

Article

Comparing the Residential Sustainability of Two Transformation Models for Chinese Urban Villages: Demolition/Relocation Market-Oriented and New Rural Construction

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Abstract: In China, large-scale urban village transformation has profoundly influenced the residential sustainability and interests of indigenous villagers. Local governments have widely adopted a demolition/relocation market-oriented model (D/RMM) for transformation of most of the urban villages (UVs) in China. During the D/RMM process, the interests of indigenous villagers have generally suffered to a certain extent. Originally, the new rural construction model (NRCM) was only used to improve rural development and sustainability. However, it has now occasionally been applied in the UV transformation process to safeguard and guarantee the interests of the village collective and villagers. Given the considerable difference between the two transformation models, we explored the sustainability and impact mechanisms of residential landscapes in terms of housing condition sustainability, community environment sustainability, and livelihood sustainability, through the cases of Beimiantan New Village (BNV) with NRCM and Xiaoyantan Village (XV) with D/RMM in Lanzhou, Gansu, China. The research findings reveal the differences in institutional design and social influence, and changes in the redistribution of benefits between the two transformation models. Overall, the residential sustainability of NRCM is higher than the D/RMM's. Meanwhile, the influence factors in the residential sustainability of the two transformation models can mostly be attributed to three aspects: (1) Land development rights allocation models and earning redistribution fundamentally affect villagers' housing condition sustainability; (2) The collective economy and the informal economy are the potential drivers of sustainable village community transformation; (3) Informal institutions and village social networks protect and continue the social capitals in village. Specifically, the NRCM in BNV has the following advantages in improving residential sustainability: (1) Collective land assets can be further activated; (2) Villagers' vested interests are largely safeguarded; (3) The main role of social low-rent housing and informal employment places in the original village is optimized to a larger extent; (4) The original villagers' social networks remain stable and intact. In summary, villagers' rights are maintained and enhanced via informal institutions, informal economies, and original social relationship networks are completely preserved through NRCM in BNV, as much as possible. Therefore, NRCM can maximize the villagers' interests, that may be conducive to residential sustainability in the transformation of China's urban villages.

Keywords: urban villages transformation; residential sustainability; new rural construction model (NRCM); demolition/relocation-oriented market model (D/RMM); sustainable livelihoods

1. Introduction

The residential landscape, the environmental landscape of residential zones [1–3], includes residential buildings, residential artificial environment landscapes, natural environmental landscapes, and facilities (i.e., the external space environment). In a broad sense, residential landscape sustainability refers to the livability of the residential environment [4,5]. In a narrow sense, it also includes the improvement of residents' housing conditions and the sustainable livelihood issues supporting their quality of life [6,7]. The latter is an important aspect of the residential sustainability of residents, because good residential landscape reconstruction must balance the relationship between residents' public guarantee needs and individual livability needs [6–9]. However, from the perspective of urban village transformation, existing research on residential sustainability remains scarce. The insights gained from the “urban renewal movement” with respect to large-scale transformation have long been a focus for scholars in Western countries [10–13]; while the landscape of the urban village (UV) is unique in China, the research into it has long been on a limited scale. Against a background of urban suburbanization, industrial decentralization, and rural urbanization, many rural settlements and communities have passively been involved in industrialization and urbanization in China. Original rural settlements are surrounded by urban construction land, resulting in mixed communities with a typical urban-rural dual structure, known as urban villages (UVs). The UVs' economic form is embodied by the exogenous rental economy based on self-owned houses and collective properties, and the social structure is an acquaintance society based on consanguinity, kinship, and informal institutions. In reality, their essence is still a traditional rural social settlement.

Current UV transformations are mainly characterized by three models in China: market-oriented, government-oriented, and village collective-oriented. Most UVs have been transformed based on the market-oriented model in China since the opening and reform in 1978. Firstly, the opening and reform was a national economic reform policy in China that was initiated by Deng Xiaoping (a famous leader in China) in December 1978, and included internal reform and external opening up. The internal reforms mainly involved the adjustment of relationships of production, whereby the state established the household contract responsibility system in the villages and decentralized the state-owned enterprises' autonomous management rights in the cities. External opening up to the world refers to the establishment of a socialist market economy and a special economic zone in Shenzhen and the subsequent implementation of special opening policies in Guangdong and Fujian provinces by the government. Since then, an open pattern comprising the special economic zone, coastal open cities, coastal economic open zones, and inland has formed in mainland China. Through the implementation of the above measures, urbanization and marketization in China have been promoted. Accordingly, the UV phenomenon is a prominent product of China's rapid urbanization. As the frontier of China's economic reform, the eastern coastal zone, especially the Pearl River Delta, is the most representative region of China's UV phenomenon, because it is the first region to have experienced the reform and opening up policy and rapid urbanization in China. For example, Qianshan village in Guangzhou and Yangji village in Zhuhai were successful in attracting developers of UV transformation, by means of the circulation of collective land through bidding and auctioning. Since then, other provincial governments across the country have followed this model. However, due to the lower marketization level in the less developed western regions in China, the transformation effect is not ideal in the regions. The government-oriented model is traditional, mainly referring to the fact that the community resident committee replaces the community villager committee, such as in rural-to-residential apartment construction. However, due to the limited financial resources of the local government, this model sometimes faces a bigger capital investment problem. As a result, this has only been implemented on a small scale. The village collective-oriented model means that the village collectives undertake transformation work alone; they determine the compensation standard and resettlement rate for demolition, and raise funds for completing the transformation. Until now, a few cases with sufficient investment capacity of villagers have appeared in small-scale villages. Although these villages have independent development paths and organizational structures, they are all based on

the accumulation of collective economic means, regarding the redistribution of rights or interests and the transformation of governance models as the turning point of sustainable community transformation. This provides development opportunities for rural industrialization in rural areas. A typical example is what are known as the “industrial villages”, which rely on township and village enterprises in the Yangtze River Delta. Additionally, the villages with these transformation characteristics are also called “new collectivist villages” because they have preliminarily carried out village unitization during the UV transformation. Obviously, the new rural construction model (NRCM) introduced in this paper belongs to the third model. However, different from the previous transition of industrial villages, the model promotes the transition of commercial villages through a rental economy.

Traditionally, the large-scale demolition/relocation market-oriented model (D/RMM), predominantly applied by developers, was the mainstream method of UV transformation [14]; however, this is an unsustainable reconstruction model. Should UVs be removed? UVs have played and will continue to play an important historical role in the urbanization process in China [15,16]. First, UVs provide a lower threshold of access for the rural floating population than living in cities. With the rapid urbanization of China, much rural floating labor has flowed into the city, yet the government is unable to cover the demand for low-rent housing for such a large low-income group. As a consequence, the low living costs of UVs absorb a large amount of the rural floating population, making UVs the main absorber of the rural floating population, bearing the huge social costs of the high-speed urbanization process in China. Second, the prosperous rental economy and informal economy provide a power source for the accumulation of livelihood assets for indigenous villagers in UVs [17], creating the basic material conditions for their ultimate transformation into urban residents [18]. Therefore, UVs cannot be artificially eliminated, but the government and some related stakeholders should spare no effort in promoting their sustainable development. We assume that the issue of sustainability in UV transformation not only refers to the improvement of the living environment, but also to achieving livelihood sustainability for the villagers. The following key issues must be considered: (1) How to realize the employment and resettlement and social guarantee of landless villagers? (2) How to maintain the healthy follow-up development of the original village economies? (3) How to continue the main role of low-rent housing and informal employment places played by the original UVs?

In November and December 2018, and in February and March 2019, we conducted, respectively, a preliminary investigation and a formal investigation in villages included in the UV transformation project of Lanzhou in 2018. These villages had been, or were about to be, transformed, and most of the villagers were resistant to the involvement of developers or had different degrees of dissatisfaction or concerns about their life and work conditions after the transformation. Only villagers in Beimiantan New Village (the original village was named Beimiantan Village, and the village following the transformation was renamed Beimiantan New Village) were highly satisfied with their overall production and living conditions. Even many women who had married people outside the village brought their families to settle down there. This phenomenon interested us greatly. Through further investigation, we found that the village adopted a new rural construction model that the village collective and villagers spontaneously organized against a background of land expropriation. Although this model was proposed by the Chinese central government in 2005, it has mainly been applied to administrative villages and outer suburb villages far from cities, and it rarely appears in UV transformation. UV transformation mainly adopts a market-oriented model in China, and the new rural construction model (NRCM) has not been applied in the past. Therefore, the purpose of this study is to compare and analyze the residential sustainability of NRCM and D/RMM, focusing on the transformation model based on the power of the people, and to further fill the gap in previous studies, which have mainly focused on the role of the government and developers in UV transformation. In this context, we aim to answer the following questions. In urban village transformation, which model has higher residential sustainability: NRCM or D/RMM? Which aspects of residential sustainability are embodied in the two models, respectively? What are the impact mechanisms behind them? Moreover, in future UV transformation, more attention should be paid to the relationship between citizens,

indigenous villagers and the floating population. To ensure productive resources integration and property rights privatization, the government should establish supporting laws and regulations that are conducive to defining land property rights. For example, some specific issues should be the focus, such as how the collective land enters the market and how to legalize the construction of houses with limited property rights and so forth. Promoting transformation with the help of non-market folk society power is a sustainable method and a valuable tool for future research.

2. Literature Review and Theoretical Construction

2.1. Analysis Based on the Theory of Sustainable Livelihoods

The term “sustainable livelihoods” was first introduced in the report of the World Commission on the Environment and Development in 1991. The most universal concept proposed by Chambers and Conway [19] refers to the ability of individuals or families to earn a living based on capabilities, assets (including reserve stocks, resources, right of request, and ownership rights), and activities to improve their long-term living conditions. Scholars from several research institutions such as the University of Sussex Development Institute (IDS) have made remarkable contributions to the livelihood issues [20–22]. The livelihood framework focuses on the micro-level on the complex local vitality of livelihood structure as well as the diversity and initiative of people’s livelihood channels [20,23,24]. It focuses on rural development issues from the dimension of poverty reduction [25]. The theory incorporates interdisciplinary concepts and elements such as neoclassical economics and new institutional economics, with particular attention on the effects of the institutional process on adopting strategies and achieving goals for human beings. In practice, the farmer’s household is usually regarded as the research unit [26,27].

2.1.1. Rural Areas: A Field of Livelihood Construction

Globally, rural areas have high incidence of poverty and livelihood inequality [28]. The sustainable livelihood approach represents a change in rural development concept and discourse, advocating the creation and promotion of local capacity, vitality, and competitiveness through local resource mobilization [29,30]. In the livelihood framework, the village or community is the field of livelihood construction. It not only provides the background for livelihood development, but it is also the space for production and reproduction of various livelihood assets. Rural ecology, geography, complex institutions, and other conditions have not gained enough scholarly attention yet, but these factors have implications for people’s livelihood strategies and paths [20]. With China’s rapid urbanization spreading to rural society, the UV phenomena and the rural floating labors are common. Therefore, villagers’ sustainable livelihoods are no longer confined to rural areas and the use of local resources. The strategy of cross-regional livelihood construction concerning rural and urban areas will become mainstream [31]. To a certain extent, this is a manifestation of a new rurality that may better guarantee the sustainable livelihood of villagers.

2.1.2. Villagers: Actors to Adopt Multiple Livelihood Strategies

The livelihood framework focuses on the initiative of villagers. From the perspective of structuralism, such as Marxism or New Institutional Economics, villagers are usually regarded as passive subjects who are always being sacrificed [32]. In actors theory, villagers are regarded as social actors who have initiative and can use various resources to actively construct livelihood strategies [33]. The livelihood framework also focuses on the heterogeneity of villagers and dynamic changes in their livelihood strategies. This perspective concentrates on how villagers can maintain rural life and small-scale peasant economy through livelihood diversification. For landless villages in UVs, their sustainable livelihood has the following characteristics: (1) Continuity, the current state can extend to the future and have ability to develop and change in the future; (2) Development, it is the fundamental aspect of sustainable livelihoods. Only when the livelihood of landless villagers develops can their

living conditions be improved; (3) Justice, because landless villagers make contributions and sacrifices for urbanization—only by guaranteeing their livelihoods can they improve the residential sustainable in UV transformation.

2.1.3. Homestead: The Most Important Livelihood Asset of villagers

An important aspect of the livelihood framework, villagers rely heavily on various assets, and the accessibility of these assets has substantial influences on their livelihoods [25]. The homestead is an important asset, and is vital for the diversity and sustainability of villagers' livelihoods. Specifically, from the perspective of livelihood, land issues are reflected in the following dimensions: First, livelihood framework analysis is concerned with the roles of institutions, organizations and policies, exploring the impact of social structure on access to land resources [34]. Second, from the perspective of actor initiatives, the focus is on the micro-practice of land resources' allocation, combination and utilization, and the related power and political relationship [20]. Local features and complexity cannot be ignored in UV transformation. Additionally, attention should be paid to the impact of land marketization on villagers' livelihood [35]. The low-rent housing economy and informal economy in UVs are important livelihood assets of landless villagers.

2.2. Demolition/Relocation Market-Oriented Model of Urban Villages

D/RMM is a mainstream model based on overall demolition and reconstruction in current UV transformation, and reflects the capital operation logic. It is guided by the principle of "who invests, benefits". Firstly, the local government expropriates the village collective land and converts it into nationalized urban construction land. After that, the government adopts a thorough marketization path by circulating land use rights, namely, all land parcels are publicly tendered and auctioned, and sold to real estate developers [36]. In the transformation, the land is divided into three types: The first type is the construction land parcel, which is mainly used for real estate development. The second type is the rebuilding land parcel, for constructing villagers' resettlement houses; meanwhile, developers will provide one or two sets of "rebuilt houses" for each household of landless villagers. The third type acts as public financing land for UV transformation. The government identifies the land transferee, and raises transformation funds through collective land use rights transformation. However, as a result of the transformation, low-rent houses in the UVs disappear and are replaced by a large amount of high-price commercial houses, from which the real estate developers profit. This has considerably increased the living cost of landless villagers and the floating population. Subsequently, these low-income groups are forced to lose their guarantee of survival, and UVs are stripped of the benign social function of providing low-rent houses [37,38]. Moreover, D/RMM has a negative attitude toward UV chaos and disorder—it advocates one-off large-scale demolition and reconstruction and emphasizes functional zoning and use purification. Additionally, the model lacks villagers' participation and decision-making in planning and implementation, and reflects the tenure goals formulated by government departments, even ignoring the actual situation in UVs and landless villagers' actual needs to some extent [39]. This model is not conducive to the sustainable residential development of the villagers, which is manifested in the following ways: (1) The original economic operation mechanism of UVs is destroyed. The low-rent housing economy and the informal economy in UVs provide living space and employment opportunities for local residents. Single large-scale demolition and reconstruction deprives landless villagers of the opportunity to obtain income from collective land and their homestead in the urbanization process. This means that the model deprives them of a stable income source. Self-employed commercial shops, which provide income for low-cost operators in UVs, are largely demolished and has caused economic depression in UVs and surrounding areas, which destroys the economic vitality of original villages. Subsequently, massive amounts of low-income groups face unemployment. (2) The original social capital of UVs is reduced. UVs have accumulated a large amount of social capital, mainly through the social relationship networks of villagers, informal institution and the interpersonal trust environment built up by local villagers

over a long time; it is the best soft asset for landless villagers in terms of maintaining sustainable livelihoods in the passive urbanization wave. China's villages are acquaintance societies based on the village-community relationship networks. Consequently, the social capital of UVs mainly comprises relationship resources that depend on the original acquaintance circle, whose traditional logic is an informal institution that is maintained by traditional ethics, family networks, interpersonal relationships and folk credits. Chinese traditional villagers are characteristically ill-informed and conservative; they are more willing to maintain strong ties based on consanguinity relationships, geographical relationships, and kinship than to develop external weak ties. In addition, landless villagers, rural floating population, low-cost operators and consumers take what they need from the social capitals of the UVs. Hence, UVs provide an indispensable living space for low-income groups. This stable supply–demand relationship also represents the vitality of existence and development in the UVs. No matter which form is adopted to demolish UVs, the original village social networks are damaged, which means that landless villagers are unable to obtain the necessary buffer and protection against the rapid impact of passive urbanization [40].

2.3. Construction of a New Socialist Countryside

China has attempted to improve the rural settlements and villagers' residential sustainability. Before the reform and opening up, the most influential government efforts included the rural construction movement and the new socialist countryside construction in 1950. These strategies aimed to improve villagers' living quality, rebuild community organizations, and adjust rural production relationships through the agricultural cooperation movement, and promote productivity development [41]. When Chinese worker–peasant and urban–rural relationships entered a new process that needed to be restructured [42–45], the Fifth Plenary Session of the 16th Central Committee proposed strategic measures of a new socialist countryside construction in the outline of the 11th Five-Year Plan in 2005 [46]. The biggest difference between the reaffirmed concept and one in the past is that this construction focus on resources reintegration and the residential sustainability of villagers.

The main characteristics of new socialist countryside construction are embodied in centralized human power, material resources, and financial resources, and uniform planning and implementation. The whole construction follows the principles of “villagers oriented, village collective undertaken, town government led” [46]. The specific implementation methods are as follows: (1) Before the implementation of the project, the village committee conducts a uniform opinion poll of the villagers in the villagers assembly, and the agreements are signed for dismantling old houses and building new houses; (2) The town government conducts uniform planning and construction. The town government uniformly formulates new rural construction planning and deploys the project implementation tasks. There are two construction strategies. First, the villagers build their own houses according to the uniform plan. The government subsidizes housing construction funds and allocates building areas. Generally, the building area of each household is 100 m², and the type is three-storied. The villagers pay for the expenditure by themselves beyond the scope of the amount of the government subsidy. The surrounding greening, water, and electricity infrastructure are equipped by the government. Second, the government organizes housing construction and then sells houses to villagers at a lower price with certain subsidies. This strategy is mainly used for relocation planning of poverty alleviation. In brief, the above two situations do not change the nature of the villagers' land ownership, that is, the land is still owned by the villagers collectively; (3) The town government provides and divides homesteads for villagers. The town government, as the planning department, reasonably determines the locations and scales of house construction, defines the building standards and homestead areas in strict accordance with the relevant regulations of the all levels of government; (4) The construction units build a uniform infrastructure for new villages. The construction unit shall be determined by public bidding. The successful bidder for the construction units subsequently builds public infrastructure such as roads, power grids, water, and sewerage in the new villages; (5) The village committees

uniformly conduct the homestead arrangement. After the demolition of the old villages, the village committees sort the homesteads of the old villages into cultivated land.

The current new rural construction still has the following problems in terms of villagers' residential sustainability: (1) Many young and middle-aged laborers from villages live in cities for their job, then rural hollowing appears [47]. Driven by economic marketization and the urban–rural income gap, many young and middle-aged laborers flow into cities for jobs, and the people remaining in the new countryside belong to vulnerable groups such as the elderly and children. (2) Many villagers are more inclined to move to a city and buy a house than to move into a new rural community due to the value increase of house in cities, whereas rural houses have little space for appreciation; (3) The atmosphere of local rural life is insufficient. Formalist planning neglects village diversity, which results in the phenomenon of “thousands of villages having similar faces”, in which villagers lack the traditional local rural atmosphere, and even the original rural life form is difficult to maintain, due to the loss of the young and middle-aged population. Above all, this affected rural development sustainability. (4) Economic driving forces are lacking, and investment and financing channels are blocked. The new rural construction mainly aims at relatively poor outlying villages, where collective economic strength is weak. As a result, most villagers leave the villages for jobs in the cities; hence, the impetus of planning and construction impetus in village is insufficient.

3. Materials and Methods

3.1. Case Study Area

In Lanzhou, UVs are mainly distributed in the four municipal districts, that is, Chengguan, Anning, Qilihe and Xigu, forming a dual-nuclear cluster center, Chengguan-Anning, and several secondary centers. With rapid urbanization and integration of construction land in the urban area of Lanzhou since 1990, a total of 83 UVs are divided into four types needing to be transformed: transformation on the original site, transformation on the relocated site, partial transformation, and comprehensive transformation. Among these, transformation on the original site is the most common, followed by transformation on the relocated site. Yantan (YT), subordinated to the Chengguan District, is one of the places where the land value-added benefits increased the most in Lanzhou, and has a superior location. Before 1990, it was only an important agricultural area in the suburbs of Lanzhou City, with growing of vegetables and apples being its main industries. Subsequently, with the establishment of the Lanzhou High-Tech Industrial Park in 1992, the land of Yantan was quickly expropriated as urban construction land, resulting in a rapid increase in land values. Meanwhile, the rapid urbanization of Yantan also produced 15 UVs, including Beimiantan New Village (BNV) and Xiaoyantan Village (XV). When the regional renewal development and UVs transformation are placed on the agenda, these UVs may face the dilemma of land expropriation, house demolition, and resettlement compensation of indigenous villagers. This study selects BNV and XV as case studies because of the two villages' unique characteristics. First, they are both located in the core area of Lanzhou, where land value-added benefits are huge. The distribution of land value-added benefits has attracted the attention of different stakeholders, including the local government, real estate developers, the floating population, and indigenous villagers. Second, the two villages have similar characteristics in terms of population distribution, family structure and occupational composition, which makes residential sustainability comparable. Third, both villages have detailed data that can be obtained, and thus, they are relatively complete transformation samples.

In China, BNV is a rare “UV” that was experimentally transformed by adopting the new rural construction model in the city center. Located to the northeast of Yanbei Street, Yantan (Figure 1), the village covers an area of 51.89 hm². In around 2004, the BNV village committee assigned some members to Xi'an and other places to investigate the experience of new rural construction, especially to learn how to activate collective land assets in new rural construction. Then, village committee cadres entrusted the Gansu Urban Rural Planning and Design Institute with planning the first and second new villages

and signed house building agreements with the villagers. By 2006, the villagers were under uniform supervision to build new villages on the original site. In 2007, faced with disputes over the lack of homesteads for the married women in the village, the village committee established a third new village for them. This village is mainly inhabited by married women and their families, who are still registered as permanent residents in the BNV, so it is also called the Women Village. In 2007, the community village committee was transformed into the community resident committee, administrated by the Yanbei Street Office. The new village promotes community economic cooperation, the joint stock institution, village-owned enterprises such as the Yantan Pipeline Market, the Beimiantan Heating Station and Beimiantan Commercial and Trade Co., Ltd. (Lanzhou, China). These enterprises not only create employment opportunities for villagers, but their demand for space also further expands the market, renting the first floors of villagers' houses as warehouses. The transformation parcels were divided into three parts. After some of the village's land parcels had been expropriated by local government, villagers used land expropriation compensation as a new rural construction fund. The second part comprised villagers' homesteads, which were used as the uniform new rural construction parcels. The surplus parts were used as reserved collective land parcels to promote collective economy development and to provide a guarantee for the villagers' future life. This transformation model is greatly reliant on the willingness of landless villagers, namely, that they wish to be resettled on the original site and acquire the same residential area as before the transformation. Nowadays, villagers rely on informal economies such as self-owned house rental and self-employed commerce to create considerable profits. This economic structure has undergone a transformation in marketization towards "making money by the rental economy".

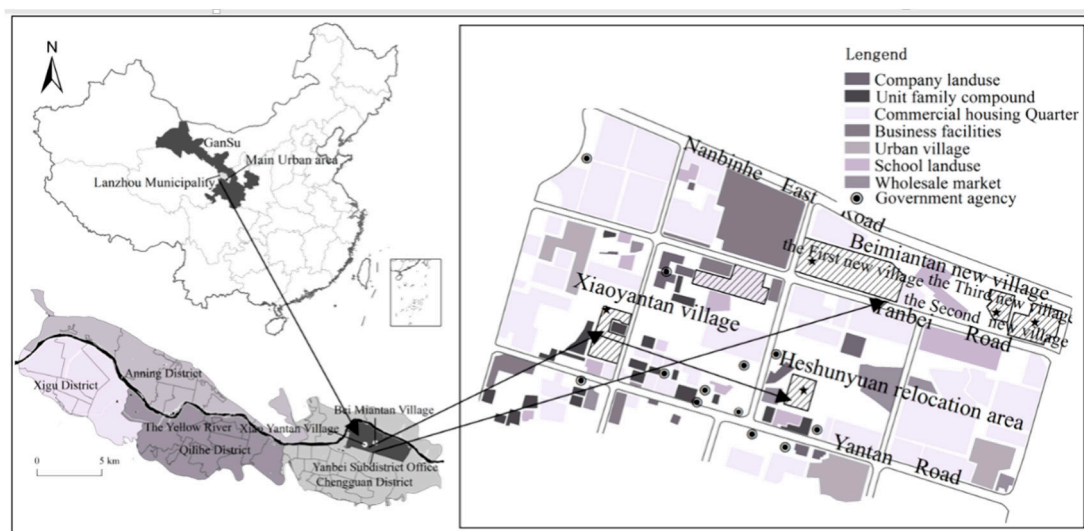


Figure 1. Location and spatial elements of the urban surrounding of the two urban villages.

XV is a community under the jurisdiction of Yanbei Street, Yantan, Lanzhou City (Figure 1), with an area of 46.83 hm². Although XV has the same transformation background as BNV, local villagers made a living in a completely different way from the villagers in BNV before capital entry. The village underwent two rounds of farmland expropriation in 2005 and 2010 due to government road construction demand. By 2014, the village had become a village without agricultural production, and villagers earned money by renting self-owned houses, as well as the village collective storefront rental market. Once the economic rationality of villagers was awakened [48], they rebuilt and renovated their self-owned houses to expand the rentable house areas and obtain greater benefits. The Lanzhou Yantan secondhand goods market is also a typical example of the village collective outsourcing land to outside contractors. The village committee established a market on this land, and then rented the market storefront to merchants everywhere, from which they collected rent. The village is one

of the earlier urbanized villages; meanwhile, it is the most difficult urbanization area in Yantan. The transformation faces difficulties because the interests of the different stakeholders with respect to demolition compensation are hard to balance. The village's developer is Lanzhou Jinhong Hongyan Real Estate Development Co., Ltd. (Chengguan district, Lanzhou, China), and the construction of the resettlement area is divided into two phases. At present, the Heshunyuan residence zone, which is the phase I resettlement area, has been completed, and 902 villagers whose houses had been demolished have been resettled. The phase II project is still in progress.

3.2. Survey Design and Data Collection

This study examines residential sustainability in UV transformation through field research and factor analysis method. The sustainability scale design for the two models is an important research foundation. Although there is no flawless survey scale currently available for this topic, the related research provides references that could help us to advance this work [49–63]. On the basis of relevant research and discussion, we propose a conceptual framework for the evaluation of residential sustainability based on housing conditions, the community environment, and livelihood. With respect to sub-indicators of housing conditions, we referred to relevant studies on the housing conditions of rural floating populations and indigenous villagers in UVs [49–54], supplementing the sustainability content with previously available indicator structures. As for sub-indicators of community environment and livelihood sustainability, we specify indicators on the basis of precedents related to the evaluation of satisfaction in UV transformation [53–63]. A household questionnaire survey method was used, combined by further interviews with 13 villagers and 5 village committee cadres to gain in-depth understanding of the relevant background context. Beginning with a preliminary investigation in November 2018, we officially completed the formal research work in February and March 2019. It is a common phenomenon that many relatives with consanguinity and kinship live intensively in large families in China's villages. Although large families underwent relocation, villagers disengaged from their original family and made up new families after UV transformation, still living in the same resettlement area. Against this background, in order to reduce the possibility of selected objects belonging to the same large family, we firstly obtained a list of household heads' names with the help of village committees. Then, we conducted a household questionnaire survey and adopted an equidistant sampling method according to family address, and randomly selected households to ensure that there was an equal probability that every household could be selected. Meanwhile, we asked for the household heads' names, and noted them on the list in case of repetition. The content and structure of the questionnaire included basic family situation and a residential sustainability survey of the villagers. After the transformation, BNV comprised 670 households, with a permanent population of 2280; XV comprised 634 households, with a permanent population of 2120. Therefore, 134 and 127 questionnaires, respectively, should be distributed in the two villages, in accordance with the standard ratio of 1:5. A total of 260 questionnaires were distributed and 252 were recovered, of which 240 questionnaires were valid, representing an overall effective recovery rate of 95.2%. The following is a detailed explanation for the residential sustainability scale indicators.

(1) Interpretation of indicators of housing condition sustainability

We selected five indicators to reflect the housing condition characteristics in this study, the specific weighting and assignment methods of each indicator are shown in Table A1. (1) Housing ownership index (HOI). Property rights of houses and housing source are selected as its sub-indicators, wherein the property rights of houses define the owner's right to possess, use, benefit and dispose of the property, with housing source also reflecting the property right relationship, to a certain extent. (2) Housing crowding index (HCI). We use per capita residential area (m^2) and housing structure to measure this. The division method of per capita living area refers to GB 50180-93 *standard of the Code for Planning and Design of Urban Residential Areas*. The housing structure is measured based on the whole set rate of the building. Generally speaking, the higher the number of complete sets in newly built houses, the higher

the quality of the houses. (3) Housing privacy Index (HPI). We adopted housing privacy and housing function to measure this index. In general, if the houses' privacy is high and the houses only carry out a residential function, the villagers' residence will be disturbed to a lesser degree. (4) Housing facilities index (HFI). On the basis of a method of measurement found in the literature [54], we establish three sub-facility indexes to measure HFI. The overall level of HFI is the sum of following three sub-indices: basic facility index, intermediate facilities index and advanced facilities index (Table A1). Notably, we updated facility items according to the difference in the housing conditions of the resettled communities. The 7 items belonging to the former index cover basic facilities (including tap water, power facilities, natural gas, heating, flush toilet, water heater, water supply and drainage facilities), and each item scores 1 point. Items 8–14 are intermediate facilities (including lighting, fire fighting, elevator, parking lot, garbage collection, gate guard and monitoring, broadband network), and each item scores 2 points. Items 15–21 are advanced facilities (including fitness and entertainment venues, cultural and sports facilities, educational facilities, community parks and squares, medical facilities, business services, landscape and sitting-out areas), and each item scores 3 points. Specifically, we listed the above 21 housing facility items in our questionnaire; respondents then selected the corresponding facilities possessed by their families, or with which they were equipped in the community. Afterwards, we calculated the total scores of each questionnaire based on the rules and the calculation method provided in Table A1. All index values ranged from 0 to 1. The higher the number, the better the facility configuration. (5) Housing quality index (HQI). We measured HQI based on three sub-indicators: building quality, housing ventilation effects and lighting condition, and residential area. Then we asked the villagers their satisfaction with these three aspects. The degree of villagers' satisfaction was expressed as a numerical value using a five-point Likert scale, the responses in which were classified as 'not at all satisfied', 'slightly satisfied', 'moderately satisfied', 'very satisfied' and 'extremely satisfied', with the corresponding values of 1, 2, 3, 4 and 5, respectively. The specific calculation method was as follows:

$$HQI = \sum_{i=1}^n HQ_i \quad (1)$$

where: HQI is the sum of three sub-indicators, and its value ranges from 1 to 15. According to the equidistance method, housing quality is divided into three degrees: when $HQI < 5$, the quality of housing is "low quality"; when HQI ranges from 5 to 10, housing quality is "medium quality"; when $HQI > 10$, housing quality is "advanced quality". The method for assigning weights and classifying the hierarchical structure for indicators is based on the literature—the evaluation method of the socio-economic status of the floating population in UVs [55].

(2) Interpretation of indicators of community environment sustainability and livelihood sustainability

The residential environment and livelihood sustainability are essential factors affecting living quality. We selected 19 sub-indicators from 6 dimensions evaluating community environment and livelihood sustainability, and their operational definitions are as follows (Table A2). Community planning and environment includes property management (X_1), support for public facilities (X_2), landscape greening (X_3), community security (X_4), and places of public activity and facilities in the community (X_5). The location condition of resettlement areas not only has an important impact on villagers' daily commute, but plays a role in potential market thrust in terms of stimulating tenants' rental behavior. Therefore, we selected the convenience of public transport around (X_6), distance between the resettlement area and the city center (X_7), and commuting status (X_8) as sub-indicators. The economic situation after the transformation is not only directly related to villager livelihood, but also indirectly reflects their occupational class. We selected stability of income source (X_9), work intensity and tiredness (X_{10}), and income increase or decrease situation after transformation (X_{11}) as sub-indicators. As many scholars have stressed the importance of social networks and their impact on the lives of villagers [57,58,63], we selected friendliness and support of community members (X_{12}), scope for making friends in the community (X_{13}), the degree of reservation in the acquaintance society

(X_{14}), and the impact of social networks on livelihood sustainability (X_{15}) to measure neighborhood attachment. Social guarantee situation reflects social equity, and is one of the most important ways for villagers to deal with emergency situations. Thus, we used coverage level (X_{16}) and guarantee level (X_{17}) of the villagers' social insurance to evaluate this. Given that the villagers have turned to non-agriculture households since UV transformation, we only considered urban insurances that villagers had already enjoyed (i.e., old-age insurance, medical insurance, unemployment insurance, employment injury insurance and other social insurances), and exclude rural insurances. Additionally, psychological willingness is also an important aspect for evaluating residential sustainability. We choose degree of satisfaction with resettlement compensation (X_{18}) and willingness to reside and enter old-age care in the resettlement area for a long period (X_{19}) as its sub-indicators. The degree of residential sustainability for each of the above factors was obtained through investigation, and is expressed in numerical form by a five-point Likert scale. Villagers' subjective feelings or views in response to these issues were classified as 'completely unsustainable', 'somewhat unsustainable', 'neither sustainable or unsustainable', 'completely sustainable', 'somewhat sustainable', with corresponding values of 1, 2, 3, 4 and 5, respectively.

To avoid there being too many indicators, the dimension structure was merged using the factor analysis method. These main factors can represent most of the original factor information, and also show the structural dimension of residential sustainability in UVs. They are converted into values between 1 and 100 points based on a standard score, using main factor variance contribution rate as the weight. The composite score was subsequently calculated. New factors were transformed in the same way to obtain the specific scores for each dimension. The main expression equation of factor analysis is:

$$X_i = u_i + a_{i1}F_1 + a_{i2}F_2 + a_{i3}F_3 + \cdots + a_{im}F_m + \varepsilon_i \quad (2)$$

where: X_i represents the original indicator variable; F_m ($m < i$) represents the unobservable common factor, which synthesizes the original i indicator information; and ε represents the information part that is not included as a special factor.

Among the 240 valid questionnaires received from the two villages, males and females in BNV accounted for 63.33% and 36.67%, respectively (Table 1), while they accounted for 45.32% and 54.68%, respectively, in XV. In terms of age, samples from both villages were dominated by middle-aged and elderly people. The educational level of villagers in both villages was low, mainly at the level of primary or junior middle school. Respondents were from the following several types of family. In BNV, 43.33% and 31.67% were from extended families and joint families, respectively. In XV, respondents were predominantly from nuclear families and extended families (28.33%, 40.00%). The size of the families tended towards miniaturization. As for occupational types, the villagers mainly worked as general staff, or had left the village for jobs and self-employed jobs. In addition, employees of township organs, organizations and departments also accounted for a relatively high proportion of the villagers in BNV, mainly belonging to the staff of village collective organizations.

Table 1. Demographic characteristics of samples (N = 120, per village).

Variable Name		Percentage (%)	
		NRCM(BNV)	D/RMM(XV)
Gender	Female	36.67	45.32
	Male	63.33	54.68
Age	19~30	21.03	25.38
	31~45	48.67	51.33
	46~60	30.30	23.29

Table 1. Cont.

Variable Name		Percentage (%)	
		NRCM(BNV)	D/RMM(XV)
Level of Education	Primary school and below	45.00	42.50
	Junior middle school	28.33	39.17
	Secondary technical specialized school, or senior high school	23.33	11.67
	Junior college, or undergraduate and above	3.33	6.67
Family structure	Empty nest family	3.33	5.00
	Nuclear family	21.67	28.33
	Extended family	43.33	40.00
	Joint family	31.67	26.67
Career structure	Unemployment, or waiting for employment	35.83	55.83
	Freelancer	5.00	7.50
	General staff, or leaving village for jobs	19.18	28.33
	Self-employed household	21.66	6.67
	Staff of township organs, organizations, and institution	18.33	1.67

4. Results

4.1. Sustainable Measurement of Housing Condition

In terms of the housing form, the houses in BNV were built by the villagers themselves through transformation at the original site. The XV resettlement area (Heshunyuan residential zone) contains affordable housing built by the developer through transformation at the relocated site. The resettlement compensation in BNV was mainly currency resettlement (68%), supplemented by currency and material resettlement (32%). with the combination of currency with material resettlement as a supplement was mainly applied to families with many people but fewer homesteads. If their residential area was not sufficient, they could buy the building area at 1298 yuan/m² below market price and in this manner could ensure that the per person building area was not less than 64 m². Every household was allowed to build four floors under the allocation policy of the building area, reconstruction households could build an area of 140 m² × 4 if they had sons in their family, and they could build an area of 72 m² × 4 if they had daughters in their family. The area of the newly built house could not be less than that of the original house. The villagers in BNV mainly consist of joint families or extended families, and the distribution policy was able to protect the vested interests of the villagers. The resettlement compensation in XV was dominated by housing resettlement (54%), supplemented by surplus housing area discount currency placement (46%). The area replacement ratio from one to three floors was 1:1; that is, the original housing area was equal to the corresponding area in the resettlement area. As concerns the relocated households with more than three floors of the original housing, resettlement was adopted in the three floors, and the resettlement pattern in parts exceeding three floors was adopted at a price of 6500 yuan/m². There are significant differences in the total housing area before and after transformation in the two villages. In BNV, the households with a significant increase in total housing area accounted for 98% of the total samples, of which area growth ranged from 0 to 600 m², accounting for 84%, with unchanged areas or decreased areas by only 1%, respectively (Table 2). In XV, the increased, unchanged and decreased areas accounted for 53%, 8% and 39%, respectively. Furthermore, the area growth range of all sample households was less than 300 m², but the area reduction scope is obvious, and varies from 0 to 900 m² (Figure 2a).

Table 2. Economic situation and housing sustainability under the two reform patterns.

NRCM(BNV)					D/RMM(XV)			
Total (household)		120			120			
Housing form		Self-built houses by villagers			Affordable housing			
Total housing area after reform	Increased	98%			Increased	53%		
	Unchanged	1%			Unchanged	8%		
	Decreased	1%			Decreased	39%		
Resettlement and compensation pattern	Currency resettlement		68%		Housing resettlement		54%	
	Combination of currency and physical resettlement		32%		Surplus housing area discount currency placement		46%	
Income condition	Increased	93%	Decreased	7%	Increased	28%	Decreased	72%
Consider the source of income that promotes income growth	House rental economy		93%		House rental economy		82%	
	Leaving village for jobs		4%		Leaving village for jobs		12%	
	Village organization employment		3%		Self-employed shop stalls		6%	
Exist leasing economy and revenue situation	Existing		100%		Existing		73%	
	Exist, increased in revenue		97%		Exist, increased in revenue		34%	
	Exist, decreased in revenue		3%		Exist, decreased in revenue		66%	
Housing status sustainability	Average value		Standard deviation		Average value		Standard deviation	
HOI	4.00		0.21		3.80		0.41	
HCI	5.18		0.81		5.40		0.85	
HPI	6.12		0.76		5.62		1.03	
HFI	0.83		0.54		0.63		0.87	
HQI	12.63		1.57		10.52		2.89	

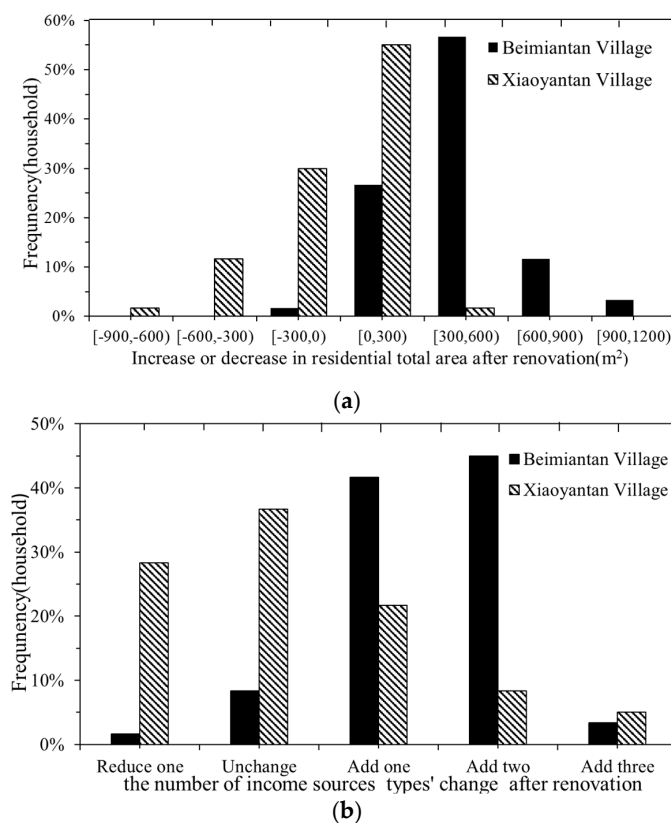


Figure 2. Villager's residential area compensation and occupational income status. (a) The change in total residential area after the transformation. (b) The change of income source types after transformation.

Compared with income status before transformation, 93% of villagers in BNV state that they think that their income has increased. Among the villagers who think that their income has increased, they think that the main means of promoting income growth was the house rental economy (93%), followed by leaving the village for jobs, and employment with the village collective (this refers to the village committee and village-owned enterprises that provide jobs for villagers). Income source channels have increased by 90%, and the channels have tended to diversify (Figure 2b). In comparison, only 28% of villagers in XV stated that they think their income has increased, either due to self-owned house rentals (82%), leaving the village for jobs (12%), or self-employed shop stalls (6%). Income source channels have increased by 35%, and the channels have tended to remain single. When comparing the income structure proportions before and after the transformation (Table 3), villagers in BNV received their income mainly from agricultural farming and leaving the village for jobs before the transformation. After the transformation, the income structure was largely converted to self-owned house rentals, and village collective shares and dividends. Additionally, the village collective employment portion also increased significantly. Before the transformation, XV's income structure comprised self-owned house rentals, and shares and dividends of village collective. Additionally, very few agricultural plantations still existed on non-expropriated cultivated land. After transformation, agricultural farming stopped. Furthermore, the proportion of self-owned house rentals decreased, and the proportion of village collective shares and dividends did not change much, although the number leaving the village for jobs increased significantly compared with the number before the transformation, which reflected the increased livelihood pressure faced by landless villagers. The main driver promoting the two villages' income growth was self-owned house rentals, but initially, it was unclear why there was such a wide gap in the degree of income improvement between the two. In further investigations, we found that every household in BNV was involved in self-owned house rentals (100%), and 97% of villagers thought their income had increased as a result of this factor. However, only 73% of households in XV

still had maintained self-owned house rentals, among them, only 34% of households held that their income had increased due to this factor. It shows that the retention degree and income status of the rental economy in XV are not as good as before, mainly due to the substantial decrease in rentable housing area per household following the transformation. Conversely, the sharp growth in the tenant market in BNV should be understood in terms of increasing rentable area and rent. On the one hand, the area allocation policy of BNV ensured that the building area per household increased, and that the villagers would have the rest of their house to rent (villagers usually live on only one floor, with the other three floors being rented as houses, storerooms and storefronts). On the other hand, the uniform planning of the new rural construction promotes village landscape urbanization and external benefits, in comparison with the low-rent housing provided in other UVs. The village's environmental optimization, self-sufficient service industry clusters, location and transportation improvement are able to provide a better residential environment for tenants, thus, above all, greatly increasing the housing rental market.

Table 3. Proportion of income structure before and after transformation.

	NRCM(BNV)		D/RMM(XV)	
	Before	After	Before	After
Self-owned house rentals	3.33%	96.67%	61.67%	61.67%
Leaving village for jobs	15.75%	19.17%	17.35%	70.23%
Village collective employment	2.50%	21.67%	1.67%	1.67%
Village collective shares and dividends	1.67%	85.83%	3.33%	85.00%
Government subsidy	1.67%	5.00%	1.67%	23.33%
Self-employed shop stalls	3.33%	21.24%	1.67%	15.20%
Agricultural planting	76.67%	0%	65.00%	3.33%

Housing sustainability indicators show that the HOI and HPI values of BNV are higher than those in XV, and the HCI value is lower than that in XV. The houses in BNV were self-built by the village collective and villagers. Thus, villagers have their own house property rights. The relocation area of XV is state-owned land, the second-phase project is still in progress, and issuance of the real estate license is not fully in place. Therefore, the HOI is generally low. The HPI is related to the HCI, housing area allocation policy, and family structure factors. XV has more people with fewer homesteads, and the original villagers built additional illegal buildings with four or five floors to increase rent-seeking space. The compensation policy for demolishing one house and rebuilding another is limited to houses below three floors; surplus house floors fall under the discount currency placement policy, and the resettlement price is far lower than the Yantan land market price. After the transformation, the villagers of XV mainly consisted of nuclear families and extended families. To maximize the rentable area in a limited housing area, a large family will often live intensively in one or two suites, with surplus rooms being used for renting. Therefore, the current residential status of more people but a smaller residential area in XV has aggravated the unsustainable housing conditions. The overall HQI scores are 12.63 in BNV and 8.92 in XV. The residential area of the villagers in BNV increased by a large margin, with no reductions being observed. The villagers themselves selected the engineering team to build their own houses, and the construction process was conducted according to construction drawings and uniform planning. Hence, the construction quality met the villagers' own residential requirements. Each unit of a building is a household, and each household can build four floors. Then, villagers can choose to live on floors with relatively good ventilation and lighting. Conversely, XV's resettlement area was uniformly built by real estate developers. Residential floors were allocated according to the villagers' relocation order, and villagers had no choice regarding building quality, ventilation, lighting, or residential area. The HQI in BNV is higher than that in XV. The overall HFI scores are 0.83 in BNV and 0.63 in XV. With respect to the three sub-facility indexes, firstly, the scores for the basic and intermediate facilities indexes are generally equivalent in the two

villages. The advanced housing facilities index is 0.43 for BNV and that of XV is only 0.14, which is significantly different. BNV is equipped with fitness and entertainment facilities, cultural and sports facilities, a community park plaza, landscape greening, and resting places. Villagers can conduct activities in relatively abundant open space. The residential areas on the first floors of each household are rented out as commercial storefronts, and the cluster of self-sufficient commercial facilities has increased the vitality of the community and resulted in greater convenience for the villagers (Figure 3a). Apart from the tall tower buildings, XV's relocation zone lacks cultural and sports facilities, landscape and leisure places, and commercial facilities. Villagers' daily activities mostly consist of gathering to be in the sun, and chatting in the downstairs areas of residential buildings. Thus, XV is extremely lacking in activity spaces, and the vitality and sustainability of the community are generally low (Figure 3b).



Figure 3. Plane map and corresponding photos of the two villages' resettlement areas (Source: the plane map was drawn according to the investigation and community introduction data; photos were taken by the author). (a) Beimiantan New Village (BNV). (b) Xiaoyantan Village (XV).

4.2. Sustainable Measurement of Community Environment and Livelihood

Before using factor analysis to construct the structural dimension of residential sustainability, a Pearson correlation analysis of 19 indicators of residential sustainability was conducted. We found that all indicators were significantly correlated, indicating that the selected indicators did not need to be excluded. Subsequently, statistical tests are conducted to determine whether the indicators were suitable for factor analysis. The Kaiser–Meyer–Olkin (KMO) test value was 0.603, and the Bartlett test of sphericity's approximate Chi-square value was 345.112, with a significance level of 0.00. Hence, the correlation coefficient matrix was considered to be significantly different from the unit matrix. Both tests indicated that the 19 indicators described above were suitable for the factor analysis model. According to the calculation, there are six dimensions of residential sustainability structure in the relocation area (generally, factors with a characteristic value greater than one are chosen as principal components in statistics), and the main factors are represented by F_1 , F_2 , F_3 , F_4 , F_5 , and F_6 , respectively. Compared with F_1 , the eigenvalues of F_5 and F_6 are much smaller than that of F_1 , which means that their factor naming lacks explanatory power. The variance maximization method was used to rotate the factor loads orthogonally, and the post-rotation load value and its structural dimension factor score are shown in Table 4. At present, there is no uniform standard for the measurement of residential sustainability, so the social integration degree method is used as a reference; the structural factors [64] or factor variance contribution are used as the weight in the existing literature [65,66]. We use the latter to weight the sustainability of the residential environment and livelihood security by using the variance contribution rate of each main factor. Subsequently, the scores of the six new factors are converted to values between 1 and 100 according to the standard scores. The specific principal factor naming explanations and structural dimension factor scores of the two villages are as follows (Table 4).

(1) BVN

The factor loads of X_9 , X_{10} , and X_{11} on F_1 (economic status factor) are found to be the highest. From the index expression content, this mainly refers to the occupation and income status of the villagers after the transformation, which is the first main factor. The factor loads of X_{12} – X_{15} on F_2 (social relationship factor) are found to be the highest. These four factors reflect the social relationship networks of the villagers after the transformation. X_1 – X_5 have the highest factor loads on F_3 (community environmental factor), which reflects the sustainability of the community residential environment. X_6 – X_8 have the highest factor loads on F_4 (location condition factor), and the three factors reflect the location conditions of the new village. X_{16} and X_{17} have the highest factor loads on F_5 (social security factor), which reflects the social security situation that the villagers currently enjoy. X_{18} and X_{19} have the highest factor loads on F_6 (psychological willingness factor), which reflects villagers' satisfaction with resettlement compensation and willingness to live in the community for a long time. Comparing the eigenvalue size of each factor, we find that the eigenvalues of F_1 and F_2 are larger, which indicates that the economic condition factor and the social relationship factor have the most significant impacts on the sustainability of the community environment and the livelihood in the new village, whereas the psychological willingness factor has the weakest effect. Regarding the scores of each factor, the sustainability scores of the structural factors in BVN were ranked in the descending order $F_2 > F_1 > F_3 > F_5 > F_6 > F_4$, which indicates that the sustainability of the villagers' social relationship network and economic status after the transformation are the highest, while the sustainability of the location condition has changed little.

(2) XV

The main explanatory factors for XV were found to be the same as those for BVN, but the ranking of the influences of structural factors on the sustainability of the residential quality was different from that of BVN, as follows: F_1 (economic status factor) $>$ F_2 (community environment factor) $>$ F_3 (social guarantee factor) $>$ F_4 (social relationship factor) $>$ F_5 (location condition factor) $>$ F_6 (psychological willingness factor). Regarding the eigenvalue size of each factor, the first three factors' eigenvalues are

the largest, which indicates that economic status, community environment, and social guarantee have the most significant impacts on the sustainable quality of XV's resettlement area. Regarding the scores of each factor, the sustainability scores of the structural factors in XV are ranked $F_3 > F_5 > F_4 > F_2 > F_1 > F_6$, which indicates that the sustainability of villagers' social security and location conditions after transformation are the highest, whereas the sustainability of the community environment, economic status, and psychological willingness are the lowest.

4.3. Analysis of Influencing Mechanisms

4.3.1. Land Development Right Allocation Model and Earning Redistribution

The differences in the land development rights allocation models in the two villages have affected the subsequent pattern of villagers' land earning redistribution [64,66]. BNV takes the village collective as the development subject, whose land development patterns are housing and the collective property rental economy (Figure 4a). This pattern originated from collective spontaneous land circulation behavior, driven by the village collective to pursue the maximization of collective land benefits. The village collective took the lead in setting up a collective joint-stock company and centralizing the scattered homesteads of the villagers as construction parcels for the new village. Subsequently, the village collective led the villagers in constructing a new socialist countryside under uniform planning, and part of the collective land was used as property rentals to develop the collective economy. Eventually, the village collective fed the profits back to the villagers in the form of annual dividends or infrastructure investment. The corresponding land development rights allocation model is the "free transformation model" (Figure 4c). This model circulates the land development rights to the village collective and the villagers, who maintain collective ownership of the land [65,67]. After the transformation, the land development rights, which partially reflect public interests, were handed over to the government. XV introduced real estate developers as the investment and construction subject (Figure 4b). This type of marketization behavior is representative of the most common urban village land development model in China, that is, the land expropriation model (Figure 4d). The local government expropriates collective land from UVs and circulates the land use rights to real estate developers via bidding and auctioning. Subsequently, developers use a portion of the land parcels to establish resettlement areas for the landless villagers. Then, they construct various types of commercial houses using the rest of the parcels, and sell or rent them at higher prices [68]. A common phenomenon is that the local government expropriates collective land from villagers at a lower price, and sells it to developers at a higher price; thus, the government may obtain huge economic benefits as a result of this process. After the government has fully nationalized the land development rights through land expropriation, the government may return some of the land development rights to the village collective for the construction of the resettlement area and the compensation of landless villagers.

The difference between ownership rights and use rights for collective land has had a profound impact on the construction quality of the two villages' resettlement areas and the allocation policy of the villagers' housing areas [68,69]. The land in BNV is still collectively owned, and the rural land property rights belong to the villagers. After the transformation, villagers' residential areas are several times larger than before ones, they build new houses and rent them out for rentals, which considerably stimulate their enthusiasm for the transformation. Villagers are simultaneously given long-term and effective land use rights. Thus, this model protects villagers' land property rights and fundamental interests. The cultivated land in XV was completely expropriated in 2014, and the villagers no longer live on agricultural farms. Nowadays, many homesteads have spontaneously entered the market, and villagers live off house rent and land rent. Land expropriation by the government deprives villagers of an economic foundation for their survival. However, with respect to the compensation to the villagers for land expropriation, other than one-off currency compensation, the government has not calculated or redistributed any potential land income. Additionally, the one-off currency compensation has decreased under the influence of rising prices and inflation. The villagers in XV lost

their land, but did not receive considerable resettlement compensation; this also means that they lost their interest in engaging with land use, income redistribution and assets for improving their long-term livelihood conditions.

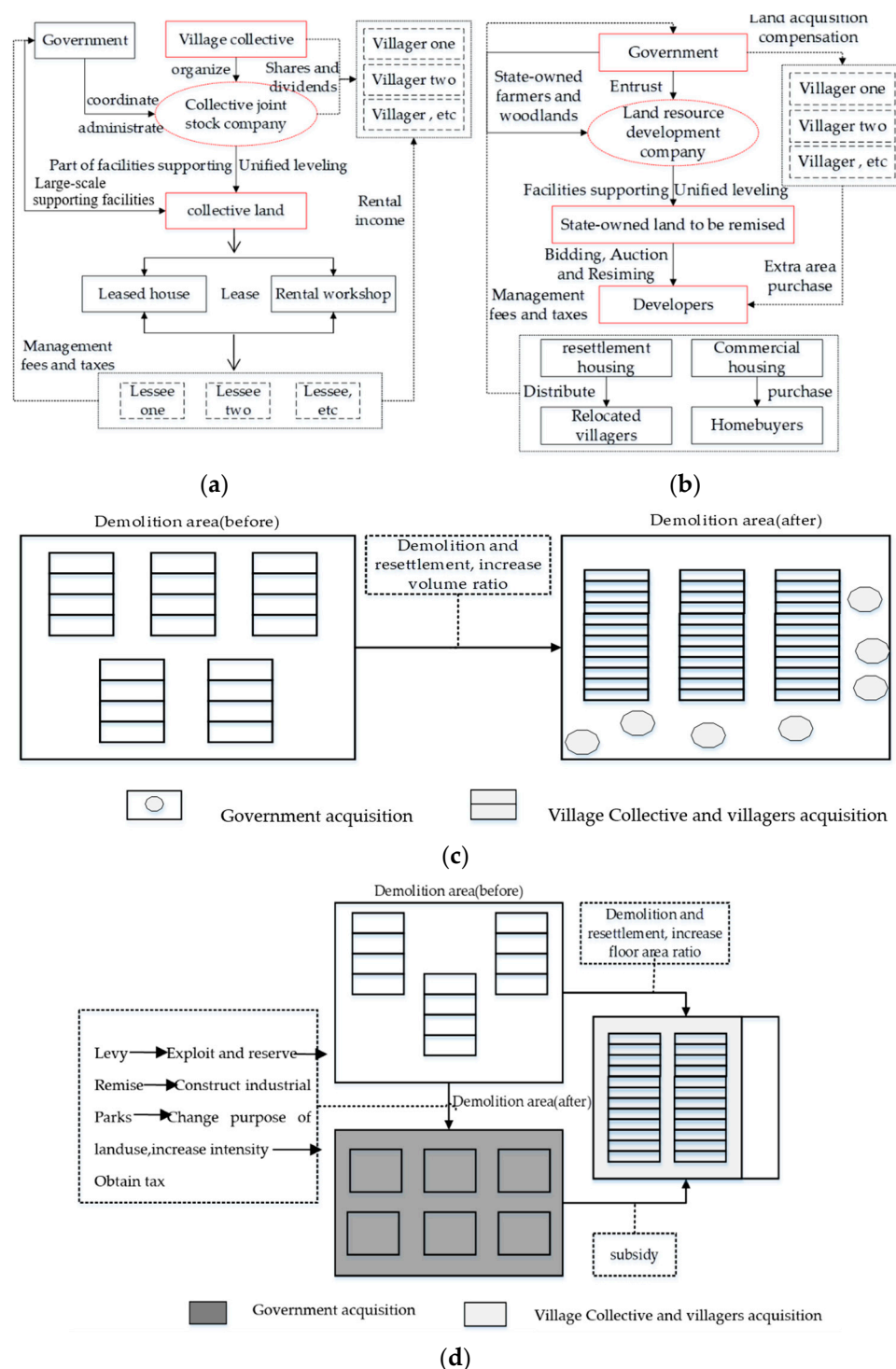


Figure 4. Comparison of the land development right allocation models used in the two villages in the transformation (the dotted arrows represent the flow of funds, and the solid arrows represent the mode of action in (a,b)). (a) Land development and capital flow in BNV; (b) land development and capital flow in XV; (c) schematic diagram of allocation model based on the “free transformation model”; (d) schematic diagram of allocation model based on the “land expropriation model”.

Table 4. Factor load matrix and composite sustainability structural factor score.

Independent Variable	Model One. NRCM(BNV)						Model Two. D/RMM(XV)					
	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆
X ₁ Realty management	0.346	0.563	0.726	0.115	0.065	0.271	0.554	0.565	−0.203	0.081	−0.218	0.076
X ₂ Public facilities supporting	0.663	0.263	0.907	0.413	0.018	−0.2	0.515	0.736	−0.277	−0.085	−0.512	0.141
X ₃ Landscape greening	0.631	0.136	0.816	0.048	0.447	−0.325	0.398	0.689	−0.502	−0.245	−0.304	0.028
X ₄ Community security	0.268	0.6	0.72	−0.263	0.506	−0.161	0.557	0.551	−0.635	0.276	0.224	−0.142
X ₅ Community public places	0.227	−0.461	0.815	−0.183	0.225	0.138	0.046	0.813	0.505	0.635	−0.437	−0.146
X ₆ Convenience of public transport	−0.161	0.169	0.666	0.844	0.143	−0.007	0.636	−0.364	−0.265	0.017	0.817	0.026
X ₇ Distance from the city center	−0.504	−0.349	−0.205	0.761	−0.156	0.195	0.541	−0.335	−0.429	0.019	0.869	−0.412
X ₈ Commuting status	0.372	0.586	0.411	0.886	0.384	0.216	0.427	−0.404	−0.158	0.374	0.927	−0.503
X ₉ Stability of income sources	0.701	−0.091	−0.26	0.698	0.153	0.489	0.832	−0.156	−0.039	−0.458	0.441	0.487
X ₁₀ Work intensity and tiredness	0.799	0.104	0.418	−0.659	−0.056	0.18	0.748	0.134	0.617	0.566	−0.036	0.495
X ₁₁ Income increase or decrease situation	0.856	0.715	−0.415	0.028	0.591	0.017	0.824	0.071	0.238	0.426	0.433	−0.312
X ₁₂ Friendliness of community members	0.222	0.738	0.066	−0.178	−0.071	0.482	0.607	0.238	0.545	0.773	−0.046	0.154
X ₁₃ Scope of making friends in the community	0.17	0.822	0.067	0.288	−0.266	0.153	0.147	0.454	0.316	0.853	0.484	−0.068
X ₁₄ Acquaintance social reservation situation	0.441	0.801	−0.084	0.371	−0.532	0.013	0.262	−0.354	0.499	0.689	−0.335	−0.231
X ₁₅ The impact of social networks	0.46	0.769	0.182	−0.188	0.361	0.198	0.454	0.382	0.534	0.824	0.045	−0.123
X ₁₆ Coverage degree of self-owned insurance	−0.227	0.019	0.284	0.632	0.769	0.185	−0.184	−0.244	0.922	0.347	−0.481	0.424
X ₁₇ Guarantee level of self-owned insurance	0.368	−0.215	0.342	0.164	0.824	−0.316	0.533	−0.359	0.906	0.105	−0.343	−0.262
X ₁₈ Satisfaction degree of settlement mode	0.408	−0.282	−0.154	0.112	0.08	0.757	0.469	−0.073	0.413	0.055	0.181	0.762
X ₁₉ Willingness of residence and old-age care	0.545	−0.431	0.074	0.084	0.054	0.633	0.589	−0.328	0.204	0.009	0.198	0.813
Characteristic value	2.761	2.057	1.561	1.449	1.319	1.26	3.57	2.505	2.034	1.516	1.393	1.23
Variance contribution rate (%)	26.275	18.393	13.548	10.219	8.554	6.63	30.648	20.307	17.077	10.308	8.738	5.721
Accumulated variance contribution rate (%)	26.275	44.668	58.216	68.435	76.989	83.619	30.648	50.955	68.032	78.340	87.087	92.799
Average score (to measure sustainability)	52.112	58.726	34.539	23.676	19.598	28.745	22.541	25.454	50.655	31.448	45.36	15.865

4.3.2. Collective Economy and Community Transformation

There exist differences in the features of collective economy and community transformation between the two villages. Community transformation in BNV is embodied in organic renewal through collectivist transformation. The village still retains many traditional village community structure patterns, but they are embedded in the urban management mechanism after UV transformation. Community transformation in XV is embodied in overall demolition and reconstruction through market-oriented transformation, and the traditional village community has been completely transformed and attached to the urban management mechanism [70–72]. Moreover, different community transformation models have greatly influenced the collective economy in the two villages. In other words, the degree of reservation in the collective economy is quite different as a result of the two community transformation models [71]. The public ownership institutions for rural property, an institutional foundation of the rural collective economy at the present time in China, mainly comprise collective property rights institutions and mutual assistance and cooperation mechanisms. They not only define the property right relationship between collective ownership and individual possession, but also have strong administrative characteristics. In addition, the formation and development of UVs' collective economies mainly depends on collective land resources. Undoubtedly, the shares and dividends of each villager are also closely related to the development of collective economies and collective land resources. To summarize, the collective economy has become a link between industrial production relationships and village community transformation [73].

With the usage value of rural land increasing continuously with marketization, BNV has ensured that rural land ownership still belongs to the village collective under NRCM, and the rural land resources have been re-collectivized. The village's collective economy is generated by the cooperative development and independent management of collective land, which forms a rental property-based economic development model [74]. The early collective income in BNV involved labor-intensive industries set up by the village collective, which had preliminary industrialization tendencies. However, since UV transformation and the monetization and marketization of land rights profits, the village collective's income mainly comes from property rentals and the profits of three major village-owned enterprises. The economic management system of the village collective consists of the economic association and several subordinate organizations known as economic communes. The community share-cooperative economy was established on this basis [75]. The administrative affiliation relationship between the village collective and villagers has gradually been weakened through this process, while the economic property rights relationship between them has been constantly strengthened. Therefore, we hold that the village's collective economy plays the following roles in ensuring villagers' residential sustainability: First, the village collective organizes and undertakes the agency management of the collective property of villagers; second, the collective economy performs a welfare guarantee function for landless villagers. The villagers' shares and dividends have increased since the transformation [76], and with the increasing scale of village-owned enterprises and village committee, villagers gain many employment opportunities from them. Conversely, the original collective-owned land in XV was completely transferred to state ownership through collective land expropriation. The landless villagers' resettlement area is categorized as government-assigned land, and the construction is presided over by developers. If the villagers wish to rent, transfer or co-build the houses on this plot, these activities must be approved by the relevant authorities, which has curbed the development of the rental economy to a certain extent. Thus, the change in collective land ownership in the village has brought the institutions of collective land and housing property rights into the urban real estate market management system. However, the change in property rights is only a unilateral agreement with the city government and does not have approval from the village collective or villagers. It also does not have the bilateral binding force of a common agreement between the two groups. In the present UV transformation, there is a serious lack of public finance and social management on the part of the government. Policy input is mainly used to compensate the cost of land expropriation, which is limited to solving the short-term living guarantee issues of landless villagers. Villagers' long-term education, medical care,

old-age care, municipal support facilities, and public service facilities have not been considered in the construction and management of the city. The NRCM in BNV retained the collective economy as much as possible and allowed it to continue to play the above social security functions for villagers. However, with the loss of collective property rights and the depression of the collective economy, the collective economy of XV has been unable to carry out these functions, which has greatly affected the livelihood sustainability of the villagers. Developers might only focus on economic benefits, by increasing the floor ratio excessively in order to settle more landless villagers with fewer rebuilt land parcels, while placing housing quality in the relocation area as a secondary concern. This problem has greatly reduced the residential sustainability of the villagers in XV, and has caused the villagers to strongly resist the deep involvement developers in UV transformation.

4.3.3. Informal Institutions and Village Social Relationship Networks

If a village is compared to a building, the internal structure of the village is like the framework of the building. At first glance, BNV and XV are similar in terms of social composition (e.g., the sex, age, education level, and family structure of the villagers), but societies with similar superficial structures may have fundamental differences. Specifically, the differences in residential sustainability of the two villages are reflected in the informal institutions and social relationship networks [77]. China's societies have always been interpersonal societies dominated by strong ties. China's villages have the social characteristics of independent communities; essentially, they are also acquaintance societies based on village–community relationship networks. The traditional logic of relationship networks is that of informal institutions based on traditional ethics, family networks and interpersonal credits; this is neither the prohibitive rule of hierarchy nor the transactional contract rule of the market, but rather fulfills constructive and protective functions for the development of the collective economy in UVs. During the transition period, the old formal institutions have been broken, while new formal institutions (i.e., administrative institutions and market rules) had not yet been established and perfected in China's villages. For this reason, informal institutions based on interpersonal relationships were more vigorous than the formal institutions in China's villages, where the formal institutions had always been weak.

BNV experienced the re-collectivization process and revitalized land assets in the UV transformation [71]. Furthermore, the complete village social networks in BNV were still complete after the restructuring of the social orders of the village. For one thing, the villagers adopted a sophisticated, expedient, and flexible way of absorbing new things that benefit them; for another, their operation logic still retains the deep characteristics of the original village. Hence, this transformation model causes the reconstructed economic structure to be embedded in the original social relationships [78]. This type of informal institution can greatly protect the operation of the collective economy in BNV. In summary, the operational mechanism includes the following: (1) The operation of vague collective property rights depends heavily on interpersonal trust in the community [79]. NRCM realized the centralization of villagers' residence and the integration of collective land through the transformation on the original site and uniform planning. Therefore, the village has retained a relatively complete acquaintance network with a higher credit guarantee and local attachment. The interpersonal trust among villagers reduced the collective transaction costs and organizational costs and created a benign external environment for collective economy operation [80]; (2) The social relationship networks can operate on a broader scope (i.e., beyond the limitations of family size). The usage efficiency of public assets depends on the ability of community members to solve collective problems. This not only embodies the collaborative cultural tradition of Chinese peasants, but is also a product of the development of relationship networks; (3) The social relationship networks can provide informal protection for collective accumulation. The initial capital of the collective economy in BNV mainly came from the accumulation of collective agriculture in the past. In addition, the preservation of complete social networks and the reforming of stock immobilization can also help to curb the loss of collective heritage [81]. Conversely, the compensation and resettlement method in XV is completely different from that in BNV. Villagers in XV either choose

to move into resettlement areas, or they choose currency compensation and now live elsewhere; it can be said that the villagers have been disbanded to some extent since the transformation. At a deeper level, the original acquaintance relationship networks of villagers have been broken, and the rural society structure has become extremely fragmented in XV. The incomplete social network has increased villagers' survival risks and reduced the cohesion of the village community [82]. The villagers are already lacking the ability to form internal social connections and relationships, so they are also unable to form a network of common social assistance.

Granovetter's theory regarding the strength of weak ties shows that weak ties are the bonds between groups, which provide heterogeneous information and act as an information bridge [70–74], while strong ties are the bonds inside the groups, which provide a greater homogeneity of information [83–85]. Based on Granovetter's theory, Prof. Bian proposed a strong relationship hypothesis. It shows that China's society is not a society of weak ties like the United States, but rather it is a society of strong ties. Achieving success in China does not depend on weak ties, but rather on strong ties [86–89]. Prof. Fei found that a sequential structure exists in Chinese village societies [90], whereby individuals are involved in various layers of private social networks from the inside to the outside, relying heavily on the intimacy of interpersonal relationships [91]. Hence, there exist typical strong ties in rural societies in China, which are composed of consanguinity, kinship relationships, and geographic relationships (Figure 5). Specifically, the social relationship networks of the two villages result in different relationship resources. Firstly, landless villagers in the two villages have little possibility of changing jobs and being re-employed. For one thing, the education level and labor skills of landless villagers are generally low, and their ability to participate in market competition and adapt to the market is limited; for another, the desire of landless villagers for re-employment is not strong. Because of land expropriation, they are forced to participate in the process of urbanization. However, in essence, they have been accustomed to a land-based lifestyle and are unwilling to face the highly stressful urban-rural employment markets. Even with the same re-employment background, the influence mechanism is different, due to differences in the social networks between the two villages [92]. Villagers in BNV reside centrally in the new village, and their original circle of acquaintances was not broken up following UV transformation, so the village retains the strong ties of the acquaintance networks and provides more interpersonal resources. The village collective and village-owned enterprises have created many jobs for the villagers, thus solving the employment problems of some villagers internally through community transformation. Other than human capital, the law of interpersonal relationships also plays an important role in the distribution of employment posts [93]. However, following the market-oriented transformation of XV, villagers were not able to realize centralized residence in a geographical sense to the necessary extent, and the acquaintance circle of the original village disintegrated. Relatively speaking, there have been no improvements in the low human capital and landless villagers' employment conditions. Hence, the villagers have faced more serious unemployment problems since the transformation, which worsens their adaptability dilemma.

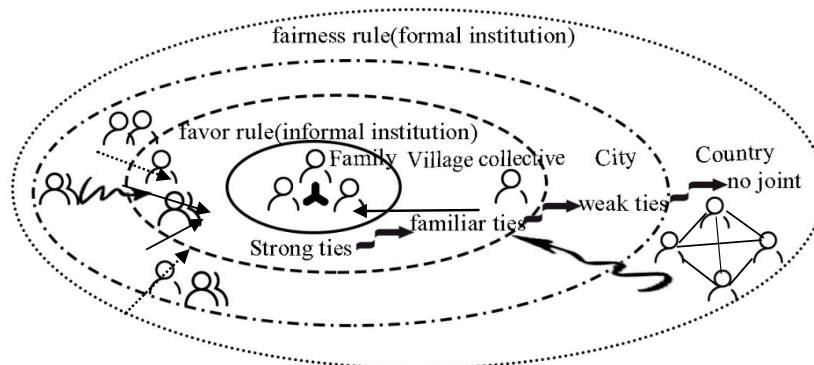


Figure 5. China's rural social network compliance rules under the differential order pattern (solid arrows are strong ties, dotted arrows are weak ties).

5. Conclusions and Discussion

5.1. Conclusion

The residential sustainability of NRCM is generally higher than D/RMM. From the perspective of income situation and income structure, the housing rental economy is used as the main tool to promote villagers' income in the two villages following transformation. Specifically, as a result of more reservations, higher housing rental income, and increasing shares or dividends from the village collective and collective employment of villagers, villagers' income sources have become more diversified since NRCM in BNV. However, since the implementation of D/RMM, the income sources of the villagers have become deficient, the housing rental income has decreased, the number leaving the village for jobs has increased significantly, and the stability of their work has decreased; meanwhile, their working intensity and the livelihood pressure have increased since the transformation. From the perspective of housing condition sustainability, since NRCM, the villagers have a higher overall sustainability with respect to their own housing condition than previously. Specifically, in BVN, Housing ownership index, Housing privacy index, Housing quality index and Housing facilities index are higher than those in XV, and its Housing crowding index is lower than that of XV. This is related to the differences in housing allocation policies, family structures, housing construction, and infrastructure construction between the two villages. As for community environment sustainability and livelihood sustainability, overall, the two items in BVN are higher than those in XV, and the two items in BVN are mainly manifested in the sustainability of the villagers' social relationship networks and economic status. The influence factors in the residential sustainability of the two transformation models can mostly be attributed to three aspects: (1) Land development right allocation models and earning redistribution fundamentally affect villagers' housing condition sustainability; (2) The collective economy and the informal economy are the potential drivers of sustainable village community transformation; (3) Informal institutions and village social networks protect and continue the social capitals in village. In summary, villagers' rights are maintained and enhanced via informal institutions, informal economies, and original social relationship networks are completely preserved through NRCM in BNV, as much as possible. Therefore, NRCM can maximize the villagers' interests, which should be conducive to residential sustainability in the transformation of China's urban villages.

5.2. Discussion

UVs comprise a special type of residential landscape with Chinese urbanization characteristics; the transformation of UV has prompted discussions regarding the fairness of urban spatial resource allocation, as well [94]. Since the reform and opening up, China has adopted a demolition/relocation market-oriented model, which seemingly ends the history of the villages through a one-off transformation, but this radical reconstruction leaves a number of remaining historical problems. For local villagers, the end of the village does not mean that the villagers vanish, and they will face more sustainable livelihood challenges, including the inadequacy of land rights and interests, the difficulty in re-employment channels, the incomplete coverage of social security, and difficulty with urban integration. For the floating population who live in UVs, the demolition and removal of the UVs do not fundamentally solve their living problems. To settle down in the cities, these low-income groups would have to move to other urban villages that have not been demolished, causing a vicious cycle between the generally increasing housing rent in the surrounding areas and the emergence of "new UVs". Thus, the continuing effect of D/RMM is known as the "Tangjialing phenomenon"; proposed by Prof. Gu [95], it is prevalent in UV transformation in China.

Transformation of the original site on the premise of continuity should be one of the current feasible models; specifically, villagers and village collectives conduct urban village transformation at the original site, on the premise of retaining and expanding the rental economy. UVs have very strong local embeddedness, and this is based on consanguinity, kinship, clan, geographic relationships, folk beliefs, and village rules. At first glance, the demolition and reconstruction of UVs and commercial real

estate development seem to provide villagers with beautiful and comfortable houses; however, it also results in villagers losing land value-added benefits from the original UVs' locations, which is primarily embodied in the loss of housing rentals, collective properties, and other livelihood opportunities. Eventually, this may lead to the disintegration of the original social networks and the disappearance of the acquaintance society at a deeper level. NRCM is a sustainable exploration; it attempts to promote UV transformation with the help of non-market folk society forces, and has a unique effect on transcending the limitation of economic rationality. If we over-rely on market-oriented transformation, the erosion of market laws and capital profit-seeking are hard to avoid. For example, the volume ratio may be too high in the resettlement area (relatively speaking, it is appropriate that the volume ratio of the residential districts ranges from two to three), and may even be far higher than in the general commercial housing districts. An excessive population density has a lasting negative impact on the sustainability of the community environment and villagers' residences. An additional advantage of NRCM is the revitalization of collective land assets. Moreover, its transformation benefits also lie in activating collective land assets and optimizing the functions of low-rent housing in urban areas by protecting reasonable land development rights of villagers. Therefore, it is necessary to explore the land development right allocation model, which is allocated by the government, village collectives, and villagers, simultaneously. Government should establish a reasonable institution for the gradual transfer of land development rights [96]. Based on the above discussion, the following suggestions are made based on an economic perspective: first, the government should establish supporting policies that are conducive to the economic transformation of the community joint-stock companies in UVs, in order to safeguard villagers' employment. Second, the government should build a special investment and financing platform to reduce the risk of village collectives' independent investment. Eventually, the government should rebuild an interest redistribution mechanism that balances fairness and efficiency. Rural collective land should be granted the same development rights as urban construction land; the establishment of a uniform urban-rural construction land market is one of the directions that China's land institution reform will take in the future. From a social point of view, the government should guide the establishment of community self-governance mechanisms that meet the needs of transformation. Also, the government should guide village collectives to participate in land re-planning. The village collectives should be allowed to develop the remaining land. Eventually, it will be necessary to protect sustainable development of internal industries in UVs, to promote industrial development, and to increase employment.

In the future, the end of villages and villagers will be the final outcomes of UV transformation in China, which will include three aspects: (1) The end of the physical aspect of UVs; this refers to the demolition of houses and the disbandment of villagers; (2) The end of organizational entities by the disintegration of village administrative, economic, and social organizations. In particular, this is reflected in the abolition of the Village Committee System (VCS) and the implementation of the Community Resident Committee System (CRCS); (3) The end of social relationships means the dissolution of the acquaintance society. For instance, villagers either choose currency compensation and have to make their own living, or choose housing resettlement and move into resettlement areas in a different construction phase. Thus, the original villagers are scattered and distributed in different urban spaces, and consanguinity and geopolitical relationships will gradually disintegrate; for this reason, the above dimensions will subsequently emerge in XV. Although BNV will not face demolition in the near future, the villagers still fear that they will face the same fate as XV in the next decade, and their vested interests will not be safeguarded. BNV has expanded its economic boundaries based on its own economic strength, such as rental market networks. Thus, its administrative boundaries have also changed, as the village committee turns into the community resident committee. Based on our investigation, we find that the villagers are increasingly adapting to the urban lifestyle and values; meanwhile, the village value system has gradually diversified. With the trend of further urbanization in the future, the cultural and social boundaries between urban and rural areas will be further blurred.

However, if the government guides and governs properly in the future, BNV may retain its original social relationship networks relatively completely following the termination of the rural housing form.

5.3. Limitations

Although this study provides several new insights into residential sustainability issues in UV transformation, it still has space for improvement. First, this study focused on only two UVs; the diversity represented by different UVs should be considered in further research. However, even if the village case can be studied in-depth, it lacks universal explanatory power on account of limitations in the characteristics of villages. Second, the study mainly focuses on the analysis of residential sustainability from the perspective of indigenous villagers in UV transformation. Future research should focus on floating urban labor and tenants in UVs, because there is a possible difference in residential sustainability between migrants and indigenous villagers.

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Appendix A

Table A1. Descriptive statistics for housing condition sustainability indicators of relocation villagers.

Shorthand	Sub Index	Weighting Method
HOI	Housing forms and property Rights	Rented house = 1; accommodation = 2; self-built house = 3; self-purchased house = 4
HCI	Per average housing area(m ²)	>=46 m ² = 1; 36~45 m ² = 2; 21~35 m ² = 3; <=20 m ² = 4
	Housing set ratio	Complete set house = 1; incomplete set house = 2; bungalow = 3
HPI	Housing function	Only living room = 2; both life, production and business use = 1
	Housing privacy	The five-point Likert scale: [1 2 3 4 5]
HFI	Basic facility Index	$I_1 = \sum I_a / 42$, I_a is total score of the former seven items facilities ownership
	Intermediate facilities index	$I_2 = \sum I_b / 42$, I_b is total score of 8~14 items facility ownership
	Advanced facilities index	$I_3 = \sum I_c / 42$, I_c is the total score of 15~21 items facility ownership
	Overall facility index	$I = \sum I / 42$, I is total score all facilities ownership
HQI	Building quality	The five-point Likert scale: [1 2 3 4 5]
	Ventilation and lighting	The five-point Likert scale: [1 2 3 4 5]
	Residential area	The five-point Likert scale: [1 2 3 4 5]

Table A2. Descriptive statistics for the sustainable quality indicators of relocation villagers.

Index Name	Range of Values	Average Value	
		NRCM(BNV)	D/RMM(XV)
X ₁ Property management	1–5	4.07	3.20
X ₂ Support of public facilities	1–5	4.08	2.97
X ₃ Landscape greening	1–5	4.30	3.02
X ₄ Community security	1–5	4.15	3.63
X ₅ Community public places and organizations	1–5	3.3	1.98
X ₆ Convenience of public transport around	1–5	4.47	4.22
X ₇ Distance between the relocation area and city center	1–5	4.32	4.15
X ₈ Commuting status	1–5	4.54	4.22
X ₉ Stability of income sources	1–5	3.08	2.71
X ₁₀ Work intensity and tiredness after transformation	1–8	3.72	6.09
X ₁₁ Income increase or decrease situation	1–2	1.93	1.25
X ₁₂ Friendliness and support of community members	1–5	4.32	3.62
X ₁₃ Scope of making friends in the community	1–5	4.53	4.16
X ₁₄ Acquaintance social reservation situation	1–2	2.00	1.8
X ₁₅ The impact of social networks on livelihood security	1–5	3.50	3.05
X ₁₆ Coverage degree of self-owned social insurance	1–5	1.92	2.07
X ₁₇ Guarantee level of self-owned social insurance	1–5	2.96	3.20
X ₁₈ Satisfaction Degree of Settlement Compensation	1–5	3.93	2.48
X ₁₉ Willingness of residence and old-age care in the resettlement area for a long time	1–5	4.38	3.45

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