nature, improves the urban spatial image while improving pollution [25], and makes cities and suburbs more attractive [30] and more sustainable [24].

3. Jing'anli Old Community Regeneration

3.1. Basic Information of Jing'anli Community

Jing'anli community is located in Hangzhou Road Street, Binhai New Area, Tianjin. It extends to Fuzhou Road in the North (including the green space on the south side of the road), current commercial buildings in the South (excluding commercial buildings), Guilin road in the West and the enclosure of the community in the East. The community was built before 1990, with a land area of about 4.2 hectares and a total construction area of about 43100 square meters. It is dominated by six story multi-story houses. The greening environment in the community is poor, sundries are piled up and placed disorderly, parking is difficult, residents have a single activity site, lack of interest, and greening is relatively few. However, the architectural texture in the community is relatively complete, mainly in determinant layout.



Figure 1. Satellite map of Jing'anli.

Table 1. Basic information of community.

Category	Total households	FAR	Greening rate	Parking space
Value	805	1.60	10%	150

3.2. Proposal of Renovation of Jing'anli Community

Tianjin Binhai New Area has experienced rapid development and urban construction for more than ten years since it was incorporated into the national development strategy, and has made remarkable achievements. In particular, in 2019, the State Council issued the opinions on supporting the high-quality development of Tianjin Binhai New Area [31], giving Binhai New Area a new orientation and a new mission in the new era.

At the same time, Binhai New Area is also an important birthplace of "Jingu culture", with profound historical accumulation in literature, art, military, industry, diet and other aspects. As the old urban area in the core urban area of Binhai New Area, Hangzhou Road street not only condenses the cultural life charm of the original Tanggu old city, but also is an important main battlefield for the construction of "beautiful Bincheng" and "secondary entrepreneurship". At the beginning of the 14th five-year plan and the key year of "beautiful Bincheng" construction, it carries the major mission of breaking the problem and exploring the path of urban regeneration in Binhai New Area.

With the support of the local government, relevant organizations carried out the urban micro regeneration planning and design competition with the title of "beautiful Bincheng · happy community", discussed the ideas and methods of urban micro regeneration with a new humanistic spirit, and strive to improve the value of existing elements through limited investment, accurate design and sustained implementation strategies, so as to produce "huge" benefits with "small" intervention.

3.3. Contradictions in the Renovation of Jing'anli Community

The primary contradiction in the transformation of jing'anli community is the disharmony between jing'anli and the surrounding development. The first is the overall image. Because the community has been built for a long time, the building facade is old and the color is messy. After years of development, the old community image of Binhai New Area does not adapt to the urban development; Secondly, the space on the West and north sides of the community is not connected with the urban space, does not reflect the strong local cultural heritage, and is in contradiction with the "secondary entrepreneurship".

The secondary contradiction of this renovation is the contradiction between the existing cramped and dilapidated space and the improvement of the quality of life of community residents, which hinders the residents' yearning for a better life. First, the recognizability of the entrance and exit of the community is poor, which can not reflect the details of the community; Second, the utility poles and residents' private facilities occupy the public space of the community and hinder people's vision; Third, there are more elderly people in the community, and the consideration of accessibility in the old community has lagged behind the times and life; Fourth, there is a shortage of parking spaces in the community. Vehicles are parked randomly, occupying public activity venues and interfering with residents' walking experience; Fifth, there is a shortage of internal facilities. In addition to community workstations and health service stations, it is difficult to meet the needs of aging day care centers and residents' daily activities.



Figure 2. Current situation and problems of Jing'anli.

4. Regeneration Design Scheme Under Sustainable Urban Form

From the perspective of policy and residents' needs, the planning and design scheme of Jing'anli in Tianjin Binhai New Area is carried out on the basis of in-depth research on the community and Research on the government's policies for the transformation of old communities (Figure 3). Finally, the sustainable form type is used to guide the regeneration planning and design.

The needs of residents are mainly concentrated in two aspects. On the one hand, the number of elderly people in the

community is increasing, and the community needs to be transformed to adapt to aging; On the other hand, residents' demand for facilities, including parking and public activities. Then we interpreted the regeneration policy of old residential areas in Tianjin. First, there are three levels of regeneration and transformation, basic, perfect and upgrading. Some regeneration measures for basic facilities and buildings, such as adding elevators, stair transformation, internal lifting, etc; In addition, it includes some requirements for supporting services, such as health stations, cultural centers, and service facilities, such as charging piles (Figure 4). Then we formed the design framework of the old community regeneration plan (Figure 5).

The planning structure is "H" type, with the original two public centers in the community as the benchmark, extending to the north and south, forming two main cores, and some landscape connections between the two cores; The other level is the landscape architecture of the base. The landscape core inside the community is located in two public centers. On this basis, make rational use of the

building spacing of the community, connect the small green space inside the community, and contact the landscape outside the community on this basis. One is the road protective green space on the north side, and the other is the linear green space beside the street on the west side of the road. Then we carried out the planning and form design of sustainable urban form (Figure 7).

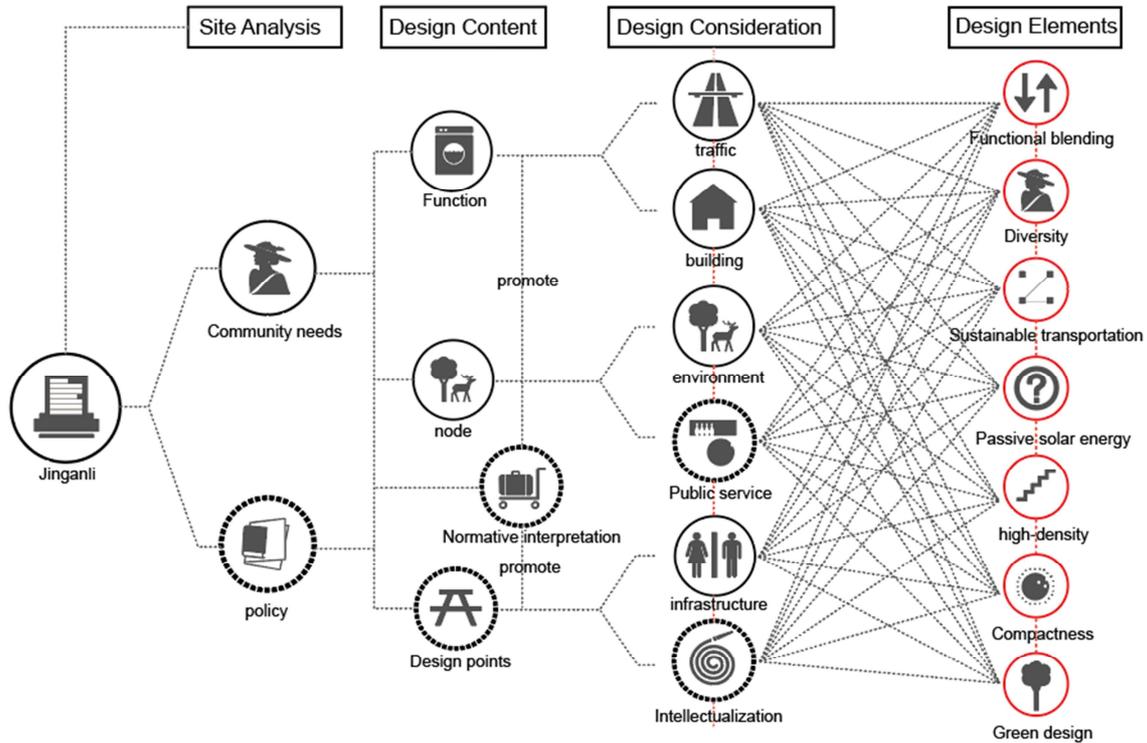


Figure 3. Design path.

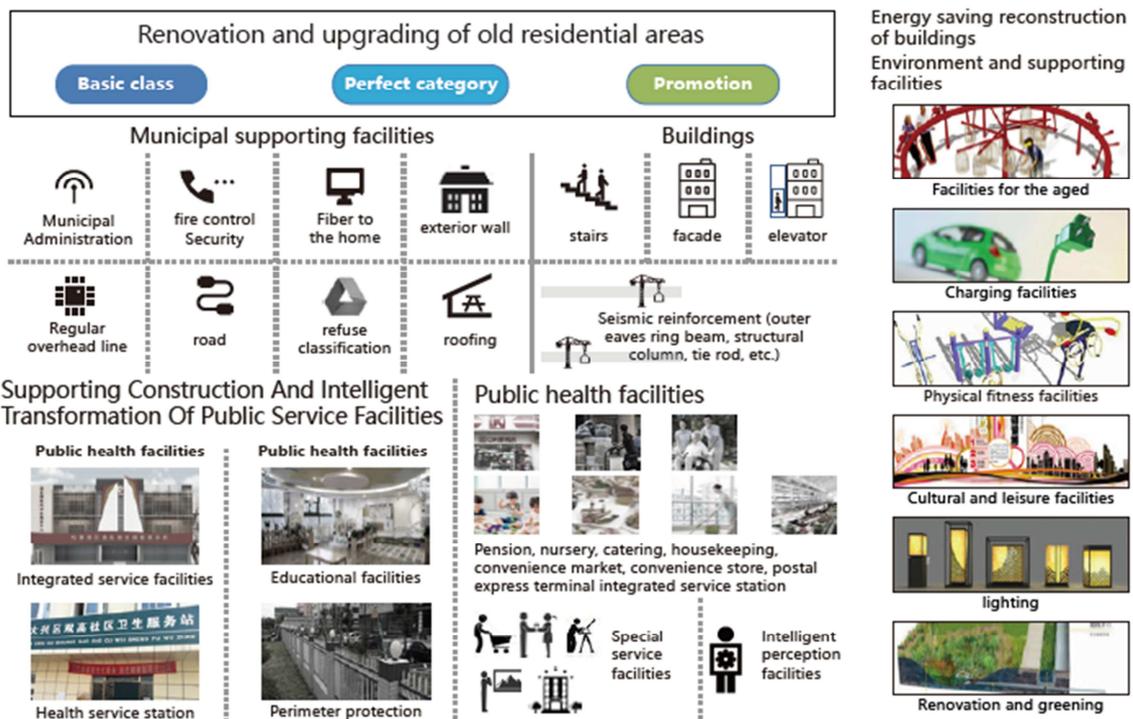


Figure 4. Policy research.

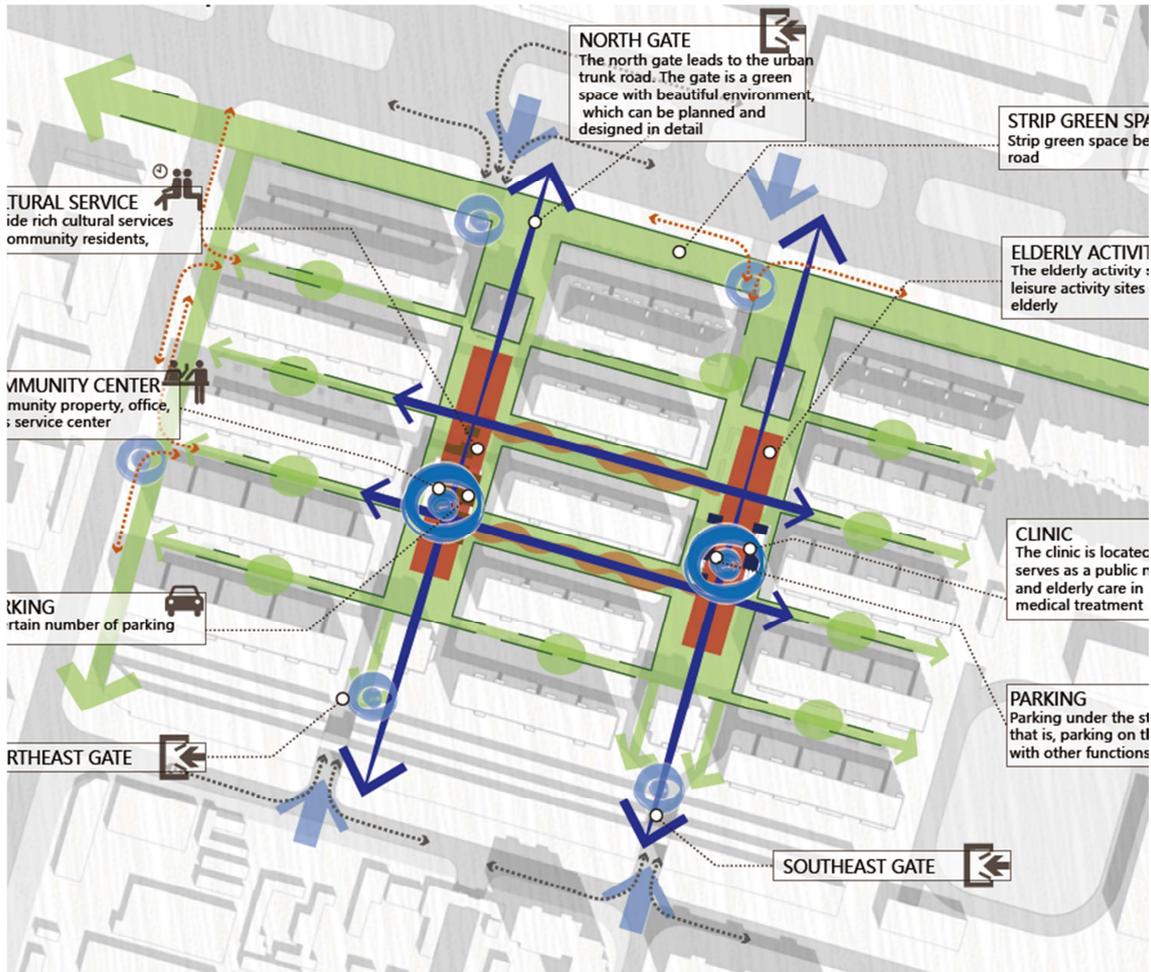


Figure 5. Regeneration framework.



Figure 6. General plan of updated planning.

4.1. Mixed Land Use

Mixed land use is the basic feature of sustainable urban form. Due to the shortage of parking space in the community and the lack of public space in the community, we have three-dimensional layout of public supporting facilities, parking facilities and activity space (Figures 9 and 10). We place the parking on the first to second floors of the core area, and then combine the pedestrian public space with the existing buildings to build a public center of the community, which can meet the needs of facilities, It can also meet the demand for leisure and greening, and then the upper space is connected with the ground through the large ramp in the north and the elevator in the south.

4.2. Sustainable Transportation System

The sustainable transportation system is mainly reflected in the diversion of people and vehicles in this update. The measurement mainly forms a loop around two public centers, which is connected with the entrance and exit. The pedestrian space is the landscape footpath between residential buildings in the community (Figure 6). In this way, the traffic operation measurement efficiency is improved, the safety of residents is guaranteed, and their continuous walking experience is maintained.

4.3. High Density and Compact Development

High density and compact development are similar

propositions, but they are different. High density tends to increase the construction intensity at the vertical level, and compact development tends to increase the construction intensity at the horizontal level. In this regard, we have protected the elderly through the installation of elevators, communicated the connection between residents and the roof on the basis of the installation of elevators, opened up the roof vegetable garden and made rational use of the tense space; On the other hand, the three-dimensional transformation of the community public center has also increased the density and compactness of the community.

4.4. Diversity

Located in the center of the community, the diversity is mainly reflected in the two community centers. The design borrows two community buildings with different current situations to build a community center with different characteristics. At the same time, the functions of the center are also distinguished.

4.5. Passive Solar Energy Utilization and Green Design

Passive solar energy utilization and green design are microclimate related designs. It is mainly reflected in the cultural corridor in the west of the community. Through specific turns and offsets, different lighting conditions and landscape combinations are created to give people different experiences (Figure 8).

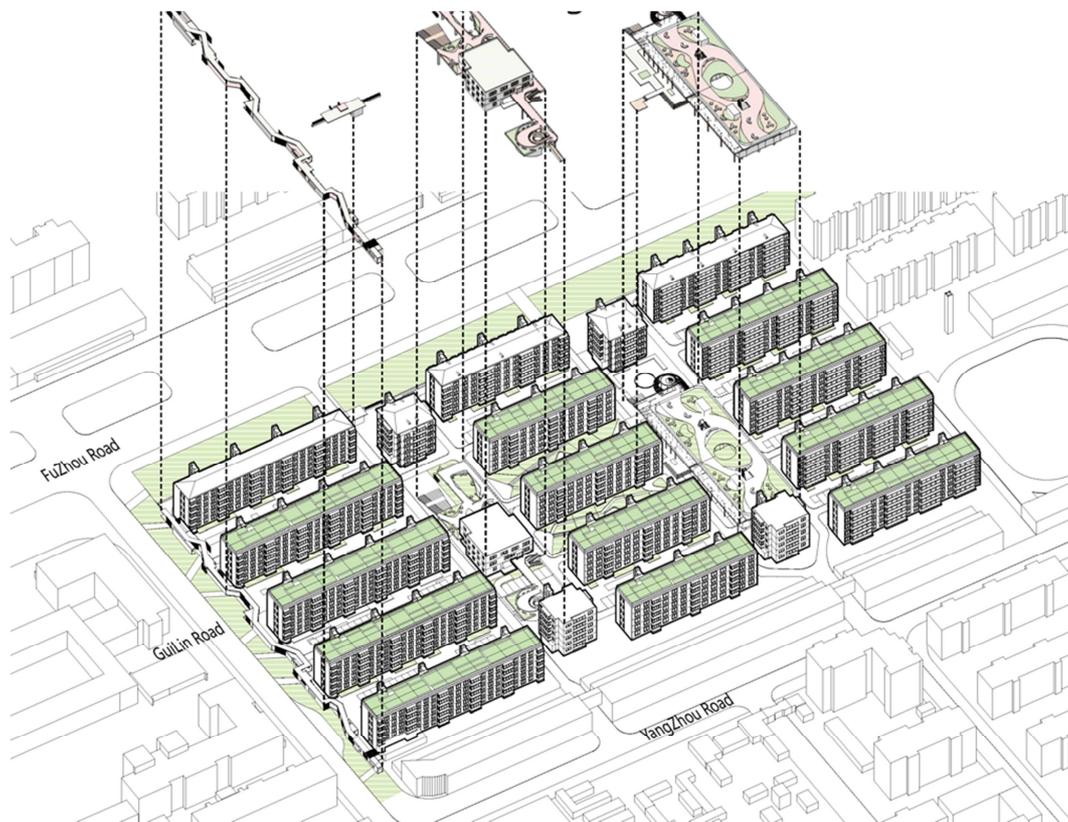


Figure 7. Axonometric drawing of planning and design scheme.

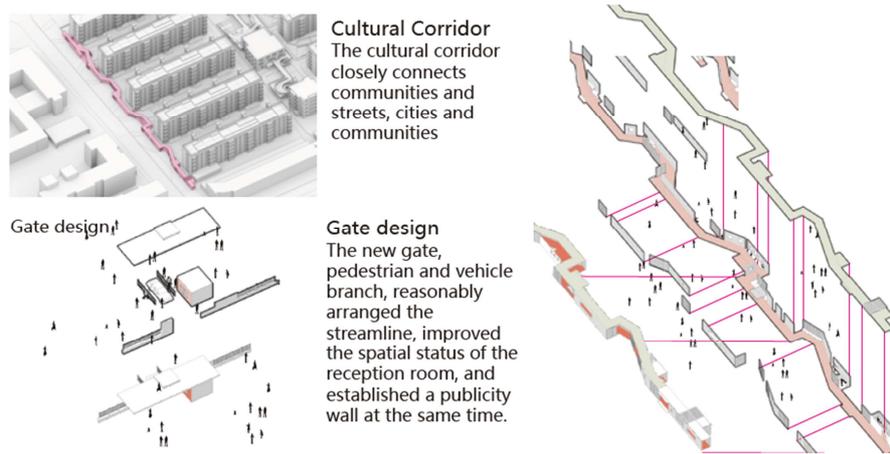


Figure 8. Cultural corridor.

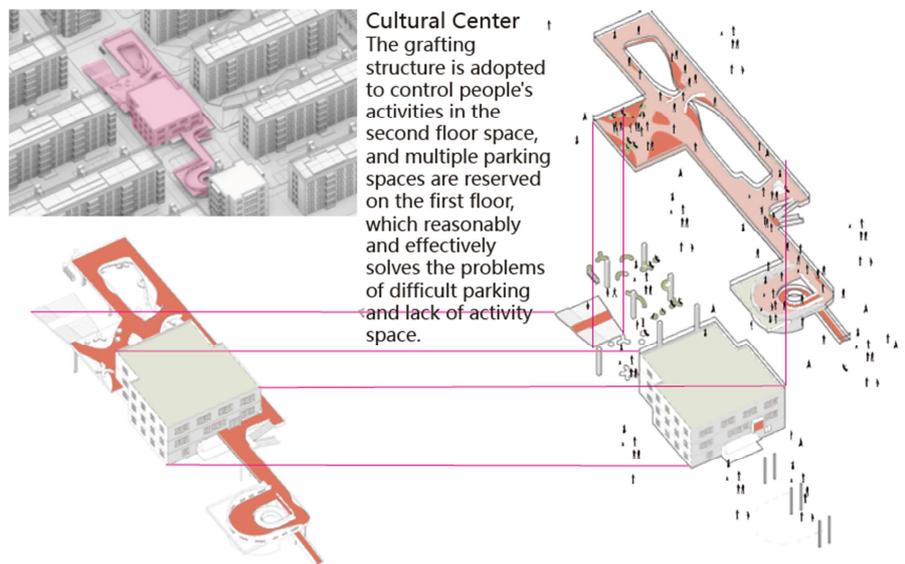


Figure 9. Cultural Center.

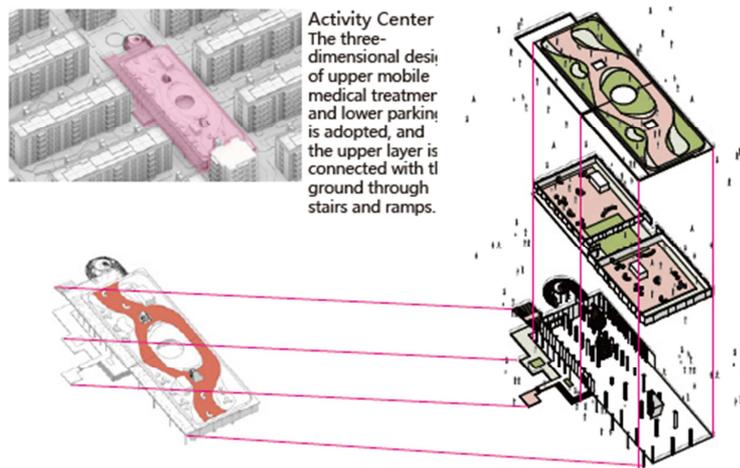


Figure 10. Activity Center.

5. Conclusion

There have been many explorations in the research on the

regeneration of old communities in China. Jing'anli in Tianjin Binhai New Area has invited the majority of designers to give advice and suggestions in the urban design competition. The regeneration exploration of old communities based on

sustainable form discussed in this paper also participated in it in the form of competition results, and was highly recognized by the organizers. This paper describes and analyzes the regeneration method in detail, hoping to provide useful enlightenment for the regeneration methods and paths of old communities in the future, which can be summarized as the following three points.

First, the needs of residents should be fully considered in the renovation of old residential areas. At present, local governments have also launched some manuals on the transformation of old communities to guide the regeneration of old communities, such as the technical guide for the transformation of old communities in Jiangsu. They have conducted various guidance on the transformation of old communities, such as the installation of elevators and barrier free slow lanes, which are in a universal sense. There are still some unique needs in the community that should be targeted. In the renovation of Jing'anli community, residents have direct demand for parking, community center activities and service facilities, and the roads are narrow, so there is a three-dimensional design scheme this time; In addition, in Jing'anli community, only a few slow walking trails are used, so the two public centers can be almost directly reached after residents go downstairs, which is affected by the architectural layout. Therefore, the specific needs of the old community should be fully considered in the process of updating the old community.

Second, the renovation of old communities should be combined with relevant policies. As mentioned above, the needs of residents in the community are different. Similarly, there are differences in various regions, including policies and culture. We should also consider local policies and cultural customs. The area where Jing'anli community is located is an important birthplace of "Jinggu culture". The Hangzhou Road street where it is located not only condenses the cultural life charm of the original Tanggu old city, but also is an important main battlefield for the construction of "beautiful waterfront city" and "secondary entrepreneurship". Therefore, in the transformation of the local old communities, we should fully tap the cultural characteristics, make full use of the existing space and give full expression to the call for secondary entrepreneurship, That is to solve the problem of human sustainable development.

Third, the expansibility and innovation of the regeneration and transformation of old residential areas. In the process of land development, the planning department and developers will seek the best fit point in the planning process, which can not only meet the urban development, but also create better value and achieve a win-win situation. The same should be true for the transformation of old residential areas. We should give sufficient demonstration in the transformation process to expand the new value of the residential areas; The transformation of Jing'anli community is not only the transformation within the community, but also the rebirth of the block. The road greening area is dredged in the north and the streets are connected in the west, which greatly expands the attribute of the transformation of the old community; However, due to the restriction of property rights, there is no

corresponding design for the commercial buildings in the south. From this perspective, this is also the deficiency in this transformation.

To sum up, at present, the transformation of old communities is in full swing, but the problems in the regeneration process are still continuous. The "one size fits all" regeneration method needs to be revised for the transformation of old communities. While grasping the actual main needs of residents, we should explore comprehensive and diversified regeneration and transformation methods to meet the needs of urban social development. It is the promotion of urban functions and the transformation of old residential areas that complement each other. At the same time, all levels of society need to pay more attention to the value of the transformation of old communities, and explore more ideas and creativity for their regeneration and implementation methods, so as to specify more perfect and stronger regeneration guidance.

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