
DOCTORAL DISSERTATION

**Post-occupancy evaluation of poverty
alleviation relocation housing for minorities
in Pu'er City, China**

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ABSTRACT

Ex situ poverty alleviation relocation (ESPAR) is one of the essential poverty reduction initiatives in China. The government relocates poor rural households in remote areas, thereby improving their housing conditions, infrastructure services, public facilities, and standard of living. However, the current relocation approach is relatively crude. If model construction is adopted and the actual needs of users are ignored, the charm of minority housing is easily lost, resulting in villagers' discomfort with the environment. There is an urgent need to construct an evaluation feedback system suitable for ESPAR housing and to understand the influencing factors affecting occupancy satisfaction, which is essential for planning and formulating effective and sustainable housing policies.

Based on the perspective of human settlement theory, this study takes minority poverty alleviation housing as the research object and adopts post-occupancy evaluation as the main research method. The paper constructs an evaluation framework from seven dimensions suitable for poverty alleviation relocation (PAR) housing for ethnic minorities in southwest China. After that, eight typical relocation villages in Pu'er City, Yunnan Province were used as research samples to investigate the built environment. By using correlation analysis and path analysis, the factors affecting the satisfaction of PAR residences were explored, and improvement strategies were proposed for different dimensions. The results show that the respondents' overall satisfaction with PAR residences is good. On the other hand, the main factors influencing the overall satisfaction of PAR housing were building durability, housing space design, and regional features, while the socio-demographic characteristics of residents mainly influenced the overall satisfaction by affecting the sub-variables.

This study differs from the traditional binary model of thinking about the design object in terms of the design subject, clarifies more sensitive and valued habitat needs of users, and provides a new set of data to guide and help improve the built environment. It is hoped that the research in this paper can provide some references for the construction and sustainable development of migrant resettlement projects, minority housing in other less developed areas, and low-income housing projects around the world, and explore a more reasonable development path.

Keywords: Post-occupancy evaluation; Ex-situ poverty alleviation relocation; Residence satisfaction

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Chapter 1 Introduction

1.1 Research Background

1.1.1 The global issue of ending poverty

Poverty has been a major challenge that has plagued many countries throughout the history of human development. Poverty is a state of lack of resources, which creates different levels of obstacles to development, leaving groups in poverty without the capacity and opportunities for development and in a state of chronic distress. The reduction and elimination of poverty is the goal of human society.

1) World Poverty Situation.

According to the World Bank's latest report "Poverty and Shared Prosperity: Piecing Together the Poverty Puzzle," living on less than \$3.20 a day represents the poverty line for low- and middle-income countries, and living on \$5.50 a day represents the poverty line for upper-middle-income countries. 1.9 billion people worldwide lived on less than \$3.20 a day in 2015, accounting for 26.2% of the total population. Nearly 46 percent of the world's population lives on less than \$5.50 a day. Nearly half of the world's poor - some 3.4 billion people - still struggle to survive on the edge of the basic subsistence line. Nearly 10 % of the world's population lives on less than \$2.15 a day. [1]

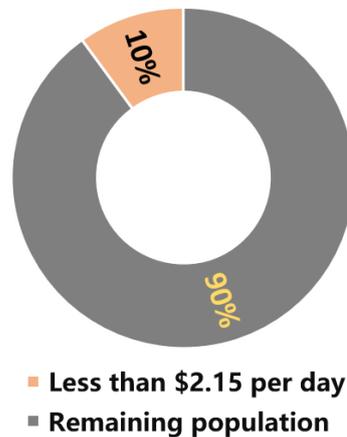


Figure 1-1 World Poverty Situation

And both low and middle-income countries have a wide range of multidimensional poverty[2]. The problem of poverty is also reflected in three main aspects: first, the regional imbalance, i.e., the most frequent incidence of poverty is concentrated in sub-Saharan Africa. Second, the special resource-dependent

characteristics of poverty, where a large proportion of the poor are located in resource-rich regions [3]. The homogeneity of the economic structure and the uneven distribution of wealth has led to a more serious gap between the rich and poor within the country. Third, the correlation between regional conflicts and poverty, on the one hand, violent conflicts arising from the existence of more serious ethnic, social, and religious conflicts within the region become one of the poverty-causing factors; on the other hand, the population in the region with superior resource endowment, excluding the poverty-causing factors of intra-regional conflicts, is more due to the political turmoil of the countries in the region caused by the intervention of foreign powers, thus generating more poor people.

2) Ending poverty becomes the primary goal.

In the early post-World War II period, when the Western countries were struggling to recover, promoting economic development was the most important international issue at that time, and achieving economic growth was considered the fundamental means to solve the problem of poverty in all countries, and the basic model was to rely on the support of international aid forces. In the 1960s and 1970s, as the Third World countries gradually entered the international arena, the Soviet Union and the Western developed countries, to compete for power, provided international development aid to solve the poverty problem, and aid for economic growth was the main poverty management concept. Until the 1990s, global development entered a new historical stage, global governance theories emerged, and the emergence of new global development concepts such as "governance", "people-centered" and "sustainable development" has further deepened the meaning of the definition of global poverty governance.

In 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development, which was unanimously endorsed by the world's heads of state and set the goals for UN action to promote global sustainable development over the next 15 years, with the further eradication of all forms of poverty as its primary goal[4]

The proportion of the world's population living in extreme poverty fell from 16 percent in 2010 and 36 percent in 1990 to 10 percent in 2015. Over the past 25 years, more than 1 billion people have been lifted out of poverty. This progress has occurred primarily in East Asia, where poverty rates fell from 52 percent in 1990 to 10 percent in 2010 to less than 1 percent in 2015 [5]. Countries have made impressive progress in eradicating extreme poverty, helping to further reduce global interest rates. The number

of people living in extreme poverty continues to decline, but at a slower pace, and the world is not on track to meet the goal of eradicating poverty by 2030. Today's extreme poverty is highly concentrated, with rural populations most affected [6].

1.1.2 The proposed policy of Ex-situ poverty alleviation relocation

Poverty has been a major challenge that has plagued many countries throughout the history of human development. Poverty is a state of lack of resources, which creates different degrees of obstacles to development, leaving those in poverty without the capacity and opportunities for development and in chronic distress. Since the reform and opening up of China in 1979, China has made significant progress in achieving the goal of poverty eradication, reducing the number of rural poor by 739.9 million people under current standards over the past 40 years. China's contribution to world poverty reduction exceeds 70% [7].

From the global experience, poverty reduction or elimination relies on two main experiences. First, during the long-term economic and social transformation process, the poor have been lifted out of poverty through increasing employment income; second, social welfare is provided to the few remaining poor who could not benefit from the transformation process. This is the basic experience of poverty reduction in primary and post-industrialized countries. Although China's poverty reduction is consistent with this experience in terms of results, China's national conditions dictate that China needs to reduce and gradually eliminate poverty while developing.

As the total number of rural poor continues to decrease, the remaining poor population is increasingly concentrated in areas with extremely harsh living conditions. For poor areas with a harsh ecological environment, the traditional "local poverty alleviation" approach is costly and difficult to implement in these areas, and the benefits of policy investment are weak. Even if they rely on the government's power to get rid of poverty, they may return to poverty due to the constraints of natural conditions and the impact of natural disasters. In 2007, the central government issued China's first programmatic document for relocating the poor to other areas, the "Eleventh Five-Year Plan for Relocating the Poor to Other Areas", which clearly stated that "from 2006 to 2010, 1.5 million rural poor people will be relocated. This marks the first time that China's relocation plan for poverty alleviation has been published. This marks a new stage of government coordination and local promotion for China's relocation to alleviate poverty.

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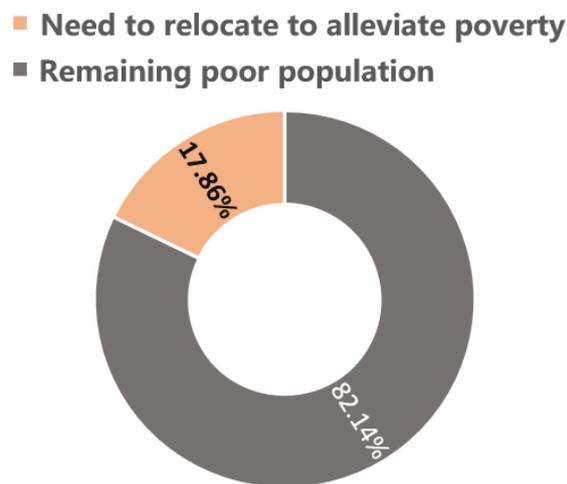


Figure 1-2 Proportion of poor people requiring resettlement

In 2016, China has the task of lifting more than 56 million poor people out of poverty, and nearly 17.85% of them need to be relocated to other places to alleviate poverty (Figure 1-2). In September 2016, the National Development and Reform Commission released the "Thirteenth Five-Year Plan for Relocation to Poverty Alleviation", which pointed out that in the next five years, nearly 10 million people living in poverty will be relocated to other areas, and efforts will be made to solve the problem of poverty alleviation for poor people living in areas where "one side of the land cannot support one side of the people" [9]. Since then, the development of relocation to alleviate poverty has been on the full scale at the central and local levels. Through state support, the government organizes the poor people who voluntarily relocate from the mountainous areas with fragile ecology, inconvenient transportation,

lack of resources, and frequent natural disasters to live in places with a better environment, convenient transportation, richer resources, and perfect medical and teaching public services, and helps the relocated residents to increase employment opportunities and achieve stable poverty alleviation. With the gradual improvement of the living standard of the rural poor in China, and the comprehensive and in-depth promotion of poverty alleviation work. The type of poverty in China's rural areas will change from absolute poverty to relative poverty, and poverty alleviation work should also aim to improve the development capacity of the poor themselves, to achieve the goal of real and permanent poverty alleviation.

1.1.3 The problem of resettlement areas emerged

During the 13th Five-Year Plan period, a total of about 35,000 centralized resettlement areas were built across the country, with more than 2.66 million sets of resettlement houses and an average housing area of 80.6 m² per household [10] With the completion of relocation, the effects of the project have received wide attention from the government, society, and academia. Some studies have shown that relocation has increased the income of migrants [11] and improved family life [12].

After moving into the new environment, the follow-up development of the relocated population becomes the key to precise poverty alleviation. The follow-up development of relocated migrants involves all aspects of production and life, and their poverty alleviation and enrichment require the joint efforts of multiple power actors. From the perspective of relocated migrants, they move from poverty to prosperity by exchanging with specific actors in a specific field. Coping with vulnerability and relocation risks, achieving sustainable livelihoods, and ultimately escaping from poverty are the keynote of the whole process of relocating migrants. This is not only about how to achieve "moving out" when the external environment and structure of production and life are not conducive to survival but also how to achieve "stability, development, and prosperity" after relocation.

However, the reality that has to be faced is that the current relocation approach is rather crude, with some local governments using centralized construction of relocation houses and unified planning and arrangements out of high concern for land use and the economy. This relocation model is efficient and effective, but it cannot provide a specific analysis of specific problems and an in-depth study of user needs, so there are still many problems with this model. Although the government can organize inter-village relocation and compensate farmers with land and monetary compensation for

property losses, the future material life of migrants is uncertain [13].

Based on the Construction features, literature studies, and on-site observations, some problems may arise in the resettlement area: Large restrictions by funds, there may be quality problems; policy control of the area, the household size may be smaller; uneven construction teams of projects around the world; in order to save costs, the pre-construction research work of the project is lacking.

Especially, most of the poverty alleviation and relocation areas are in the complex topographic minority gathering areas with rich and colorful minority residential culture, which needs to be inherited and carried forward. If model construction is adopted and the real needs of users are ignored, it is easy to cause "one side of a thousand villages", to lose the charm of minority housing, cause villagers to be uncomfortable with the environment, generate homesickness, and even have relocation problems. However, few studies are exploring the influencing factors of satisfaction of minority poverty alleviation housing residences.

It is an important task to meet the actual needs of users, improve the quality of modern rural life, and make minority communities sustainable. Over the past two decades, post-occupancy evaluation surveys have been widely adopted as an important tool to assess residents' comfort and satisfaction. However, there are few existing studies on POE of housing for relocated ethnic minority poor, and there is an urgent need to construct an evaluation feedback system suitable for migrant housing for ethnic minorities to understand the influencing factors that affect occupancy satisfaction, which is essential for planning and developing effective and sustainable housing policies [14].

1.2 Research Questions

The main questions of this research are;

(1) What is the existing condition of ethnic minority resettlement area and how satisfied are the residents with the housing they are living in?

(2) What is a significant factor contributing to occupant satisfaction of the seven dimensions?

(3) How do you identify their priority level when investing resources among many factors?

1.3 Research Objectives

This study presents an effective methodological framework for identifying the potential advantages and disadvantages of resettlement houses and improving the quality of the built environment points in resettlement areas, taking the satisfaction of users of resettlement houses for poverty alleviation of ethnic minorities as the research object;

The specific research objectives are:

(1) Establishing a theoretical framework for evaluating the satisfaction of resettlement housing suitable for ethnic minorities in southwest China;

(2) Complete an in-depth analysis of satisfaction characteristics related to the living environment of resettlement housing in the study area and identify statistically significant correlates that can inform housing attributes that can meet household needs and maximize satisfaction;

(3) Identify the demand categories of functional elements affecting the satisfaction of the built environment in relocation and resettlement areas, to clarify the intrinsic mechanism of each element and its priority sequence in satisfaction enhancement, with a view to providing a scientific basis for optimal allocation of police resources and design solutions.

This study wants to contribute to the sustainable development of ESPAR.

1.4 Scope of Research

The scope of the research is listed below:

A survey and analysis of the satisfaction of the households in the resettlement houses for the relocation of ethnic minorities to alleviate poverty in Pu'er City, China, and the current situation of their built environment in the resettlement area.

Post-occupancy assessment mainly focuses on seven dimensions of resettlement areas for relocation of ethnic minorities to alleviate poverty; Housing space design, Physical environment, Building Safety, Building durability, Infrastructure, Environmental Livability, and Regional Features.

Specific analyses based on significant factors and their importance will be extensively studied.

1.5 Research Outlines

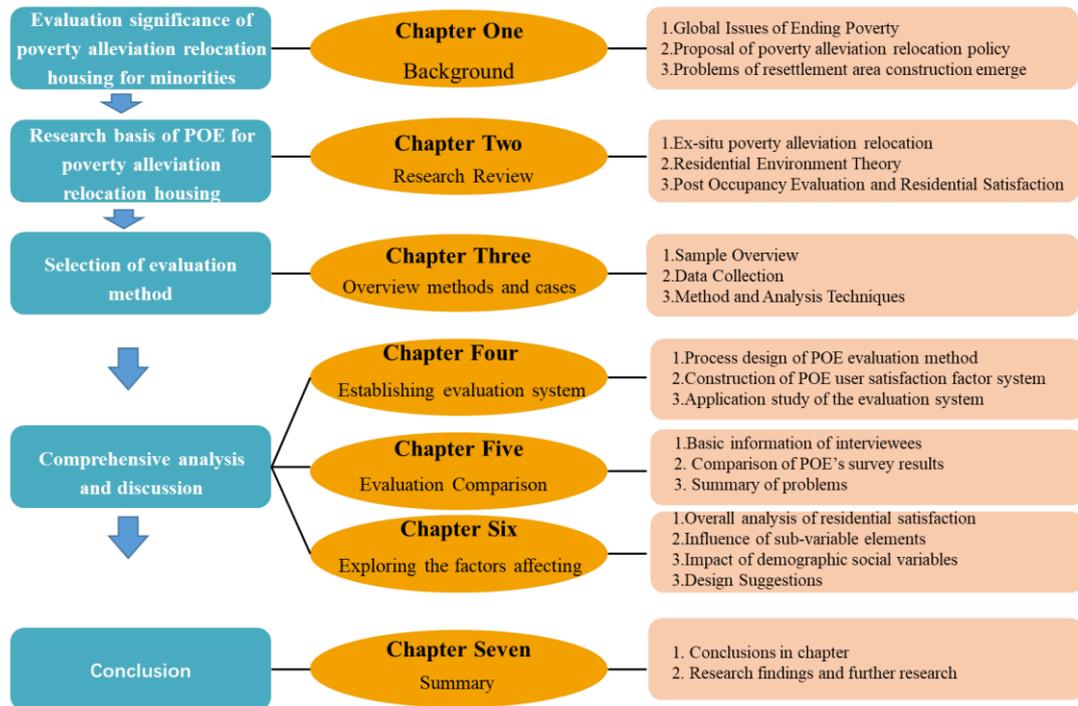


Figure 1-3 Research purpose and main research content.

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Chapter 2 Review of relevant research

2.1 Basic research on Ex-situ poverty alleviation relocation

2.1.1 Overview of the development of Ex-situ poverty alleviation relocation

Poverty alleviation relocation (PAR) is a national rural development policy in China that uses resettlement as a tool to address environmental and poverty-related issues in a rapidly changing world [1]. As early as 1983, the Chinese government explored the implementation of the "Hangzhuang Migration" program in response to the severe drought and water shortage in three western regions (Hexi, Gansu, Dingxi, and Xihaigu, Ningxia) and the difficulty of survival of local people, initiating the first poverty alleviation and relocation [2]. After that, poverty alleviation relocation became an important measure of developmental poverty alleviation in China. In 2001, the concept of "poverty alleviation relocation" was officially proposed by the State Planning Commission. The pilot project of poverty alleviation relocation was carried out in four provinces (autonomous regions) of Inner Mongolia, Guizhou, Yunnan, and Ningxia, and was subsequently extended to 17 provinces across the country. Years of practice have proven that, due to the extremely poor production and living conditions and the ineffectiveness of in-situ poverty alleviation measures, relocation for poverty alleviation has become the most effective way to get rid of poverty in areas where "one side of the land cannot support one side of the people". From 2001 to 2015, a total of 36.3 billion yuan of central subsidized investment has been allocated to relocate the poor, supporting the relocation of more than 6.8 million people. And the Chinese government is fully implementing a poverty alleviation and relocation program from 2016 to 2020, which is a significant increase in the amount of money invested and the number of people relocated compared to the previous five-year plan.

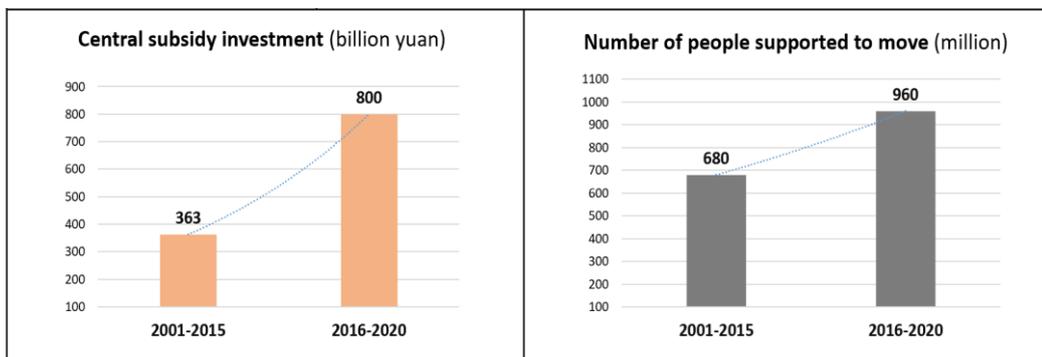


Figure 2-1 Comparison of investment amount and number of people for poverty alleviation and relocation

Content	Total	2016	2017	2018	2019	2020
Total investment	5922	1463	1939	1625	683	212
Central government budget investment	800	160	160	160	160	160
Provincial investment and financing main arrangement funds	4907	1248	1704	1404	501	50
Relocation object self-financing	215	55	75	61	22	2

Table 2-1. Schedule of card relocation investment (unit: 100 million yuan)

In November 2015, the Central Committee of the Communist Party of China (CPC) held a conference on poverty alleviation and development, and the CPC Central Committee and the State Council issued the Decision on Winning the Battle against Poverty, marking a new stage of poverty alleviation and development in China. By the basic strategy of precise poverty alleviation and eradication, large-scale work on precise identification of poverty alleviation targets has been carried out in various regions, and information on the distribution of the poor population, causes of poverty, and needs for poverty eradication has been mapped out nationwide, among which about 10 million rural poor people still live in areas where "one side of the land cannot support one side of the people". Based on this reality, the Chinese government has made "relocating a group of people out of poverty" one of the "five groups" of precise poverty alleviation projects in the new era of poverty eradication and decided to spend five years to relocate these poor people out of the poor living environment and difficult production and living conditions, and help them increase their income. It will help them to increase employment opportunities and achieve stable poverty alleviation. Starting in 2016, PAR projects were carried out on a large scale in China, with 22 provinces or municipalities participating

Although this program is unique in China, it offers a wide range of opportunities to address environmental and poverty-related issues around the world [3].

Time	1983-1993	2001-2005	2006-2015	2016-2020
Region	 <p>Gansu, Ningxia</p>	 <p>Inner Mongolia, Guizhou, Yunnan, Ningxia</p>	 <p>Shaanxi, Chongqing, and other provinces</p>	 <p>22 provinces/municipalities nationwide</p>
Event	Addressing severe drought and water shortages and survival difficulties of local people	Ex-situ poverty alleviation relocation pilot	Implementation of ecological migration, and relocation for disaster avoidance	Ex-situ poverty alleviation relocation implemented
Self-financing	High	High	Moderate	less
				

Table 2-2. Development of poverty alleviation relocation

The Chinese government has defined the areas to be relocated for poverty alleviation and the conditions for relocation are: First, deep rocky mountains, remote alpine, desertification and serious soil erosion, and water, soil, light, and heat conditions are difficult to meet the needs of daily life production, do not have the basic development conditions; Second, "National Main Functional Area Planning" clearly prohibited development or restricted development zones; Third, transportation, water conservancy, electricity, communications, and other infrastructure, as well as education, health care and other basic public service facilities are very weak, engineering measures to solve the difficulty, high construction and operating costs; Fourth, serious endemic diseases, geological disasters are frequent in the area.

The construction tasks of relocation: there are tasks such as resettlement housing,

supporting infrastructure, basic public services, etc., as well as the restoration of ecological issues related to the land after moving out.

2.1.2 Types of Ex-situ poverty alleviation relocation

At present, China's relocation methods for Ex-situ poverty alleviation are into two categories: centralized relocation and decentralized relocation, of which centralized relocation is the main one, accounting for 12.44 million people, or 76.4%; decentralized relocation is about 3.84 million people, accounting for 23.6%.

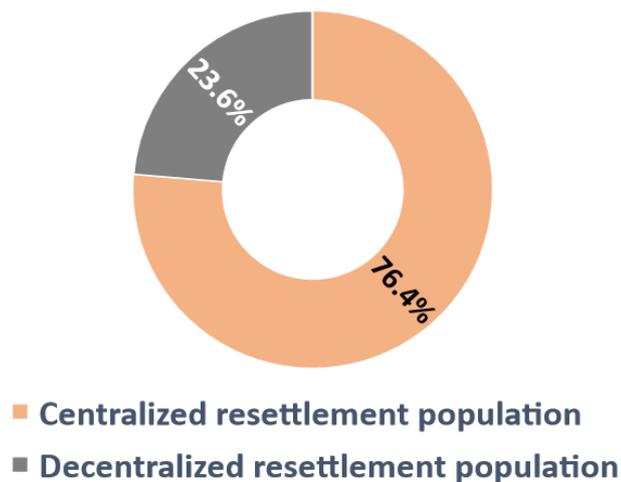


Figure 2-2 Percentage of relocation methods

Centralized resettlement refers to the government's construction of development bases to resettle immigrants, and there are several types of centralized resettlement: (1) close to the administrative village, relying on the central village near the major traffic routes or administrative villages with good traffic conditions, and guiding the relocation target to settle nearby, accounting for 39% of the centralized resettlement population. For example, in Zengji-side Village in Yanchi County, Ningxia, the village households live very scattered, and some of them live in places with big mountains and deep ditches, and the investment in village road construction and drinking water supply infrastructure is very large. The village has adjusted the collective land of the village, reallocated residential bases to the households around the main administrative village, and concentrated the households for resettlement, thus saving the investment in infrastructure construction. (2) Construction of new resettlement villages for migrants. Relying on newly reclaimed or adjusted use of arable land, the construction of new immigrant villages is planned for centralized resettlement in neighboring counties, townships, or administrative villages, accounting for 15% of the centralized resettlement population. For example, in Fengji Gou Village in Yanchi County, Ningxia,

the original village was located in a mining area, and after the reclamation of the coal mine, the home base collapsed seriously. Public service facilities such as sports and fitness facilities are provided. The two methods of resettlement, namely resettlement within the administrative village and resettlement in the new village, mainly solve the problems of housing and accessibility of infrastructure and public services for poor farmers, and there is no change or adjustment of agricultural production land for farmers. However, the prerequisite for this type of resettlement is that the local natural and social conditions such as transportation are relatively good. The third way of centralized resettlement is a small town, industrial park resettlement or tourist area resettlement, etc. Relying on the new urbanization construction, the resettlement area is built in the county, small town or industrial park or near the key villages and towns of local tourism, folk culture, and other characteristic resources for rural tourism or tourist scenic spots, accounting for 42% of the centralized resettlement population. With the interest in rural tourism, the mode of relying on tourism resources for relocation to alleviate poverty is also increasing, such as the town of Baima in Wulong County, Chongqing, relying on the local tourism resources of Tianchi, relocating three nearby villages to alleviate poverty, centralized planning and design, providing financial support for the construction of wind and landscape, transforming farmers' housing and developing rural tourism. Shuanghe Town, on the other hand, relying on the local high mountain summer resources, provides funding to support the relocation of farmers to build houses in places with convenient transportation, attracting elderly people and students from Chongqing and other surrounding areas to this summer vacation. This mode of resettlement often requires the intervention of market operators, especially enterprises, especially in industrial parks and small towns, etc. This mode of resettlement is often far from the original living area of farmers, agricultural production is affected due to the distance of farming land or unsuitable for continued production, and livelihood is more dependent on non-farm employment. The ability to have a long-term stable source of income is the key to the sustainable improvement of the livelihoods of these relocated households, and the changes in the livelihoods and housing patterns of these migrants are more significant, and the process of social adaptation and integration is relatively longer. The fourth mode of centralized resettlement is for the relocation of special hardship cases and disabled people who are eligible for centralized support, which is carried out by incorporating them into the support institutions or building special housing in the relocation area, accounting for 4% of the centralized resettlement population. For example, Huangxi Village in Xiushui County, Jiangxi Province, has built 20 sets of houses in the central village to centrally

resettle the low-income households, the five-guarantee households, and the households on the edge of the five-guarantee households scattered in various natural villages; the local government has also centrally built 31 sets of houses next to the aforementioned Fengji Gou Village Migrant New Village to centrally resettle 31 poor households with no one to depend on in Fengji Gou Township where the village is located. This housing model usually has a relatively small housing area of 40-50 square meters, and the ownership of the housing belongs to the village collective. This model is also a response to the fact that the previous poverty alleviation through relocation could only support poor households with certain economic development abilities and exclude poor households without development abilities so that poverty alleviation resources can benefit more poor people.

The second type of resettlement method for Ex-situ poverty alleviation relocation is decentralized resettlement. It is divided into inset resettlement and other resettlement methods. The first way is to rely on the resources such as public facilities and vacant houses already in the resettlement area, and the local government adopts the way of buying back vacant houses and allocating farmland for resettlement, accounting for 70% of the decentralized resettlement population. The way of resettlement also includes the independent choice of resettlement in the form of employment in the city and relying on relatives and friends, accounting for 30% of the dispersed resettlement population. The diversification of resettlement methods gives the local communities a better chance to develop localized poverty alleviation programs based on local resource endowments, natural conditions, and the degree of socio-economic development and living habits, which also provides policy permission for different types of poor farmers to choose the resettlement methods they can afford, thus reducing the poverty-stricken population's This can reduce the exclusion of poor people and improve the poverty alleviation effect of Ex-situ poverty alleviation.

On the other hand, in terms of the regional distribution of relocation targets, the relocation population in 12 provinces (autonomous regions and municipalities) in the central and western regions of China under the 13th Five-Year Plan is about 6.64 million people, accounting for 67.7% of the total relocation population, and about 4.23 million people are planned to be relocated simultaneously; the relocation population in 6 provinces in the central region is 2.96 million people, accounting for 30.2% of the total relocation population, and about 1.44 million people are planned to be relocated simultaneously. The population of relocated people in the four provinces in the eastern region is about 210,000, accounting for 2.1% of the total size of the relocated population, and about 800,000 people are planned to be relocated simultaneously.

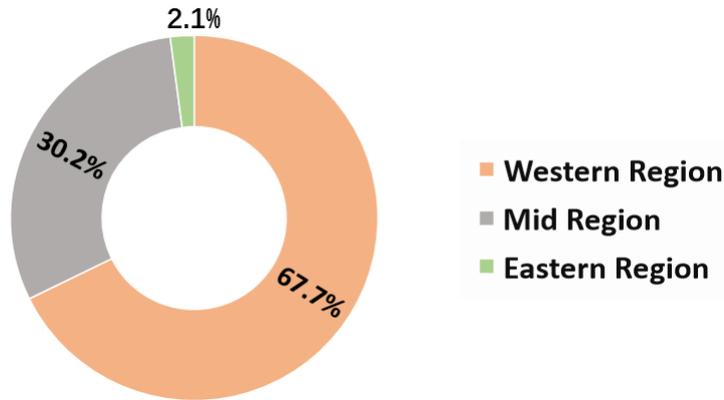


Figure 2-3 Regional distribution of relocation targets

2.1.3 Construction requirements of Ex-situ poverty alleviation housing

Resettlement housing following the principle of "guaranteeing basic, safe and applicable", the construction area of housing for the relocation of the population with fixed records and cards strictly enforces the standard of not more than 25 square meters per person, in which single-person single-family housing can be solved by centralized construction of apartments, and happy homes, nursing homes and other ways, the specific construction methods and standards by the local government combined with The specific construction methods and standards are determined by the local government with the local reality. In this way, one household home can be allocated in the home base reserved for the renewal of space, and stable poverty can be expanded. The construction of housing for the concurrently relocated population should be organized and implemented under the unified guidance of the local government and by the planning of the settlement area, and the housing area standard can be used as a reference for the standard of the relocated population for the construction of the file card, which is determined at the discretion of the local city and county governments. New housing structure design to implement the relevant building codes and technical standards to ensure housing quality and safety. Centralized housing construction in the housing area should be unified planning, project implementation can take the unified construction, self-built, built on behalf of the way to carry out. Relying on small towns or industrial parks resettlement, the local government may take the discretion to buy back urban commercial housing in line with the area control standards, but shall not buy back public rental housing, low-cost housing, and other state-subsidized investment in the construction of housing. Relying on rural tourism area resettlement, resettlement planning and housing, infrastructure, public service facilities and

commercial facilities, and other construction to meet the characteristics of rural tourism, taking fully into account the actual needs of tourism development, and promote the harmonious unity of the resettlement area and scenic spots.

There are three types of houses for easy relocation.

One kind is the five-guarantee special hardship resettlement house: mainly for the five-guarantee households, after the five-guarantee households reach the age of 60, the civil affairs department will arrange to live in the old people's home, with an area of 20-25 square meters, with no personal contribution, only the right to live, no property rights and no property certificates.

The second kind is a kind of turnkey project: mainly for low-income households and families with special difficulties, per capita, not more than 25 square meters, no personal money, only the right to live, no property rights, no real estate license.

The third kind is the centralized resettlement house for general poor households: with property rights, which can apply for a real estate registration certificate but cannot be used for sale or other commercial purposes within a certain period of time. This period varies from place to place and is generally 5-20 years in which it cannot be sold. There are the following conditions for receiving the key: first, the per capita payment is 2,500 yuan, but the whole family will pay no more than 10,000 yuan; second, the new house will vacate the old house, which means that after receiving the key to the new house, the original old house at home must be demolished by the government within a certain time, and the original home base will be returned to farmland.

2.1.4 Research Trends in Poverty Alleviation Relocation for Minorities

Due to the intertwined ethnic, poverty, ecological, and social problems, ethnic minority areas are known as the most difficult "bones" for poverty alleviation and relocation in China. And the studies on this issue are mostly found in Chinese journals. With the help of China Knowledge Base, the author searched by entering "poverty alleviation and relocation for ethnic minorities" and got the academic research trends from August 2015-2022. From the research trends, it can be seen that there were few studies on the relocation of ethnic minorities to alleviate poverty before 2015, and the attention began to rise in 2015, and gradually became a popular research topic. The research trend is still on the rise so far.

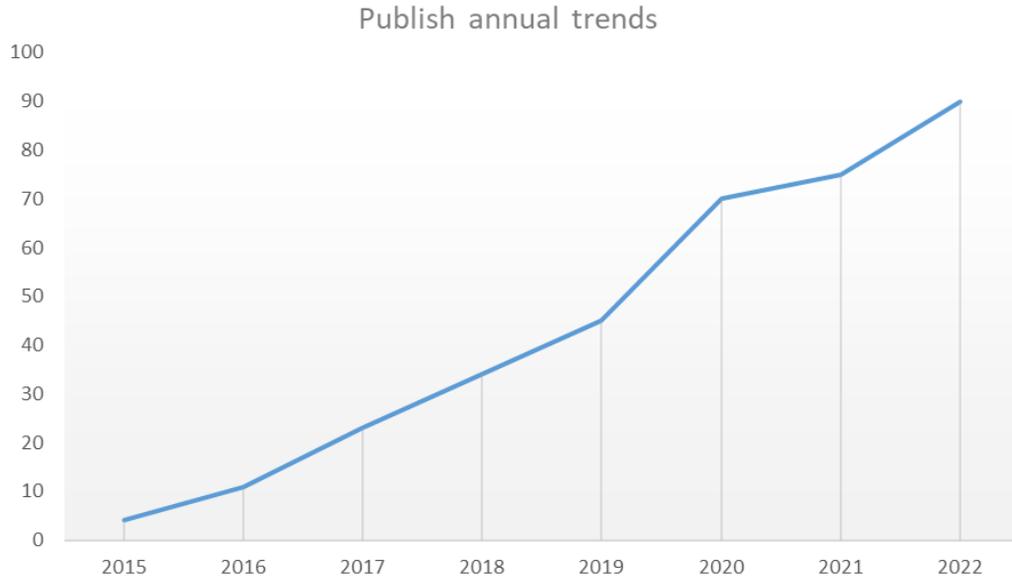


Figure 2-4. Trends in Poverty Alleviation Relocation Research

Earlier studies focused on the analysis of migrant migration intentions and the factors that influence it. Zhang Lu et al. found that farmers' willingness to accept rural re-configuration is the result of a combination of their household characteristics, settlement infrastructure, and occupational [4]. Yezhi Qiang tried to use GIS technology to identify suitable resettlement sites for ethnic minority relocation projects [5]. In addition, the problems faced by ethnic minority immigrants after they enter the place of migration have also become a hot topic of concern for scholars. Many scholars have studied the factors influencing the livelihood strategies of ethnic minorities after relocation [6-7]. And Wen Hu e explored the key factors that produce social isolation in resettlement areas [8]. Deming Zhu believes that communities such as infrastructure, social interaction, economy, and living environment significantly influence the construction of local attachment [9]. In terms of ethnic relations in the relocation site, Luo Rong argues that farmers in ethnic areas move to live in a new environment, which exposes them to conflicts in language, lifestyle, and cultural habits [10]. Luo Chengsong found that cultural identity was the primary factor influencing ethnic relations [11]. Some scholars have proposed preservation strategies for minority cultures in the relocation areas [12]. In terms of the resettlement model, Wu Xingyan believes that the unified planning and construction model of relocation has led to changes in four areas: residential space, economic space, social interaction space, and political space [13]. Xie Dawei observes the exchange and identity between different ethnic groups in the community from the perspectives of cultural inter-embedding, psychological inter-embedding, and economic inter-embedding [14]. And in the field of

research in architecture, Wang Jianhua applied Yao cultural elements to the landscape design of the resettlement area for PAR [15]. Liu Jiaping designed a new form of earth maintenance dwelling suitable for the development of ecological architecture in the resettlement area and made a demonstration for the development of Yi raw earth dwellings [16].

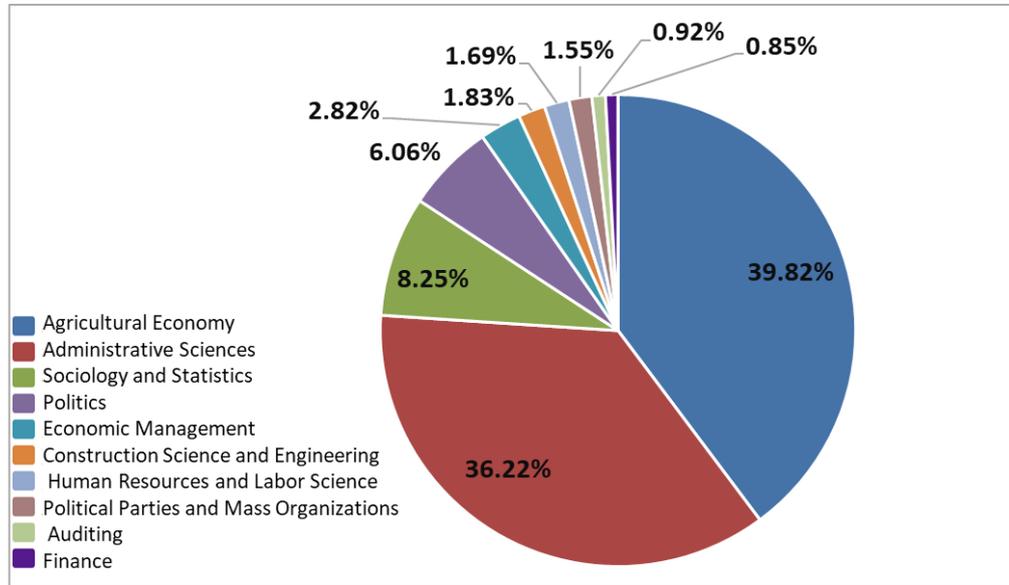


Figure 2-5 Minority PAR research field

In summary, most of the existing studies on PAR for ethnic minorities focus on economics, management, and anthropology, but these studies provide valuable references and support for the construction of indicator sets. In this study, we explore the influencing factors of occupancy satisfaction in minority resettlement housing from the Post-occupancy evaluation, which helps to supplement the entire understanding of the spatial dimension of PAR buildings.

2.2 Theoretical Perspectives on Living Environment

2.2.1 Human Settlement environment

Housing contributes to levels of poverty and deprivation and is an important topic even in countries where overall poverty levels are declining [17]. Housing, as a form of the built environment [18], should be comfortable, economical, reasonably maintained, and architecturally expressive while being connected and compatible with the environment [19].

Since the middle of the 18th century, with the accelerated industrial revolution and

urbanization, along with various ecological and environmental problems, the United Nations (UN) Vancouver Declaration proposed the concept of habitat as a collection of human societies, including all social, physical, organizational, spiritual and cultural elements, covering cities, towns or rural areas. It consists of the physical elements and the services that support them (UN, 1976). The physical elements include housing (providing security, privacy, and independence for humans) and infrastructure (i.e., the complex networks that deliver goods, energy, or information). Services, on the other hand, cover all the elements that communities need to fulfill their functions as social agents. Currently, habitat is considered the spatial dimension and physical manifestation of socio-economic activities (UN, 2012). All creative behaviors are inseparable from the influence of habitat conditions; therefore, building a good habitat is undoubtedly an important goal and measurement indicator of socio-economic development, as well as a prerequisite for development.

The theory of the human settlement environment is an important foundation for the study of living environment conditions. The science of human settlements originated from urban planning. Before the concept of human settlement environment was formally proposed, early urban planning ideas already reflected the concept of human settlement environment with natural ecology as the core, such as Howard's "garden city" [20].

Thereafter, the science of human settlement was founded by Doxiadis in the 1950s. After reflecting on the urban problems of the 20th century, he argued that all human settlements, both urban and rural, were in crisis and that "human settlement no longer satisfies its inhabitants. From an economic point of view, many inhabitants are unable to obtain their basic needs in settlements and are either homeless (as in cities such as Calcutta) or living in extremely poor quality houses, as is the case in many cities and all villages around the world. From a sociological point of view, the 'human being' has been forgotten in the cities, and a sense of abandonment has gradually developed among the inhabitants of many small towns and villages. From a political point of view, the new social formations and new people have not yet found the right political institutions to match them. From a technological point of view, most human settlements still lack the facilities necessary for their proper functioning, despite the rapid advances in technology today. Finally, from an aesthetic point of view, too, we only have to look at the ugliness of the existing settlements around us to agree with this judgment." [21]

In order to solve the problems of human settlement, Doxiadis believes that it is necessary to create a systematic and comprehensive science of human settlement, based

on multidisciplinary synergy, to truly understand the objective laws of urban and rural settlement and to guide human beings in the correct construction of human settlements [22].

Doxiadis classifies human settlements into five basic elements, including natural, human, social, residential, and support networks [23]. (1) Nature, which refers to the overall natural environment, is the basis for the creation and function of the settlement; (2) Humans, which refers to the settlement as individuals; (3) Society, which refers to the system of human interactions; (4) Architecture, which refers to all structures that provide a substrate for humans and their functions and activities; (5) Support network, which refers to all man-made or natural linkage systems that serve the settlement and link the settlement as a whole, and considers "The interrelationship between the five elements forms the human settlement.

In the 1970s, urban development began to emphasize the improvement of residents' quality of life, and quantitative methods began to be applied in the index system of urban habitat. In the 1980s, sustainable development became an important element of habitat development, and since 2000, habitat planning began to focus on equity, and in early 2005, the Global Habitat Forum was established by the United Nations Committee on Communication, Cooperation, and Coordination. During this period, urban habitat construction began to move from theory to practice.

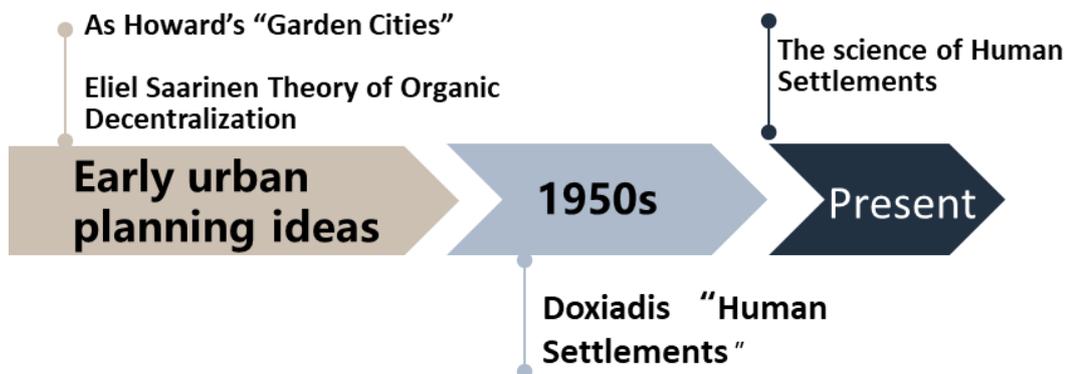


Figure 2-6 Development of Human Settlements Theory

With the intensification of the dramatic changes in the habitat environment and the increasing prominence of habitat problems, more and more academic research has begun to focus on the habitat environment and its dynamic evolution. Habitat science is an open discipline system, involving geography, urban planning, ecology, social science, etc.

2.2.2 Residential environment

Guided by the science of human settlements and the theory of sustainable development, research on the evaluation of the living environment has become increasingly active. The living environment is usually defined as the sum of various environments surrounding the living space, including natural conditions, various facilities, and the social environment of the area [24]. In 1961, the World Health Organization (WHO) proposed four basic concepts of the living environment, namely safety, health, convenience, and comfort, and this concept has been widely adopted around the world. The Japanese scholar Asami added the concept of sustainability to the traditional four concepts by considering the degree of individual contribution to society as a whole [24]. Ge Jian et al. added the concept of "community" to represent the spiritual needs beyond the basic material needs of the living environment [25].

Some planning scholars argue that the residential environment includes three separate dimensions: the dwelling, the physical spatial structure of the residential community, and the neighborhood, which represents the social dimension [26]. The study of the residential environment is similar to that of the habitat environment but differs in the scale and scope of the study. The habitat environment is usually studied at five levels: global, regional, urban, community, and architectural, while the scale of the study of the residential environment is usually at the level of streets, neighborhoods, and buildings within a separate city or town, and the scope of the study focuses on aspects of the physical and social environment of the city. From the early days when the concept of living environment focused only on the physical environment such as buildings and streets, with the rise of humanism, it began to focus more on the human scale and human needs, emphasizing the importance of the social environment. At the same time, for different research scales, the focus of residential environment research content is different. For example, at the urban scale, residential environment research focuses on the natural ecological environment, the configuration of public services, and the social and cultural atmosphere and historical heritage; while at the community scale, it focuses on community public space, building density, community-level services, and neighborhood interaction; at the architectural scale, it At the building scale, the focus is on household type, housing size, family relationships, etc. [27].

2.2.3 Evaluation of residential environment

From the perspective of policy research, the purpose of residential environment assessment is to accurately and objectively understand the current situation and

problems of the residential environment in an area, and on this basis propose reasonable improvement goals and formulate effective improvement measures. Although the qualitative or quantitative description of the current situation through spatial evaluation can help to grasp the problems, the strengths and weaknesses of the study area can be clarified by comparing them with each other, and social consensus can be aroused.

The evaluation research on the living environment includes at least two major elements: first, the evaluation of the objective entity of the living environment, including the analysis of the influencing factors of the living environment, the evolution mechanism, and the integrated simulation research. The evaluation index system mainly includes the specific indicators of the components of the hard environment and the soft environment, and the indicators can be divided into three categories: portraying the state, reflecting the trend, and measuring the orientation.

Among these studies, many excellent ideas have been analyzed and refined, and they provide a lot of valuable references for the theory and practice of habitat construction in China. For example, Ning et al designed a habitat index including living conditions, ecological environment quality, infrastructure, and public services to evaluating the changes in the living environment in recent years, and put forward the principles and suggestions for optimizing the habitat environment in Shanghai; Ning proposed an evaluation system including living conditions, public facilities and services, infrastructure, landscape and ecological environment, and community and cultural environment for the characteristics of small towns. The evaluation system includes indicators such as living conditions, public facilities and services, infrastructure, landscape and ecological environment, and community human environment, etc., and designed a model to evaluate the habitat environment of small towns in terms of residents' satisfaction, development degree (residents' evaluation of development status) and livability degree (a combination of satisfaction and development degree); Wu proposed a multi-dimensional sustainable development system in horizontal (including economic development, social development, resource and environmental development, and physical development) and vertical (including home, community, town, and region); Chen Fu-Min et al. Chen proposed the evaluation system of the urban habitat environment from the principles of safety, comfort, harmony, and convenience, and the evaluation factors of building quality, environmental safety, landscape, public services, and community culture to assess the satisfaction of the urban habitat environment; Gu proposed to construct urban settlements or ecological cities from several aspects such as economic environment,

ecological environment, and social environment. Li Bin proposed to evaluate the quality of urban habitat construction in terms of the natural subsystem, architectural subsystem, supporting subsystem, and social subsystem; Hu proposed to evaluate urban habitat in terms of living conditions, urban ecological environment, public service infrastructure, and sustainability; Zhang proposed that the evaluation of urban livability should focus on the urban scale, in terms of safety, health, the convenience of living, transportation, etc. Zhan proposed that the evaluation of urban livability should focus on the scale of urban areas, and evaluate the five dimensions of safety, health, the convenience of living, the convenience of transportation, and environmental comfort, and take Beijing as an example to conduct a comprehensive evaluation of urban livability employing a survey of residents' satisfaction. We proposed a system of evaluation indexes including social civilization, economic affluence, environmental beauty, resource carrying capacity, living convenience, and public safety in the design of "scientific evaluation criteria for livable cities". In short, the focus of the research is mainly concentrated on the design of the index system and the quantitative description and comparative analysis of the spatial environment. In terms of the technical route, it is usually to establish an evaluation system containing several elements or statistical indicators and then conduct a single-factor or comprehensive evaluation. At the macro level, it focuses on the overall strengths and ranking of cities and regions, and analyzes the strengths and points out the weaknesses of each city or region through comparison; at the micro level, it focuses on finding the weaknesses in the living environment and puts forward rationalization suggestions.

In a comprehensive view, regarding the evaluation of the residential environment, research hotspots mainly focus on urban and suburban areas [28,29], and some scholars have also evaluated rural areas [30], and most of them have evaluated the objective entities or subjective perceptions of the residential environment by establishing corresponding models and constructing relevant evaluation indicators. Although there are many evaluation indexes, it is difficult to reflect the living environment of relocation and resettlement areas because of the large evaluation scale or the lack of relevance.

The living environment is an issue of great concern to urban residents in their daily lives. It is important to analyze residents' psychological perceptions of the facilities, environment, culture, and service contents of the living environment the residents themselves, which is an important guideline for the construction of the living environment. Compared with previous studies based on objective data, studies based on residents' subjective evaluation can better reflect the concept of "people-oriented"

urban development. The quality of the living environment serves people, and its quality is ultimately judged by people's subjective perceptions.

The minority settlement environment is a component of the rural habitat environment. The rural habitat environment consists of natural, human-made, and social environments [31], and the environmental components of these settlements determine the well-being and productivity of rural residents [32], for which the construction of targeted evaluation indicators is crucial.

2.3 Overview of Post Occupancy Evaluation (POE) and Residential Satisfaction

2.3.1 Definition of POE

Emerging from the mid-1960s, POE, full name: Post-Occupancy Evaluation. Research scholars have provided different explanations for the conceptual definition of POE depending on the research perspective [33]. The definition of POE research elaboration given by more representative scholars is briefly sorted out in the following table.

Table 2-3. The definition and focus of POE

Scholar or institution	Define	Focus
W. F. Preiser, White, & Rabinowitz(2015)	"Post-occupancy evaluation is the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time. "[34]	Building occupants and their needs, and thus they provide insights into the consequences of past design decisions and the resulting building performance.
Friedman et al., (1978)	"An appraisal of the degree to which a designed setting satisfies and supports explicit and implicitly human needs and values of those for whom a building is designed"[35]	The results depend on the users of the project
Zimring and Reizenstein (1980)	"the examination of the effectiveness for human users of occupied design environments"[36]	"Effectiveness" includes the many ways that physical and organizational factors enhance the achievement of personal

Scholar or institution	Define	Focus
		and institutional goals.
Royal Institute of British (1991)	“a systematic study of buildings in use to provide architects with information about the performance of their designs and building owners and users with guidelines to achieve the best out of what they already have” [37]	A diagnostic tool for the evaluation of building performance

From the definitions given by scholars, it is obvious that POE plays an important feedback role in the life cycle of a building [38] and provides insights to building industry professionals and facility managers on how to improve the design and operation of the built environment [39], with the building occupants being the focus of post-occupancy evaluation.

2.3.2 Features and classification of POE

① POE has the following three characteristics

1) Objective data sources.

Post-use evaluation should ensure the objectivity and authenticity of its information sources, rather than the subjective experience of conjecture, to evaluate and analyze the building from the perspective of users, managers, and other parties to ensure the objectivity of data with the reference value.

(2) Scientific analysis method. Analyze and compare the evaluation results and information according to the standardized and systematic evaluation procedures, and use quantitative analysis methods such as data analysis to ensure the scientific correctness of the analysis results.

(3) Practical evaluation conclusions. The evaluation results should be able to judge whether the actual use of the design meets the needs of users, whether the architectural design is reasonable, and to propose strategies for solving existing problems and extracting what can be learned from the design to provide reference decisions for its future similar buildings.

② Classification of POE

Preiser, a well-known scholar, classified POE into three categories according to the depth of architectural evaluation: descriptive evaluation, investigative evaluation, and diagnostic evaluation.

Although each POE has different objectives and time intervals, the operational procedures share the same three phases (Figure 2), i.e., plan-implement-apply, and the results can all equally influence future design decisions.

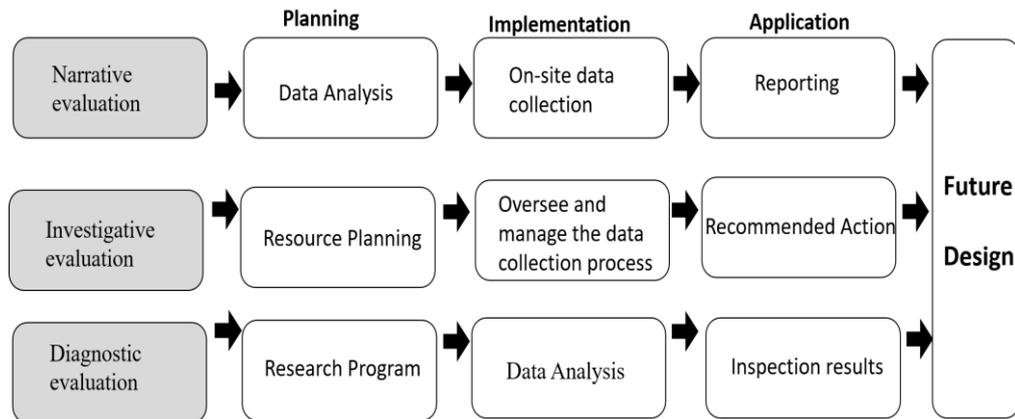


Figure 2-7. Operating procedures of POE

Source: Adapted by the authors from Post-occupancy Evaluation

1) Narrative evaluation. The narrative evaluation is a short-term evaluation of the building, which generally takes 2-14 hours. Through direct on-site investigation and information collection, it simply describes the building's performance and environmental advantages and disadvantages and makes an objective and true report, and the comments are more subjective.

2) Investigative evaluation. Investigative evaluation takes longer than the narrative evaluation, generally 6-10 days, the need to use a variety of survey methods to collect feedback from users, to evaluate the use of the situation and the main problems of the performance indicators, and the evaluation conclusions are more objective and reliable.

3) Diagnostic evaluation. Diagnostic evaluation is a comprehensive and in-depth evaluation of the building performance of the research object, the survey time is more than six months. The survey results not only put forward improvement opinions on the research object but also reveal the prevalent problems for analysis and provide new decisions for similar buildings for design in the future.

2.3.3 Review of POE research

The exploration of POE began in Europe and the United States in the 1960s, with the post-war economic boom and a period of great historical change in social form, in which the economic and cultural context rendered the psychological disciplines and some applied disciplines to develop deep, and POE was born in such a context. In the nascent period, some university scholars conducted small-scale individual case studies around group dormitories and schools and drew theoretical and practical results from them to feed back to serve the subsequent construction of such buildings.

In the 1970s, POE gradually gained the attention of the academic community and its research theories and operational methods also tended to mature, and the research objects were gradually expanded, such as public housing, hospitals, office buildings, etc. [40], and the research objects were also extended from ordinary users to official office clerks and military personnel [41]. In the late 1970s, the famous American scholar Friedman published a classic book describing POE: "Environmental Design Evaluation" (Friedman Environmental Design Evaluation", which explained POE. Not only that but also explored deeply from the perspective of social science and put forward a relatively comprehensive and complete theoretical system framework, the evaluation theory and procedures of POE were more clearly defined [42].

In the 1980s, POE was implemented in a wide range of spaces and fields, such as the extension of conventional corporate offices, government buildings, all kinds of public buildings, and even urban public open spaces, and the theoretical approach was improved to give scientific guidance for practical application, prompting POE to reach the stage of practical application. The masterpiece, Post-Occupancy Evaluation, provides a very practical post-use evaluation model, focusing on office buildings and general-purpose studies, using several case studies to demonstrate the use of descriptive, research, and diagnostic levels in different scenarios [43], and this theory has given many architecture and evaluation scholars with guidance and was widely absorbed and further extended.

In the 1990s, with the substantial deepening of POE theory and practice, its research objects and scope have become more and more extensive, covering a wide range of building types, including almost most building types, coupled with the theoretical achievements of related disciplines, have had a profound impact on the development of POE theory, making the original theoretical basis and practical experience tend to be perfected, and many theories and methods of humanities and social sciences are combined in the actual research work. In the actual research work,

many theories and methods of humanities and social sciences are combined in it, which makes the discipline more comprehensive. As a result, theoretical researchers and practitioners of POE are valued and respected in society. For example, Professor Plessy of the University of New Mexico has directed his architecture students to publish several research papers on elderly care facilities, which have been highly recognized by the academic community. The University of Michigan has several architectural doctoral dissertations on satisfaction studies, such as "A Study of Satisfaction in Subsidized Housing: An Evaluation Study of the Real Estate Development Fund Program in Saudi Arabia" [44].

Many international countries have established evaluation models in POE, and gradually formed an increasingly comprehensive, universal, comprehensive and systematic theoretical evaluation system [45]. These model systems can be briefly summarized into two aspects: first, the hard survey of the physical environment indicators of the building project, POE is used to evaluate the performance of the building's technology, construction methods, material selection, and other indicators; second, the system is appropriately used to investigate and measure the flexible behavior psychology of the building to assess whether it meets the original intention and psychological expectations of the designers and users.

Currently, POE is used more often in six building types: residential, university, office, school, public, and hospital [46]. However, POEs of residential housing facilities have only started to receive serious attention in the last two decades [47]. Studies have proven that post-building maintenance and operation costs can increase due to errors in planning, design, and technology application [48]. Therefore, it is necessary to establish a systematic feedback process from which lessons can be learned to ensure quality as well as value for money [49].

2.4 POE's residential satisfaction evaluation

Concerning post-occupancy evaluations conducted on low-income or public housing, many scholars have explored the physical environment of housing. Zhu Xiaolei discussed the sensitivity of the evaluation index of typical guaranteed housing in Guangzhou and concluded that thermal performance is an urgent issue in the current guaranteed housing living quality [50]. Michael found that the use of air conditioning in hot and humid climates may not improve the overall thermal comfort of occupants [51]. Habid Becerra-Santacruz's evaluation of low-income housing in Mexico used a

four-dimensional interactive visualization to present the results of temperature and humidity monitoring [52]. Wael evaluated the building performance of youth housing in terms of natural ventilation, thermal comfort, and light [53].

On the other hand, scholars have assessed public housing residents' preferences and satisfaction based on the POE approach to explore more rational and sustainable design strategies. Some scholars believe that residential satisfaction is the difference between actual and expected conditions of family housing and community [54]. Understanding the factors that determine the level of housing satisfaction is fundamental to the development of any successful housing policy [55]. Moreover, understanding the behavior and experience of the occupants in the POE helps to identify shortcomings in building operations [56-58]. A.M.MI studied satisfaction with public housing from a Hong Kong perspective using the POE method, suggesting that the differences in satisfaction with the living environment among subjects with different social statuses may reflect differences in the perception of social class [59]. Tanaphoom Wongbumru's assessment of satisfaction with old and new public housing in Bangkok is based on three aspects: residential units, building units, and the community environment [60]. Doris CCK sees problems with public housing in Brazil linked to reduced utility bills [61]. Among M Kantrowitz's researchers, the sense of territory is an important influencing factor of residents' satisfaction [62]. Eziyi Offialbem believes that the type, location, and aesthetic appearance of the main activity areas, as well as their size, determine public housing satisfaction [63]. Husrul Nizamet tried to relate POE to the security of low-cost housing in Malaysia [64]. Fan Wu et argue for the need to pay more attention to sound insulation and community facilities in public housing [65]. Nese Dikmena Finds that Post-Disaster Public Housing Residents Prefer Traditional Homes [66]. And Incorporating participatory design in public housing helps identify the housing needs of the occupants [67]. Zhuang Weimin believes that in future development, more attention should be paid to the user's subjective feelings, spatial experience, and soft indicators such as architectural appearance and aesthetic quality [68]. Although many factors have been evaluated for public housing, there is still a lack of a set of explanations that are appropriate for minority PAR housing. In this paper, we hope to explore which factors contribute to residence satisfaction in PAR.

From the above study, it can be seen that the satisfaction level of housing can be studied through the POE method, while the satisfaction level of low-income or public housing can be influenced by the social characteristics of the population and various physical environment factors, and further specific analysis is needed for the factors

influencing the relocation and resettlement housing of ethnic minority immigrants due to the differences in housing type, society, policy, and culture.

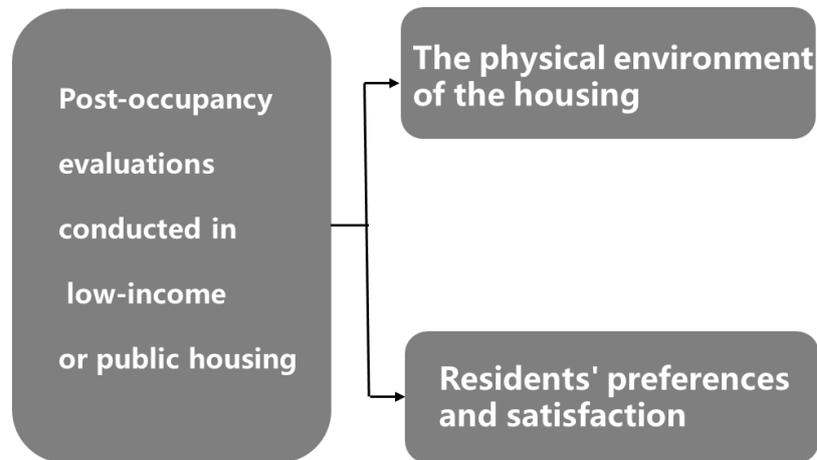


Figure 2-8 POE Research Directions in Low-Income or Public Housing

2.5 The guidance value of the POE method for this paper

POE is a scientific procedure and tool with objective data sources, scientific analysis methods, and practical evaluation results. The direct results of POE can form a feedback mechanism for architectural design, which can help designers to make decisions on the design of similar buildings in the future and promote the effective improvement of design quality.

The research on the architectural design of minority settlement areas should not simply study the surface phenomenon, focusing only on the creative thinking of the design theme, the architectural form, and the analysis method of image thinking, and personally judge the success of its architectural design, outside the users and social environment. The rationality of the design results should be scientific and objective testing and investigation, combined with the recognition of the user group, to further derive the results for use in the same type of architectural design.

Therefore, the POE method is a scientific and necessary research procedure to explore the influencing factors of the architectural environment of minority resettlement houses, and to conduct systematic and scientific research on minority resettlement houses from various aspects such as users, social relations, social culture, and built environment, so as to finally come up with a more objective design strategy and provide a scientific reference for future minority resettlement house designs.

2.6 Summary of the chapter

This chapter makes a systematic study of related research contents. In the study of Ex-situ poverty alleviation relocation, the development overview of easy poverty relocation, relocation and resettlement methods, and construction requirements of relocation and resettlement houses in China are reviewed, and then the research trends of Ex-situ poverty alleviation relocation for ethnic minorities are analyzed to have a more comprehensive understanding of easy poverty relocation and resettlement areas for ethnic minorities. The study then reviews the current state of research on habitat and living environment theory and explores the relationship between the two. Further, the current research on the evaluation of the living environment is analyzed. In the overview study of the post-occupancy evaluation method, the definition of POE, the characteristics of the POE method, the classification of the operation process, and the research overview are analyzed, and the current state of research on residential satisfaction was analyzed. Finally, the guiding significance of the POE method for this study is proposed in conjunction with the purpose of the study.

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Chapter 3 Research Methodology

3.1 Case Study

In this paper, Pu'er city is selected as the study area of PAR housing for ethnic minorities in southwest China. The regional environment is the background for the construction of migrant relocation and resettlement areas. This section analyzes the regional environment of Pu'er from natural ecological, social-humanistic, and spatial aspects as the basis for the selection of the study sample, the evaluation of migrant relocation and resettlement areas, and the proposal of relocation and resettlement area design strategies.

3.1.1 Natural environment

Natural conditions are climate, geography, topography, vegetation, fauna, water, land, land use, etc., which are the place and basis for human gathering [1]. Whether it is an urban community or a rural village, the natural environment is an important part of human habitat. Minority relocation and resettlement areas are new rural communities that have been relocated from their original rural villages to new areas whose ecological and natural environments have been largely disconnected from the original village ecological environments. The ecological environment of the new rural communities formed through relocation has been inclined to that of urban communities, and the ecological environment components such as greenery, space, and water environment have been changed to different degrees. On this basis, the residents of the merged rural community will compare the ecological environment of the existing community with the ecological environment of the original rural community, and thus influence their satisfaction with the housing in the minority resettlement area.

The study provides an overview of the natural conditions of the study area in terms of geographic location, topography, climate, land resources, and vegetation ecology, and tries to identify the factors that limit the development of the human environment in the area and even lead to poverty in the area.

1) Geographical location

Pu'er City is located in the southwestern part of Yunnan Province, China, between 22°02'-24°50' N latitude and 99°09'-102°19' E longitude. It borders Vietnam and Laos to the southeast and Myanmar to the southwest, with a national border of about 486 km (303 km with Myanmar, 116 km with Laos, and 67 km with Vietnam). With a vertical distance of 208.5 kilometers from north to south, 55 kilometers from north to west, 299

kilometers from south to east, and a total area of 45,385 square kilometers, Pu'er is the largest state (city) in Yunnan Province. As a typical border minority underdeveloped area, Pu'er is a key development zone for easy poverty alleviation and resettlement in Yunnan Province.

2) Topography and Landforms

Topography and landforms not only determine to a large extent the location of village and town settlements, environmental characteristics, etc. but are also important considerations in spatial planning and development. The altitude of Pu'er City ranges from 317m to 3370m, with an average altitude of 1305m. The topography and geomorphology have obvious characteristics and are typical mountainous terrain, with large and small mountain ranges crisscrossing the whole area, and the mountainous area accounts for 98.3% [2]. The whole area can be divided into four types according to the terrain: dam area, mountainous area, semi-mountainous area, and alpine mountainous area. With high mountains and deep valleys, extremely inconvenient traffic, steep slopes, and little land, crop yield is not high, easy to cause regional poverty.

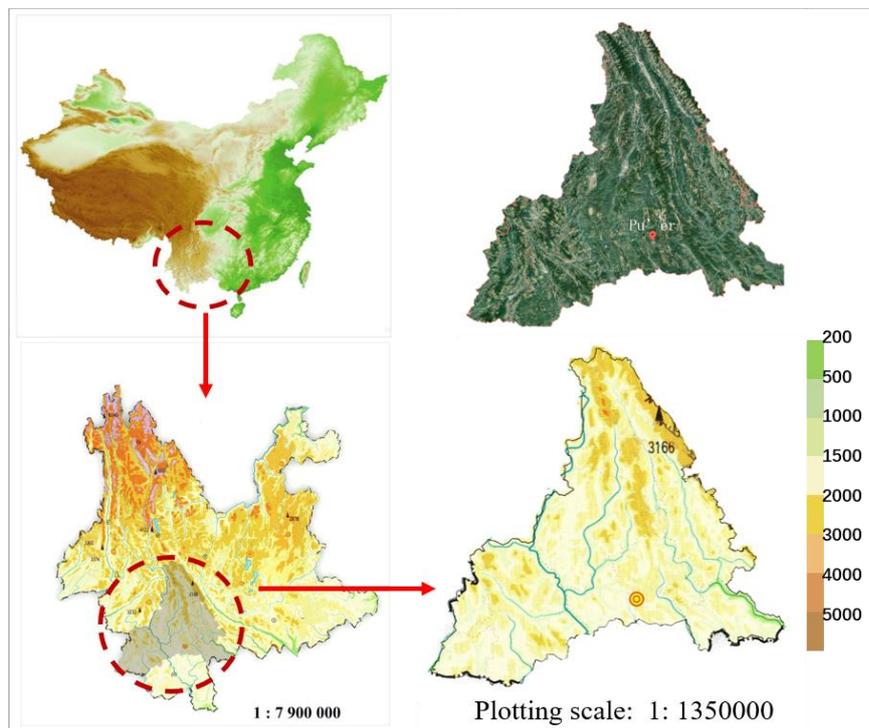


Figure 3-1. Topography of Pu'er City

3) Climate

Most of the area under the jurisdiction of Pu'er City is located south of the Tropic

of Cancer and has a mountainous monsoon climate with the south subtropical zone as the main part. Due to the influence of regional elevation, the vertical climate in the area has obvious characteristics, and different climate types are distributed at different altitudes with many characteristics of mountain climates. There are four types of climate, including central, southern, northern subtropical climate, and northern tropical climate. The average annual temperature is about 17~20°C [3], the four seasons are mild, the average annual rainfall is 1424~1624 mm[4], and the climate is humid. The temperature difference between day and night is small, sunshine is sufficient, and rainfall is abundant, but the dry and wet seasons are distinct, and the dry and rainy seasons have a large impact on the mountainous areas, and the output of the pillar industry agriculture is easily affected.

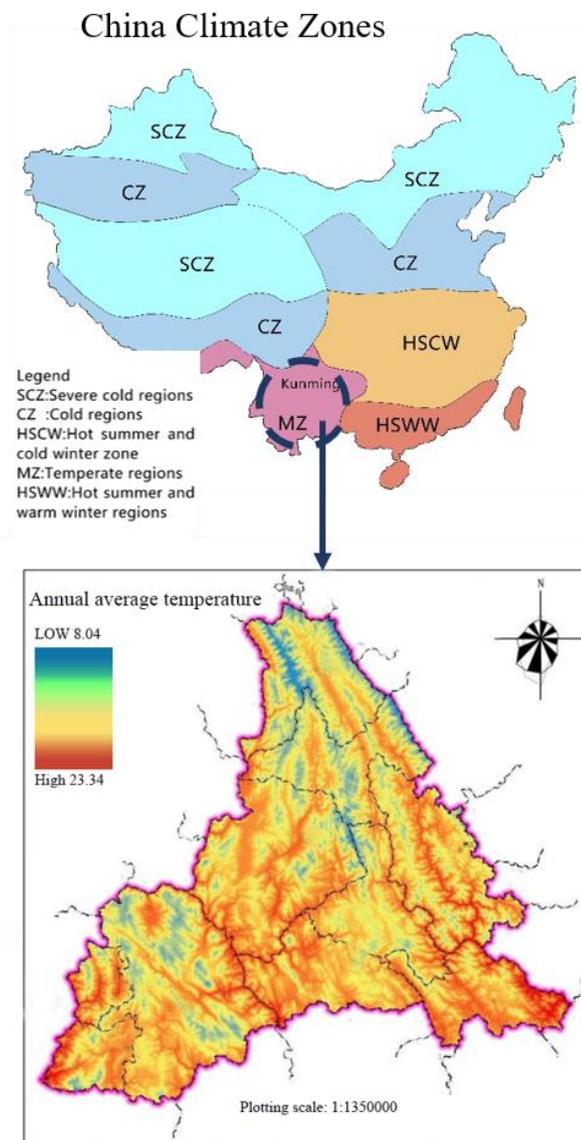


Figure 3-2. Annual average temperature conditions in Pu'er City

4) Land Resources

The total land area of Pu'er City is 45,000 square kilometers, with the mountainous area accounting for 98.3%. According to the results of the Third National Land Survey of China, the total scale of arable land in Pu'er City is 421,320.81 hectares, mainly dry land, 332,280.78 hectares, accounting for about 78.87% of the total scale of arable land, which is limited by topography and water distribution, with fewer reservoirs and ponds, resulting in less arable land with paddy fields, accounting for only about 20.01% of the total scale of arable land. Urban, town, village, and industrial and mining land 68,533.75 hectares [5]. Among them: 2991.39 hectares of urban land, accounting for 4.36%; 55968.44 hectares of village land, accounting for 81.67%.

5) Vegetation ecology

Pu'er City is rich in forest land resources, with a forest area of 3,303,900 hectares in 2020 and a forest coverage rate of 74.59%. The overall forest land resource area in Pu'er City decreases by 2484.74 ha and the grassland resource area decreases by 5992.37 ha from 2014-2018. The gradual decrease in the area of ecological space dominated by forest and grass resources indicates that the positioning of ecological functional areas needs further optimization and adjustment, and the spatial contradiction of human-land development as a key ecological functional area exists locally. In addition, the city's mountainous area accounts for 98.3%, with complex topography, geological structure, and fragile geological environment. Moreover, in recent years, heavy rainfall extremes are prominent, and natural disasters such as landslides, mudslides, cave-ins, and ground subsidence are very likely to occur. Villagers in mountainous and semi-mountainous areas build houses with improper site selection, imperfect drainage facilities, unreasonable slope excavation, and loading, etc., which may induce geological disasters.

3.1.2 Social and human environment

Coordinating the relationship between population, resources, environment, and development in the region will enable the region to maintain sustainable development capacity [6]. Some scholars believe that the socio-humanistic environment is a concept corresponding to the natural environment, which is the sum of various cultural phenomena of human society and all material and spiritual achievements created by humans in the process of transforming nature and transforming society. It can be understood as a system of a region, which, like a living body, has the process of birth,

aging, sickness, and death. The renewal and development of the components of the social and humanistic environment are the sources of vitality in the characteristics of the regional humanistic environment. Many scholars have studied the influential factors affecting immigrants' social adaptation, among which economic production, daily life, cultural practices, and identity are important factors affecting immigrants' social integration [7].

1) Regional population and ethnicity

A settlement is a community, and the so-called community is a relatively independent territorial society in which people carry out certain social activities, have social interaction, and have common cultural maintenance [8]. From the definition of community, we can know that community includes spatial, cultural, physical, and demographic elements, of course, the most important element is a certain population group, and territory without a population cannot be called a community.

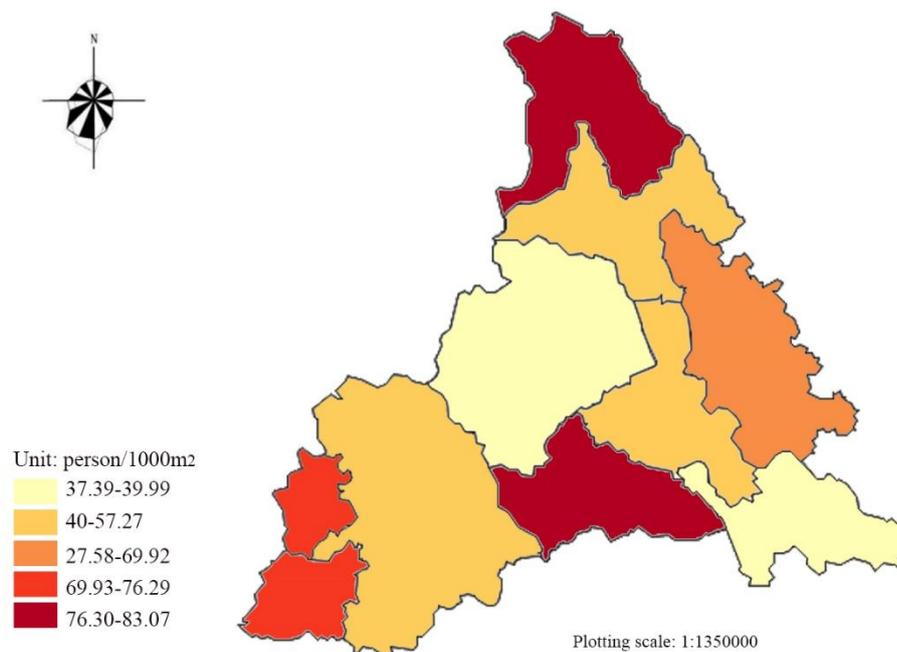


Figure 3-3. Population Density by County in Pu'er City in 2018

According to the data of the seventh national census of China, in 2020, the resident population of Pu'er City included 970,000 people living in cities and towns, accounting for 40.53% of the total population, and 1.43 million people living in villages, accounting for 59.47% of the total population. Among the 10 counties (districts), the top three in terms of the population were Lancang County, Simao District, and Jingdong County, with a combined population of 48.27 of the city's total

population. Geographical differences make the spatial distribution of the population vary widely among districts and counties. From 2014 to 2018, the trend of concentrating the city's population in key development areas is not obvious, and a large household population is still solidified in the original agricultural production space and ecological protection space [9].

The population of ethnic minorities in Pu'er City reaches 1,471,600, accounting for 61.2% of the total population. There are 26 ethnic minorities in the region, and 13 of them have been living here for generations. There are mainly Hani, Yi, Dai, Lahu, Wa, Brown, Yao, etc. Four counties in Pu'er City, namely Lancang, Menglian, Ximeng, and Jiangcheng, are border counties with 486.3 kilometers of national border and 16 border townships (towns) bordering Vietnam, Laos, and Myanmar respectively. Among them, there are 48 administrative villages and 358 natural villages on the frontier line, and all 48 frontier villages involve ethnic groups living across the border. The border areas are mainly dominated by ethnic minorities such as Wa, Lahu, Dai, and Hani, who directly transitioned from primitive or slave societies to socialist societies before liberation, but their lifestyles and production habits remain from primitive and slave societies.

2) Regional Economic Development

The economic construction of Pu'er City started late, with a low degree of social development and a weak development foundation. Among the 9 autonomous counties of ethnic minorities and 1 county-level district in the city, there are 8 national-level poor counties and 10 districts and counties included in the scope of regional development and poverty alleviation in the mountainous regions of western Yunnan. Through the implementation of poverty alleviation policies, the proportion of the city's poor population with an annual income of more than 5,000 yuan rose from 3.69% in 2015 to 95.34% in 2019. 600,000 poor people will all be lifted out of poverty in 2020, and the implementation of poverty alleviation policies has made positive contributions to economic development, ethnic unity, frontier consolidation, and social harmony in Pu'er City [10].

In recent years, the economy of Pu'er City has been growing steadily, and the regional GDP in 2021 is 6.7% higher than the previous year. during 2015-2019, the per capita net income of farmers and per capita disposable income of urban residents are climbing. However, the gap between urban and rural per capita income and expenditure is still large (Figure 3-4).

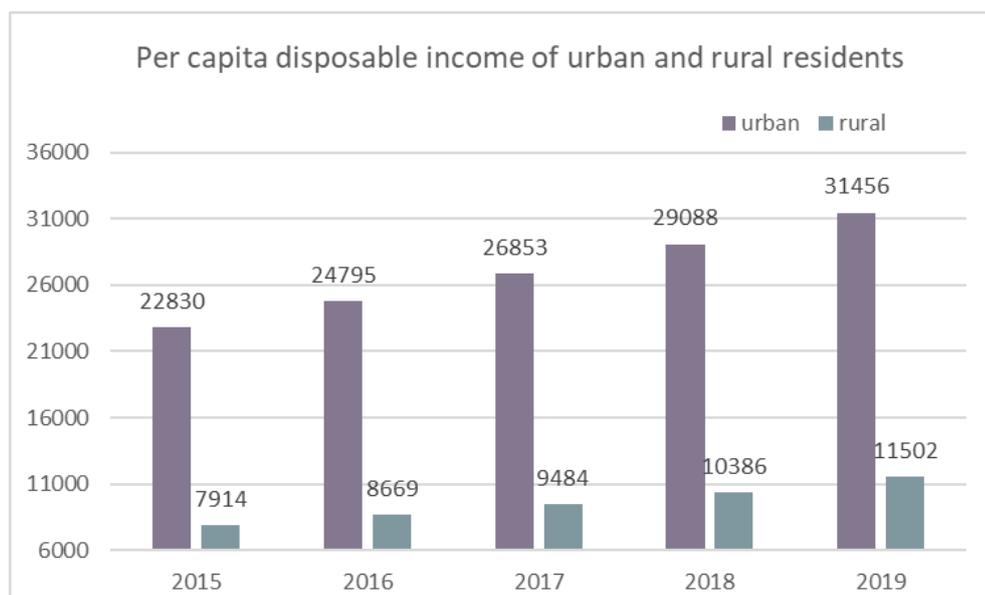


Figure 3-4. Per capita disposable income of urban and rural residents

3) Culture and Education

Pu'er is the prefecture-level city with the largest number of ethnic components in the country, with its unique regional culture and rustic folklore. Since ancient times, Pu'er has been a channel for ethnic migrations and has accumulated rich and colorful historical and cultural heritage resources. The unique and rich folk culture and the rich folk music, dance, crafts, sports, food, costume culture, and highly distinctive customs created by various ethnic minorities have made Pu'er a bearer of ethnic folk culture. The regional architecture created by ethnic minorities over the centuries has formed a distinctive architectural culture, representing the creativity of a nation and the mark of the times. The inheritance and innovation of ethnic architectural culture are conducive to the study of ethnic architecture with distinctive regional characteristics and the understanding of ethnic customs and habits, religious beliefs, and aesthetic concepts.

In terms of education, Pu'er City has fully implemented various student financial aid policies, and the consolidation rate of nine-year compulsory education has reached 84.59% (The 13th Five-Year Plan for Education Development in Pu'er City); an important breakthrough has been made in the balanced development of compulsory education. However, constrained by the level of economic development, education investment is still insufficient, infrastructure construction is lagging, and the standardization of compulsory education schools has a long way to go. Among the city's population aged 15 and above, 5.96% of the population aged 15 and above are

illiterate, the development of education for ethnic minorities is slow, the population of illiterate and semi-literate is large, the population with higher education is small, and women's education is obviously at a disadvantage. In particular, the disadvantage of the geographical environment in poor areas and the imperfect infrastructure have led to the inability of the more advanced technology and talents from the outside world to communicate and guide in a practical way. Therefore, for people in poor areas, the poor living environment has led to a lack of education in terms of talent, resulting in the vast majority of people's education level being relatively low, at the same time, the education status of ethnic minorities is seriously affected by economic and geographical factors, and the education of specific ethnic minorities is very backward [11].

3.1.3 Spatial camping environment

1) Traditional Minority Houses in Pu'er City

The earliest form of architecture for ethnic minorities was cave dwellings. Later, they built houses on trees to avoid fierce animals and entered the era of nesting. After saying goodbye to the nest dwelling era, they built traditional dry-rail buildings by using elevated construction methods, and partly under the influence of Han Chinese houses, they built straw-wood houses with four sides completely on the ground. Dry-pen-type houses have the common features of traditional dry-pen buildings, the upper floor is enclosed on all sides as living space, and the lower floor is elevated to keep livestock or pile up miscellaneous things. The difference is that traditional dry-pen houses are mostly used by the rice farming people to prevent moisture and flash floods, while for the people, the elevated houses are more for the continuation of the nesting era to avoid insects, snakes animals and to prevent moisture [12].

The common features of both dry-rail houses and floor-to-ceiling houses are the low-pressing caged grass roofs and exaggerated curved side eaves. The roof is used to cover the entire house, following the practice of bird's nests in the nesting era. The huge curved side eaves have the function of blocking the wind and rain, and the partial rooms can be added under the eaves to increase the use of space, which, together with the simple structure and convenient construction, have been used until now. Influenced by the neighboring ethnic groups, after the cliff painting era, some ethnic minorities, such as the Wa, Dai, and Brown, added elevated sunbeds to their dry-rail houses in the areas immediately adjacent to the houses for drying grain, neighborly exchanges, and women's fabrics. The floor-to-ceiling sunbeds are located separately on one side of the house and detached from the dwelling. The early houses were built facing the cliff wall,

and later, even though they were detached from the cliff wall, the concept of building with a high slope as the main direction was still maintained.

Most of the poor ethnic minorities in Pu'er City live on the southwestern edge of Yunnan, which is located in a complicated terrain and inaccessible so the integration process between ethnic groups and Han Chinese is slow, and the ethnic cultures are still well preserved, and most of the rural buildings of ethnic minorities retain their ancient and primitive architectural forms. The distribution of ethnic groups has led to differences in economic methods and productivity levels, the migration of ethnic groups due to population distribution, social and historical turmoil, and the natural climate and geography have all contributed to the uniqueness of traditional farmhouse spatial forms of ethnic minorities.

First, the Adaptive characteristics of traditional houses of ethnic minorities to the geographical environment

In Pu'er City, there are many valleys and few flatlands, rivers are crisscrossed, mountains and rivers are interconnected, the elevation of the territory is high in the north and low in the south, and the elevation of the territory is 1500~2000m. Due to the heavy mountains in the minority settlement areas, villages and cottages are generally located on the hillside or flat places on the top of the mountains, which are built from high to low and arranged in a neat and orderly manner, which is more conducive to the ventilation between buildings. However, because of the higher slopes and hilltops, the wind is stronger, so some minority houses are generally built with lower heights and steeper roof slopes, and short gables to prevent wind. Generally speaking, most of the flat places build floor-to-ceiling houses or flat palm houses, and in places where the height difference is relatively large, the height difference is absorbed by building a dry-rail building with an elevated bottom floor. At the same time, it can resist attacks from fierce animals or snakes, etc.

Second, elements of minority characteristics are under the influence of climate.

From the above analysis, we know that the dwellings of ethnic minorities are distributed in the subtropics near the Tropic of Cancer, with no severe cold in winter and no severe heat in summer. The average annual temperature is 10°C-13°C. Rainfall is abundant throughout the year, with an annual rainfall of about 1500mm.

In such a climate with high rainfall, high air humidity, and strong solar radiation, to prevent moisture, shade, and radiation, ensure air flow and circulation, and achieve ventilation and heat dissipation, the architectural form of minority houses in the region

adopts flat palm houses. To prevent dampness, shade, and radiation, ensure air flow and circulation and achieve ventilation and heat dissipation, the construction forms of minority houses in the region are flat palm houses, floor-to-ceiling houses, and dry fence houses with an elevated ground floor. In humid and rainy environments, most of the residences are hipped roofs or four-slope roofs, which are conducive to blocking rainwater and preventing the washout of rainwater on the side walls. The purpose of the elevated dwelling is not only to facilitate waterproof ventilation, but also to prevent moisture and avoid the infestation of insects and snakes, and also to resist flooding when flash floods come. The construction materials of minority houses are mostly made of rammed earth, round wood, bamboo, thatch, and tile. Because of the fire-pit culture, religious beliefs, and lifestyle dependence on fire pits, the main fire pits of ethnic minorities stay lit for years.



Figure 3-5 Traditional Minority Dwellings in Pu'er City

(2) The dilemma of the geographical location of minority villages in Pu'er City

The border villages in Pu'er City are generally characterized by scattered buildings, single-story dwellings, chaotic spatial utilization, inefficient community management, low-quality of the human living environment, and weak infrastructure. The spatial concentration of ethnic minority settlements is low, with small-scale and fragmented distribution, and they are mostly located in mountainous areas with closed transportation.

The complex and diverse terrain, fragile ecological environment, backward transportation facilities, and remote location conditions cause the spatial constraint of rural development in the less developed areas of Pu'er. On the one hand, the area is mostly a mountainous and deep valley of the Hengduan Mountains, with crisscrossing mountain ranges, three rivers, and lofty and precarious terrain. Most of the villages are influenced by the topography and ecological environment, and the vertical altitude difference of the settlement is large, forming a typical three-dimensional spatial pattern of mountain settlement, showing a spatial pattern of "large dispersion and small settlement", resulting in the scattered distribution of many villages, which has a strong spatial concealment. On the other hand, the less developed areas have only some low-grade roads for a long time, until the 21st century, national highways, high-speed, railroad, and air transport lines have been developed rapidly. The region has been in a state of backward transportation facilities and inconvenient travel for a long time, and most of the villages are weakly connected with the outside world, with less factor flow, and in a one-way export state.

For the economy of a region to develop, it needs to have more convenient transportation facilities and related infrastructure as a guarantee. Secondly, with good infrastructure conditions is to have a relatively unique geographical advantage, if a region in the more difficult mountain, will form a certain traffic with the outside world and poor communication conditions, it is impossible to have timely and effective communication with the outside world on information, communication. This inevitably leads to information asymmetry, and more convenient and beneficial policies for the people cannot be put into practice.

In Pu'er, 98.3% of the land area is mountainous terrain with heavy rainfall, and many villages with poor people are built in areas prone to geological disasters, which makes the living conditions harsher. At the same time, the transportation infrastructure

in many places is backward, and the development of production is constrained, making it more difficult to get rid of poverty. Lancang, Ximeng, Menglian Lahu, Wa, Mojiang County "black woods area" Hani people living in the area, the poor population accounted for more than 65% of the city's poor population, poverty is large and deep, is one of the most impoverished areas in Yunnan Province. For historical and natural reasons, social development is low, the developing awareness of the masses is low, the financial investment of the state is insufficient, the poor people's housing is poor, the village infrastructure construction is lagging, and there is no stable industry to get rid of poverty and increase income, especially in the "black forest area" Hani settlement and the Lancang Lahu settlement, the poor people's living habits are backward. The living environment is poor, the water conservancy facilities, energy, transportation, and information related to agricultural production are far from meeting the needs of agricultural production, and natural disasters such as floods, storms, mudslides, and landslides are frequent due to the influence of monsoon climate. The proportion of non-agricultural industries and the degree of industrialization are low, and the masses are weak in increasing production and income; the development of social undertakings such as science, education, culture, and health is slow, and the problems of long distances to school, difficulty in seeing doctors and monotonous cultural life are prominent. Social instability still exists. Historically, disputes over mountains, forests, water, and land have often led to mass armed fights, resulting in slow or even stagnant development in the area for a long period. In recent years, disputes over mountains, forests, water resources, land boundaries, and industrial development still exist, affecting ethnic unity, social stability, and economic development in the region.



Figure 3-6 The Human Environment Dilemma of Minority Villages in Pu'er City

3.1.4 Overview of poverty alleviation and relocation

To effectively solve the problem of poverty alleviation for this part of the

population, Pu'er municipal government actively implements the relocation project. Pu'er ESPAR was completed mainly in November 2019, and a total of 386 centralized resettlement sites were built, ranking second in the province [13]. Among them, 26 are centralized resettlement areas in towns and cities, increasing the urbanization rate of the city by 0.4 percentage points. The centralized resettlement areas have been fully completed with supporting infrastructure and public service facilities such as water conservancy, education, health, roads, etc. There are mainly short-distance relocation and long-distance relocations for poverty alleviation in Pu'er. The first way of short-distance relocation is to relocate villagers from their original village to a safe neighboring area, and the second way is to relocate to other villages or areas within the same township administrative unit. Long-distance relocation, on the other hand, relocates villagers to a nearby town or a neighboring city.

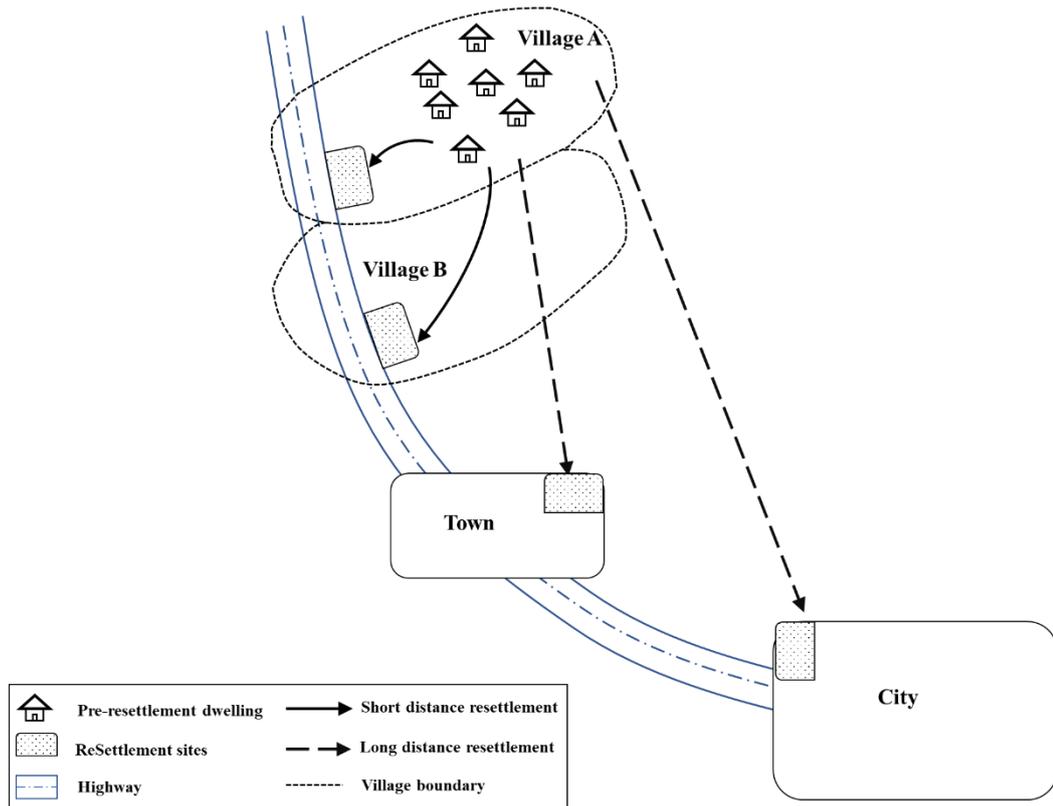


Figure 3-7 Relocation method illustration

In terms of construction subsidy funds for the resettlement area, the "2017 Pu'er City Easy Poverty Alleviation and Relocation Work Rectification Plan" stipulates that the relocation subsidy standard for households with fixed records is 20,000 yuan per person, the old house demolition subsidy is 6,000 yuan per person, and a part of the

construction funds will be raised by the farmers according to the principle that each household should not exceed 10,000 yuan. The policy strictly stipulates that the per capita house construction area is no more than 25 square meters per person, to control the phenomenon of some farmers incurring debt burden by climbing to a larger area and unrealistically expanding the area for house construction. On the other hand, Pu'er City has a wide geographical area, and the construction cost of houses in each relocation and resettlement site varies due to different transportation distances of materials and different labor prices, and also varies due to housing structure (the cost of building is slightly higher than the price of the bungalow). Overall, the cost of building a square meter of housing in the resettlement site for poverty alleviation in Pu'er City is about RMB 1,100-1,300. As of December 31, 2017, the city's housing construction subsidy fund policy for the relocation population has all been adjusted to a per-person subsidy, and the policy of borrowing for housing construction for poor people based on the construction records has been abolished. The total amount of government subsidies at all levels for the construction of resettlement housing for the population on file and card is 1.447 billion yuan, and the cost of resettlement housing construction is 1.641 billion yuan, with a housing construction fund subsidy rate of 88.2%. Funds allocated for the construction of infrastructure and public service facilities in centralized resettlement sites amounted to 455.81 million yuan.

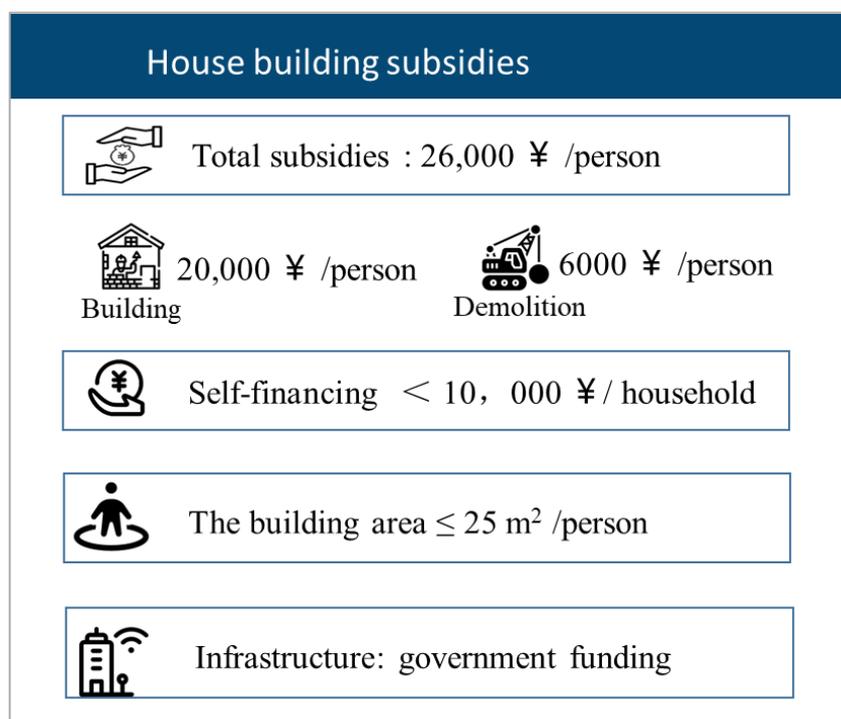


Figure 3-8 Subsidy policy for resettlement housing

However, the process of resettlement development also reveals many problems, especially the construction of large-scale rural resettlement houses, which brings great development as well as challenges to the ethnic minorities in poor areas. On the one hand, the material life of farmers has been improved to a certain extent, on the other hand, the rapid construction of a unified housing model is likely to result in the "one-sided" rural appearance of a thousand villages, which gradually leads to the extinction of minority village culture and ethnic architecture with unique regional characteristics. Therefore, it is urgent to protect and continue the characteristics of minority residential houses and promote the design research of minority resettlement houses.

3.1.5 Sample selection and overview

Based on the underlying study above, in this paper, Pu'er city is selected as the study area of PAR housing for ethnic minorities in southwest China.

Located in the southwestern part of Yunnan Province, Pu'er City shares borders with Vietnam, Laos, and Myanmar and is adjacent to Thai-land and Cambodia. Pu'er is the region with the largest number of ethnic groups in Yunnan and the largest number of cross-border ethnic minorities in China [14]. In 2021, there were 26 ethnic groups in Pu'er, with a minority population of 1,457,000, accounting for 61.2% of the total population [15]. Not only do they live across the border, but they have also formed a common origin culture and cultural identity, and the ethnic culture of Pu'er has certain similarities with that of South Asia. In terms of relocation projects to alleviate poverty, Pu'er ESPAR will be completed mainly in November 2019, with 386 new resettlement areas, ranking 2nd in the province [13].

From the background of the study, it can be seen that 67.7% of the poverty alleviation and relocation housing in China are located in the western region, and Pu'er City is located in the western region. In addition, the number of ethnic minorities in Pu'er City is large, and the number of resettlement housing for ethnic minorities is also large, therefore, the selection of Pu'er as the study area for the ESPAR project of minorities is typical and representative, and the study of the resettlement housing for minorities in this region has high reference value for other ethnic regions or less developed regions in the world.

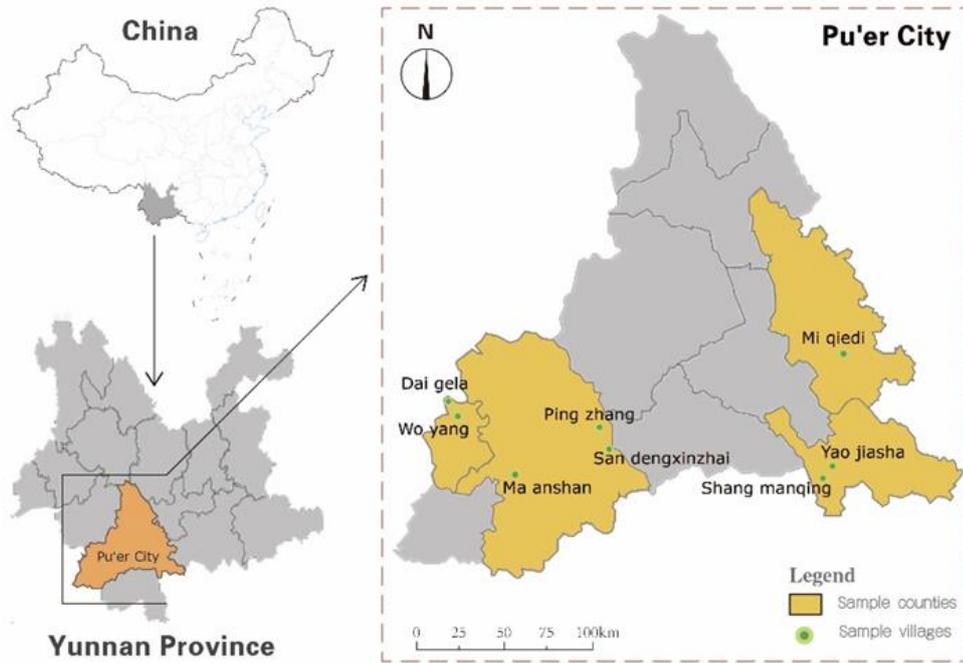


Figure 3-9. The locations of the eight ESPAR samples in Pu'er, Yunnan, China.

The principles for selecting cases in this study are: First, the community is a new community planned for poverty alleviation relocation; Second, the residents of the community are mainly minorities, with the status of farmers and a more stable demographic structure; Third, the residents as a whole have moved in to live for more than one year. These principles ensure that the selected cases are typical of new minority rural communities; at the same time, the residents have lived there for a long enough time that their subjective perceptions of the built environment have formed, reflecting the authenticity of the evaluation. Based on the above principles, eight re-settlement projects in four typical minority autonomous counties in Pu'er City, China, were selected as evaluation cases. Figure 1 shows the geographical location of the main study cases. Four counties were chosen, namely Mojiang Hani Autonomous County, Jiangcheng Hani Yi Autonomous County, Lancang Lahu Autonomous County, and Ximeng Wa Autonomous County. Jiangcheng County mainly selected two Yao resettlement villages, ShangManqing and YaoJiashan; Ximeng selected two Wa villages, WoYang and DaiGra; Lancang County selected two Yi villages: PingZhang Village and XinZhai, and MaAnshan Lahu village; Mojiang County selected Mi Qiedi Hani village as the study object. A detailed overview is shown in the table.

The selected samples satisfy the principles of selecting typical minority resettlement communities, the counties they belong to regions with large minority populations, and more relocation and resettlement projects, and the selected samples

strive to reflect different ethnic diversity to enhance the representativeness of the study sample.

In the actual research, the relocation method of poverty alleviation and resettlement for ethnic minorities in Pu'er City is mainly based on the short-distance centralized relocation method, mainly to reduce the sense of discomfort caused by the relocation of ethnic minorities to live in a more unfamiliar environment. The main relocation methods of several resettlement area cases selected in this paper are all based on short-distance relocation, in which villagers are relocated from their original villages to safe neighboring areas or areas within the same township administrative units. And the villagers in the new resettlement areas all belong to the same original village, or the same neighboring village ethnic groups are relocated uniformly to synthesize a new village.

Table 3-1. Case study profiles

County	Village	Population	Ethnicity	Total households	Area (m ²)	Construction status
Jiang Cheng	Shang Manqing	97	Yao	21	3564.2	
	YaoJia shan	307	Yao	72	6035	
Xi Meng	WoYan g	222	Wa	68	8030.56	

County	Village	Population	Ethnicity	Total households	Area (m ²)	Construction status
	DaiGra	156	Wa	53	5445.25	
	Ping Zhang	185	Yi	50	5634	
Lang Cang	MaAnshan	174	Lahu	48	5560	
	XinZhai	320	Yi	74	7210	
Mo Jiang	Mi Qiedi	104	Hani	26	4116.4	

3.2 Data Collection

Data collection for this study included both primary and secondary data. The

primary data were collected using a combination of qualitative and quantitative methods; questionnaires, interviews, observations, and experimental case studies. First-hand information is also called primary information, mainly through the researcher, and the object of the research directly collects information about consumer demand, consumer structure, market competition, and other aspects of information. It refers to the information collected by the researcher directly from the research subjects through on-site field investigation according to the current specific needs. First-hand information refers to their direct collection and collation and direct experience first-hand information refers to documentary information (refers to the original) and physical information, oral information first-hand information is the person holding the information is the first to contact the information and has a high degree of confidentiality. First-hand information has the advantages of empirical evidence, vividness, and readability. First-hand information is characterized by direct evidence, accuracy, and scientific rigor. Primary data is obtained straightforwardly through interviews, inquiries, questionnaires, measurements, etc. By collecting first-hand data, pending questions can be solved. Secondary data: The data and information accumulated by others, mainly from the data in public publications or public reports, there are many external channels to obtain secondary data, mainly in the form of economic data edited and published by government departments and agencies, design institutes, policy documents, design drawings, and other aggregates. The collection of secondary data mainly involves identifying the required information, searching for information sources, collecting secondary data, screening secondary data, organizing secondary data, and proposing for transfer. These data are described in more detail below in this section.

3.2.1 Questionnaire design and sample size:

The questionnaire consisted of two parts. The first part includes socio-demographic information about individual households, including gender, age, education level, income, source of income, and household size. The second part reflects the residents' satisfaction with the PAR community. With the help of semantic questionnaires, each indicator and overall satisfaction are evaluated by users separately. The evaluation criteria use a Likert scale structure, which classifies the psychological responses to each indicator into five levels. That is, "very satisfied", "quite satisfied", "average", "not very satisfied", and "The data on residents' satisfaction with the resettlement housing was obtained by assigning 5, 4, 3, 2, and 1 to each of the five types of responses.

The sample size of the questionnaire was calculated using the Taro Yanane technique [16], with a confidence level of 95%. The survey was calculated to require at least 366 survey responses. We determined the number of questionnaires to be distributed in each of the eight villages in proportion to their population.

$$n = \frac{N}{1 + N(e)^2}$$

where, n = Sample size

N = Total of the population (57264)

e = the acceptance of probability of error (equal to 95%)

$$n = \frac{57264}{1 + 57264 \times (0.05)^2} = 366$$

We finally distributed a total of 422 questionnaires, excluding those with incomplete and misunderstood answers, and obtained 408 valid questionnaires, with an effective rate of 96.68%

Table 3-2 Collection of questionnaires

	Distribution	Receiving	Valid	Efficient
Total	422	422	408	96.68%
Shang Manqing	29	29	27	93.10%
Yao Jiashan	84	84	82	97.62%
Wo Yang	61	61	60	98.36%
Dai Gela	36	36	36	100.00%
Ping Zhang	51	51	48	94.12%
Xinzhai	86	86	85	98.84%
Ma Anshan	46	46	44	95.65%
Mi Qiedi	29	29	26	89.66%
Reliability test			0.958	

In this study, the number of questionnaires was distributed according to the proportion of the population in the resettlement area, with Shang Mangyi 27, Yao

Jiashan 82, Wo Yang Village 60, Dai Gela 36, Ping Zhang Village 48 and Xin Zhai 85, Ma Anshan 44, and Mi Qiedi 26, which has exceeded the calculated questionnaire volume requirement.

The survey was conducted through face-to-face interviews, and respondents were randomly selected from among the residents of the resettlement area. Although Chinese language education is currently widespread in the villages, local language interpreters were provided for each survey in consideration of the elderly. The villagers of the eight villages surveyed had lived in the resettlement areas for more than two years, and had accumulated some experience in using and subjective feelings about their place of residence, which met the needs of the study.

3.2.2 Interviews and observations

The interview and observation method is mainly to investigate the information that cannot be obtained in the questionnaire method or is very ambiguous, such as people's dynamic behavior, emotions, the atmosphere of the family environment, the personality traits of family members, etc. to discover specific details of information to explore the meaning behind the phenomenon. There are quite several methods of observation and interview, all aiming to collect the needs of customers including their direct needs potential needs conventional needs specific needs.

The observation method is one of the basic research methods in psychology that purposefully and systematically determines the psychological characteristics of subjects by observing and recording their speech and behavior. The observation method mainly includes external observation, participant observation, and image tracing. The design team generally investigates typical users through population classification. Their behavior is observed through questionnaires, face-to-face interviews, and observations to summarize users' usage habits, daily patterns, routine needs, interests, deep psychological demands, and preferences. External observation is also called non-participant observation. It means that the observer takes the position of a third party, outside the observed phenomenon and group, and does not participate at all in the group activities of the observed subject.

The interview method is a method in which the interviewer collects information systematically and systematically through individual interviews or group conversations in accordance with the requirements and purposes determined by the research, and following an interview outline or questionnaire. It is a process of social interaction

between the interviewer and the interviewee, and through this interactive process, information is obtained. The interview method, like the observation method, is also a method of collecting information in user research. The interview method is based on the psychosocial interactions that occur directly or indirectly between the researcher and the interrogated person. It is a form of data collection and is the most frequently used method of data collection in qualitative research.

In the process of returning the questionnaires, some of the research respondents were randomly interviewed. As open-ended questions in the questionnaire, a number of households were hired to provide their opinions and comments, as well as feedback on the living conditions of the housing project and the built environment. Although Chinese language education is currently widespread in the villages, we had a local language interpreter for each survey in consideration of the elderly. The villagers of the eight villages surveyed have lived in the resettlement area for more than two years. They have accumulated a certain amount of user experience and subjective feelings about their place of residence, which meets the needs of the study.

Afterward, the study also conducted a walkthrough survey to better investigate the current state of the homes, buildings, and neighborhoods, and photographic records were taken as data collection to aid in later research analysis and discussion.

3.3 Methods and analytical techniques

3.3.1 Reliability test

Reliability refers to the degree to which the actual value of a test differs from the true value. The higher the reliability, the greater the agreement between multiple measurements, and the better the reliability can be reflected by an indicator that evaluates the trend of data dispersion. Reliability analysis is concerned with the stability and consistency of a particular type of questionnaire measurement results, rather than broad general consistency, and its magnitude is expressed by the reliability coefficient, which ranges from 0 to 1; the larger the reliability coefficient, the greater the degree of reliability of the measurement results. The reliability coefficient is a statistical indicator of the level of confidence, not the correctness of the results, but the sample size of the study population must exceed 40. Reliability coefficients include stability coefficients (consistency across time), equivalence coefficients (consistency across forms), and internal consistency coefficients (consistency across items). Reliability can be divided into intrinsic and extrinsic reliability depending on the target. Intrinsic reliability is a measure of whether a certain set of questions in a questionnaire

measures the same concept and has high intrinsic consistency, while extrinsic reliability is a measure of the degree of consistency of evaluation results after repeated measurement of the same respondent at different times in the same questionnaire.

Reliability (internal consistency) is an important foundational aspect of questionnaire measurement in the form of Likert scales. The assessment of instrument reliability using Cronbach's alpha is the first step in all possible ways to split the test items in the inter-item correlation matrix.

$$\alpha = (k/(k-1)) * [1 - \sum (s_i^2) / s^2 \text{ sum}]$$

where, α = reliability of questionnaire instrument

k = number of question

s_i^2 = summary of variance score of each item

$s^2 \text{ sum}$ = variance score of the questionnaire instrument

Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha is to 1.0 the greater the internal consistency of the items in the scale [17]. There is a reliability degree as the following rules of thumb: "> .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor, and < .5 – Unacceptable". Therefore, it should be noted the coefficient reliability is considered to be acceptable when Cronbach's alpha > 0.7 [17].

The criteria for discriminating the values of confidence indicators are listed in the following table

Table 3-3 Cronbach's α Coefficient

Cronbach's α	Internal consistency
$\alpha < 0.6$	poor
$0.6 < \alpha < 0.7$	Questionable
$0.7 < \alpha < 0.8$	Acceptable
$0.8 < \alpha < 0.9$	good
$\alpha > 0.9$	Excellent

The reliability of the 30 variables was tested by using Cronbach's alpha. The result was 0.958 for 8 resettlement areas in Pu'er City. These are higher than the acceptable level of Cronbach's alpha at .70 [18].

3.3.2 Correlation Analysis

The correlation test examines the relationship between two or more variables separately, meaning that the relationship between two variables is independent of other variables. These variables measure the strength and direction of the linear relationship between the two variables.

The correlation coefficient is a statistical indicator designed by the statistician Carl Pearson. It is a statistical indicator designed by the statistician Karl Pearson, and we most commonly use the Person correlation coefficient. The correlation coefficient describes the relationship between two variables and the direction of correlation.

The correlation coefficient can range from -1 to +1 [19].

$-1 \leq r < 0$ variance score of a questionnaire instrument

$r=0$ means the two variables are not correlated.

$0 < r \leq 1$ means the two variables show a positive correlation

However, to select variables for the next regression model for a valid regression model, a correlation coefficient should be more than 0.3 or above denoting a strong relationship, and those variables required a p-value of less than 0.05 to indicate statistically significant [20].

When using Pearson correlation analysis, five assumptions need to be considered. (1) Both variables are continuous variables. (2) The two continuous variables should be paired, i.e., derived from the same individual. (3) There is a linear relationship between the two continuous variables, and scatter plots are usually done to test this hypothesis. (4) there are no significant outliers for both variable, and the Pearson correlation coefficient is susceptible to outliers. (5) The two variables conform to a bivariate normal distribution.

The person correlation coefficient, also called simple correlation coefficient or linear correlation coefficient, is used to detect the degree of linear correlation between two continuous-type variables.

(1) The overall Person correlation coefficient is denoted by the letter ρ and is calculated as.

$$\rho_{x,y} = \frac{\text{cov}(\mathbf{x}, \mathbf{y})}{\sigma_x \sigma_y} = \frac{E[(\mathbf{x} - \mu_x, \mathbf{y} - \mu_y)]}{\sigma_x \sigma_y}$$

Or

$$\rho_{X,Y} = \frac{E(XY) - E(X)E(Y)}{\sqrt{E(X^2) - (E(X))^2} \sqrt{E(Y^2) - (E(Y))^2}}$$

(2) The Person correlation coefficient of the sample, denoted by the letter r , is used to measure the linear relationship between the two variables and is calculated as follows.

$$r(X, Y) = \frac{\text{Cov}(X, Y)}{\sqrt{\text{Var}[X] \text{Var}[Y]}}$$

There is expressed as the product of the covariance of two variables divided by the standard deviation of the two variables.

$\text{Cov}(X, Y)$: denotes the covariance.

$\text{Var}[X]$: represents the variance, which becomes the standard deviation after opening the root sign.

To summarize: the Pearson correlation coefficient between two variables is defined as the quotient of the covariance and standard deviation between the two variables.

3.3.3 Regression analysis

Linear Regression Model: A linear regression was employed as a casual method based on the assumption that the variable to be forecast (dependent variable) has a cause-and-effect relationship with one or more other (independent) by linear trends [21]. Least squares is a standard method in regression analysis. Least squares (also known as the least square method) is a mathematical optimization technique. It finds the best functional match of the data by minimizing the sum of squares of the errors. The least squares method can be used to easily find unknown data and to minimize the sum of squares of the errors between these found data and the actual data. The least squares method can also be used for curve fitting.

The formula for a regression line is:

$$Y = a + bX$$

where X is the explanatory variable and Y is the dependent variable. The slope of the line is b , and a is the intercept (the value of y when $x = 0$).

Multiple Regression Model: Multiple regression is an extension of simple linear regression analysis and uses to assess the association between two or more independent variables and a single continuous dependent variable. The general form of the multiple regression equation can be used as the following equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \varepsilon$$

where,

Y = the dependent or response variable,

$X_1, X_2, X_3, \dots, X_k$ = the independent or predictor variables,

$E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$ = is the deterministic component of the model,

β_1 = the contribution of the independent variable X_i and,

ε = a random error of the model.

Firstly, the variable in the model is a linear relationship between the dependent and dependent variables. Secondly, the independent variables must be linearly independent. Thirdly, there is no highly correlated among the variables (multicollinearity test). And finally, the error distribution should also be normal (Saunders, 2009).

3.3.4 Path analysis

Path analysis lies in the study of model impact relationships and is used to test model hypotheses. Path analysis is an extension of multiple regression analysis, applying not one but a set of regression equations. It is a method to study the multilayer causal relationships between multiple variables and the strength of their correlation. The main purpose of path analysis is to test the accuracy and reliability of a hypothetical causal model, to measure the strength of the causal relationship between variables, and to answer the following questions: ① whether there is a correlation between the two variables in the model and; ② if there is a correlation, then further study whether there is a causal relationship between the two; ③ if there is an effect, then whether it is a direct effect, an indirect effect through mediating variables or both; ④ what is the magnitude of the direct effect and the indirect effect. how the magnitude

of both direct and indirect effects.

The main steps of path analysis are: ① Selecting variables and building causality models. Researchers mostly use path diagrams to visualize the hierarchy of variables, the path, type, and structure of the causal relationship between variables, etc., expressed as the causal model established. ② Testing hypotheses. ③ Estimating parameters. The path coefficients and residual path coefficients are calculated first, and then the correlation coefficients between the two variables are calculated. In addition, the total causal force between the two variables is calculated, including the direct force of the variable pair, and the indirect force of the pair through the intermediate variables [22].

3.4 Summary of this chapter

This chapter introduces the research object, Pu'er City, and discusses the research methodology that answers the research questions and research objectives, followed by an explanation of the research design, data collection procedures, sampling methods, and data analysis.

First of all, this chapter analyzes the regional environment for the construction of poverty alleviation and relocation resettlement areas in Pu'er from four aspects: natural, economic, social, and spatial, summarizes the current constraints faced by the construction of migrant relocation and resettlement areas in Pu'er, and provides a basis for the scientific formulation of the construction evaluation system for migrant relocation and resettlement areas. 1) The regional natural ecological conditions in Pu'er are explained from four aspects: topography and landscape, climate, and vegetation ecology, and concludes that the natural environment of Pu'er. The comprehensive characteristics are more mountainous areas, a fragile geological environment, and low crop yield. 2) The social and human environment characteristics of the Pu'er region are elaborated from three aspects: regional population and ethnic groups, economic development, and culture and education. The population of Pu'er is dominated by ethnic minorities, and it is adjacent to many countries in Southeast Asia, forming a similar ethnic culture. The spatial distribution of Pu'er's population shows the uneven distribution of districts and counties, with large differences according to topography and transportation conditions. The overall economic strength is accelerating but the total economic volume is still small, the difference in county development is obvious, and the gap between urban and rural development is large. 3) The built environment of poor mountainous areas in Pu'er is characterized by a scattered spatial layout of border

village settlements, low-quality of the living environment, poor infrastructure, mostly located in mountainous areas, and closed transportation. Based on the analysis of the environmental development background of the Pu'er region, it is concluded that the construction of resettlement projects for migrants in Pu'er faces many conditions such as topographic and environmental restrictions, cultural diversity and complexity, as well as geographical restrictions of the urbanization process.

Secondly, the principles of selecting the research sample are introduced, the representativeness of the sample is elaborated, and the descriptive analysis of the selected sample is carried out. The selection of Pu'er as the research area of the minority ESPAR project is typical and representative, and the study of the resettlement housing for minority people in this region has high reference value for other ethnic regions or less developed regions in the world. Finally, the research methods and analysis techniques of this dissertation are introduced. The steps of the analysis method are described in terms of both qualitative and quantitative research. This dissertation mainly adopts research methods such as combining field research and literature analysis, combining theoretical research and empirical evidence, combining qualitative and quantitative methods, and using analysis techniques such as linear analysis, regression analysis, and path analysis to scientifically designate and implement as well as analyze the evaluation of the use of minority poverty alleviation and relocation housing.

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Chapter 4 Construction of POE System for Minority Resettlement Area

As mentioned in the background section of the previous study, although migrants have solved the real problems of disaster avoidance and poverty alleviation and promoted socio-economic and urbanization development, the construction of resettlement areas adopts a government-led "top-down" construction model, and there are still many problems in the process of construction, implementation, and use. For example, the contradiction between people and resources, the lack of attention to the needs of migrants, the difficulty of establishing social networks, the lack of urban and rural integration of site selection, the lack of an appropriate construction model, and other real problems. Although some scholars in management and sociology have conducted some research on livelihood and society, there is a lack of research on the built environment of resettlement areas.

The author believes that the success of the architectural design and positioning planning directly affects the sustainable development of resettlement areas. In the past, the design was mainly a two-dimensional paradigm of design objects and design subjects, mostly the personal experience and subjective judgment of designers, which can lead to ignoring the real needs of users. The research on design strategies also tends to be inherited and simple subjective judgments, with less reference to users' needs, and ignoring the real situation of reality. Therefore, it is necessary to conduct an in-depth study and introduce the POE method to scientifically and rationally suggest guidance for the subsequent design.

4.1 The process design of the POE evaluation method

4.1.1 Design of the evaluation process

The study used a post-occupancy evaluation method, and the evaluation process was divided into three phases: preparation, implementation, and conclusion [1]. In the preparation stage, firstly, the purpose and significance of the study should be clarified and a suitable evaluation model should be selected. Second, design the evaluation index set. Research related literature, introduce expert inquiry method, questionnaire method, etc. to construct the evaluation index set. Third, select evaluation subjects and evaluation objects, design questionnaires based on the evaluation index set, and establish the evaluation system.

During the implementation phase, a survey was conducted for selected resettlement projects. A questionnaire survey of users was conducted to derive feedback on user satisfaction. It was also combined with user interviews, researcher participation in the empirical method, and Walkthrough as a complement to the evaluation to make a

comprehensive assessment of the built environment of the resettlement houses for poverty alleviation of ethnic minorities.

In the concluding phase, the scoring results were compiled, and the evaluation was analyzed and summarized. Regression models were used to analyze the demographic socioeconomic indicators and the relationship between each indicator and overall satisfaction, and to explore the habitat of ESPAR minority communities. Finally, targeted recommendations are made.

The evaluation process of POE of poverty alleviation and resettlement housing for ethnic minorities is shown in Figure.

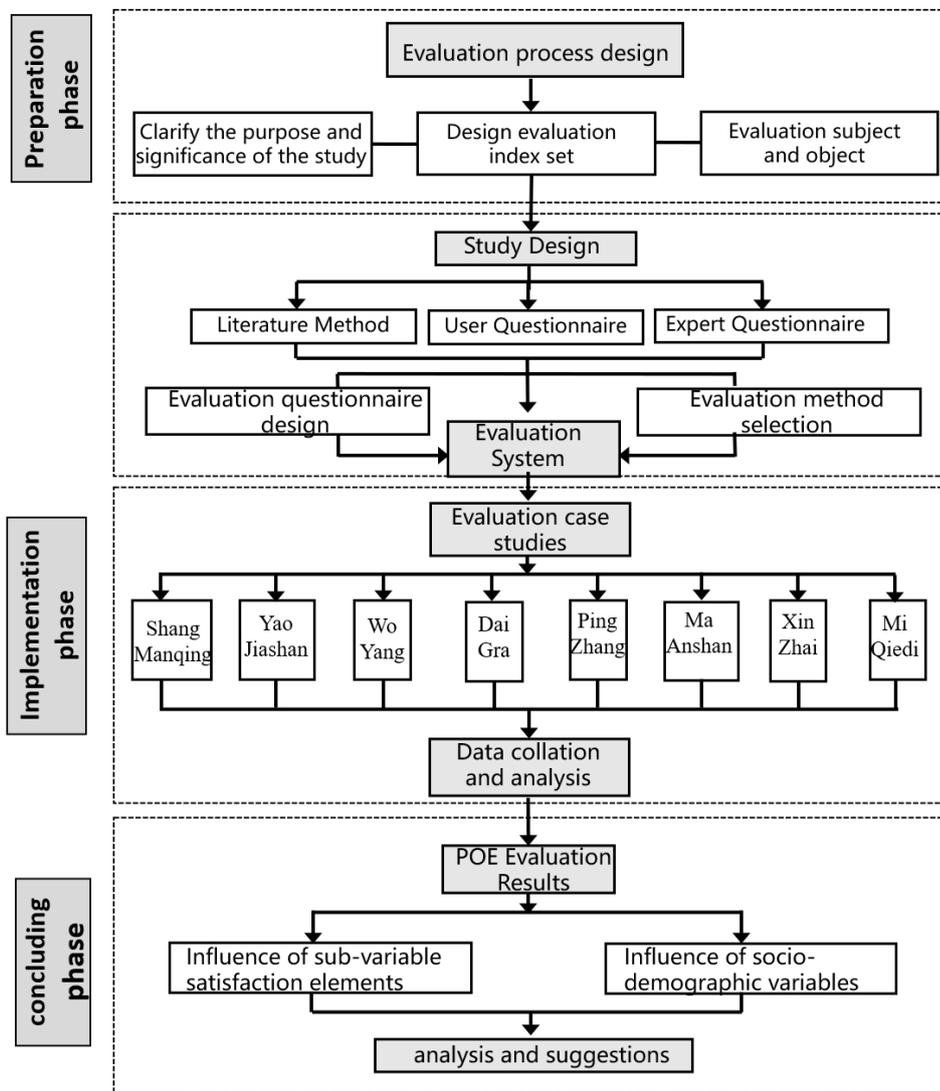


Figure 4-1 Evaluation process schema

4.1.2 Selection of evaluation methods

1) Selection of evaluation model

The previous section introduced that POE evaluation types are classified as narrative, survey, and diagnostic. Three factors need to be considered in the selection of the evaluation model.

First, the purpose of introducing the POE method.

The ultimate purpose of POE is to identify the problems and desirable features of the built environment in the evaluated resettlement areas and to understand the current state of construction of resettlement housing for ethnic minorities in China. The purpose of the evaluation is to learn from the experience and analyze the solutions to the design deficiencies, and finally propose solutions that can be applied to the design and construction of future resettlement houses for poverty alleviation and relocation of ethnic minorities, to improve the quality of the construction of the resettlement areas and the symbiosis of the environment.

Second, the objectivity and truthfulness of evaluation indexes.

The selection of evaluation indexes should be systematic, comprehensive, and scientific, so the evaluation indexes should be objective and realistic. According to the evaluation indexes, further questionnaire design can be carried out.

Third, the quantitative description of evaluation indicators.

The evaluation results should be in the form of scientific quantification to make reasonable judgments, so the collection of evaluation data needs to be rigorous and collected in various ways.

Based on the above factors, this paper selects survey-based evaluation as the post-use evaluation mode of poverty alleviation and resettlement housing for ethnic minorities. The narrative evaluation is slightly more subjective and is not considered in the paper, while the diagnostic evaluation can provide a comprehensive and in-depth evaluation of the detailed performance criteria.

2) Selection of evaluation subjects and objects

The thesis conducts the post-occupancy evaluation on the selected key research sites, and the evaluation objects are the migrant relocation and resettlement projects of eight typical ethnic minorities in Pu'er City. eight villages have their own characteristics in terms of ethnic population, geographical location, scale, and architectural characteristics. As for the selection of evaluation subjects, they mainly focus on the occupants of the resettlement areas and evaluate the minority poverty alleviation and relocation resettlement houses from different perspectives due to

different needs.

4.1.3 Design and distribution of evaluation questionnaires

The questionnaire consisted of two parts. The post-occupancy assessment framework of the minority ESPAR housing for this study formed the structural basis of the questionnaire sent to the occupants. The first part includes socio-demographic information about the individual household, including gender, age, education level, income, source of income, and household size. The second part reflects the residents' satisfaction with the PAR community. The design was based on the evaluation indicators within the evaluation system, 7 primary indicators and 30 secondary indicators, which were applied to the development of the questionnaire. The indicators within the evaluation index set can basically reflect the situation of An residents in the use of the building. The evaluation criteria adopt the structure of the Likert scale, and the psychological response of each index is divided into five levels, namely "very satisfied", "quite satisfied", "average", "not very satisfied", "not very satisfied" and "not very satisfied". The sample size of the questionnaire was calculated using the Taro Yanane technique [2] with a confidence level of 95%. The survey was calculated to require at least 366 survey responses. We determined the number of questionnaires to be distributed in each of the eight villages in proportion to their population.

4.1.4 Quantification of evaluation results

The fuzzy comprehensive evaluation method is used to analyze the scale data, which can intuitively determine the evaluation results of the satisfaction of the resettlement houses for poverty alleviation of ethnic minorities. After considering the relationship between each relevant factor and the built environment of the resettlement area, the evaluation is carried out after fuzzy transformation and operation. Firstly, the set of evaluation objects is determined: $X =$ comprehensive evaluation of satisfaction of poverty alleviation resettlement housing for ethnic minorities, the set of evaluation factors is constructed, and then the domain of the rating theory of the rubric is determined i.e. $Y = \{\text{very good, better, average, poor, very poor}\}$. With the help of the semantic questionnaire, each indicator is evaluated by users separately, corresponding to its score value. Collating the score results and calculating the comprehensive evaluation result: the comprehensive evaluation result Z is calculated based on the average score of each indicator. final grading: according to the flow table, the values within the reference affiliation of the comprehensive evaluation result are determined, which can be more intuitive to see the comprehensive situation of the evaluation.

Table 4-1 Fuzzy evaluation grading table

Rate the value Z_i	Evaluation Words	Level
$Z_i \geq 4.5$	Very good	E1
$3.5 \leq Z_i < 4.5$	Good	E2
$2.5 \leq Z_i < 3.5$	General	E3
$1.5 \leq Z_i < 2.5$	Poor	E4
$Z_i < 1.5$	Very poor	E5

4.2 Construction of POE user satisfaction factor system

The core part of constructing the POE System for Minority Resettlement Areas is to construct the evaluation index set, which can further guide the evaluation to be carried out in a principled and systematic way. The selection of indicators should ensure scientific nature, authenticity, and clear structure. Try to achieve comprehensive indicators. First, read references, and master the theoretical basis of resettlement areas, find out the characteristics of resettlement areas, under the guidance of characteristics, the selection of indicators, and then use semi-structured interviews, to the user's psychological demand further inductive research, perfect the indicators, to avoid the limitation of subjective factors and the level of knowledge, Build specific factors system of user satisfaction for POE as comprehensively as possible.

In the process of constructing the evaluation index system, we need to pay attention to the volatility and innate incompleteness of evaluation indexes. With the development of the economy and changes in social structure, people's consciousness and values are also changing, so it is impossible to simply refer to the current situation and the development of social dynamics and to properly introduce users' semi-structured interview evaluation information so that the selection of evaluation indexes can keep up with the times.

4.2.1 Selection of evaluation indicators

- 1) The preliminary factors set was summarized by the literature study

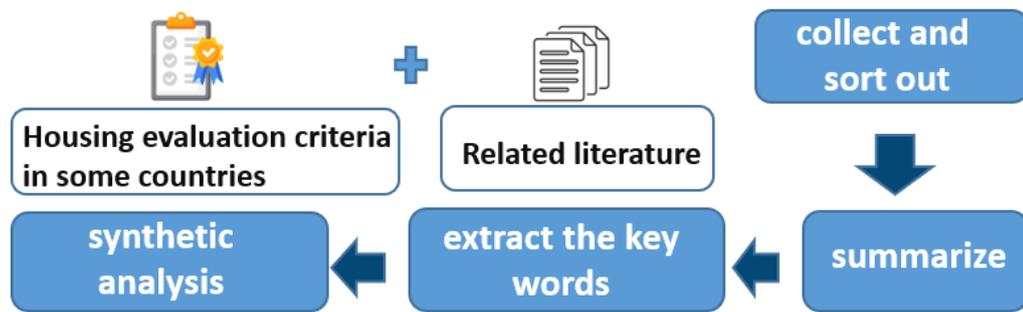


Figure 4-2 The process diagram of the evaluation indicator set by the literature research method.

The first step is to collect and sort out the research literature on resettlement housing, and deliberately identify the relevant literature on resettlement housing design, low-income housing evaluation, housing evaluation, and so on in the keyword search. In order to ensure the scientific nature of the collected data, the official evaluation standards of domestic and foreign housing are first collected ((Fig.2). Then collect the research literature of researchers, mainly using the CNKI and SCI paper database, select the master and doctoral articles with high impact factors and institutions of higher learning, to ensure the scientific basis of the reference materials. The second step is to conduct a preliminary reading of the collected literature, and then summarize it. According to the design reference of immigrant residence, the data are screened to exclude some data that do not belong to the scope of architectural design and select the determined literature. The third step is to carry out the precision of the selected papers, inductive analysis of the evaluation index of low-income housing and the design strategy of immigration relocation housing, and extract the keywords and extract. For example, Kang Ye [3] proposed that the standards affecting residential satisfaction of resettlement houses include three first-grade indexes, namely, construction quality, property management, and living environment, and 22 secondary indicators. Wang Juan [4] proposed that the important indicators affecting residents' life satisfaction in urban village relocation areas include community planning and environment, community supporting facilities, house type design, housing quality, property management, and 40 secondary indicators. Tanaphoom Wongbumr, Bart Dewancker [5] think that Bangkok's residential satisfaction index should include three first-grade index dwelling physical, building physical, community physical aspect, and 18 secondary indicators. Zhou and Wang [6] evaluated the livability of resettlement communities from the perspectives of

the living environment, supporting facilities, urban integration, community management, historical sites, and traditional culture continuation. An extract of the references is shown in the table below:

Table 4-2 Housing evaluation index in some countries

Countries	Relevant indicators
The United States	Sanitary facilities; Food preparation and refuse disposal; Space and security; Thermal environment; •Illumination and electricity ; Structure and materials; Interior air quality; Water supply; Lead-based paint; Access; Site and neighborhood; Sanitary condition; Smoke Detectors
France	Plumbing, electrical equipment, indoor noise, cooling, maintenance costs for roofing and exterior finishes, heating and heating water, access to the house, wall finishes for shared access sections, variability of kitchen equipment, wall finishes for kitchen, bathroom and toilet, floor finishes, maintenance costs for equipment.
Japan	Structural safety, fire safety, durability, daily maintenance and management, thermal insulation performance, air environmental performance, lighting, lighting performance, sound insulation performance, elderly life corresponding performance, anti-theft
European Union	Structure resistance and stability, fire safety, hygiene, health and environment, use safety, noise safety, heat preservation and energy saving
China TSPARB GB/T50362-2005	Applicable performance (unit plane, housing type, building decoration, sound insulation performance, equipment and facilities, Barrier-free facilities), Environmental performance (land use and planning, architectural modeling, green space and activity venues, outdoor noise and air pollution, water body and drainage system, public service facilities, intelligent system), Economic performance (energy saving, water saving, land saving, material saving), Safety performance (structural safety, building fire prevention, gas and electrical equipment safety, daily safety precautions, indoor pollutant control), Dur

Countries	Relevant indicators
	ability (structural engineering, decoration engineering, waterproof engineering and moisture-proof measures, pipeline engineering, equipment, doors and windows)
U.K.	Location: Amenities, Play and leisure, Liabilities, Noise, Accessible distances, Measuring; Site – Visual impact, layout and landscaping; Site – Open space; Site – Routes and movement; Unit – Size; Unit – Layout; Unit – Noise, light, services & adaptability; Unit – Accessibility within the unit; Unit – Sustainability; External Environment - Building for Life
	Safety and durability: safety, durability.
	Health and comfort: indoor air quality, water quality, sound and light environment, indoor heat and humidity environment, indoor heat and humidity environment
China ASGB GB/T50378-2019	The convenience of life: travel and accessibility, service facilities, intelligent operation, property management
	Resource conservation: land saving and land use, energy saving and energy use, water saving and water use, material saving and green building materials
	Livable environment: site ecology and landscape, outdoor physical environment

Table 4-3 Housing evaluation index in some works of literature

No.	Author	Title	Evaluation Indicators
1	Adesoji David Jiboye[7]	Post-occupancy evaluation of residential satisfaction in Lagos, Nigeria: Feedback for residential improvement	Housing type, accessibility, car parking of provision, adequacy and efficiency of services, building density, landscape and children playing spaces, visual quality and spatial configuration, structural soundness, privacy and level of security, and sense of community.
2	Eziyi Offia	Performance evaluation	1. Building Type, 2.Number of bedrooms

No.	Author	Title	Evaluation Indicators
	Ibem[8]	of residential buildings in public housing estates in Ogun State, Nigeria: Users' satisfaction perspective	in the Building, 3. Sizes of Bedrooms in the Building, 4. Sizes of Living Rooms, 5.Sizes of Cooking and Storage Space, 6.Size of Dining Space, 7.Quality of air in Living/Dining space, 8.Quality of air in the Bedrooms, 9. Quality of Natural Lighting in Kitchen, 10.Privacy in the building, 11.Quality of Natural Lighting in Bedrooms, 12.Quality of Natural Lighting in Living room, 13.Thermal comfort in the Building, 14.Location of building in the housing estate, 15.Initial and Maintenance cost of the building, 16.Protection against Noise in the Building, 17.The aesthetic appearance of Building, 18.Design of Bath and Toilet facilities, 19.Fire safety and protection, 20.Protection against dampness in the Building, 21.Protection against insects and dangerous animals, 22.Security in the Buildings, 23.Type of materials used in the construction of Building, 24. Design of building about occupants' way of life, 25.Power supply in the Building, 26.Water supply in the Building, 27.External Lighting on the Building
3	Haliloglu Kahraman,Z errin Ezgi	Dimensions of housing satisfaction: A case study based on perceptions of rural migrants living in Dikmen[9]	1.Architectural Features, Size and Quality of the House: Living in a low-rise house, Living in at least 100 m2 house, Living in a house younger than ten years old, Living in a house with a garden (or a large balcony instead), Use of natural gas heating system, Existence of small windows in rooms; 2. The functionality of the House: Existence of room for children, Existence of room for guests, Existence of storage room, Existence of a large kitchen,

No.	Author	Title	Evaluation Indicators
			Existence of a balcony for hanging clothes, Appropriateness of the house for preparing stored food for winter, Appropriateness of the house for washing and beating carpets and wool beds; 3. Interior Features of the House: Use of enduring construction materials, Use of smooth material on the floor, Use of bright colors in rooms, Use of fluorescent lighting in rooms, Existence of inbuilt modular furniture, Existence of squat toilet; 4. Location of the House: Proximity of the house to the workplace, Proximity of the house to urban services; 5. Social Features of the House: Proximity of the house to the homes of existing neighbors, Proximity of the house to the homes of relatives; 6. Economic Features of the House: Affordability of the house, Being the owner of the house.
4	Wei Shui	Analysis of the Influencing Factors on Resettled Farmer's Satisfaction under the Policy of the Balance between Urban Construction Land Increasing and Rural Construction Land Decreasing: A Case Study of China's Xinjin County in Chengdu City[10]	Living conditions of the family: Farmers' income (X1), Farmers' employment status (X2), Building quality (X3), The electricity/gas/water supply (X4), Traditional festivals (X5); Government policies: The p-values of land rights guarantee (X6), The p-values of land consolidation compensation (X7), Information on land consolidation (X8), The factor of employment channels (X9), Use of farmland hire (X10), Housing's soft terms (X11); Communal facilities: Rural infrastructure (X12), Means of transportation (X13), Public facilities (X14), The business service of the network system (X15), Safety installation (X16);

No.	Author	Title	Evaluation Indicators
			Property management: The relocation areas maintenance (X17), Social security (X18), Property management fee (X19); Ecological and environmental quality: Sewage treatment (X20), Environmental sanitation (X21), Living conditions (X22).
5	Zhonghua Huang	Assessment and determinants of residential satisfaction with public housing in Hangzhou, China[11]	Housing characteristics: Area, Floor, Bedroom Number of bedrooms; Orientation Neighborhood characteristics: Green, Sanitation, Quietness; Security Public facilities: Market, Primary school, Hospital, Distance to urban center; Social environment: Residential stability, Social isolation
6	Eziyi Offia Ibem	Investigating dimensions of housing adequacy evaluation by residents in public housing: Factor analysis approach [12]	Housing units' attributes: 1. Level of privacy 2. Sizes of bedrooms 3. Natural lighting in the kitchen 4. Natural lighting in bedrooms 5. Ventilation in bedrooms 6. Sizes of living and dining spaces 7. Ventilation in living and dining spaces 8. Lighting in living and dining spaces 9. Sizes kitchen and storage 10. Protection against dampness in building 11. Protection against noise pollution 12. Level of thermal comfort in the residence 13. Protection against harmful Insects 14. Security measures in residence 15. The number of bedrooms 16. Fire protection measures Housing services and infrastructure: 1. Sanitary and drainage facilities 2. Road network 3. Power supply 4. External lighting 5. Potable water supply 6. Refuse disposal facilities in the estate Neighborhood facilities:1. Public transport service 2. Place of worship 3. Parking

No.	Author	Title	Evaluation Indicators
			spaces 4. Open spaces and green areas 5. Playground for children 6 Healthcare facilities 7. Educational facilities 8. Shopping facilities 9. Recreational facilities Management of facilities:1. Communal activities 2. Management and maintenance of facilities in the estates
7	Irene Appeaning Addo	Assessing residential satisfaction among low-income households in multi-habited dwellings in selected low-income communities in Accra [13]	Dwelling (physical)characteristics (D): Number of rooms, Room size, Cost of housing, Utilities available, Privacy in the compound; Social networks (S): Community support, Community Safety, Proximity to friends and relations; Neighborhood facilities (N): Proximity to Central Business District (CBD), Proximity to the market, Proximity to workplaces, Proximity to community standpipe, Proximity to the public toilet, Proximity to the bus station, Proximity to recreational facilities, Environmental cleanliness.
8	Nese Dikmen	Housing after the disaster: A post-occupancy evaluation of a reconstruction project [14]	1. building materials, 2. construction system, 3. spatial orientation, 4. organization, 5. location
9	Tanaphoom Wongbumru	Post-occupancy evaluation of user satisfaction: a case study of “old” and “new” public housing schemes in Bangkok[5]	Dwelling physical aspect: 1. Size 2.Size of living area 3.Size of kitchen space 4.Size of bedroom 5. Size of toilet and bathroom 6. Size of balcony Materials 7. Quality of materials used in floors 8. Quality of materials used in walls 9. Quality of materials used in ceiling 10. Operation of windows 11. Operation of doors 12. Operation of sanitary in toilet

No.	Author	Title	Evaluation Indicators
			<p>Environments</p> <p>13. Quality of indoor air quality</p> <p>14. Quality of ventilation</p> <p>15. Quality of natural lighting</p> <p>16. Quality of room from noise;</p> <p>Building physical aspect:</p> <p>1. Design of the building</p> <p>2. Natural lighting</p> <p>3. Quality of building facility</p> <p>4. Quality of building materials</p> <p>5. Quality of paints of this building</p> <p>6. Quality of garbage storage</p> <p>7. Cleanness of building</p> <p>8. Management rules & regulations</p> <p>9. Cost of maintenance;</p> <p>Community physical aspect:</p> <p>1. Community location;</p> <p>2. Security of your neighborhood;</p> <p>3. Public park</p> <p>4. Sport/playground facilities;</p> <p>5. Car par</p> <p>6. Accessibility to the disabled and aged people.</p>
10	Bala Ishiyaku	Confirmatory factorial validity of public housing satisfaction constructs [15]	<p>Tangible building satisfaction construct: Burglarproof, Nets on window, Doors/windows, Ceiling, Floor, Water facilities, Cooling facilities, Heating facilities, Walls</p> <p>Intangible building satisfaction construct: Lighting general, Sunlight, Artificial lighting, Privacy</p> <p>Building satisfaction construct: Rooms size, Living room, Roof, Number of rooms, Kitchen Store, Garage, Dining space</p>
11	E.E.Wijegu narathna	Long-term satisfaction of resettled communities: An assessment of the physical performance of post-disaster housing[16]	<p>Plot size, Size of house, No. of rooms, Lighting, and ventilation, Quality of building materials, Quality of workmanship, Orientation of the house, Level of privacy, Ease of cleaning/maintenance, Provisions for alterations/expansion, Sanitary facilities,</p>

No.	Author	Title	Evaluation Indicators
			Location of settlement compared to previous, Distance to the city center
12	Anh Tuan Nguyen	Housing satisfaction and its correlates: a quantitative study among residents living in their affordable apartments in urban Hanoi, Vietnam[17]	Physical characteristics of apartments: Size, Number of rooms, Number of bathrooms, Number of balconies, Type of apartment; Subjective characteristics of apartments: Price, Architecture design, Quality, Location, Master plan of the building, Environment
13	XiaZhao	China's rural human settlements: Qualitative evaluation, quantitative analysis, and policy implications [18]	Rural sanitation: (RS1)Greening, (RS2)Household waste disposal, (RS3)Household sewage disposal agricultural, (RS4)Agricultural waste disposal; The housing condition: (HC1)House style,(HC2)Living space, (HC3)Toilet condition; Rural infrastructure: (RI1) Transportation of the village, (RI2)Power supply, (RI3)Water supply, (RI4)Internet; The farmers' economic burden: (EB1)Burden of production expense, (EB2)Burden of medical expense, (EB3)Burden of elderly-care expense; The rural social services: (SS1)Cultural entertainment activities, (SS2)Local Healthcare, (SS3)The village committee services
14	Yi Wang	Evaluation and determinants of satisfaction with rural livability in China's less-developed eastern areas: A case study of Xianju County in	A. Natural environmental condition: A1 Climate comfort A2 Water quality A3 Geological stability A4 Green coverage rate B. The sanitation status: B1 Popularization of sanitary toilets B2 Household sewage disposal B3 River & pond pollution

No.	Author	Title	Evaluation Indicators
		Zhejiang Province [19]	disposal B4 Household waste disposal C. Infrastructure condition: C1 Running water supply facilities C2 Energy supply facilities C3 Cultural &recreational facilities C4 Postal & communication facilities C5 Road traffic facilities D. Public service level: D1 Medical convenience D2 Education convenience D3 Shopping convenience D4 Social insurance condition E. The housing condition: E1 Housing quality E2 Housing space E3 Housing style E4 Surrounding landscape F. The human social amenity: F1 Public security F2 Neighborhood relationship F3 Democratic management
15	Yongzhong Tan	Evaluating residents' satisfaction with market-oriented urban village transformation: A case study of Yangji Village in Guangzhou, China[20]	Resettlement compensation (A): Housing resettlement (A1) Economic income (A2) Villagers' participation (B): Policy publicity (B1) Openness and transparency of the program (B2)Openness and transparency of information (B3) Utterance of rights by villagers (B4) Solicitation of villagers' wishes by enterprises beforehand (B5) Cultural inheritance and protection (C): Historical and cultural protection (C1) Historical building and cultural relic protection (C2) Inheritance of folk customs in the village (C3) Housing conditions (D): Lighting condition (D1) Ventilation effect (D2) Residential area (D3) Apartment layout design (D4) Sound insulation effect (D5) Building quality (D6) Community planning and environment (E):

No.	Author	Title	Evaluation Indicators
			<p>Landscape design of community (E1) Greening level of community (E2) Lighting facilities at night in the community (E3) Neighbourhood relations (E4) Design of road system in the community (E5) Air and noise in the community (E6) Community space feeling (E7)</p> <p>Community and surrounding facilities (F): Place of activity and facilities in the community (F1) Parking facilities in the community (F2) Convenience of traffic (F3) Convenience of schools (F4) Convenience of medical facilities (F5) Convenience of commercial facilities (F6)</p> <p>Property management (G): Maintenance of public equipment (G1) Security of community (G2) Property fee (G3) Quality of property service (G4)</p>
16	Bangkim Kshetrimayum	Factors Affecting Residential Satisfaction in Slum Rehabilitation Housing in Mumbai [21]	<p>Dwelling external : de1 Water supply ,de2 staircase,de3 Electrical repair service,de4 Electric supply ,de5 Corridor ,de6 Lift,de7 Access road;</p> <p>Dwelling internal: di1 Comfort in the house, di2 Privacy in the residence, di3 Natural lighting inside the house, di4 Adequacy of number of rooms, di5 Location of your residence in the building, di6 Toilet</p> <p>Access to facility: af1 Distance to post office, af2 Distance to metro, af3 Distance to fire station, af4 Distance to government health center, af5 Distance to bank</p> <p>Community Environment: ce1 Relation/contact with neighbors, ce2 In this neighborhood, residents treat each</p>

No.	Author	Title	Evaluation Indicators
			other pleasantly, ce3 Relation/contact with the community, ce4 I care about this neighborhood, ce5 I trust my neighbors, ce6 Business and job opportunity/livelihood
17	Fan Wu	Evaluation of the Human Settlements Environment of Public Housing Community: A Case Study of Guangzhou [22]	B1 Built environment: 1 Housing environment: D1 Per capita housing area 2 Public transportation: D2 Metro station D3 Bus stop; 3 Public facilities: D4 Medical facilities D5 Educational facilities D6 Commercial facilities D7 Parks and recreational facilities; 4 Location: D8 Distance from the city center. B2 Residential satisfaction: 1. Indoor environment: D9 Space design D10 Housing area D11 Housing quality D12 Ventilation and lighting D13 Acoustic insulation D14 Maintenance; 2 Community environment: D15 Landscape D16 Sanitation D17 Community amenities D18 Security D19 Estate management service; 3. Social relations: D20 Relations with neighborhood D21 Relations with friend D22 Relations with family
18	Pengyan Wang	Satisfaction Evaluation of Rural Human Settlements in Northwest China: Method and Application [23]	(B1)Living conditions: (C1) Housing quality(C2) Kitchen hygiene (C3) Toilet hygiene (C4) Wall quality(C5) Water quality (B2)Environment : Greening (C6)(C7)Air quality (C8) Domestic waste treatment facilities (C9) Wastewater treatment facilities (B3)Physical infrastructure (C10) Road quality (C11) Street lights(C12) Power facilities (C13) Irrigation facilities(C14) Communication facilities(C15)

No.	Author	Title	Evaluation Indicators
			Recreational amenities (B4)Public service: (C16) School accessibility(C17)Medical treatment accessibilit (C18)Social Security(C19) Number of shops (C20) Employment training (B5)Governance: (C21) Village committee (C22) Organization (C23)Village rules (C24) Planning scheme (B6)Culture: (C25) Cultural events (C25) Social atmosphere (C27) Neighborhood (C28)Public security
19	Tania Sharmin	Post occupancy and participatory design evaluation of a marginalized low-income settlement in Ahmedabad, India [24]	Thermal comfort, Overall happiness with the living quality of the houses, Thermal acceptability, Adequate, daylighting, Adequate ventilation; Neighbours, living independently, safe, privacy, noise, talking with people, amenities, spaces for recreation, having a say, neighborhood facilities
20	Emmanuel Bosompem Boadi	Antecedents of Residential Satisfaction in Resettlement Housing in Ellembelle: A PLS-SEM Approach	Public Facilities (PF):PF1 Educational facilities PF2 Open spaces for community gatherings and recreation PF3 Commercial facilities PF4 Healthcare facility; Neighborhood Environment (NE):NE1 Infrastructural services, NE2 Safety and security, NE3 Appearance and orderliness, NE4 Access and connectivity, NE 5 Social relationship/integration; Dwelling Characteristics (DC): DC1 Ample spatial sizes of unit, DC2 The reasonable function of unit layout, DC3 Comfortable, and healthy indoor environment, DC4 Quality of housing materials;
21	Becerra-	Evaluation and	Indoor climatic conditions: air

No.	Author	Title	Evaluation Indicators
	Santacruz, H	visualization of Mexican mass housing thermal performance	temperature, relative humidity levels.
22	Moustafa, W.S	Building performance assessment of user behavior as a post-occupancy evaluation indicator: A case study on youth housing in Egypt	lighting, natural ventilation, thermal comfort

2) Frequency statistics and comprehensive analysis

Introducing the method of word frequency statistics, the frequency can reflect the accumulated experience of experts and scholars, and reflect the importance of these indicators. Firstly, the keywords summarized in the relevant literature are integrated, and the indicators with strong relevance to architectural design, planning, and environment are mainly selected for frequency statistics, and some more similar indicators and indicators with weaker relevance to architecture are screened out. After that, the screening indicators are categorized and processed, and after summarization and semantic refinement, the POE evaluation index set is initially constructed (draft).

Table 4-4 The composite evaluation index set related literature statistical table

Field Layer	Index Layer	Source of Indicators	Frequency
	Planning layout	12, 15, 18, Britain, China	5
Function design	Room-scale	2, 3, 5, 6, 7, 9, 10, 11, 12, 17, 20, US, China	12
	Number of functional rooms	2, 5, 6, 7, 10, 11, 12, 16	8

Field Layer	Index Layer	Source of Indicators	Frequency
Physical environment	Room temperature and humidity	2, 6, 19, 21,22, Japan, EU, GBES, US	9
	Daylighting	2, 6, 9, 10, 11, 15, 16, 17, 19, 22, Japan, GBES, Britain	13
	Ventilation	6, 9, 11, 15, 17, 19, 22	7
	Sound insulation	2, 6, 9, 15, 17, 19, Japan, Britain, GBES, France, EU, China	12
Building Safety	Structural safety and anti-seismic	1, US, Japan, EU, China, GBES	6
	Structural safety and anti-seismic	2,6, US, Japan, EU, China	6
	Antitheft design	10, Japan, China	2
Infrastructure	Traffic facilities	1,4,6,9,13,14,15,17,18,20, Britain, US, GBES	13
	Educational Facilities	5,6,14,15,17,18,20, GBES	8
	Medical and sanitation facilities	5,6,11,13,14,15,16,17,18,20, GBES , US	12
	Recreational and sports facilities	1,6,7,9,13,14,15,17,18,19,20, GBES , China	13
Construction quality	Waterproof, damp proof	2,6, China, GBES	4

Field Layer	Index Layer	Source of Indicators	Frequency
	Quality of doors and Windows	9,10, China, GBES	4
	Appearance and decoration quality	1,9,18, China, GBES	5
	Quality of building materials	2,3,8, 9,11,20, France , US , GBES	10
	Community road quality	18, France	2
	Traffic convenience	14, 15, 17, 20, GBES, Britain, China	7
Living environment	landscape engineering	1,5,6,13,14,15,18, GBES, Britain, China	10
	Community policing	7,9,14,15,16,18,20	7
	Surroundings	4,12,14,15,17,18, GBES , China	8
Locality	Regional architectural style	13, 14, China	3
	Continuation of national customs	GBES	2

After analyzing and comparing the related indicators, the keywords are combined, eliminated, or refined: for example, parking and signage are grouped into "traffic facilities"; similar indicators are grouped and unified, for example, noise and sound insulation are unified into sound insulation. After counting the frequency of words, we can see that the indicators with higher frequency include room size, lighting, sound insulation, transportation facilities, medical facilities, cultural and sports facilities, construction materials, and greenery, which indicates that most scholars consider the above indicators as the main categories of low-income housing needs.

3) Supplement of evaluation indicators

The subject of post-use evaluation is the user, and to more directly and accurately reflect the will of the evaluation subject, feedback from users was incorporated into the evaluation indexes of this study. Semi-structured interview data was used as the content analysis method, supplemented by some user interviews in the resettlement area, to find factors with high concern rates from residents' personal feelings. These evaluations, ranging from satisfactory to unsatisfactory, reflect the needs that residents value and care about and should be included in the evaluation index.

Based on the results of the literature search, this study developed an interview outline: (1) What aspects of the human living environment in the resettlement area you live in do you consider unsatisfactory? (2) What aspects do you think need special attention to improve the human environment of the resettlement area? The villagers who lived in the resettlement area for a long time were selected for semi-structured interviews using the purposive sampling method. The interview time for each villager was 15-20 min.

By aggregating and classifying the information related to the building level, the keywords already included in the index set were selected and included in the evaluation index as evaluation factors. (Table 5)

Table 4-5 Evaluation keywords translation

Evaluation keywords	Keywords translation
No fire pit/no space for worship	Continuation of national customs
Yard too small / no yard	Yard Design
Easy to slip in the rain/slip in the bathroom	Slip and fall prevention
Too far from the farming place/no place to raise chickens	Farmland/Livestock Fields
Missing the old home/lack of sense of belonging	Community attachment

4) Preliminary construction of evaluation index set

The evaluation indexes in this paper are based on the concept of habitat environment regarding the habitat environment components of natural, human, social, residential, and support networks [37]. The evaluation indexes are selected based on the concept of habitat environment, the ideas of safety, health, convenience, comfort, and sustainability, the community level as the basic unit of investigation, the components of habitat environment, and the characteristics of the resettlement area and the needs of migrants. By combing and drawing on relevant literature studies, and including housing evaluation standards of several countries, such as China's Green Building Evaluation Standard (GB/T50378-2019) and Housing Performance Rating Standard (GB/T50362-2005), The Housing Quality Indicators system (HQI) in the U.K., Japan's Housing Quality Assurance Act (HQAA)⁷⁰, the U.S. Housing Quality Standards (HQS).

The literature word frequency statistics were used, which led to the selection of valid, objective, and comprehensive indicators. At the same time, the thesis introduced semi-structured interviews of users as a supplement to the selection of evaluation indicators. After that, to facilitate the weight calculation of indicators, the principle of the AHP method was introduced, and the indicators were stratified and grouped into three levels: target level, criterion level, and indicator level, and then refined the level indicators. The indicators are refined into individual indicators in turn. The construction of the evaluation indicator set is the core of the evaluation process, and if the indicator set is not determined, the evaluation cannot be carried out.

The evaluation model needs to establish hierarchical indicators, analyze the direct affiliation as well as the similar relationship, and divide the factors into three layers: the first layer is the target layer, which is the comprehensive evaluation target of the post-use satisfaction of the built environment in the resettlement area, and is the quantification of the post-use satisfaction into specific targets; the second layer is the field layer, which is the indicator layer after refining the target layer, and directly affects the overall target layer; the last layer is the index layer, which is specified to the final set of indicator factors, which contains the dimensions of the main target.

Integrating the in-depth analysis of the previous paper, a set of indicators for the POE satisfaction of immigrant resettlement residences was established (preliminary draft). In the first draft, the field layer consists of seven indicators: function design, physical environment, building safety, infrastructure, construction quality, living environment, and locality. And in the next level, the index layer is composed of 35 indicators. The function design layer is divided into planning layout, house layout

design, room-scale, number of function rooms, and yard design. The physical environment level is divided into room temperature and humidity, daylight, ventilation, and sound insulation. The building safety level is divided into eco-environmental safety, slip and fall prevention, structural safety and anti-seismic, fire safety, and anti-theft design. The infrastructure layer is divided into internet, water and electricity supply, transportation facilities, farmland or livestock fields, medical facilities, educational facilities, sanitary facilities, and recreational and sports facilities. The construction quality layer is divided into waterproof, damp proof, quality of doors and windows, appearance and decoration, quality of building materials, and community road quality. The living environment indicator consists of four indicators, which are transportation convenience, landscape engineering, community policing, and the surrounding environment. And the locality layer is divided into the following indicators: regional architectural style, integration with the natural environment, Continuation of national custom, local material selection, and community attachment.

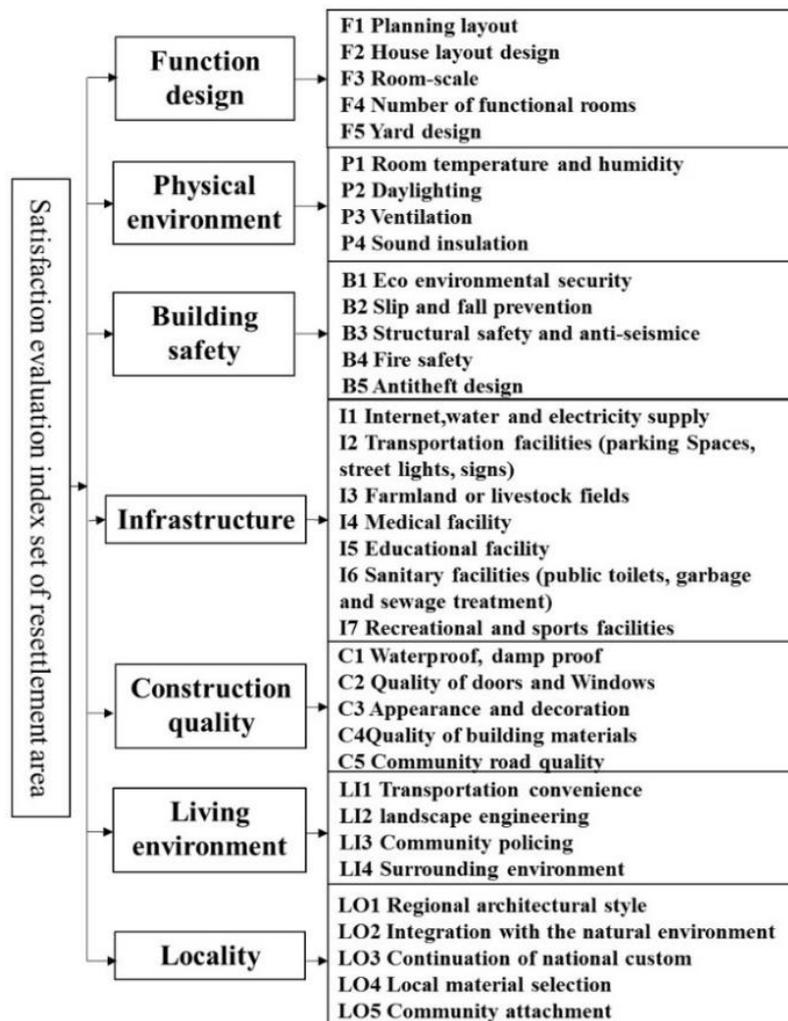


Figure 4-3 Draft Settlement Evaluation System

4.2.2 Optimization of evaluation indexes

In order to make the evaluation index set more reasonable, the thesis not only adopts the literature method and content analysis method of semi-structured questionnaire data, but also introduces the Delphi expert inquiry method, conducts three rounds of expert questionnaire consultation, modifies and improves the evaluation indexes, and adjusts the index set, to obtain a more authoritative evaluation index set. The Delphi expert questionnaire method is to select several experts according to certain criteria, obtain experts' opinions on the evaluation indexes in the form of questionnaires, and adjust the index set, to get a more authoritative evaluation index set. The specific steps are as follows:

① Selection of experts

To ensure the objectivity and rigor of expert evaluation, the object experts of this paper's questionnaire research, as well as the way the questionnaire needs to have the following set of conditions.

(1) Experts need to have a certain academic level and practical experience in different fields, so they need to have 3 years or more of work experience.

(2) The experts are mainly engaged in the field of architectural design research and have an independent understanding and knowledge of the object of this research - poverty alleviation and relocation housing. And have the willingness to actively participate in this research.

(3) The number of expert questionnaires should be a reasonable range, comprehensive of other literature practices, and the reason that this questionnaire involves the determination of evaluation indicators and the allocation of weights, regarding the Delphi method, the number of experts should generally be selected from 20-30.

(4) The questionnaire was designed in an anonymous form, but the necessary information about work units and years of work was collected.

② Questionnaire return, process, and results

The author conducted this expert evaluation questionnaire research from the end of November 2021 to January 2022, with more than 30 experts in related fields from universities, government planning bureaus, relevant design institutes, and engineering companies. The survey is divided into two parts: the first part is to know the experts' working units, working years, research directions, etc. The second part asks the experts

to judge the reasonableness of the first-level indicators, and then select and judge the importance of the second-level indicators. On this basis, the experts are invited to analyze and judge the correspondence and attribution analysis of the first and second-level indicators and ask other open questions.

The research was conducted by the relevant investigators by inviting experts to conduct questionnaire research. Among the 35 expert questionnaires sent out, 30 were returned and 30 valid questionnaires were obtained, with a recovery rate of 86% and a valid response rate of 100% of the number recovered, among which 10 experts made modifications and questions, accounting for 33% of the valid consulting experts.

③ Analysis of questionnaire results.

1) Age structure and working years of experts:

To make the expert questionnaire convincing, the age item in the composition of the experts contains middle-aged and older experts, as well as some younger experts, and the overall age span is distributed from 33-55 years old. In terms of years of work, the selected experts were all more than 3 years old.

Table 4-6. Expert working years distribution.

Years of work	Number of people	Percentage (%)
3-5 years	8	26.67
5-10 years	4	13.33
10-20 years	12	40
> 20 years	6	20
Total	30	100

2) Distribution of expert titles:

To meet the requirements of diversity, the titles of the research subjects cover a certain span. From the distribution of experts' titles, among the invited experts of the research subjects: 13.33% are professors, 20% are associate professors, 26.67% are lecturers, 26.67% are engineers, 6.67% are doctors, and other 6.67% are government planning bureau personnel, so the composition of titles basically meets the requirement

of diversity and balance.

3) The main research direction of experts.

This study selected experts from two major institutions, Chongqing University School of Architecture and the Institute of Architectural Design, and the research direction of the selected experts is mainly in the direction of architectural design. From the analysis of the research, experts in the direction of architectural design accounted for 53.33%, architectural technology accounted for 6.67%, the direction of architectural history and theory accounted for 6.67%, residential architecture accounted for 13.33%, urban renewal accounted for 6.67%, regional architecture accounted for 6.67%, and public architecture direction accounted for 6.67%, and the professional direction also basically met the requirement of diverse distribution.

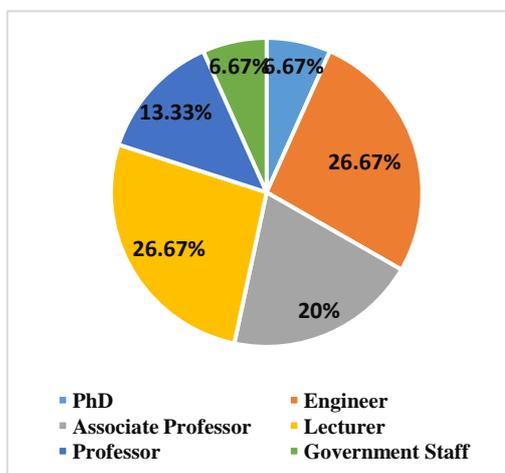


Figure 4-4 The distribution of professional titles

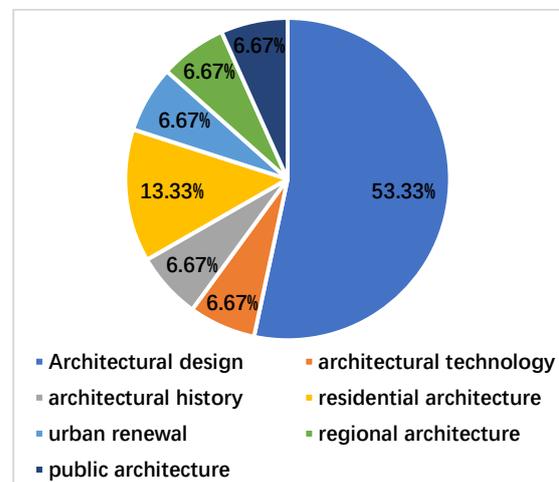


Figure 4-5 The main research direction distribution of the experts

4) Expert evaluation suggestions.

Two rounds of expert questionnaires were conducted. The first round of expert opinions focused on the index layer, and indicators were removed and names replaced in the index layer based on expert opinions (Figure 4-6).

Target layer	Factor layer (First level)	Index layer (Second level)
Satisfaction evaluation index set of the minority resettlement area	Function design	F1 Planning layout F2 Room-scale F3 Number of functional rooms F4 Yard design
	Physical environment	P1 Room temperature and humidity P2 Daylighting P3 Ventilation P4 Sound insulation
	Building safety	B1 Slip and fall prevention B2 Structural safety and anti-seismice B3 Fire safety B4 Antitheft design
	Infrastructure	I1 Transportation facilities (parking Spaces, street lights, signs) I2 Farmland or livestock fields I3 Medical and sanitation facilities (clinic, public toilets, garbage and sewage treatment) I4 Educational facility I5 Recreational and sports facilities
	Construction quality	C1 Waterproof, damp proof C2 Quality of doors and Windows C3 Appearance and decoration C4 Quality of building materials C5 Community road quality
	Living environment	LE1 Transportation convenience LE2 landscape engineering LE3 Community policing LE4 Surrounding environment (scenery, pollution, noise, disaster, taboos)
	Locality	LO1 Regional architectural style LO2 Continuation of national custom LO3 Local material selection LO4 Community attachment

Figure 4-6 Results of the first round of indicator revision

The second round of questionnaires was distributed again based on the first round of expert groups, and the second round of experts provided opinions on both the index and factor layers.

There are 29 experts who think that this satisfaction evaluation index set is properly classified, 3 experts think that the evaluation indexes and classification are improper, while 9 experts question and modify the index set.

First, suggestions on the first-level indicators.

According to the open-ended questions in the questionnaire, three experts think that the term "functional design" is not accurate enough; two experts think that the concept of "living environment" is vague and should be considered to replace the name; one expert suggests that "local" should be changed to "regional characteristics", while some experts thought that "building quality" should be changed to "building durability".

Second, suggestions for secondary indicators.

In the level of "functional design", five experts think that "planning layout" does not belong to the same level as other indicators, two experts think that the number and scale of rooms can be combined into a larger indicator item, and three experts question the name of "courtyard". Three experts questioned the name of "courtyard design".

And in "physical environment", three experts suggested that "temperature and humidity" and "ventilation" could be combined into In the "physical environment", three experts suggested that "temperature and humidity" and "ventilation" could be combined into "thermal comfort", and two experts suggested that indoor air quality was also an influencing factor.

In the "building safety", seven experts suggested that "accessibility" index should be added, and five experts suggested that "geological safety" should be added.

In "building safety", 7 experts suggested that "accessibility" should be added, 5 experts suggested that "geological safety" should be added, and 2 experts suggested that "anti-slip and anti-fall" should not be listed separately; and in "building quality", experts thought that "Three experts thought that "community road quality" should be deleted, and two experts thought that the quality of equipment and pipelines should be added.

Under the level of "infrastructure", four experts thought that the name of "arable land and pasture land" should be revised, four experts proposed to add "commercial facilities", and three experts thought that the names of various Three experts thought that the name of each facility needed to be reconsidered.

In "living environment," six experts thought the term "surrounding environment" was too vague.

In "local", 5 experts thought that "landscape memory" should be added, 2 experts thought that the name of local architectural style should be revised, and 5 experts thought that "sense of belonging to the community" did not belong to this level. belong to this level.

The author examined the final interpretation items and concluded that the indicators needed to be revised.

④Revisions and responses to the experts' suggestions on the index set

In response to the above questions and suggestions from the experts, this paper adds and adjusts according to the following principles: the indicator set is a whole, the starting point should be the second-level indicator explanation items, and each item

should be independent so as not to overlap and be ambiguous (all are objective attributes), and at the same time try to make the names of indicators at all levels more accurate.

In the first-level indicators, "functional design" is changed to "residential space design", "building quality" is changed to "building durability ", "living environment" is changed to "environmental livability", and "local" is changed to "regional characteristics ".

In the secondary indexes, "residential space design" is classified according to the space name; "temperature and humidity" and "ventilation" are combined into "thermal comfort" "indoor air quality" is added; in "building safety", "slip and fall prevention" and "barrier-free In "building safety", "slip and fall prevention" and "accessibility" are combined into "protection safety", and "geological safety" is added; "door and window quality" is revised to "structure Exterior envelope", "community road quality" is deleted, and "equipment and pipeline quality" is added; "arable land and pasture land" is modified to "production facilities", adding "commercial facilities", replacing "surrounding environment" with the ecological environment, and putting "planning layout "local architectural style" was changed to "national architectural style", and "landscape genes" was added.

After the above modifications, the following set of satisfaction indicators for the evaluation of relocation houses for poverty alleviation of ethnic minorities is obtained.

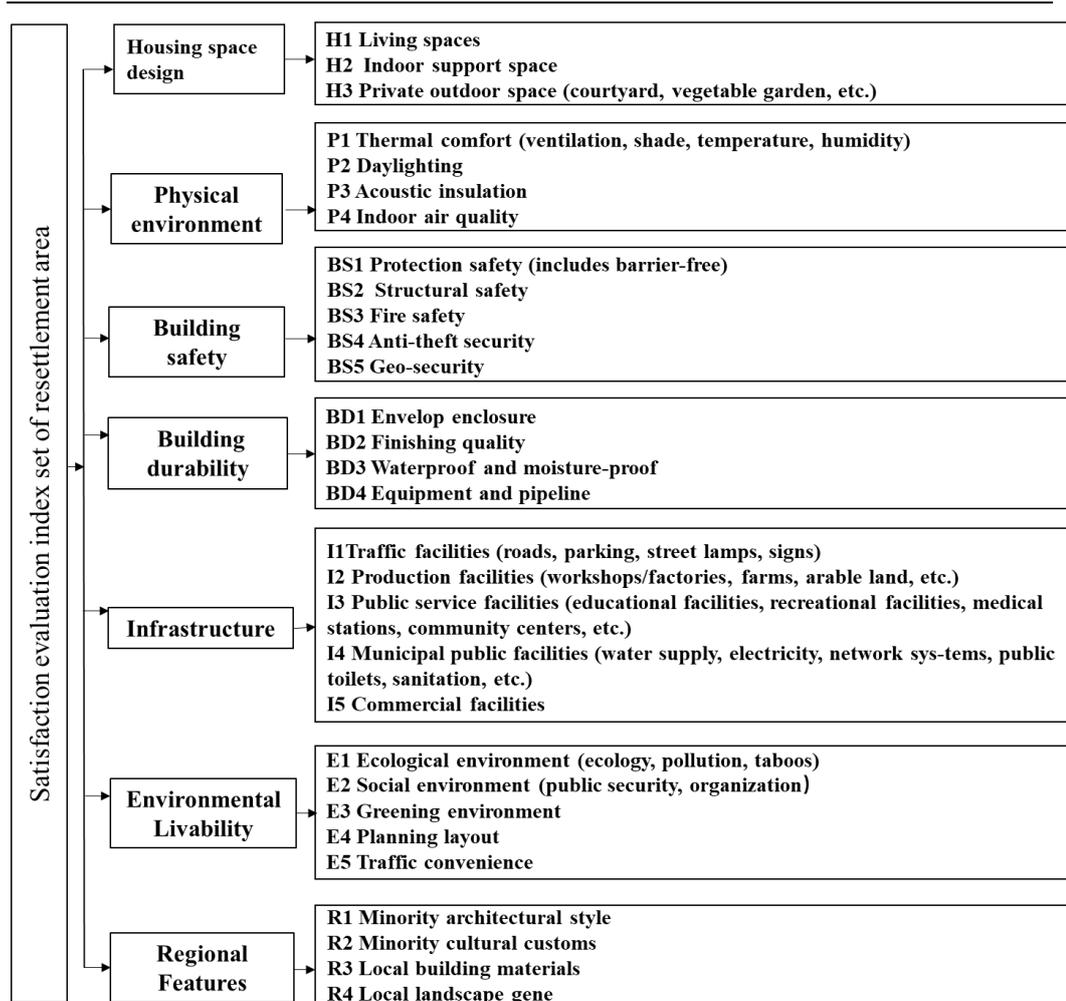


Figure 4-7 Minority Settlement Housing Satisfaction Evaluation Indicator Set

4.3 Application study of the evaluation system

To verify the applicability of the established POE working method for rural poverty alleviation resettlement areas, the paper first selected the Shangman turnip relocation project in the whole Dong village of Jiangcheng County, Pu'er City, China as an evaluation case.

4.3.1 Project Overview

The Yao people are mainly located in Jiangcheng, Jingdong, and Mojiang counties in Pu'er City. In terms of architectural forms, Yao houses can be divided into four types: first, brick and tile, second, mud and tile, third, dry fence, and fourth, fence. The roofs are all "human" type. The direction of the house, depending on the geographical location varies, generally, west to east or north to south, there are also east to west or south to north. The layout of the interior of the house is also varied, with a kitchen, dining room, bathing room, bedroom, hall, shrine, storage room, and so on. It fully

reflects the living habits of the Yao people. Yao dwellings are good at adapting to local conditions, and are divided into "half-built", "full-built" and "quadrangle". "Half-built" is usually five columns and three rooms, with a partial building attached at both ends, a partial building at one end, or a compartment in front of a partial building. The gate is mostly on the upper floor of the house, the "full building" as opposed to "half of the building" and called, generally built along the river or half of the hill on a flatter layer of the foundation, the scale and ancillary buildings and "half of the building" the same. The "courtyard" in the flatter ground is connected with the construction of four "full building" synthesis of the house, the middle of a small square open space courtyard, so-called "courtyard", this building only rich people live.

In Jiangcheng County, the whole Dong Village of the whole Dong Town is a Yao village with a subtropical climate, located in the mountainous area of the border. Farmers' income is mainly based on agriculture. In 2006, the total economic income of the village was 118,400 yuan, and the per capita net income of the farmers was only 705.00 yuan. 2015, due to the geological landslide disaster, the government moved the village from the mountain to the Sijiang secondary highway for reconstruction, taking into account the ecological safety and economic development needs.



Figure 4-8 Geographical location of the case-affiliated villages



Figure 4-9 Evaluation of the site location of the case

A total of 3,564.2m² is planned for 21 new homesites, and the rest of the land is for roads, public service facilities, basic service facilities, and industrial development. The new relocation site is geologically stable, 9 km away from the town government, and the traffic is more convenient than the original residence. The village is built according to the terrain, and the overall terrain is basically high in the north and low in the south. The building design extracts the traditional Yao slope roof architectural design elements to rationalize the functional layout, and at the same time adjusts the area by taking into account the local villagers' living needs and economic situation.

Table 4-7 Before and after village relocation

Before relocation	After relocation

Before relocation	After relocation
	
<p>The main building materials are soil, wood, and brick</p>	<p>The main building materials are brick, reinforced concrete, etc.</p>

4.3.2 Data acquisition and analysis

1) Field observation

The architectural design of the project continues the living characteristics of the Yao people and enhances the living standard of the local residents by appropriately integrating their new living concepts. The design adopts the traditional Yao architectural style, adjusts the function, rationalized layout and area according to the requirements of the times, and retains certain traditional morphological elements through the combination of forms.

In terms of living space, the design takes into account the characteristics of traditional Yao living, with the hall as the core, and combines the open space in the east and west directions to organize the dining and daily living. Through partial enclosures and partitions, the dwelling and sleeping space are separated. The residential form consists of a main house, two auxiliary rooms, and a courtyard. The number of floors is within 2, the height of the first floor is 3.0m and the second floor is 2.5m; the main house has two floors, the first floor is for the living room and residence, the second floor is for sun terrace and storage; the auxiliary rooms are for kitchen and dining room. In terms of building color, the facade is mainly colored with green tiles and white walls, and the roof is mainly in the form of traditional sloping roofs, preserving the traditional characteristics of Yao dwellings, supplemented by flat roofs, with sloping roofs for the main houses and sloping or flat roofs for the auxiliary houses.



Figure 4-10 Graphic and Planning Design Overview

The functional area dimensions of the space dwelling were compared with the minimum dwelling size standards specified in the Chinese residential design standards through a practical survey. The basic elements of a dwelling unit include bedrooms, living areas, kitchen areas, and toilets, all of which are available in this resettlement dwelling and the area complies with the national standards, as shown in the table.

Table 4-8 Sample Status Survey

<p data-bbox="422 526 555 560">Living area</p> 	<p data-bbox="778 526 887 560">Bedroom</p> 	<p data-bbox="1134 526 1228 560">Kitchen</p> 	
<p data-bbox="443 1137 534 1171">Facades</p>	<p data-bbox="783 1137 882 1171">Flat roof</p>	<p data-bbox="1082 1137 1278 1171">vegetable garden</p>	
			
	<p data-bbox="624 1597 842 1675">Required minimum area</p>	<p data-bbox="898 1619 1078 1653">The project area</p>	<p data-bbox="1114 1619 1332 1653">Is the standard met</p>
<p data-bbox="384 1697 518 1731">Living area</p>	<p data-bbox="691 1697 778 1731">>10m²</p>	<p data-bbox="938 1697 1038 1731">32.83m²</p>	<p data-bbox="1201 1697 1257 1731">Yes</p>
<p data-bbox="363 1753 539 1832">Bedroom(Two-person)</p>	<p data-bbox="707 1753 778 1798">>9m²</p>	<p data-bbox="938 1753 1038 1798">15.19m²</p>	<p data-bbox="1201 1753 1257 1798">Yes</p>
<p data-bbox="403 1843 499 1877">Kitchen</p>	<p data-bbox="707 1843 778 1877">>4m²</p>	<p data-bbox="938 1843 1038 1877">15.19 m²</p>	<p data-bbox="1201 1843 1257 1877">Yes</p>
<p data-bbox="395 1899 515 1930">Bathroom</p>	<p data-bbox="691 1899 778 1930">>2.1m²</p>	<p data-bbox="938 1899 1038 1930">3.51m²</p>	<p data-bbox="1201 1899 1257 1930">Yes</p>

In terms of infrastructure, the villages are mainly organized with the stock of land and moderate development of construction land. The facilities such as the cultural room, basketball court, newspaper reading board, village affairs public board, and science propaganda board are configured, public space is reserved for villagers to rest and communicate, and a separate centralized breeding area is set up to meet the needs of village production and life. Among them, the cultural activity room, located on the west side of the village, is used as a functional room for village visitor reception, medical first aid, mail collection, delivery, etc. A basketball court is set up in front of the activity center to meet the needs of villagers holding major festivals, farming activities, and sports exercises, and also used as an important disaster avoidance site for the village. There is a public toilet opposite the square, next to the garbage collection point, the unified livestock breeding area, and the biogas digester, which is left at a certain distance from the residential area and located downwind so that the residential area is far away from pollution.

Table 4-9 Sample Status of Infrastructure Survey

Cultural Activities Room	Public activity space
	
Public toilets and garbage collection points	Breeding area
	

2) Respondents' basic information

In this study, questionnaires were returned for the resettlement area occupants survey. There are 21 farming households in Shangmangyi, with a population of 97 people, all of whom are Yao, including 72 in the labor force. In April 2022, with the assistance of the village committee, a total of 30 paper questionnaires were distributed to the village, all of which were collected, excluding those with incomplete and untrue answers, and 27 valid questionnaires were obtained. The villagers in this village have been living in the relocation site for three years, and have accumulated certain usage experiences and subjective feelings about the place of residence, and the evaluation subjects meet the needs of the study, and the basic information of the respondents is detailed in the figure.

In terms of gender composition, there were 16 male villagers, accounting for 59% of the total sample, and 11 female villagers, accounting for 41% of the sample, with a relatively balanced ratio of men to women. In terms of age structure, villagers were mainly young and middle-aged, aged 30-59 years old. In terms of family structure, the respondents' family structure is dominated by two and three generations. In terms of education level, primary and junior high schools dominated, accounting for 96% of the sample size. The village group is dominated by farming, and those with an annual per capita income of about 5,000 to 10,000 yuan account for 48%, which is a low-income village.

3) Basic analysis of satisfaction evaluation

The subjective satisfaction questionnaire counted the subjective satisfaction of each factor on the accommodation population separately, quantified by using the semantic scale method, and the higher the score the better the evaluation. After assigning values to the questionnaire data, statistical analysis was conducted by using Excel software to calculate the average value, and the average value can accurately reflect the concentration trend of the sample, after which the resulting scores of each index factor were obtained.

Overall, the average satisfaction score for the Shangman Turnip Relocation Project was 4.2/5, which is between satisfied and very satisfied, reflecting that the villagers were generally satisfied with the project. Among the seven indicators layer satisfaction indicators, villagers' satisfaction with Building Safety, Infrastructure, and Environmental Livability is relatively high, with an average score of 4.3 or more; satisfaction with Building durability is relatively low, at 3.66, indicating that the

surveyed This aspect has problems exist. In the next factor level, the indicators with satisfaction scores above 4.5 are P3 Acoustic insulation, P4 Indoor Air Quality, BS4 Anti-theft security, BS5 Geo-security, BD4 Equipment and Pipeline, E1 Ecological environment, E2 Social environment, E3 Greening environment, indicating that the respondents are most satisfied with these aspects. Satisfaction levels below 3.5 are BD1 Envelop enclosure, BD2 Finishing quality, BD3 Waterproof, and Moisture-proof, which indicate that there are problems in these areas.

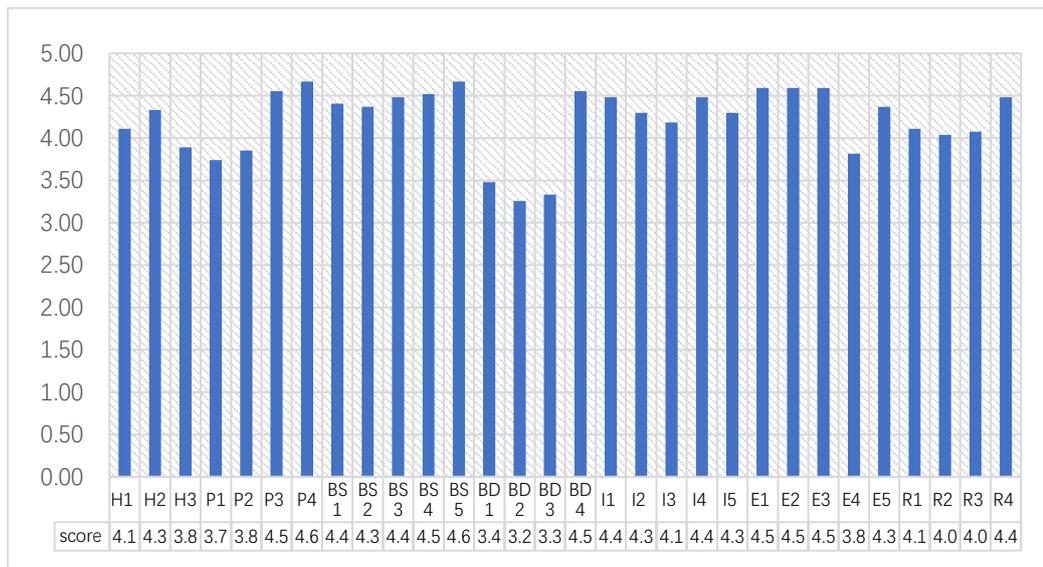


Figure 4-11 The histogram of the average score of the 7-grade index of Shang Manqing

Field Layer	Evaluation score	Evaluation language
Housing space design	4.11	Good
Physical environment	4.20	Good
Building Safety	4.49	Good
Building durability	3.66	Good
Infrastructure	4.35	Good
Environmental Livability	4.39	Good
Regional Features	4.18	Good

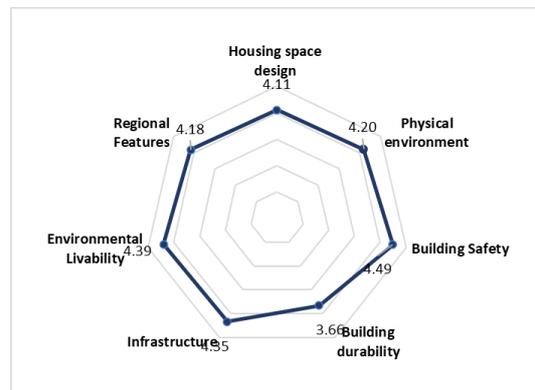


Figure 4-12 Satisfaction assessment diagram

4) Sample interviews

In order to enrich and supplement the information of users' post-use evaluation, the author interviewed four randomly selected respondents and carefully asked them about their post-use evaluation of the resettlement area, asking them about their sense of experience after using the area and counting the advantages and disadvantages, hoping to supplement the structured questionnaire with this. This semi-structured interview was conducted according to the set of evaluation indicators, and open interviews were conducted with the respondents in terms of the environment, space, and facilities of the resettlement area. Both complementary and unsatisfactory evaluations were recorded.

4.3.3 Discussion and Summary

The post-use evaluation of the resettlement area was conducted above by using field observation, subjective evaluation, and semi-structured interviews combined with surveys. After collecting the concept plan rendering and comparing and analyzing it with the actually completed effect, we found that the actual completed building matched the concept plan to a high degree, but there were also modifications, which, according to the designer, were the result of continuous communication and discussion with the residents at a later stage, especially considering the convenience of actual use. On the other hand, in the process of quantitative evaluation, the comparative analysis of the average value of satisfaction of various rating indicators, we initially found some strengths and weaknesses of the resettlement area. And through random interviews as well as non-participatory research to complement and corroborate each other, the results obtained are consistent, and it can be seen that the accuracy of this evaluation is good. Finally, we summarized and analyzed the current situation of the built environment through qualitative in-depth evaluation, and came up with the following evaluation results.

(1) Housing space design: The satisfaction of the residents of this community with the planning layout of the village is high. After field research, the village has reasonable planning zoning, a clear road network, and the spacing of houses meets the requirements of sunlight. The house type design is square and reasonable, with sufficient functional rooms to meet the living needs of three generations. However, the score of the courtyard design is low. After research and interview, we know that users think the area of the courtyard is too small to meet the needs of production, living, and interaction.

(2) Physical environment: Users are satisfied with the temperature and humidity, sunlight and ventilation of the resettlement house, and the house has increased the area of window and door openings to promote light and natural ventilation.

(3) Building Safety: The community residents are satisfied with the building safety of the village. The settlement community is geologically stable and has relatively few natural disasters. The building design meets the requirements of fire and seismic codes, and the protective fence is reasonably designed and installed with a burglar-proof fence design for high safety.

(4) Building durability: The residents' rating of Building durability is low. Rejecting the interview, we learned that because the resettlement area is a low-income public housing with limited funding, there are problems with the quality of building materials, waterproofing, and moisture-proofing, and maintenance is needed later. In the construction of rural communities, ensuring the quality of housing is the primary focus⁸.

(5) Infrastructures: villagers are highly satisfied with the basic facilities of infrastructure. Through interviews, we learned that the new community is connected to water, electricity, and the internet, also has medical stations and refuse collection points, and the sanitary conditions and pollutant management capabilities are better than the past way of living, and residents are very satisfied. A unified farming site is also built near the community, and new productive farming land is allocated, which guarantees the villagers' economic source and improves the satisfaction rating of this item. However, the rating of educational facilities is low because the community does not have a school for childcare, which needs to be considered in the planning and design.

(6) Environmental Livability: This indicator has the lowest score for accessibility. Although the community is planned near a highway, public transportation is inconvenient, and public transportation connecting the community needs to be opened later. In addition, the residents are satisfied with the greenery in the village. Based on interviews, residents believe that the designed landscapes within the community complement the peripheral landscapes such as the farmland and water systems. Residents are satisfied with the artificial, urban character of the green environment.

(7) Regional Features: The architectural shape regional index scores well. The community's buildings have traditional sloping roofs covered with small green tiles. The local Yao architectural style is preserved. However, the ratings of other factors are low. It is clear from the feedback that the ethnic customs of the users have been

changed, the building does not have a fire pit for fire prevention and hygiene, and the Yao users are not adapted to the use of modern kitchens. In addition, Yao women like to do textile work in the courtyard, but the new courtyard has no sun protection design, which affects the satisfaction of this rating. Therefore, it is necessary to design the internal environment of the building to link with the ethnic culture, to prevent the return problems of the relocated people who are not adapted to the environment and homesickness, etc.

4.4 Summary of this chapter

This chapter takes minority immigrant relocation resettlement housing as the research object, summarizes and summarizes the relevant theories and research results, and constructs the POE satisfaction evaluation system for minority immigrant resettlement areas by combining literature research and semi-structured interviews. The core part of constructing indicators for the POE method of minority poverty alleviation and relocation resettlement housing is to construct the evaluation indicator set, and further guide the evaluation in a principled and systematic way. The selection of factors for the indicator set is scientific, realistic as well as structural clarity. The process of selecting indicators is to first read a large number of references and evaluation systems in countries with more mature housing development, and after mastering the theoretical basis of poverty alleviation and resettlement housing for ethnic minorities, to find out the characteristics of poverty alleviation and resettlement housing, and to select indicators guided by the characteristics, and then to use the semi-structured interview research method to further generalize and study the needs of users. The expert inquiry method is introduced to improve the indicators based on the opinions and suggestions of several experts, avoiding the limitations of personal subjective factors as well as knowledge level, and constructing a specific set of post-use evaluation indicators of poverty alleviation and relocation housing for ethnic minorities as comprehensively as possible. The constructed evaluation index set will be used to guide the implementation of the POE system.

After the design of the evaluation system, the Yao relocation project in Jiangcheng County, China, was selected as a typical case for investigation and evaluation, and research to examine the operability of the evaluation system for minority relocation areas. The evaluation data were collected through non-participatory research, semi-structured interviews, and questionnaire research according to the operational steps of

post-use evaluation. Through the analysis of the survey information and data, the problems and the learnable points of the evaluation subjects were summarized. Thus, the applicability of this evaluation system was verified.

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Chapter 5 Research on the built
environment of poverty alleviation
resettlement housing for minorities based
on POE

After the evaluation system design was completed in the previous chapter, the POE evaluation system for minority poverty alleviation relocation housing was applied to the implementation process. A case study of eight different minority poverty alleviation relocation villages was conducted to investigate the built environment of the relocation resettlement areas, and the results of the architectural evaluation system on the cases were compared to examine the adaptability and sensitivity of the evaluation system to the minority poverty alleviation resettlement areas. Further, the problems of the built environment of the resettlement houses are explored by identifying the shortcomings.

5.1 Respondents' Profile

The data used in this study were obtained from field surveys and questionnaires conducted from 2021 to 2022. The sampling process of the formal survey was as follows: first, the survey areas were determined according to the multi-stage sampling method regarding the population size, the number of resettlement houses for ethnic minorities, and the construction progress of each area. Then, one to two resettlement areas were randomly selected in each survey area, and a total of eight sample resettlement areas were selected; finally, according to the size of the resettlement areas, the respondent households were randomly selected according to a certain proportion, and among the respondent households, those who had lived in the housing in the previous year. The respondents were selected according to the size of the resettlement area, and all the permanent residents of the household aged 15 and above who had lived in the housing for more than 6 months in the previous year were selected as respondents.

In this study, questionnaires were returned for the survey of the occupants of the minority poverty alleviation housing. Although Chinese language education is currently widespread in the village, local language interpreters were provided for each survey in consideration of the elderly. In the process of collecting questionnaires, random interviews were conducted with some of the study participants, and a walk-through survey was conducted to assist in later research analysis and discussion.

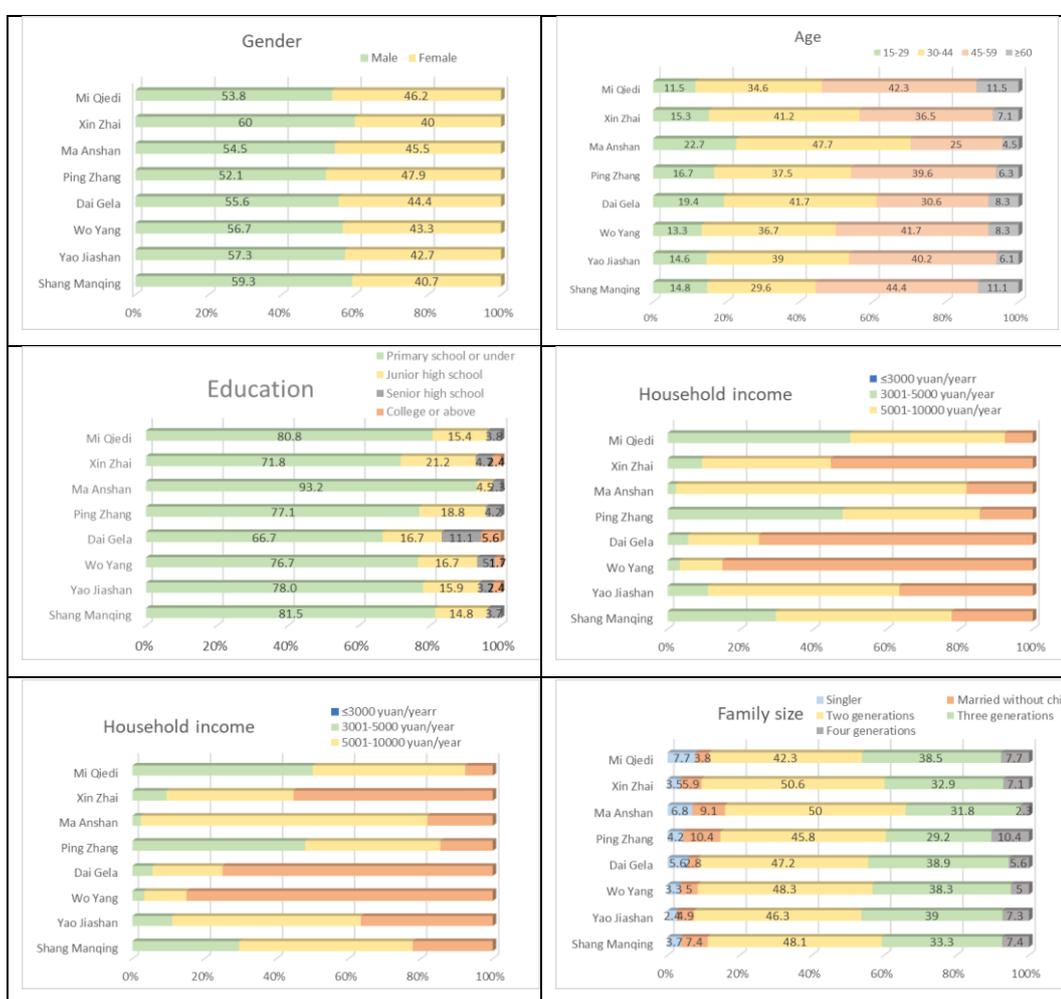
As described in the study above, this study distributed questionnaires to the selected sample in proportion to the total population of the villages, and eventually obtained 408 valid questionnaires, including 27 from Shangmangyi, 82 from Yaojiashan, 60 from Woyang, 36 from Daigra, 48 from Pingpao and 85 from Xin Zhai, 44 from Ma Anshan, and 26 from Close Ground, which had exceeded the calculated questionnaire volume requirements. The villagers of the eight villages surveyed have

lived in the resettlement area for more than two years, and have accumulated certain experiences in using and subjective feelings about their place of residence. The evaluation subjects meet the needs of the study.

Personal and household socioeconomic characteristics as a piece of basic information to understand a dwellers' background of Ethnic Minority Poverty Alleviation and Relocation Area Project including gender, age, education, occupation, income, Income source, and Family size.

The demographic information of each of the eight resettlement areas was counted, as shown in the tab below.

Table 5-1. Comparison of Respondents in Eight Resettlement Areas



According to the statistical results: the eight samples were relatively balanced between gender, age, and educational information. Slightly more respondents were male than female, and the majority of respondents were middle-aged and young adults. While most of the eight resettlement areas had only received an elementary school education or below, only a few respondents in four resettlement areas had received a

university education or above, indicating that the education level in poor minority areas is not high.

The two items of household income and income source for the eight samples had small differences, with three villages having higher annual per capita income and villagers mainly relying on planting and farming as the main source of income. And there was little difference in family size, with more than two generations followed by three generations. Overall, there is little difference in demographic information between resettlement areas, indicating a reasonable sample selection.

5.2 The overall analysis of residential satisfaction

Based on the established POE evaluation framework, the authors investigated the built environment of eight typical resettlement areas for poverty alleviation and relocation of ethnic minorities in Pu'er City. By comparing and analyzing the summaries, the built environment of each resettlement area can be obtained and the design strategies and problems that can be extracted can be discussed.

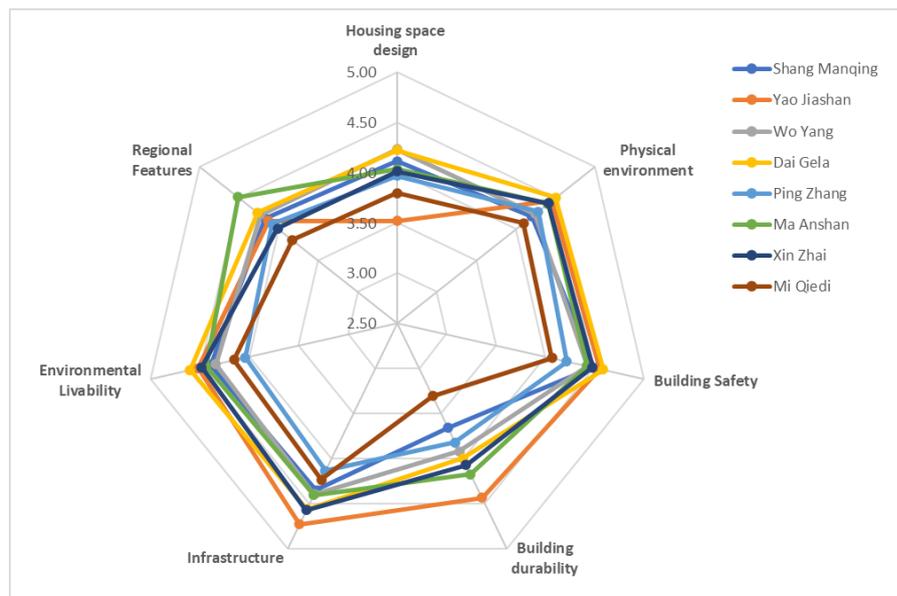


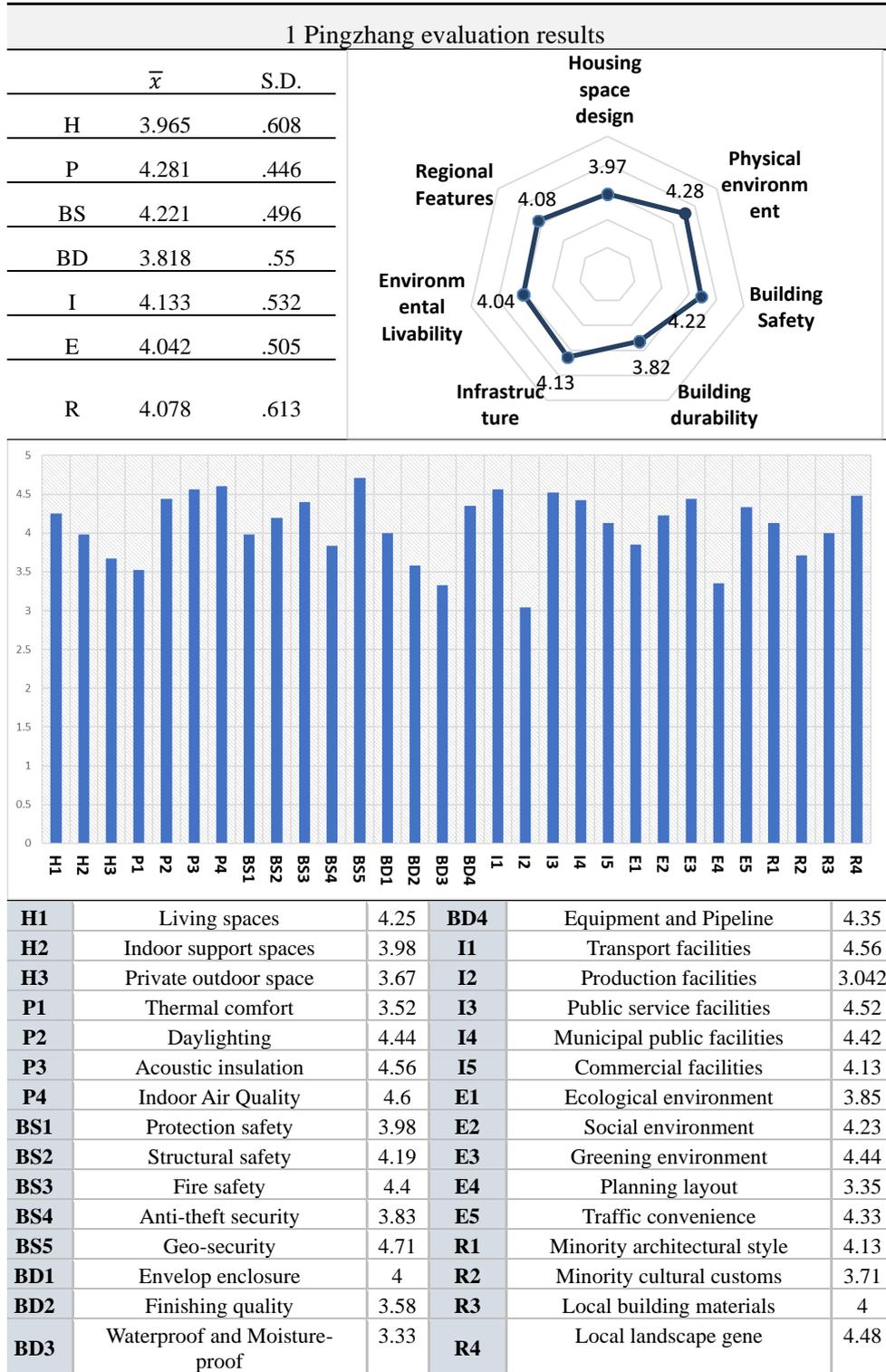
Figure 5-1. Satisfaction scores of the eight samples in seven dimensions

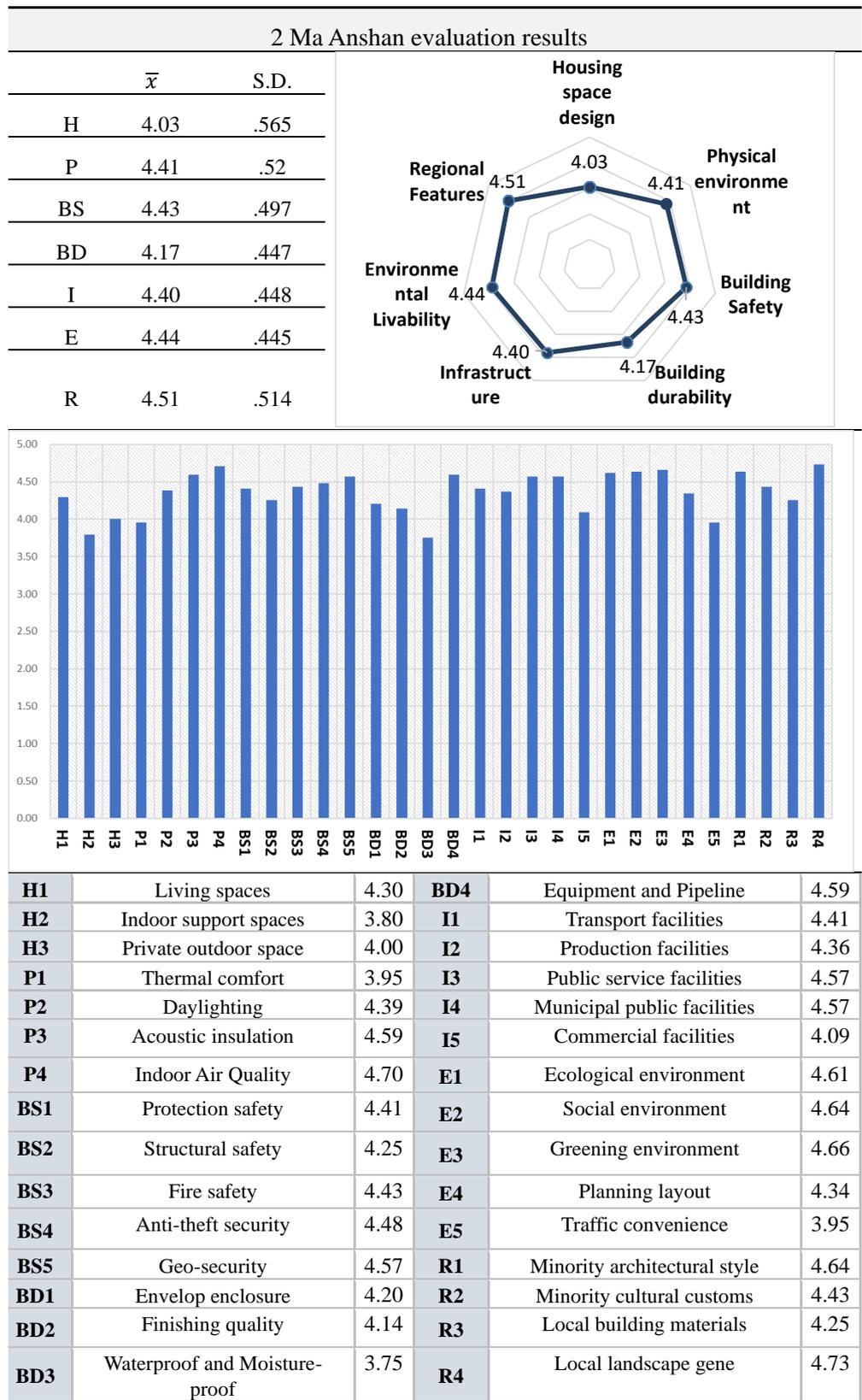
After compiling the evaluation examples, we now need to return to the scope of architecture and analyze the aspects that need to be addressed in the design process of rural minority relocation areas from the perspective of architectural design, extracting strategies for excellent designs and proposing countermeasures for the existing problems, which are finally grouped into strategies.

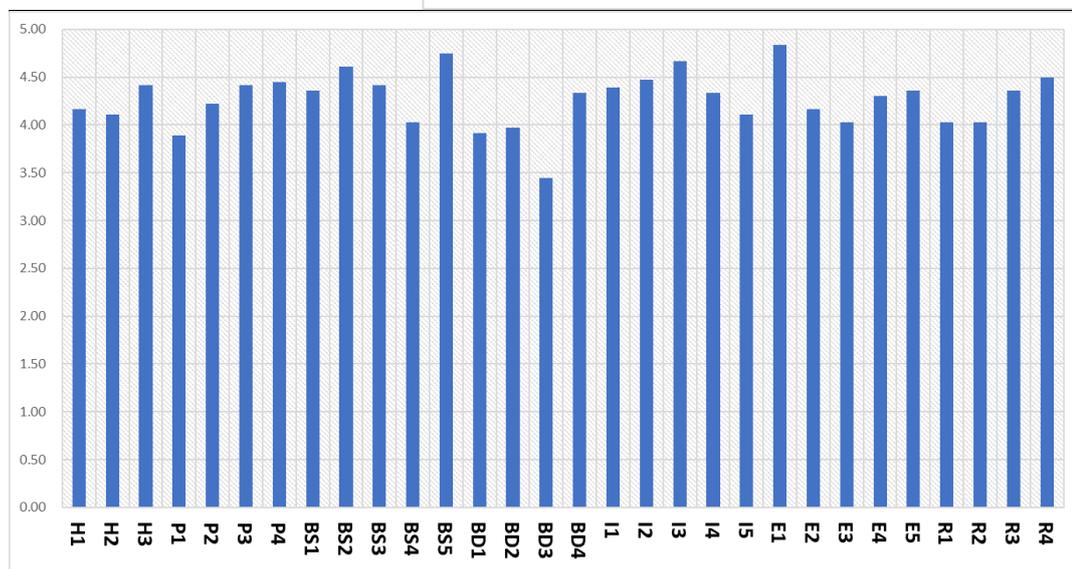
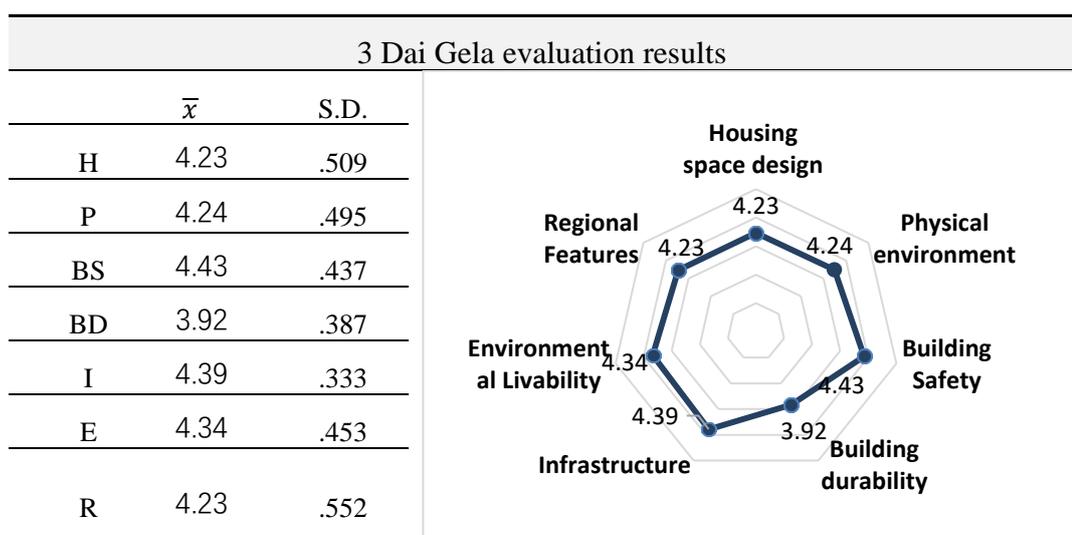
According to the evaluation indexes, the thesis further compares and contrasts the post-use conditions of the resettlement areas of ethnic minorities with the results

obtained from the indexes "Housing space design", "Physical environment", "Building Safety", "Building durability", "Infrastructure", "Environmental Livability", and "Regional Features". The results of each index are analyzed and summarized. The statistics of the survey results of the 8 samples are listed in the following Table 2:

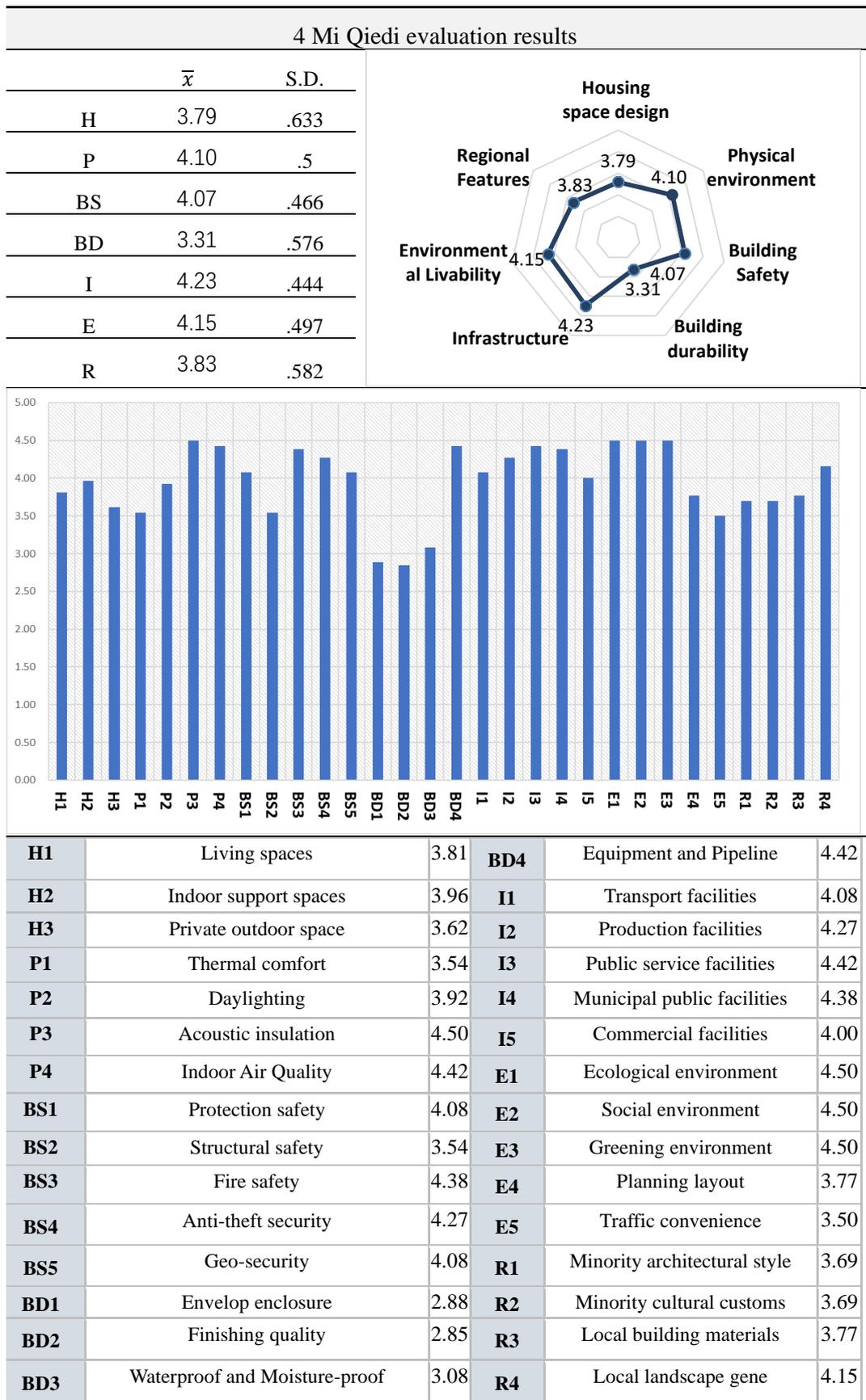
Table 5-2 Results of 8 sample evaluation scores



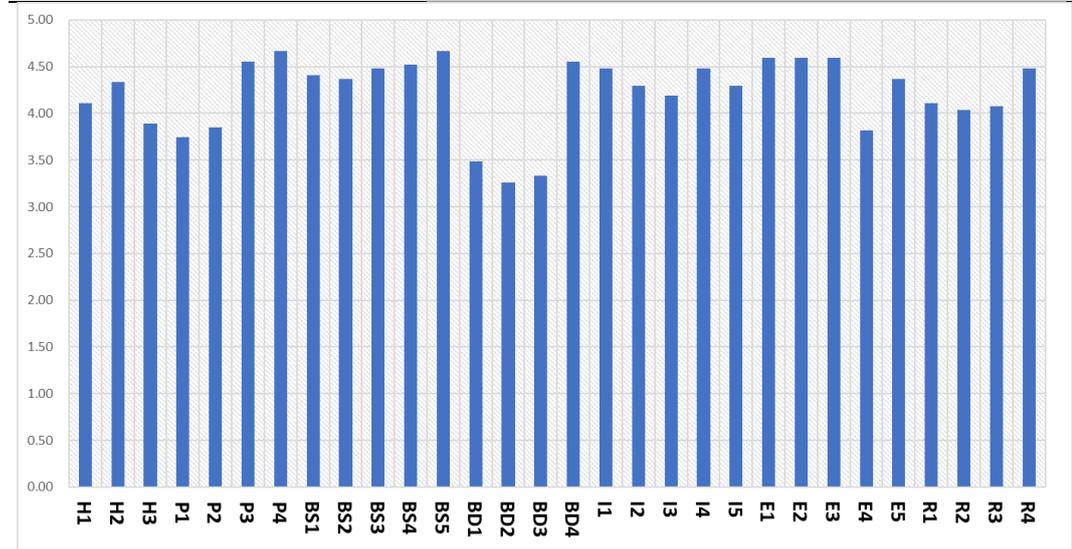
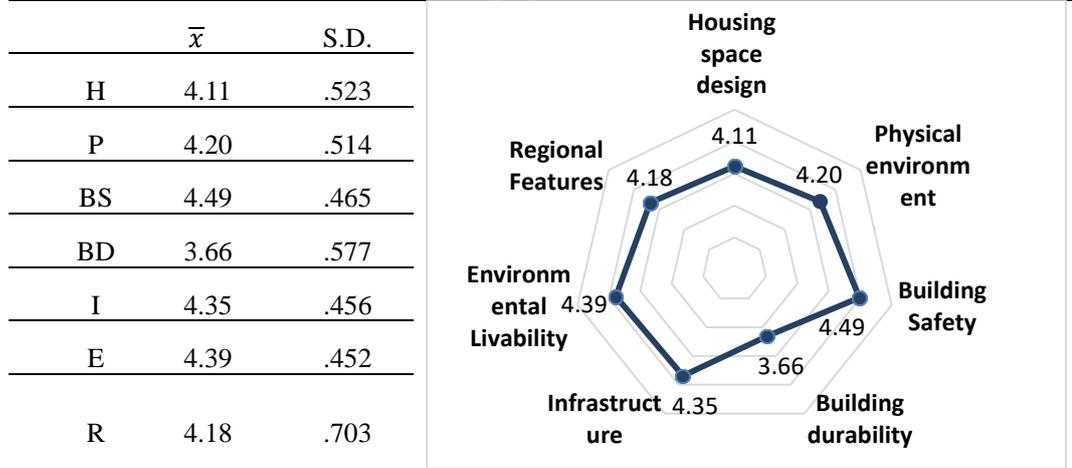




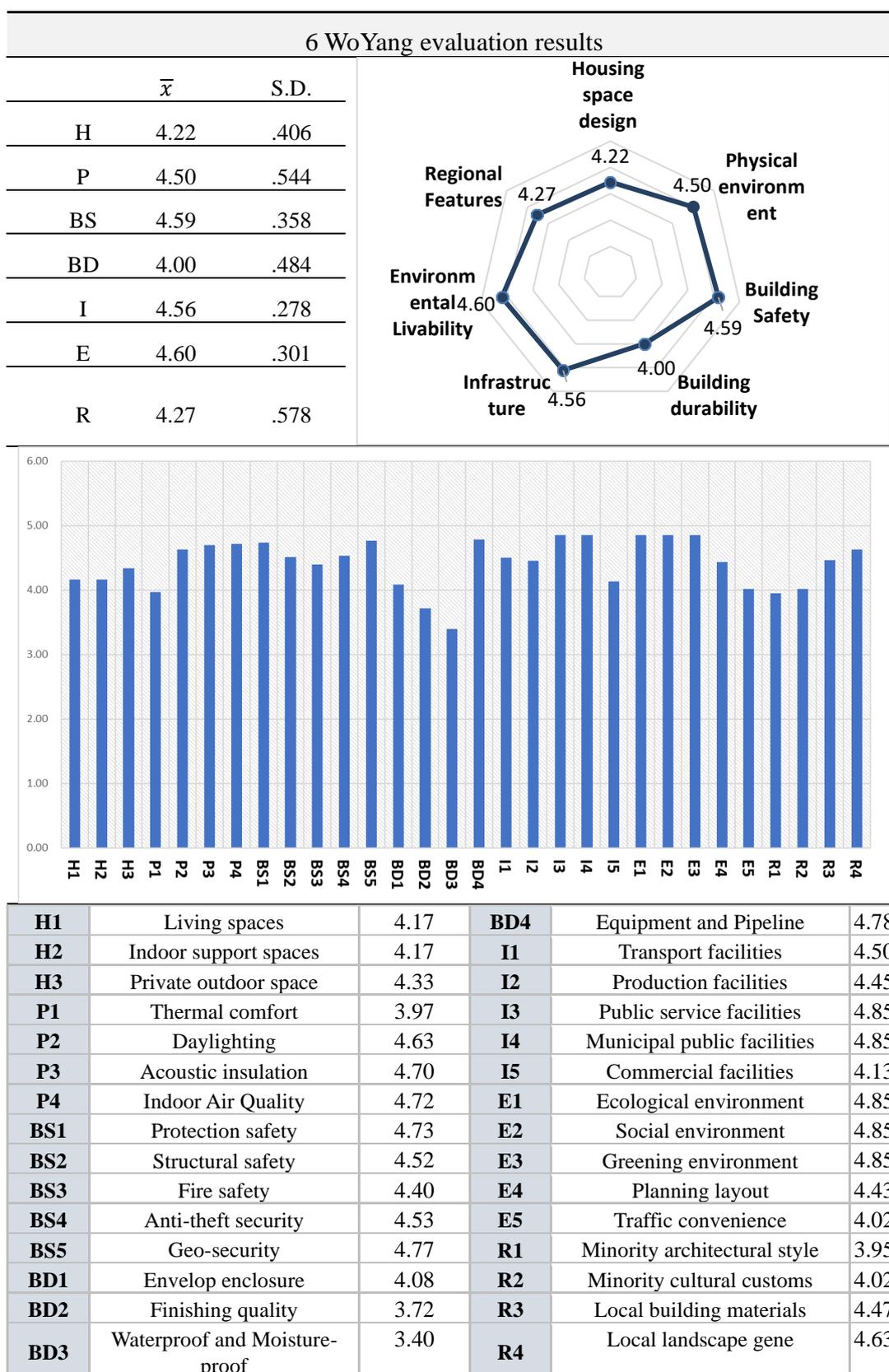
H1	Living spaces	4.17	BD4	Equipment and Pipeline	4.33
H2	Indoor support spaces	4.11	I1	Transport facilities	4.39
H3	Private outdoor space	4.42	I2	Production facilities	4.47
P1	Thermal comfort	3.89	I3	Public service facilities	4.67
P2	Daylighting	4.22	I4	Municipal public facilities	4.33
P3	Acoustic insulation	4.42	I5	Commercial facilities	4.11
P4	Indoor Air Quality	4.44	E1	Ecological environment	4.83
BS1	Protection safety	4.36	E2	Social environment	4.17
BS2	Structural safety	4.61	E3	Greening environment	4.03
BS3	Fire safety	4.42	E4	Planning layout	4.31
BS4	Anti-theft security	4.03	E5	Traffic convenience	4.36
BS5	Geo-security	4.75	R1	Minority architectural style	4.03
BD1	Envelop enclosure	3.92	R2	Minority cultural customs	4.03
BD2	Finishing quality	3.97	R3	Local building materials	4.36
BD3	Waterproof and Moisture-proof	3.44	R4	Local landscape gene	4.50



5 Shang Manqing evaluation results

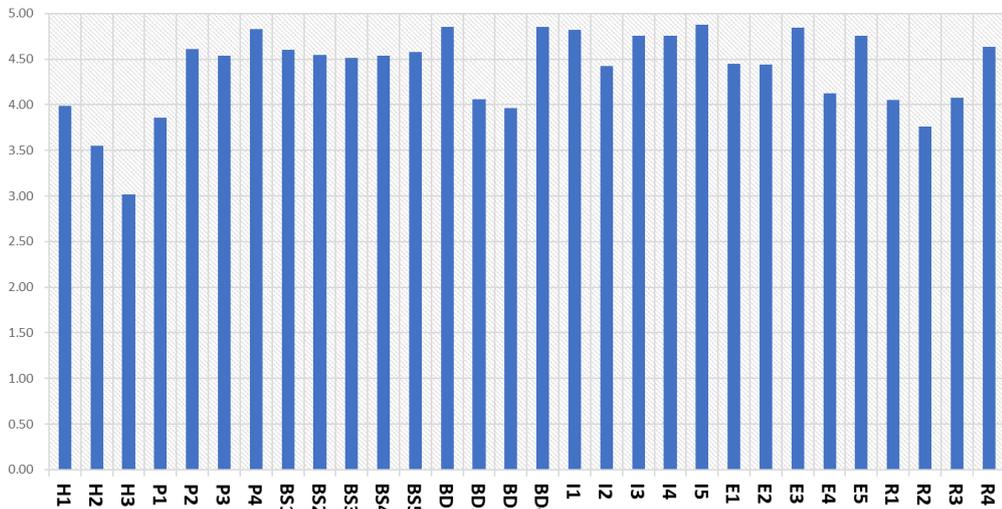
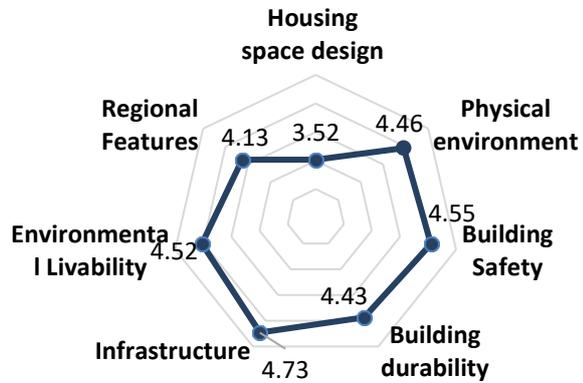


H1	Living spaces	4.11	BD4	Equipment and Pipeline	4.56
H2	Indoor support spaces	4.33	I1	Transport facilities	4.48
H3	Private outdoor space	3.89	I2	Production facilities	4.30
P1	Thermal comfort	3.74	I3	Public service facilities	4.19
P2	Daylighting	3.85	I4	Municipal public facilities	4.48
P3	Acoustic insulation	4.56	I5	Commercial facilities	4.30
P4	Indoor Air Quality	4.67	E1	Ecological environment	4.59
BS1	Protection safety	4.41	E2	Social environment	4.59
BS2	Structural safety	4.37	E3	Greening environment	4.59
BS3	Fire safety	4.48	E4	Planning layout	3.81
BS4	Anti-theft security	4.52	E5	Traffic convenience	4.37
BS5	Geo-security	4.67	R1	Minority architectural style	4.11
BD1	Envelop enclosure	3.48	R2	Minority cultural customs	4.04
BD2	Finishing quality	3.26	R3	Local building materials	4.07
BD3	Waterproof and Moisture-proof	3.33	R4	Local landscape gene	4.48



7 YaoJiashan evaluation results

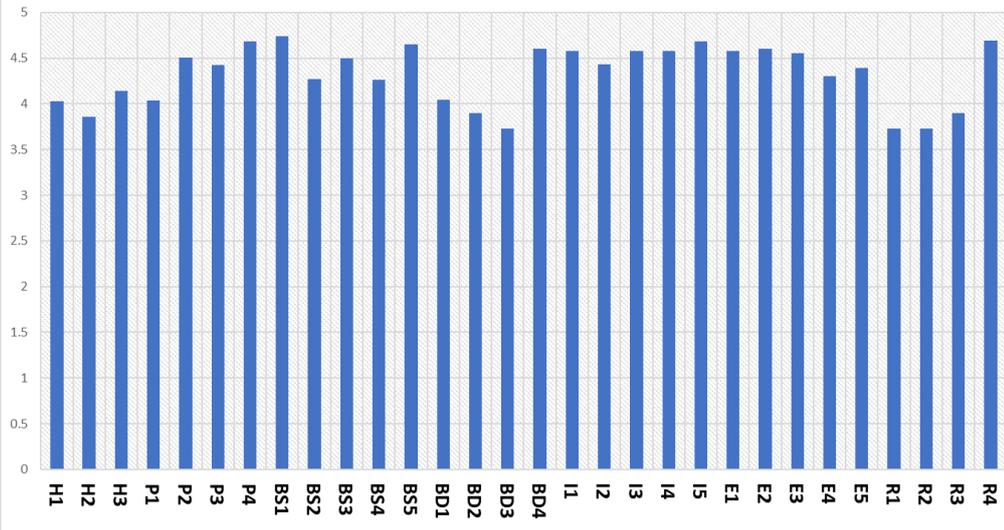
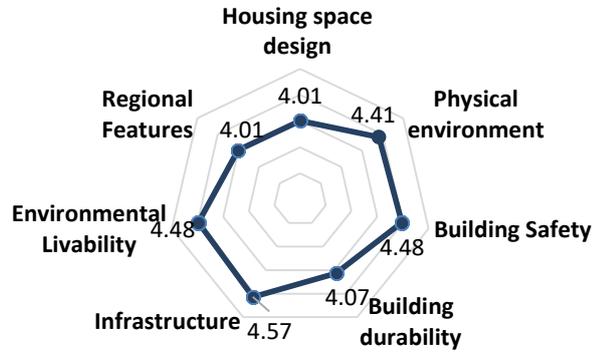
	\bar{x}	S.D.
H	3.52	.503
P	4.46	.398
BS	4.55	.357
BD	4.43	.487
I	4.73	.37
E	4.52	.485
R	4.13	.68



H1	Living spaces	3.99	BD4	Equipment and Pipeline	4.85
H2	Indoor support spaces	3.55	I1	Transport facilities	4.82
H3	Private outdoor space	3.01	I2	Production facilities	4.43
P1	Thermal comfort	3.85	I3	Public service facilities	4.76
P2	Daylighting	4.61	I4	Municipal public facilities	4.76
P3	Acoustic insulation	4.54	I5	Commercial facilities	4.88
P4	Indoor Air Quality	4.83	E1	Ecological environment	4.45
BS1	Protection safety	4.60	E2	Social environment	4.44
BS2	Structural safety	4.55	E3	Greening environment	4.84
BS3	Fire safety	4.51	E4	Planning layout	4.12
BS4	Anti-theft security	4.53	E5	Traffic convenience	4.76
BS5	Geo-security	4.57	R1	Minority architectural style	4.05
BD1	Envelop enclosure	4.85	R2	Minority cultural customs	3.76
BD2	Finishing quality	4.06	R3	Local building materials	4.07
BD3	Waterproof and Moisture-proof	3.96	R4	Local landscape gene	4.63

8 XinZhai evaluation results

	\bar{x}	S.D.
H	4.01	.54
P	4.41	.449
BS	4.48	.402
BD	4.07	.46
I	4.57	.46
E	4.48	.474
R	4.01	.657



H1	Living spaces	4.02	BD4	Equipment and Pipeline	4.60
H2	Indoor support spaces	3.86	I1	Transport facilities	4.58
H3	Private outdoor space	4.14	I2	Production facilities	4.44
P1	Thermal comfort	4.04	I3	Public service facilities	4.58
P2	Daylighting	4.51	I4	Municipal public facilities	4.58
P3	Acoustic insulation	4.42	I5	Commercial facilities	4.68
P4	Indoor Air Quality	4.68	E1	Ecological environment	4.58
BS1	Protection safety	4.74	E2	Social environment	4.60
BS2	Structural safety	4.27	E3	Greening environment	4.55
BS3	Fire safety	4.49	E4	Planning layout	4.31
BS4	Anti-theft security	4.26	E5	Traffic convenience	4.39
BS5	Geo-security	4.65	R1	Minority architectural style	3.73
BD1	Envelop enclosure	4.05	R2	Minority cultural customs	3.73
BD2	Finishing quality	3.89	R3	Local building materials	3.89
BD3	Waterproof and Moisture-proof	3.73	R4	Local landscape gene	4.69

5.2.1 Housing space design analysis

The design of the different spaces of the house is based on the needs of the occupants, and these needs even influence the arrangement and manner of spatial relationships [1]. Rural residential buildings are complex, and their room structures are related to the local environment, production methods, and residential lifestyles [2]. Housing in rural areas must be more functional than housing in cities, as it provides not only shelter but also space to store produce, tools, and livestock. The spatial design item in the evaluation system mainly measures the size, layout, and number of various room designs[3].

In 2018, the per capita housing floor area of urban residents in China was 39 square meters, and the per capita housing floor area of rural residents was 47.3 square meters[4] However, there is no description of the per capita household area in the relevant residential design specifications, and most scholars study the total area of household type and the area of each functional area, but less about the per capita household area. The National Thirteenth Five-Year Plan for Relocation to Alleviate Poverty has strict indicators for the per capita household area in the resettlement area, and the upper limit of housing construction area per capita for the relocation population is 25 square meters.[5]

Combining ergonomic requirements and the size of indoor furniture, the minimum size of each functional space in the household is summarized, and the per capita household area that meets the basic functions is calculated on this basis as the low suitable level. The upper limit of 25 square meters/person required by the code is set as the highly suitable level. According to the Residential Design Code (GB50096-2011), for example, if a three-person household is set to meet the ordinary functions, the minimum area of each functional area is 10m² for the living room, 9m² for the double bedroom, 5m² for the single bedroom, 4m² for the kitchen and 2.5m² for the bathroom, taking into account the balcony and 5.5m² for the passage, the total extreme household area is about 36m², and the extreme per capita household area is about 12m², combined with the adjustable space of the household type to increase personal development, 15m² is set as the low level. The standard line of suitability is set at 15 m². Finally, it is set that the per capita household area of 25 m² /person is highly suitable, between 20 and 25 m² is moderately suitable, between 15 and 20 m² is low suitable, and below 15 m² /person is not suitable.

To prevent poor residents from relocating in debt, the government has imposed regulations on the residential construction area, controlling the maximum living area

per capita. Thus influenced and limited by the area regulations, it is worth exploring whether the spatial design of the dwelling meets the requirements of functionality as well as comfort. Based on previous literature studies, combined with the fact that the research object is resettlement housing, this paper argues that whether the basic functions of residential house types meet the standard is mainly reflected in whether the house types are equipped with complete bedrooms, living rooms, kitchens, and public bathrooms, which are the building spaces to achieve the basic living functions. In this paper, the house types that do not satisfy the basic functions are set as unsuitable, and those that satisfy the basic functions are set as suitable.

The satisfaction survey shows that the mean value of the room space design of Woyang and Daigela is high, while Yao Jiashan has a relatively low rating of 3.52. From the mean value of the rating, the users consider the room design of the house to be good, with a grade of E2. The author has measured the housing area in the field, and all projects meet the minimum area requirement of the housing code. The per capita household area reaches 25 m^2 / human height suitable. The house types are equipped with complete bedrooms, living rooms, kitchens and public bathrooms to achieve the basic living functions of the building space, meeting the basic needs of residents, and the residential house types are suitable.

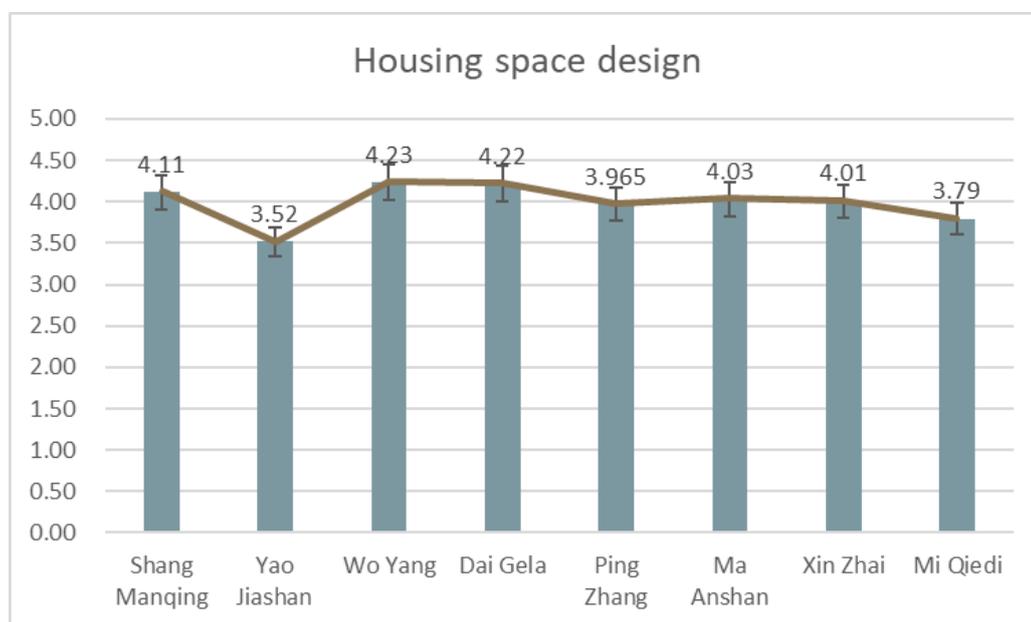


Figure 5-2. Housing space design factor layer evaluation results

Housing space design includes three indicators: "H1 Living spaces", "H2 Indoor support spaces" and "H3 Private outdoor spaces", which are used to test whether the housing space design of resettlement housing is reasonable. The space design is reasonable or not. The results of the POE practice were compiled.

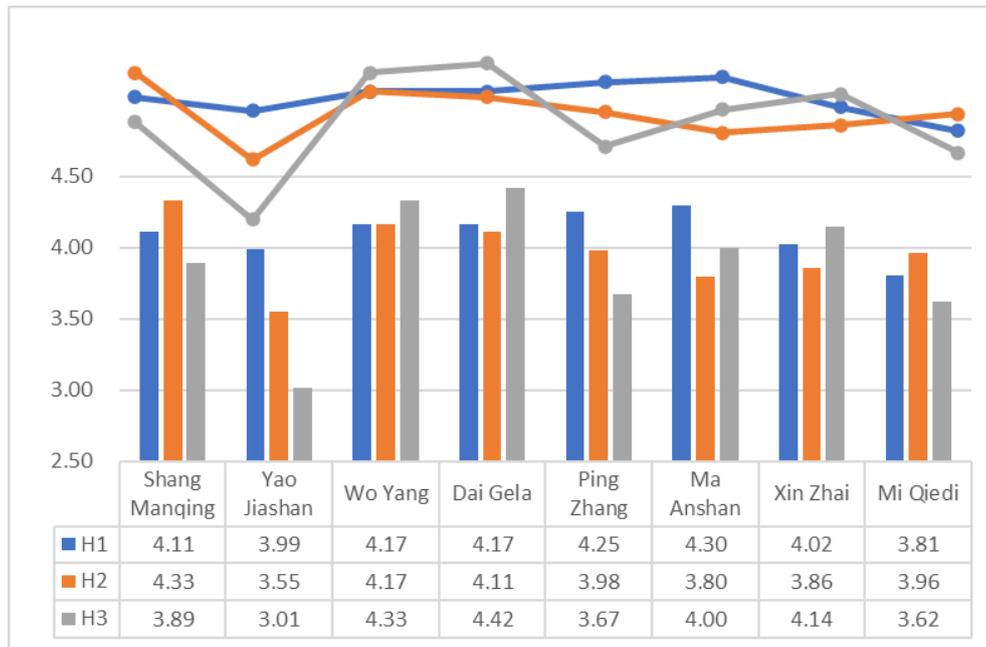


Figure 5-3. Housing space design indicator layer evaluation score

In the H1 Living spaces design, Ma Anshan, and Pingzhang have a high rating, while Mi Qiedi and Yaojiashan have a relatively low rating. living spaces mainly refer to the living room and bedroom space. Ma Anshan and Pingzhang are rated higher because of their overall building shape, and their spatial partitioning is clearer; Ma Anshan has a linear spatial composition, with the living room in the middle flanked by bedrooms and the kitchen and dining room; Pingzhang has a living room in the middle, bedrooms on both sides, and the kitchen and dining room are built separately as auxiliary spaces, with a courtyard in the middle (Figure 4).

The inside and outside of the static space and the dynamic space are separated, and the flow lines are clear and unmixed, forming a clear L-shaped spatial pattern. Combined with the user interviews, we learned that the users of the lower-rated Mi Qiedi house think that the bedrooms and living rooms of the resettlement house are too small, and some residents think that the original old house may have a larger area. In particular, the number of rooms is more dissatisfying. Some residents with more children consider the future and think that the area is sufficient for the present, but worry about the future. They are worried that they will not have enough rooms to live in when the family size increases and that they will build additional housing later when they have money.

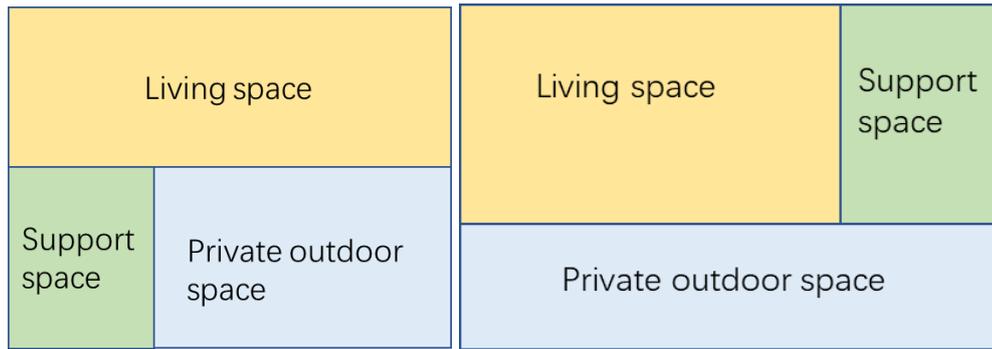


Figure 5-4. Analysis of housing space

In the H2 Indoor support spaces, the paper mainly measured the kitchen, dining room, and storage spaces, with Shang Manqing scoring high at 4.33, followed by Woyang and Daigela, and the rest of the items scoring low at 4 or less. Yao Jiashan has the lowest rating of 3.55, followed by Ma Anshan. The kitchen of the Yao Jiashan project was built as a whole with a small space size, and the design was found to be designed according to the size of the urban kitchen, which could not meet the needs of rural houses. The Ma Anshan project, on the other hand, lacks storage space because the villagers are mainly engaged in agricultural production, and the residents are dissatisfied with the lack of storage space for small machinery, grain, cash crops, etc.

In the design of private outdoor spaces, the study mainly examined yards and vegetable gardens. The courtyard is the most frequently used space in rural houses. Previous studies have shown that most of the activities of the occupants of a house are located in the "bedroom" space, which has a prominent role in relation to other spaces [6] [7]. But rural housing differs from urban housing in that the largest portion of the house is generally used for yard space and other necessary elements, including services, manufacturing, storage, and livestock and poultry storage. It can be said that rural housing provides a type of housing that is closely related to rural life. In this type of housing, the proximity of humans to livestock and services is critical. Livestock and services are a major component of rural livelihoods.[8]

The survey results of the study show that Daigela and Woyang, two Wa villages, have the highest satisfaction level of private outdoor space at 4.42 and 4.33, respectively, while Yao Jiashan has the lowest satisfaction level at 3.01. The field survey and user interviews of the study show that Daigela and Woyang have large courtyard spaces, and residents have enough courtyard space to entertain guests in the courtyard and satisfy the residents' needs for social interaction. Vegetables are grown near the courtyard to meet the demand for self-sufficiency. In the Yao Jiashan project, there is no courtyard space and the villagers do not have a vegetable plot, so the only

place to invite guests is on the public path.

5.2.2 Physical environment analysis

In the overall average score of the physical environment, Dai Gela rated the highest at 4.5 and Mi Qiedi rated the lowest at 4.1. Overall, users considered the physical environment of the residence to be performing well with a grade of E2.

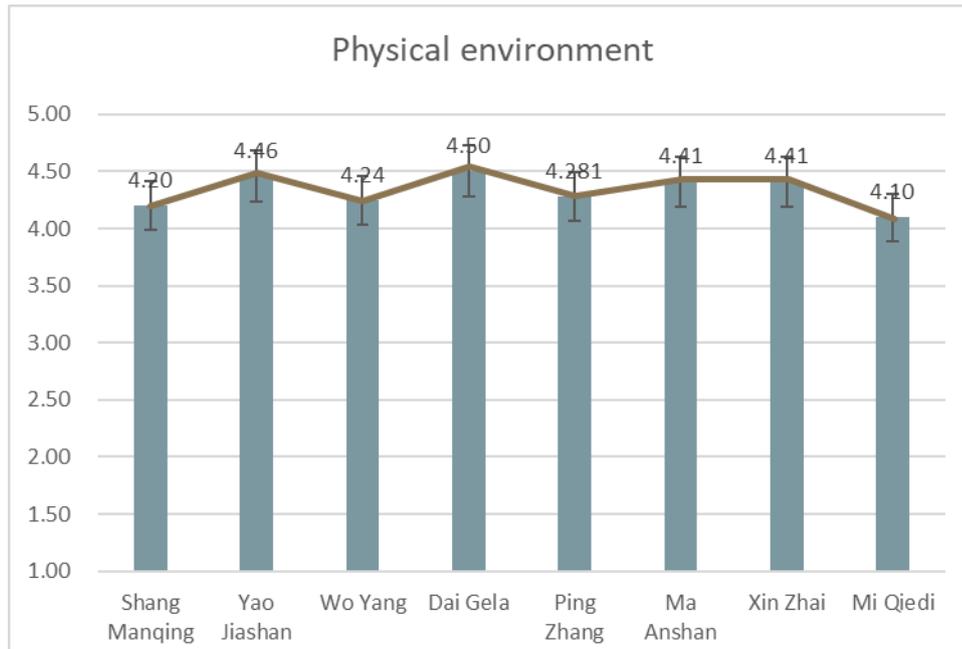


Figure 5-5. Physical environment factor layer evaluation results

Physical environment includes "P1 Thermal comfort", "P2 Daylighting", "P3 Acoustic insulation" and "P4 Indoor Air Quality", which examines the physical comfort of the indoor space of the house. The questionnaire approach was chosen to evaluate the physical environment of the residence in the study because it respects the beliefs and worship of ethnic minorities who believe that guests entering the bedroom can bring disaster or bad luck to the homeowner. Therefore, instrumental measurements that require a long running time were not used in this study.

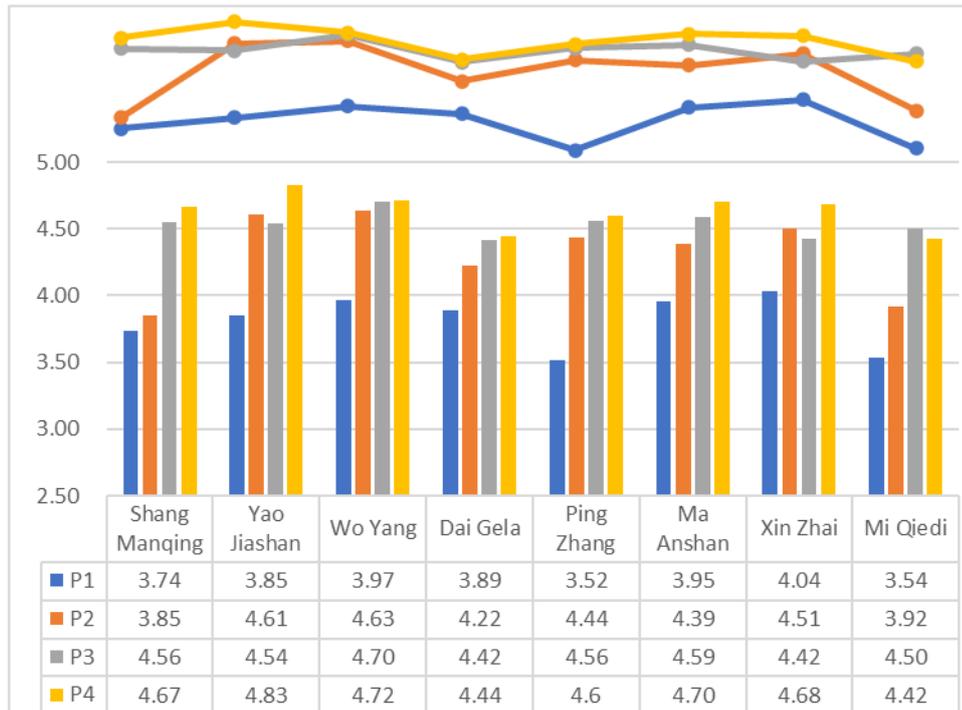


Figure 5-6. Physical environment indicator layer evaluation score

The P1 Thermal comfort index from the evaluation feedback data shows that Xinzhai has a higher rating of 4.04, followed by the Wo Yang project with 3.97. While the Pingzhang project has a relatively low rating of 3.52, followed by Mi Qiedi with 3.54. Compared to the other four evaluation indexes in the same evaluation tier, the satisfaction level of the thermal comfort index is the lowest for all projects, which is based on Previous scholarly studies are consistent that thermal performance is a pressing issue in the current housing quality of protected housing [9]. Thermal comfort looks at the temperature, humidity, and ventilation of the housing [10]. Interviews with users show that the higher-rated project, Xinzhai, was built in combination with the participation of residents, who often personally supervised the construction team in building it, and better-off residents could also use better housing materials by paying for them themselves, and users perceived thermal comfort to be slightly higher rate compared to other projects. According to China's Residential Building Code, bedrooms, kitchens, and living rooms in residential buildings are required to have exterior windows, with ventilation openings, or window openings, in each set of units being greater than or equal to 5% of the floor area of the unit. The ratio of window to floor area in bedrooms, kitchens, and living rooms should not be less than 1/7. Through the field survey, the ratio of window to floor area in all projects met the minimum control provisions of the code. However, in terms of temperature, the minority houses investigated in the study are located in the southwest of China, which has a subtropical

climate. The new houses are built with concrete blocks, and compared with the traditional dwellings built with bamboo, wood, and rammed earth, the users generally think that the summer is hotter than the original dwellings, and the dwellings are not well insulated in winter [11].

In the P2 Daylighting index, the Woyang resettlement area has a higher rating of 4.63, while Shang Manqing and Mi Qiedi resettlement areas have a relatively lower rating. In contrast, most of the houses in the Shang Manqing resettlement area are west-facing, with narrow spacing between houses and only single-sided lighting, and the natural lighting conditions of the rooms are poor [12] [13].

For the evaluation of P3 Acoustic insulation, the satisfaction level is higher in all resettlement areas, and the statistics show that the Woyang resettlement area has the best rating with 4.7, while Daigela and Xinzgai are relatively lower, but the difference in ratings is not significant. Users are all more satisfied with the sound insulation of the new houses, with some residents saying that the new reinforced concrete houses have better sound insulation than homes built with wooden panels. Other residents said that they did not care much about sound insulation and liked the buzz.

For the P4 Indoor Air Quality indicator, safeguarding indoor air quality is a comprehensive issue, of which the design phase is a key aspect. The main toxic and harmful gases in indoor air pollutants are generally released from decoration materials and their accessories and furniture [14]. At the same time, due to the use of construction materials, construction auxiliary materials, and construction processes that are not standardized, it can also make it difficult to eliminate the pollution of the building's indoor environment for a long time. In addition, if excessive decoration makes a large accumulation of pollution in the decoration materials, the concentration of indoor air pollutants will still exceed the standard [15]. The Chinese residential design code stipulates that the content of harmful substances should be controlled in the selection of residential building materials, interior decoration materials, and the selection of construction techniques. From the survey results, it is concluded that the satisfaction rating of this indicator is generally good in the eight resettlement areas. Through interviews and on-site observations, it was learned that there were no irritating odors inside the residences, the decoration materials met national standards, and the indoor air quality was more satisfactory.

5.2.3 Building Safety analysis

The mean value of the Building Safety indicator is 4.41, with users rating this indicator as good with a grade of E2. The survey shows that Dai Gela has a good rating

of 4.59 and Mi Qiedi has the lowest rating of 4.07. How residents perceive housing safety affects the way buildings are designed, built, and maintained [16]. Residents of pro-poor resettlement areas are vulnerable groups, and securing attributes such as safety and health in their homes is important to their quality of life and dignity [17].

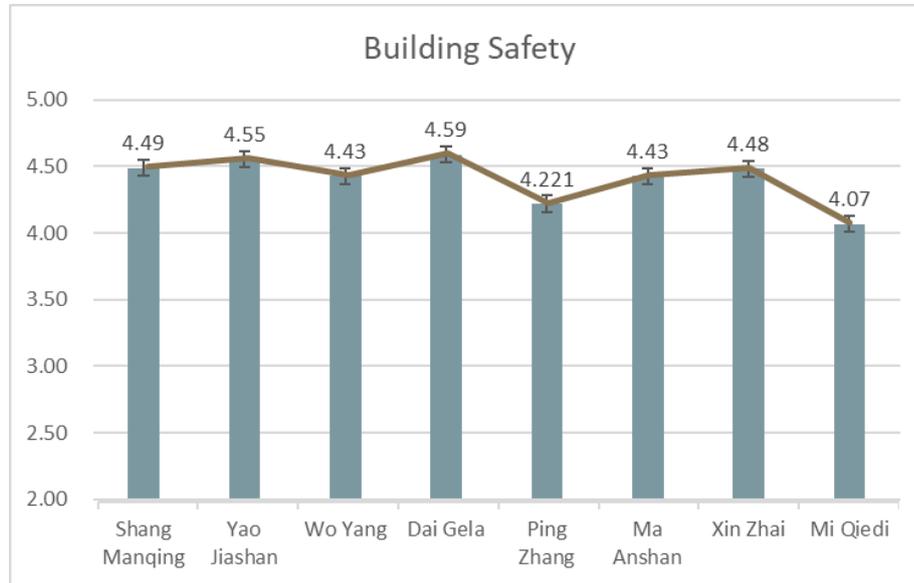


Figure 5-7. Building Safety factor layer evaluation results

Building Safety evaluation contains BS1 Protection safety, BS2 Structural safety, BS3 Fire safety, BS4 Anti-theft security, and BS5 Geo-security, a total of five indicators to investigate whether there are unsafe hazards in the use of the building.

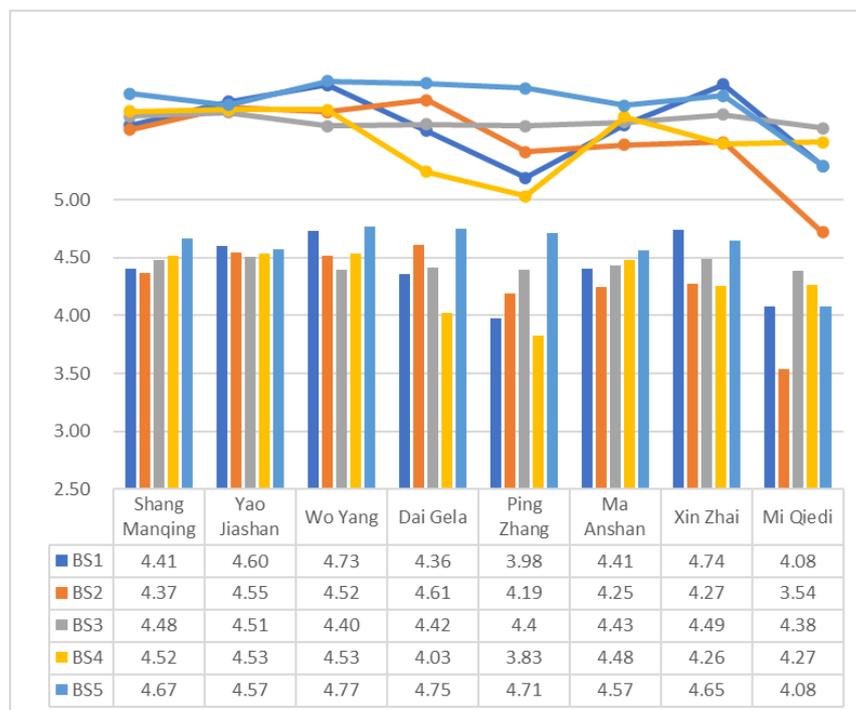


Figure 5-8. Building Safety indicator layer evaluation score

In the BS1 Protection safety evaluation, Xinzhai and Woyang have a higher satisfaction rate of 4.74 and 4.73, while Ping Zhang has a lower satisfaction rate of 3.98. The difference in satisfaction rate is large. The field survey and feedback showed that the housing in the Ping Zhang resettlement area was not equipped with canopies and the drainage design of the courtyard was not good, which led to slippery ground and often caused residents to slip and fall. In addition, Mi Qied resettlement housing has poor anti-slip measures in the bathrooms, and the satisfaction rate is low.

In the evaluation of the BS2 Structural safety indicator, most of the resettlement areas have higher satisfaction levels, all above 4.2, with Dai Gela 4.61 being the highest. Through interviews and field research by researchers, it was found that Mi Qiedi is located in an earthquake zone, but the builder cut corners in the construction process and the resettlement area experienced an earthquake that caused some structural cracks in the housing, so the lowest satisfaction for this score. 80-85% of structural failures were due to design and construction process Deficiencies in the design and construction process caused [18]. The collapse of a temporary structure or an incomplete permanent structure poses a threat to personal safety [19]. The building structure should meet the requirements of load-bearing capacity and building use function. Therefore, the post-use assessment of structural safety is very important.

In BS3 Fire safety, the satisfaction level of the eight settlements is generally good. The fire safety situation is one of the main issues in the safety situation of housing, where a fire in a building has a significant negative impact on the building and may endanger life and property[20]. Therefore, China has a stricter management review in the acceptance of residential construction, which requires a strict fire inspection to examine whether the fire evacuation distance of the building is sufficient, whether it is equipped with fire prevention equipment, whether the fire rating of the decoration materials is up to standard, etc., before deciding whether to pass the housing review. After investigation, the housing construction in the resettlement area is no exception and is also subject to strict fire inspection before it is given to the occupants. Therefore the rating of this item is high and no safety hazards have been found yet.

In the BS4 Anti-theft security, Yao Jiashan, Woyang, and Shang Manqing have high ratings of 4.5 and above; Pingzhang has a low rating of 3.83. Residents of resettlement areas often feel a sense of unfamiliarity when moving to a new environment, which can lead to distrust of their surroundings, and having anti-theft measures may increase their sense of security. . Through field observations and user interviews, we know that the resettlement areas with better satisfaction of this indicator are equipped with anti-theft windows and doors, and some resettlement areas are also

equipped with monitoring equipment, which effectively prevents theft, improve the security of resident's houses, and protect their personal property. In contrast, the Pingzhang resettlement area has no courtyard gate and no anti-theft window design, and theft has occurred. Burglary prevention is a social problem, and there are disadvantages of burglar-proof nets, which should be considered in the architectural design of burglary prevention measures, which can prevent theft and do not destroy the beauty of the building like "burglar-proof nets".

In the evaluation of the BS5 Geo-security index, all the other seven resettlement areas were evaluated satisfactorily except for the Mi Qiedi resettlement area, which had an earthquake and the villagers' sense of security against natural disasters was low. The sites of resettlement areas should avoid geological disaster potential sites. The mountainous areas in southwest China are vast, underdeveloped minority areas with frequent geological disasters [21]. Therefore, it is necessary to evaluate the Geo-security condition of the resettlement area of the southwest minority. The stability of geological conditions has an important influence on the location of the project, and it is important to ensure that the location of the resettlement area avoids geological hazards in potential locations. Generally speaking, the resettlement area should be located at a suitable slope, and the average topographic slope should be controlled at 0.2-25° according to the research results of suitable slopes for human settlements. Secondly, avoid areas with serious soil erosion and areas with potential flood hazards, etc. In the relocation process, care must be taken to avoid the risk of secondary geological disasters brought about by infrastructure construction.

5.2.4 Building durability analysis

Building durability analysis looks at the quality and durability of housing. Durability is one of the potential indicators to assess recycled construction technology[22]. General building conditions of low-cost housing as an indicator of the quality of human life [23]. Improvements in quality will create a safe and secure environment for occupants and will reduce maintenance costs and ease the financial strain on residents.

The average rating of Building durability in the eight resettlement areas was 4.41, with a rating of better and a grade of E2. Among them, Yao Jiashan had the highest rating of 4.43 and Mi Qiedi had the lowest rating of 3.31.

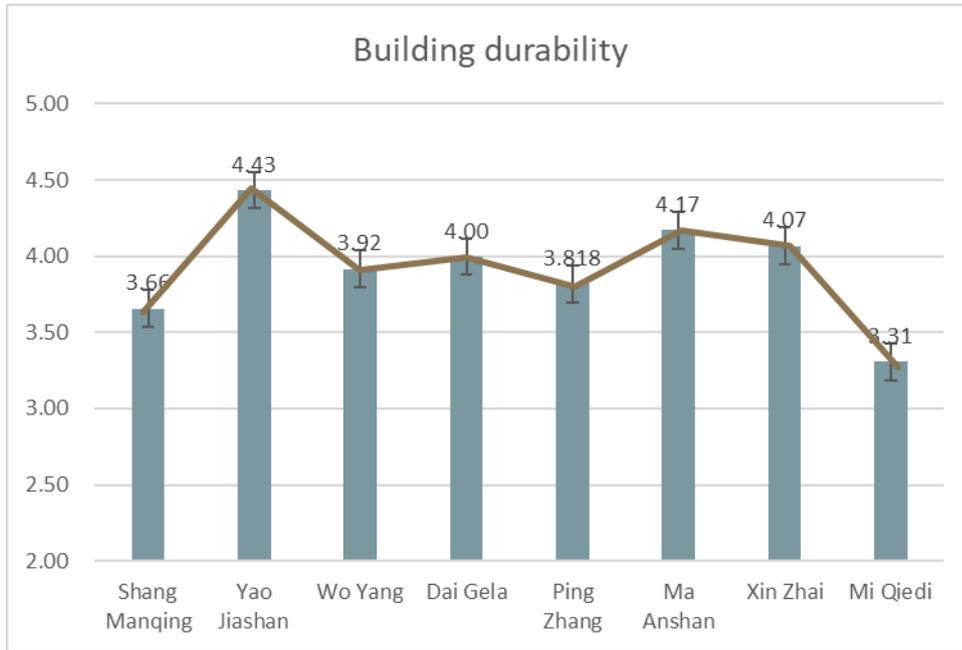


Figure 5-9. Building durability factor layer evaluation results

Building durability analysis indicators consisted of four indicators, BD1Envelop enclosure, BD2Finishing quality, BD3Waterproof and Moisture-proof, and BD4 Equipment and Pipeline. A comparative analysis was conducted for each of the eight resettlement areas for each sub-evaluation until the following results were obtained.

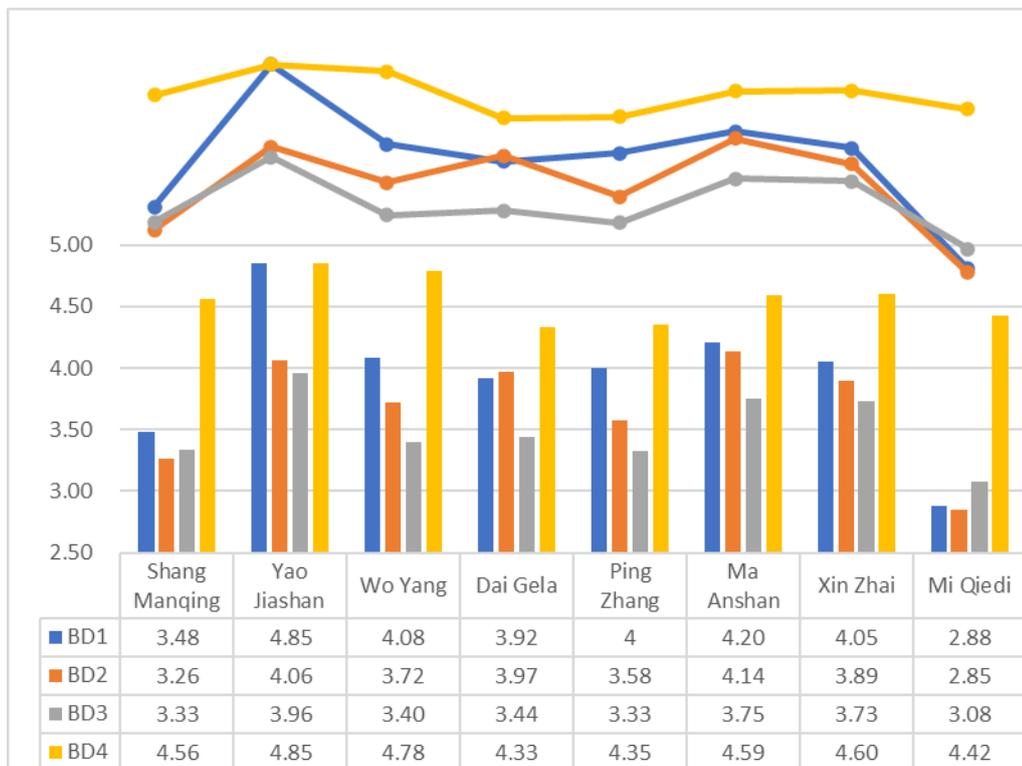


Figure 5-10. Building durability indicator layer evaluation score

In the BD1 Envelop enclosure, the post-use evaluation of facades, roofs, windows, and doors is assessed. The key to the level of energy consumption of any building is the quality of its envelope[24] Improving the durability of building maintenance structures reduces the risk of failure of systems, components, and materials and reduces warranty costs. The evaluation results show that Yao Jiashan has the highest satisfaction level of 4.85 in the evaluation of this index. Mi Qiedi has a lower evaluation of 2.88, with a large difference in satisfaction. The envelope structure of the outer walls, roofs, windows, and doors of the Yao Jiashan project building is structurally intact and not falling off, and the outer doors and windows of the building are firmly installed and of good quality. The housing in the Mi Qiedi resettlement area has cracks on the walls and cracks on the installation part of the windows.

BD2 Finishing quality, this indicator mainly measures the quality of the interior decoration and exterior finishes of the housing. Relocated people move into the resettlement area, unlike other residents, relocated residents move from other areas, do not have the conditions to supervise the decoration of the resettlement residence by themselves, and need to integrate into the new environment as soon as possible.

Therefore, the resettlement houses need to meet at least the minimum decoration requirements at the time of delivery, with simple painting, bathroom paving, and other operations completed on the basis of the roughhousing. The use of durable and easy-to-maintain decorative building materials is one of the factors that determine the durability of the decoration. The evaluation results show that Ma Anshan and Yao Jiashan have the highest satisfaction rate of 4.14 and 4.06, while Mi Qiedi has the lowest rating of 2.85. According to the field survey, Ma Anshan and Yao Jiashan are model projects with more government investment, with ethnic patterns on the exterior finish painting, clean and tidy walls, tile paving in the living room and bedroom, and better construction quality. Mi Qiedi's finishing quality is poorer, and the bathroom tiles also have broken and hollow drums.

BD4 Equipment and Pipeline, homes should use pipes, ducts and fittings that are corrosion-resistant, anti-aging and have good durability; and when combining parts with different service lives, use structures that are easy to remove and replace, renew and upgrade respectively. The evaluation results of this indicator show that users are satisfied with Equipment and Pipeline, with all eight items scoring 4.3 or higher. Some users indicated that the quality of the equipment and pipeline used in the resettlement houses was better compared to the old houses.

5.2.5 Infrastructure analysis

Better infrastructure, public services, etc. have the most important positive impact on human place attachment.[25]. China's poverty alleviation and relocation documents stipulate that the "Thirteenth Five-Year Plan" requires simultaneous planning and construction of basic public service facilities for health, education, culture, and sports, such as farmers' markets, convenience supermarkets, commercial outlets, schools, hospitals and so on.

The relevant planning layout, supporting facilities, and construction standards are implemented in accordance with industry standards, technical specifications, and construction planning of resettlement areas. The facilities of public construction should be adapted to the scale of the residential population, and the planning, construction, and delivery should be synchronized with the residential housing.

From the results of the satisfaction evaluation, it can be seen that the mean value of evaluation of 8 resettlement areas is 3.92, the rating is better and the grade is E2. Among them, Yao Jiashan has the highest rating of 4.73, users think the facilities of resettlement areas are very good. Ping Zhang has the lowest rating of 4.13. The results of the mean value of evaluation are shown in the figure below.

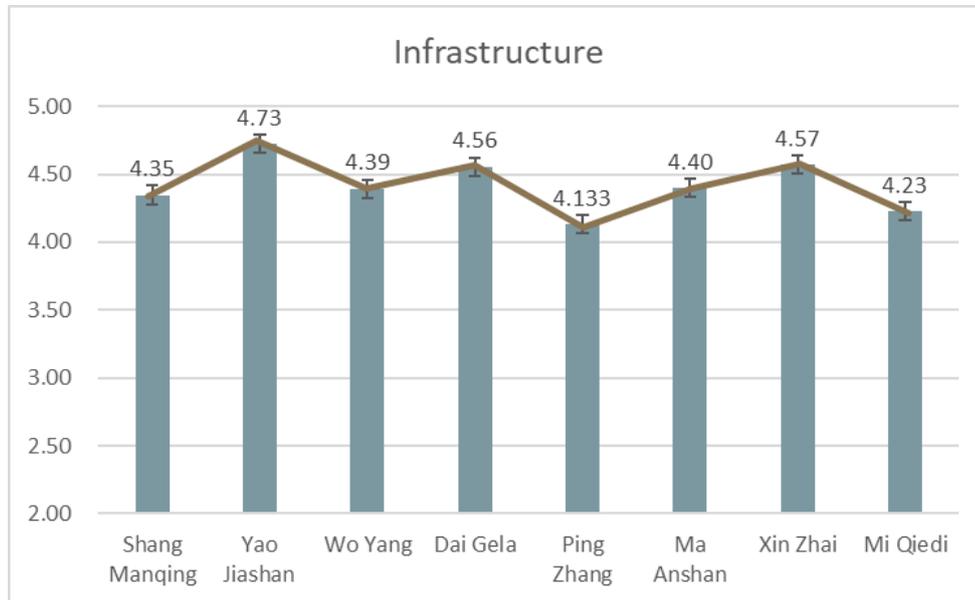


Figure 5-11. Infrastructure factor layer evaluation results

The author has compiled the following facility packages for the eight resettlement areas.

Table 5-3. The main infrastructure

Title	The main infrastructure
Shang Manqing	Transportation facilities: parking lots, street lights, signs; productive facilities: vegetable gardens, cultivation fields, breeding sheds; public service facilities: public activity venues, cultural activity rooms; municipal utilities: plumbing, heating, electricity and network systems, public toilets, and sanitation.
Yao Jiashan	Transportation facilities: parking lot, street lights, signs; production facilities: farming land, breeding shed; public service facilities: basketball court, national sports field, cultural activity room, national culture exhibition hall; municipal utilities: plumbing, heating, electricity, and network systems, public toilets and sanitation; commercial service facilities: small grocery stores, small food stalls.
Wo Yang	Transportation facilities: parking lots, street lights, signs; productive facilities: vegetable gardens, cultivation fields, breeding sheds; public service facilities: basketball courts, cultural activity rooms; municipal utilities: plumbing, heating, electricity, and network systems, public toilets and sanitation.
Dai Gela	Transportation facilities: parking lots, street lights, signs; productive facilities: vegetable gardens, cultivation fields, breeding sheds; public service facilities: basketball courts, cultural activity rooms; municipal utilities: plumbing, heating, electricity, and network systems, public toilets and sanitation.
Ping Zhang	Transportation facilities: parking lots, street lights, signs; productive facilities: vegetable gardens, breeding sheds; public service facilities: basketball courts, cultural activity rooms; municipal utilities: plumbing, heating, electricity, and network systems, public toilets, and sanitation.
Ma Anshan	Transportation facilities: parking lot, street lights, signs; productive facilities: vegetable garden, cultivation land, breeding shed; public service facilities: basketball court, activity room, children's bookstore, children's recreation area, cultural landscape corridor; municipal utilities: plumbing, heating, electricity, and network systems, public toilets and sanitation.

Title	The main infrastructure
Xin Zhai	Transportation facilities: parking lots, street lights, signs; productive facilities: cultivation land, breeding sheds; public service facilities: basketball courts, cultural activity rooms, immigration museums; municipal utilities: plumbing, heating, electricity, and network systems, public toilets, and sanitation. Commercial service facilities: grocery stores, restaurants, KTV.
Mi Qiedi	Traffic facilities: street lights, signs; productive facilities: plowing land, breeding sheds, sunbathing areas; public service facilities: basketball courts, cultural activity rooms; municipal utilities: plumbing, heating, and electrical systems, public toilets, and sanitation.

Infrastructure indicators consist of five indicators: I1 Transport facilities, I2 Production facilities, I3 Public service facilities, I4 Municipal public facilities, and I5 Commercial facilities, to evaluate whether the hard facilities meet the needs of residents.



Figure 5-12. Infrastructure indicator layer evaluation score

I1 Transport facilities indicators examine the installation of roads, parking lots, street lights, and signs. 8 resettlement areas have good satisfaction, Yao Jiashan has the highest satisfaction rate of 4.82 and Mi Qiedi has the lowest of 4.08. Through the field

inspection, it can be seen that the internal road traffic system of the Yao Jiashan resettlement area has been repaired and organized, and there are plant landscaping designs on both sides of the road. On the other hand, there is a large parking lot near the resettlement area, and the construction of street lights and signage is complete. On the other hand, the Mi Qiedi site is located at the top of the hill, the road condition is poor, the quality is not good and the width is narrow, while the signage system is not clear and the road edge lacks treatment, etc., which affects the external traffic connection and the quality of traffic facilities.



Figure 5-13 The current situation of the construction of the transportation system

I2 Production facilities and industrial base are the basis for relocation targets to achieve poverty alleviation and employment. The National Thirteenth Five-Year Plan for Poverty Alleviation and Relocation requires that poverty alleviation targets should choose to relocate based on the resource endowment of the resettlement project and choose to develop special agriculture and animal husbandry, the labor economy, or modern service industry to achieve poverty alleviation. The satisfaction survey results show that Dai Gela has the highest satisfaction level of 4.47 and Pingzhang has a lower satisfaction level of 3.04. The study investigated the industrial base of the resettlement project through interviews and field surveys, focusing on whether the type of industry of the project is appropriate to the location, and whether the scale of the industrial base can meet the employment of the relocated residents working age in the vicinity, etc. There is no new industry planned for the villagers in the Pingzhang resettlement area after relocation, and the villagers need to return to their original farmland for production, which is far away and the satisfaction rate is low. The Dai Gel resettlement project, on the other hand, focuses on the development of special agriculture and other industries, and in consideration of sustainable development, Dai Gela Village, relying on natural conditions and geographical advantages, has adopted the cooperation model

of "government + enterprise + village collective (cooperative) + farmers", one of which is to develop beekeeping and build a Chinese bee breeding site. The second is the development of the beef cattle breeding industry, the resettlement area built a cattle pen, and trained villagers to plant forage for beef cattle, the development of the beef cattle industry has become one of the leading industries to increase the income of people in Daigra village, to ensure that the poor people out of poverty with high quality, and do a good job in the development of the special agricultural industry. In addition, Ma Anshan, Yao Jiashan and Xinzhai resettlement areas also actively explore the integration of culture and tourism as well as tourism measures and methods to alleviate poverty and create tourist attractions and facilities.

I3 Public service facilities in this study focused on evaluating the installation of facilities such as education, cultural and sports, medical stations, and community centers. The government requires the simultaneous planning and construction of related basic public service facilities for health, education, culture, and sports in the relocation documents. According to the results of the satisfaction survey, the satisfaction level of this indicator in the eight resettlement areas is good, with all scores above 4.1. The construction of public service facilities is good, indicating that the project is implemented in accordance with the requirements. Each resettlement area is equipped with a cultural activity room, basketball court, or outdoor activity field to meet the needs of cultural and sports activities; there are elementary schools and kindergartens within walking distance of the resettlement areas to meet the needs of education; most of the resettlement areas are equipped with small health rooms. Some settlements are also equipped with ethnic culture museums and worship spaces to meet the needs of ethnic minority beliefs.

In I4 Municipal public facilities, we evaluate whether the resettlement areas are equipped with water, heating, electricity and network systems, and public toilets and sanitation facilities. The satisfaction rate of this index is high in all 8 resettlement areas, above 4.3. The highest satisfaction rate in the Woyang resettlement area is 4.85. The construction of resettlement areas should focus on improving the production and living conditions and development environment of the relocation target, building basic production and living facilities such as water, electricity, roads, gas, and networks to meet the basic living needs of residents. Field research shows that all resettlement areas are equipped with water and electricity systems, cell phone signal networks cover the entire village, and public toilets with a good degree of decoration are available in the village.

In the I5 Commercial facilities rating, Yao Jiashan resettlement area has the

highest rating of 4.88 and Mi Qiedi has the lowest rating. There is one large and medium-sized farmer's market in the Yao Jiashan resettlement project, with a radius of 3~5km, which can basically meet the needs of the residents in the resettlement area; there are small grocery stores on the ground floor of residential buildings in Yao Jiashan resettlement area, which are convenient for shopping. There are small restaurants near the parking lot. Therefore, the commercial facilities in the Jing'an resettlement project are abundant and meet the needs of the residents for food, housing, and transportation.

In summary, most of the resettlement areas are lacking in barrier-free facilities, while the cultural and sports facilities and educational facilities are better supported by the indicators. The resettlement areas provide more complete basic public services, which solve the worries of the relocated people such as medical schooling.

5.2.6 Environmental Livability analysis

Environmental Livability mainly reflects the combination of environmental and quality-of-life issues in rural settlements [26]. From the satisfaction evaluation results, it can be seen that the mean value of the eight resettlement areas is 4.37, and the users consider the environmental livability of the resettlement areas to be good, with a grade of E2. Among them, Dai Gela has the highest rating of 4.6 and Ping Zhang has the lowest rating of 4.04. The results of the mean value of the evaluation are shown in the figure below.

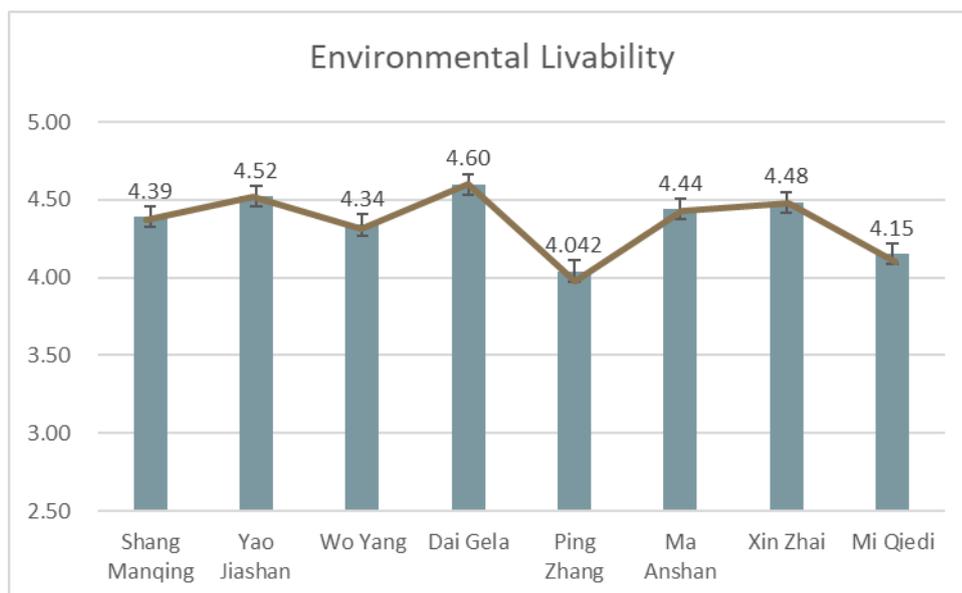


Figure 5-14. Environmental Livability factor layer evaluation results

The Environmental Livability Index examined five aspects: E1 Ecological

environment, E2 Social environment, E3 Greening environment, E4 Planning layout, and E5 Traffic convenience. The results of the comparative analysis are as follows.

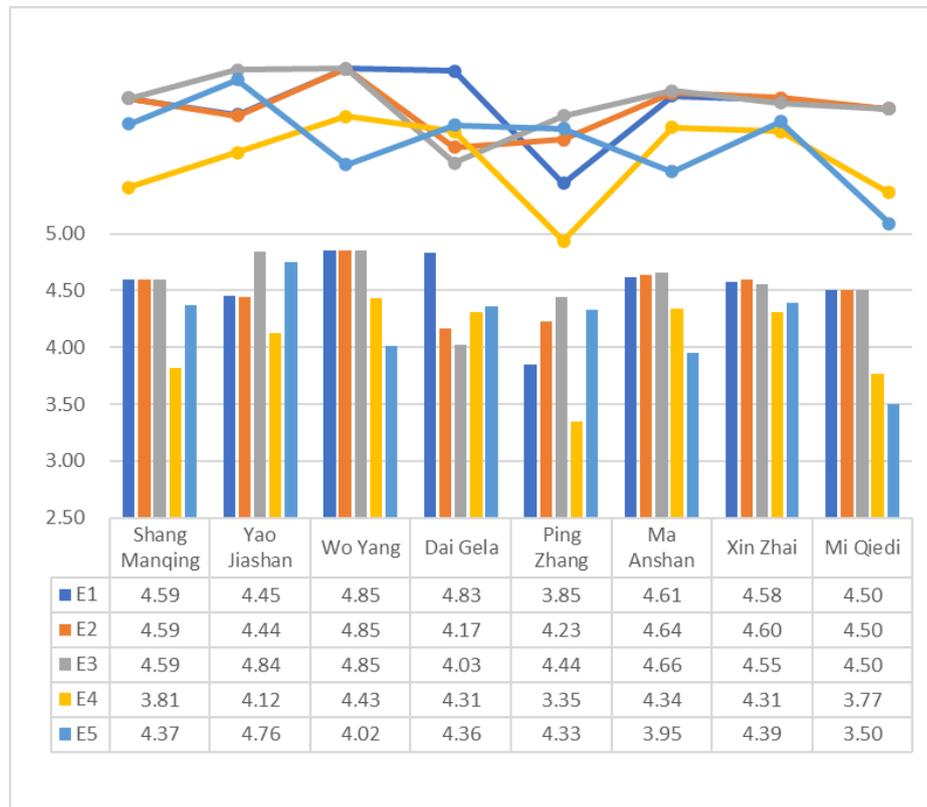


Figure 5-15. Environmental Livability indicator layer evaluation score

E1 Ecological environment index evaluates the ecology, pollution, and the surrounding ecological environment and taboos regarding the relocation and resettlement areas for poverty alleviation of ethnic minorities. As one of the settlement types, the relocation and resettlement areas and the regional ecological environment as a whole, and their construction should be based on the premise of regional ecological safety and ecosystem balance, and maintain the overall pattern of the regional ecological environment and the continuity of the natural evolutionary process. According to the evaluation results, except for the Pingzhang resettlement area, which has the lowest satisfaction rate of 3.85, all other resettlement areas have a good evaluation rate of 4.4 or more. The sites of the resettlement areas were selected considering the surrounding ecological environment, without noise pollution, soil pollution, and water pollution. Most of them were chosen in places with beautiful environments and considered the restoration and protection of the ecological environment. On the other hand, we

learned from the interviews that the site of the Pingzhang resettlement area is adjacent to a foreign cemetery and the houses face the cemetery, which is very taboo for the residents. Ethnic minorities have different beliefs and taboos about the ecological environment, and the taboos of ethnic minority residents should be fully respected.

The E2 Social environment indicator evaluates the satisfaction status of the social environment in the resettlement area in terms of security, organization, and physical management. The satisfaction results show that the residents have a high opinion of their resettlement areas. In terms of organization, the resettlement area has a poverty alleviation working group and established a WeChat group to provide residents in the resettlement area with more convenient services in all aspects of life. In terms of organization, the resettlement area has a poverty alleviation working group and a WeChat group to provide convenient services to the resettlement area residents in all aspects of life, ensuring that each resettlement area resident has a solid organization behind them. We also organize social activities to promote social stability in the resettlement area.

E3 Greening environment measures the level of environmental greening in the resettlement area, and the satisfaction results show that users are satisfied with the greening of the resettlement area, with an average of 4 or more. Trees, flowers, and grasses are planted on the land of the resettlement area, or activities of landscape and terrain design and construction are carried out to create a quiet, clean, and beautiful living environment. The settlement area maintains the existing good ecological environment as much as possible and improves the original bad ecological environment. The nature, climate, ethnicity, customs, and traditional style of the area where it is located and other local characteristics and the environmental conditions around the planning site are taken into account, fully reflecting the natural environmental characteristics of the area where it is located and creating environmental conditions with regional characteristics according to local conditions.

In the evaluation of the E4 Planning layout, the Woyang resettlement area has a better score of 4.43, while Pingzhang has a lower score of 3.35. During the planning and design period, the Woyang resettlement area has fully considered

the future development of the resettlement area and reserved land for future expansion to meet the needs of the residents of the resettlement area who need new houses after separation. The resettlement area is unified and located downwind from the livestock pasture so that the human living area is separated from the livestock breeding, which is beneficial to human hygiene and health. The distance to the city center and the convenience rating differ by 2.88 points, and the subjective satisfaction rating of residents is higher.

Yao Jiashan resettlement area has a good score of 4.76 and Mi Qiedi has a low score of 3.5. Yao Jiashan's resettlement area is located near the main secondary road and has excellent location conditions. The villages are reached by bus lines, and it is very convenient for residents to take buses to the city, which ensures that the resettlement area meets the external transportation links and has very good accessibility. The Mi Qiedi site, on the other hand, is located at the top of a hill, with poor road conditions, less public transportation, and less accessibility.

5.2.7 Regional Features analysis

The Regional Features indicator evaluates the inheritance and development of minority settlement areas in terms of regional characteristics. Ethnic minority gathering areas have a rich and colorful culture of ethnic minority residences, which needs to be inherited and carried forward. If model construction is adopted and the real needs of users are ignored, it is easy to cause "one side of a thousand villages", to lose the charm of minority residences, cause villagers to be uncomfortable with the environment, generate homesickness, and even have relocation problems.

According to the statistics of questionnaire survey data, the mean value of this satisfaction evaluation is 4.15, and users consider the construction of regional characteristics of resettlement areas as better, with a grade of E2. The higher rating is 4.51 for the Ma Anshan resettlement area, and the lower rating is 3.83 for Mi Qiedi.

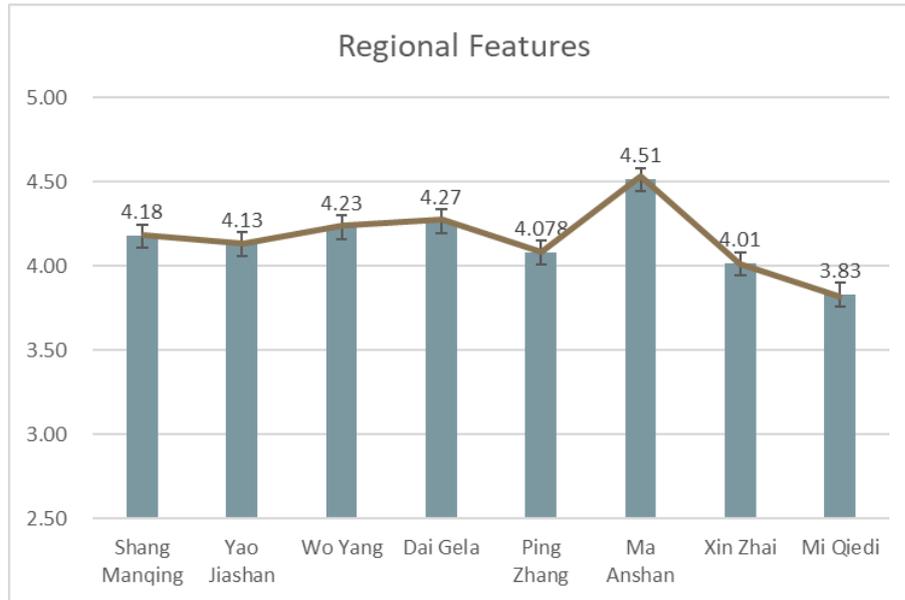


Figure 5-16. Regional Features factor layer evaluation results

For the evaluation of the regional features of the resettlement area, the four aspects of R1 Minority architectural style, R2 Minority cultural customs, R3 Local building materials, and R4 Local landscape gene are evaluated. The aim is to check whether the architecture of the resettlement area is organically integrated with the minority culture and whether it reflects the local style characteristics.

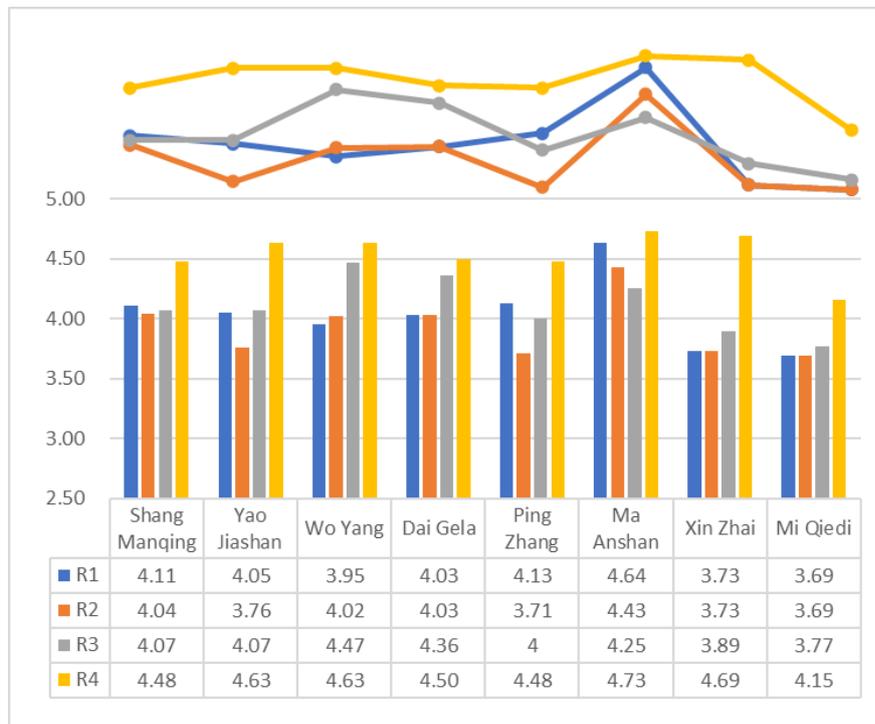


Figure 5-17. Regional Features indicator layer evaluation score

In terms of the R1 Minority architectural style, the satisfaction rating of the Ma Anshan resettlement area is higher than others, according to the POE questionnaire. The architectural style of this resettlement area is chosen from the traditional dwelling style of the ethnic group, which follows the design of the sloping roof and retains the angle of the ridge with abstract treatment, and the volume size also follows the traditional dwelling, and the façade style is in line with the architectural characteristics of the ethnic group.

According to the interview, the resettlement area positioned the village design concept as a colony of five colors, highlighting the locality, and chose to incorporate ethnic elements into the design. The cultural patterns of the ethnic group are drawn on the residential façade, and five hues are chosen as the base to enhance the cultural confidence of the ethnic group.



Figure 5-18 Appearance of Ma Anshan

R2 Minority cultural customs, Ma Anshan resettlement area has a higher satisfaction rating of 4.43 and a lower rating of 3.69 for close sites. Ma Anshan resettlement area takes into full consideration the living habits of the people who moved in before moving in, preserves the characteristics of minority fire pits culture, and tries to keep the same architecture as the original living habits to meet the living needs. For the smoke exhausting effect of the fire pits, skylights are set up and fireproof treatment is done. The architectural design has made a lot of efforts in traditional culture and practicality and strives for the relocated households to adapt to their new life faster after moving in. While Mi Qiedi eliminated the design of fire pits, some elderly respondents said that the modern kitchen could not meet their needs in some aspects. In addition, some interviewees said that the new resettlement area did not have space for ethnic rituals, which made them feel very uncomfortable.

R3 Local building materials examine whether the new resettlement houses use local building materials, which is not only a system of regional culture but also one of

the requirements of green building to reduce the emission of materials transported over long distances. The Dai Gela resettlement area uses only reinforced concrete without the use of local materials.

R4 Local landscape gene, which identifies and extracts the cultural genes hidden in the landscape, can reflect the basic characteristics of the local culture. 4.73 is a high satisfaction rating for the Ma Anshan resettlement area, which extracts the original village lane texture and maintains the original spatial pattern of the village lane. Ethnic worship objects are extracted and a landscape center is set up.



Figure 5-19 Local landscape

5.3 Summary of problems in the built environment of the settlement

After analyzing and summarizing the data obtained from the POE of the case resettlement area, combined with the author's field research, some of the problems exposed in the use of the built environment in the resettlement area of the Southwest minority were summarized and organized:

5.3.1 Small auxiliary space and insufficient courtyard space

The auxiliary space is used only second to the bedroom, so there is an urgent need to reorganize the layout of the farmhouse to fit the daily use habits of the occupants. The following problems were found after the study.

1) The kitchen scale is not designed properly. The main problems are narrow kitchen space, lack of space for cooking and raising livestock, etc. 2) Insufficient space for private compounds. The main manifestations are the lack of vegetable gardens and insufficient or lack of yard space. Residents use the yard more frequently than the living room and often need to carry out productive activities as well as social activities in the yard. The combination of personal and social activities of the residents in the residences shows the desire of these people for social life [6]. 3) Lack of storage space. Most of the farmhouses lack space for placing production tools and storing harvested

farm work. Most of the minorities still rely on agriculture as the main source of the economy after resettlement, so they must be accompanied by agricultural storage space.

Housing needs in rural areas are different from those in cities. While the most important aspects of urban planning and interventions focus on addressing the housing shortage, primarily by trying to establish a balance between supply and demand, the main issues in rural areas are different. In other words, the greatest challenge facing rural housing is not the balance between supply and demand, but the need to reconcile residential space with livelihood space. There is a need to develop a composite model of production and livelihood space for rural housing that can meet the production needs of farmers while minimizing the impact of production space on livelihood space. At the same time, its indigenous design is adapted to their lifestyles according to the location and natural environment.



a) Cramped kitchen space



b) Lack of private courtyard space



c) Lack of storage warehouses



Figure 5-20 Room problem example

5.3.2 Poor building physical properties

The main manifestations are 1) insufficient lighting and poor ventilation in the living room. Various parts of the farmhouse space generally surround the living room, and the living room is located in the middle, which is not well-lit and ventilated internally because there are no windows immediately adjacent. It is easy to affect

human use or produce safety problems such as bumping and falling. 2) Poor thermal comfort. Most of the residences are built with mixed clay, and the farmhouses do not scientifically consider the influence of climate environment in the spatial layout and façade design, and there are problems of poor heat insulation and thermal insulation in the building interior. It cannot meet the requirements of living comfort. And even using air conditioners in hot and humid climates may not improve the overall thermal comfort of the occupants [27].

5.3.3 Poor design of protection safety

1) Inadequate anti-slip measures. The lack of anti-slip design in the bathrooms of many resettlement houses easily causes safety accidents. Some courtyards of resettlement houses are not built with canopies, which causes people to slip and fall due to water accumulation and moss. Building entrances and platforms, public corridors, kitchens, bathrooms, and toilets should be set up with anti-slip measures. The building's indoor and outdoor activity places adopt anti-slip flooring with anti-slip grade reaching the current industry standard, and the building ramps and stair treads have anti-slip grade reaching the current industry standard 2) Lack of accessibility settings. The cases investigated basically do not have barrier-free settings. Rural areas are now seriously aging, and there are more elderly people. In the areas where the elderly often move, such as the elderly room, aisle, and bathroom, install fall prevention handrails, safe and durable, even if the elderly live alone at home, walking around can also have something to rely on. Eliminate the hidden danger of falls and reduce small accidents.

5.3.4 Poor quality of housing

1) Poor water and moisture resistance. Most of the resettlement houses have the problem of poor waterproof and moisture-proof performance, with marks and drums on ceilings, walls, and bathrooms, and water seepage on the roof. 2) Poor quality of peripheral components. The main manifestations are: the windows are not firmly installed, the quality of doors and windows is poor, and the installation of the connection part appears to fall off the gap. 3) Poor quality of the decoration. The wall painting of some resettlement houses is peeling off, the bathroom and staircase tiles are empty and broken, etc. The steel bars reserved for future additions to the houses are exposed and not coated with a protective layer. The building envelope such as exterior walls, roofs, windows, doors, curtain walls, and exterior insulation should meet the requirements of safety, durability and protection.



a) Poor waterproof and moisture-proof performance

b) Poor quality of exterior envelope components

c) Poor quality of the renovation

Figure 5-21 Residential Quality Issues

5.3.5 Facility settings do not incorporate demand

1) The basketball court space was used for crop drying. The residents of the minority resettlement area are farmers, and the rural residents spend most of their time engaged in labor activities with high intensity of physical exertion and no longer need to give more physical activities, thus causing the designed basketball court space to remain unused for a long time. And the basking area for food and crops, which farmers need, is not designed. 2) Lack of parking space. With the improvement of the economic level after relocation, farmers purchased tractors, motorcycles, and other means of transportation, and even families purchased small cars, but the residences were not designed with parking spaces to meet the living needs of residents. 3) Lack of space for minority rituals and entertainment. Ethnic minorities have unique national cultures and beliefs, and often need space for rituals and celebrations, in addition, ethnic minorities have their own unique recreational activities, such as playing high swings, playing gyroscopes, dancing, etc., but many resettlement areas do not have much space. 4) No simultaneous planning of production facilities. Some resettlement areas are far away from cultivated land, or there is no planning for cultivated land and new industries. The industrial development of the resettlement project should have a certain foundation, which is the basic condition to guarantee employment and poverty alleviation of the people moving into the resettlement area at a later stage, but the development prospect of the industry is also crucial. Sustainable and stable development of the industry is a strong guarantee for sustainable employment and poverty alleviation of relocated people. The government should combine the actual characteristics and features of the resettlement project and examine the prospects of industrial development.



a) Basketball court space is used for crop drying b) Lack of parking space c) Lack of space for minority rituals and entertainment

Figure 5-22 Infrastructure issues

5.3.6 Templated planning layout and lack of new construction considerations

The village planning is very monotonous and does not follow the spatial texture of the minority villages, but adopts horizontal and vertical construction methods. If this form of architectural planning is applied to the construction of new rural areas, it may make the overall layout of rural buildings more monotonous and lose the natural atmosphere. On the other hand, the planning and design period does not consider the future development of the resettlement area and reserves the land for future expansion, which cannot meet the needs of the residents in the resettlement area who need new houses after they are separated from their families.

5.3.7 Serious homogenization of design and lack of national characteristics

In the study, it was found that 1) the architectural design of resettlement houses for ethnic minorities lacked individuality and characteristics. There is the homogenization of resettlement housing design, and ethnic architectural styles have disappeared [28]. Cultural identity is the primary factor affecting ethnic relations, and housing is also the embodiment of ethnic culture; the architectural style does not conform to the traditional residential style, and it is difficult for residents to have a sense of identity. 2) Kitchens do not match with customs. The residences are not set up with fire pits, which cannot meet the cultural demands of the residents and present the problem of conflicting behavioral habits[29]. 3) Lack of rural landscape genes, the farmhouse courtyard landscape space is similar to that of urban neighborhoods. The paving of the courtyard space is covered by impermeable cement material, and although there is a small amount of greenery, there is no reasonable planning. When building ethnic villages as relocation sites for poverty alleviation, due to the special nature of the farm households staying in the settlements, they are both minority ethnic groups with unique ethnic

cultures, and at the same time, they are poor households with established cards and have requirements for poverty removal. Therefore, in the construction process, we have to fully consider the ethnic characteristics at the same time, we must take into account the social relations of the relocated people, living customs that have been cultural beliefs, etc.²⁸.



Figure 5-23 Lack of national characteristics



Figure 5-24 Analysis of the current problems in the resettlement area

5.4 Summary of this chapter

Based on the use of post-assessment methods, this chapter investigates the current state of the built environment in minority relocation areas. The study selected eight typical relocation and resettlement areas in Pu'er City, Yunnan Province, which meet the principles of minority housing selection, as the research sample, and conducted the survey and evaluation.

This chapter examines the rural resettlement houses in Pu'er minority areas from seven important aspects: residential space design, physical environment, building safety, building durability, infrastructure, environmental livability, and regional characteristics as well as the 30 sub-indicators set under them. A questionnaire survey was conducted on the users of the resettlement houses to derive feedback on user satisfaction. It was also combined with user interviews, researcher participation in the empirical method, and a Walkthrough as a supplement to the evaluation to make a comprehensive assessment of the built environment of the resettlement houses for poverty alleviation of ethnic minorities and to obtain each evaluation grade.

Further, a comparative analysis study of eight samples was conducted to illustrate the differences in the characteristics contained in the housing conditions of each village, and through objective analysis of survey information and data summary, for the seven evaluation levels, the common problems of human living environment in resettlement areas were summarized: small auxiliary space and insufficient courtyard space; poor physical performance of buildings; poor design of protection and safety; poor quality of dwellings; facilities settings not combined with The design of facilities is not integrated with the needs; the planning layout is templated and lacks new construction consideration; the design is homogeneous and lacks ethnic characteristics.

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Chapter 6 Exploring the Factors
Affecting User Satisfaction in Poverty
Alleviation Relocation Housing for
Minorities

The previous chapter analyzed the built environment of a typical minority poverty alleviation resettlement area in Pu'er City and explored the problems of the built environment in the resettlement area. To provide practical and effective strategies to support the improvement of satisfaction with the built environment in the minority poverty alleviation resettlement areas, this chapter conducts further analysis based on the data to explore the status of housing satisfaction and the main factors affecting satisfaction. In order to clarify the inner mechanism of each factor acting on satisfaction and its priority satisfaction sequence in satisfaction enhancement, we hope to focus more effectively on the superiority of satisfaction enhancement in the renewal of the built environment of the poverty alleviation resettlement area and promote the function of the poverty alleviation resettlement area.

6.1 Measurement of housing satisfaction

Housing is the place where people live, and it is often the most important form of asset for rural residents. In 2013, the Chinese government proposed to accelerate the construction of rural habitats. Improving the rural living environment is a basic requirement for building a well-off society, an important part of building a beautiful China, and an effective way to coordinate urban and rural development. At the same time, improving the living environment in rural areas will help improve the satisfaction of rural residents' housing, enhance the overall well-being of rural residents, and make rural residents more comfortable and happy. The living environment of the resettlement area for ethnic minorities is part of the rural living environment. The rural habitat environment consists of natural, man-made, and social environments.[1] The environmental components of these settlements determine the well-being and productivity of rural residents. [2]

Housing satisfaction refers to the subjective satisfaction of residents living in a particular place. Although housing satisfaction is a subjective evaluation and its interpersonal comparison has been widely questioned due to the individual differences in gender, age, education level, and life background of different residents as the subject of evaluation, existing studies have shown that people's unilateral satisfaction scores on general living conditions and housing obtained by questionnaires can effectively reflect their true subjective satisfaction[3] and that these satisfaction ratings are comparable across groups or classes [4]. In addition, self-rated housing satisfaction has strong explanatory power for some economic behaviors of people. For example, Diaz-Serrano

and Stoyanova [5], using survey data from 12 countries in the European Union, found that individual housing satisfaction can effectively explain people's migration behavior, and the lower the housing satisfaction level, the higher the propensity to move, and the higher the housing satisfaction level after moving, especially when people own their own homes. The results of many studies on housing satisfaction show that housing satisfaction is significantly correlated with residents' psychological feelings and quality of life and that improving housing conditions can effectively improve residents' housing satisfaction and thus their quality of life and happiness [6] [7] [8]. According to the concept of "satisfaction", satisfaction is often expressed in terms of expectations or desires, so demographic and social characteristics and actual housing conditions are important influences on housing satisfaction [9] [10]. The analysis of demographic and social characteristics, housing conditions and housing satisfaction can further clarify the correlation between them, which is of great theoretical significance.

The POE method allows the study of residential satisfaction. In this study, the POE survey was conducted in eight resettlement areas in Pu'er City as a study area of Poverty Alleviation Relocation (PAR) housing for ethnic minorities in southwest China, and the satisfaction of users with the built environment was assessed.

The rubric set is a quantification of the different levels of rubrics, i.e., each respondent's evaluation results for each evaluation index are replaced by numerical values. We generally denote it by V , where n is the number of hierarchical criteria.

$$V=(V_1, V_2, V_3, \dots, V_{(n-1)}, V_n)$$

In this study, the residents' overall satisfaction with the resettlement area was measured and a 5-point Likert scale was used to differentiate satisfaction, then.

$$V = \{V_1, V_2, V_3, V_4, V_5\},$$

The 5 levels of evaluation criteria represent very satisfied, satisfied, average, less satisfied, and very unsatisfied in order.

The overall satisfaction score is calculated by assigning values to each evaluation level in the evaluation set V and calculating the results in a weighted average manner. In this study, each of the five options in the questionnaire was assigned a value of 5 for "very satisfied", 4 for "satisfied", and 3 for "Neither satisfied nor dissatisfied", "dissatisfied" was assigned a value of 2, and "very dissatisfied" was assigned a value of 1, that is.

$$V=(V_1, V_2, V_3, V_4, V_5)=(5,4,3,2,1)$$

After that, the satisfaction scores were calculated by calculating the weighted average of each question for different groups. The details are as follows

$$d = \frac{5A + 4B + 3C + 2D + E}{A + B + C + D + E}$$

Where, d denotes the weighted average;

A indicates the number of highly satisfied people;

B denotes the number of satisfied people;

C indicates the number of people who are neither satisfied nor dissatisfied

D indicates the number of dissatisfied people;

E indicates the number of people who are very dissatisfied.

After the above comprehensive evaluation operation, the overall satisfaction scores of the eight resettlement areas in Pu'er City can be obtained. The analysis of the overall environmental satisfaction evaluation results of the residents can provide a clearer understanding of the construction status of the human settlement environment in the studied rural resettlement areas.

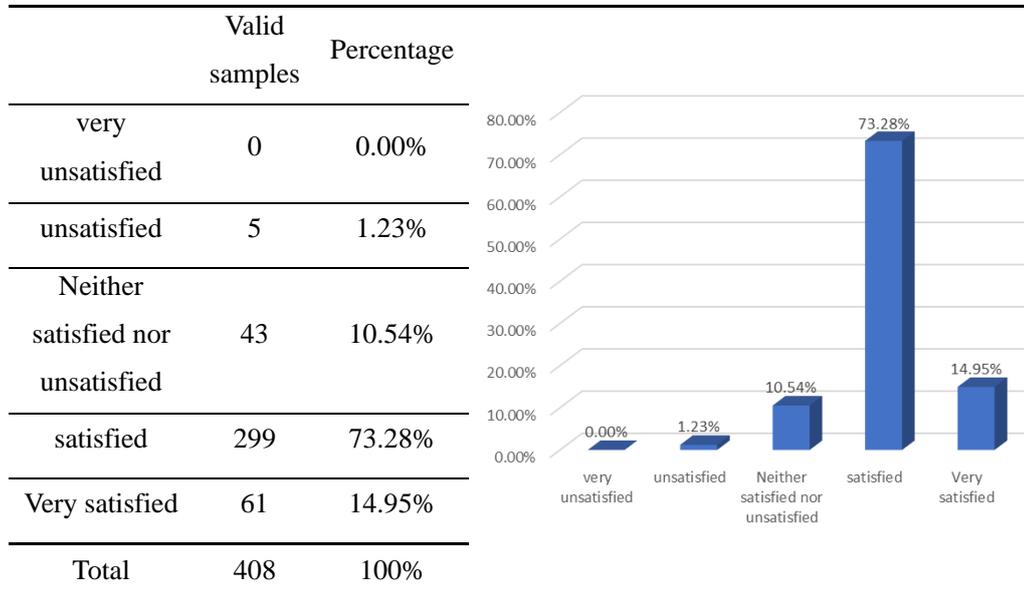
6.2 The overall analysis of residential satisfaction

6.2.1 Overall satisfaction evaluation results

Through the analysis of 408 valid sample data, the overall satisfaction score of poverty alleviation and relocation residences in Pu'er was 4.02. According to the principle of maximum affiliation, the residential satisfaction scores of households were regrouped to obtain their overall attitudes toward different indicators, with scores <2.5 being grouped to represent negative attitudes, while scores >4.5 represented positive attitudes, scores 3.5-4.5 represented good environment and scores 2.5- 3.5 represents a neutral attitude. Residents' overall satisfaction with the PAR project averaged 4.02 points, which is slightly above the level between satisfied and very satisfied. This reflects that villagers are generally satisfied with the project. Although it is a good grade according to the affiliation degree, there is a certain gap to achieve the goal of being "very satisfied", and the built environment needs to be improved.

In general, the majority of urban residents surveyed were "very satisfied" and "satisfied" with the overall satisfaction of the community, as shown in the following table.

Table 6-1. Overall satisfaction



In this study, 14.95% of the residents were "very satisfied" with the overall condition of their community, 73.28% were "satisfied", 10.54% were neutral about their community, 1.54 % of the residents were "dissatisfied" with their settlement and no residents were "very dissatisfied".

Using a rough estimation method, those residents who are "satisfied" or "very satisfied" with the overall condition of the resettlement area are classified as the high-satisfaction group, and those who are "dissatisfied" or "very dissatisfied" with the overall condition of the resettlement area are classified as the high dissatisfaction group. Then, about 80% of the residents were satisfied with the community in general, more than 10% were satisfied with the community in general, and less than 10% were dissatisfied with the community in general.

The satisfaction rate indicates that the improvement status of the human environment of poor minority residents is obvious. Overall, the residential environment of poverty alleviation relocation in Pu'er City has been greatly improved compared with the residential environment before relocation. It makes the relocated residents obviously perceive the improvement of the human living environment.

Combined with the discussion of pro-poor resettlement housing in the previous

chapters and the analysis of relevant policy documents, this paper explores the reasons for the high overall satisfaction with relocation and resettlement housing and proposes the following five reasons:

1) The increase in China's economic level and the increase of relocation investment funds;

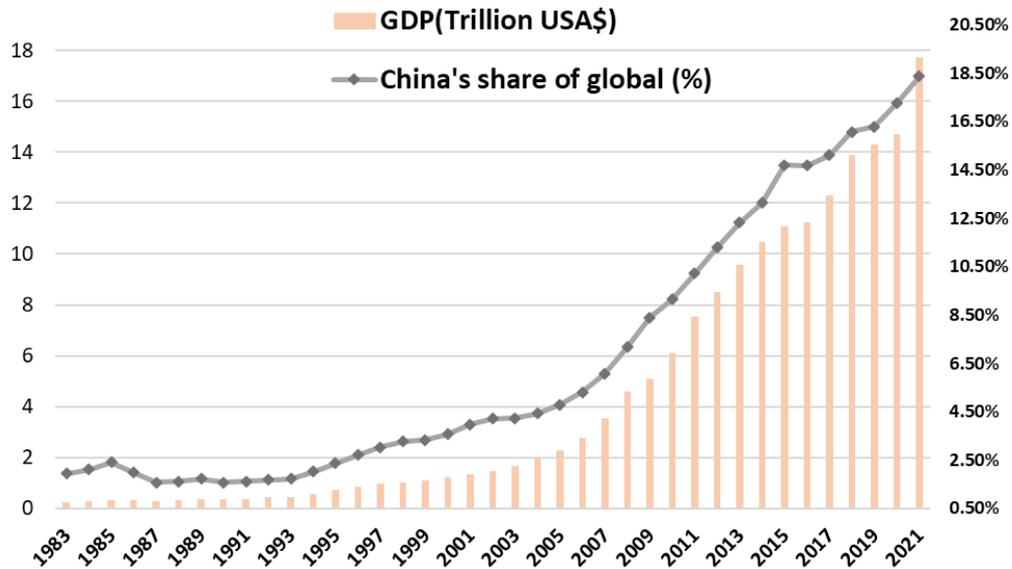


Figure 6-1 China's GDP from 1998 to 2021

In 1983, China's GDP was 0.23 trillion yuan, while by 2021 China's GDP grew by 8.1% over the previous year; the total economic volume reached 114.4 trillion yuan, surpassing 110 trillion yuan and amounting to \$17.7 trillion at the average annual exchange rate, firmly ranking second in the world and accounting for an estimated share of more than 18% of the global economy, while in 1983, China was not even able to complete 2% not even have. from 2001 to 2015, the central budget invested about 36.3 billion yuan in poverty alleviation and relocation projects, while in just five years from 2016 to 2020, the central budget invested about 80 billion yuan, greatly exceeding the total investment of the previous fifteen years. Therefore, the development of China's economy and the increase in investment is one of the key reasons why the construction of resettlement areas is getting better and better.

2) The poverty alleviation and relocation program has been developed for nearly 40 years, and the policies and construction are getting improved;

The essence of relocating the poor to alleviate poverty is to achieve the re-creation of the livelihood space of the poor, which encompasses many dimensions such as

natural ecology, economy, society and politics, and the challenges are enormous. The Chinese government was able to decide to implement the relocation of more than 10 million people from 2015 to 2020, based on the rich policy and practical experience that China has accumulated over the past 30 years of relocating people to alleviate poverty.

At present, the most important policy basis for relocation to alleviate poverty in China is the National 13th Five-Year Plan for Relocation to Alleviate Poverty. The plan very clearly stipulates the scope of poor people to whom the relocation to alleviate poverty is applicable, support standards, funding arrangements, support for subsequent production and development, as well as working mechanisms and guarantees, etc. Compared with the past policies on relocation to alleviate poverty, the new policy plan has innovations in many aspects, thus ensuring the smooth implementation of relocation to alleviate poverty.

3) Farmers do not have much self-financing, and the economic burden is relatively light;

From the 30 years of poverty alleviation and relocation policies, the Chinese government has been providing higher and higher standards of subsidies for migrant relocation, and the proportion of government input in the relocation cost has been increasing, while the proportion of self-financing by migrant farmers has been decreasing. In particular, the local policy of the Pu'er municipal government clearly stipulates that the self-financing of the households with fixed-term cards cannot exceed 10,000 yuan and cannot be relocated with debt and loans, which makes the farmers reduce the financial burden of relocation and improve their satisfaction with the resettlement houses.

4) The infrastructure support is relatively complete. People's life and trade are more convenient;

While building relocated housing, the government finances the construction of supporting infrastructure such as water and electricity, roads, communications, greening, lighting, and garbage disposal, as well as public service facilities such as schools, health service centers, elderly care, to promote the enjoyment of basic public services by relocated people. Over the past five years, China has built 89,000 kilometers of roads, 50,000 sewage treatment facilities, and 56,000 garbage treatment facilities inside and outside resettlement sites; more than 6,100 new or expanded primary and secondary schools and kindergartens, more than 12,000 hospitals and

community health service centers, more than 3,400 elderly service facilities and more than 40,000 cultural activity venues. The results of the "13th Five-Year Plan" comprehensive assessment and verification of the national acceptance team in 80 counties show that the improvement rate of relocated people's access to medical care is 99.87%, the improvement rate of elementary school students' access to school is 99.02%, the improvement rate of junior high school students access to school is 99.01%, and the access to roads, safe drinking water, electricity, radio and television, and communications in resettlement sites The basic public service capacity and level have been greatly improved. This has facilitated the life, education, employment, and transactions of the relocated farmers.

5) The government has increased industrial employment support for relocated farmers and continued to follow up on the income security of relocated farmers;

The follow-up livelihood development of the poor is the key to whether the poor can live in the relocation site with peace of mind and maintain a certain standard of living. In the previous relocation planning for poverty alleviation, there was no clear provision on the follow-up support policy, but in the current relocation planning for poverty alleviation, the follow-up support for the farmers is put in a very important position. In particular, from 2021 onward, the state has implemented a policy to consolidate and expand the results of poverty eradication and rural revitalization, establishing a five-year transition period for counties that have escaped poverty, during which industrial development funds and employment support funds will be continuously invested to help relocated farmers solve the problem of income sources.

6.2.2 Satisfaction evaluation results of each component of the built environment

Residents' overall satisfaction with the resettlement area is a comprehensive index, which is multi-faceted and multi-level, and it comes from the daily life of the resettlement area. As mentioned earlier in this study, the so-called satisfaction of the resettlement area is the overall feeling and subjective evaluation of the residents on their resettlement environment, which reflects the degree of conformity between the objective physical objects of the resettlement area and the subjective needs of the residents. However, the built environment of the resettlement area consists of different subsystems, and the built condition of different components may be good or bad and may be evaluated differently, which we need to explore further.

Based on the preliminary studies and surveys in the previous chapters, this study summarizes the many factors that affect residents' satisfaction with the community in resettlement areas into seven aspects and 30 sub-indicators. In the previous survey, residents of eight resettlement areas were asked to rate their satisfaction with each of the evaluation indicators in their communities on a scale of "very satisfied", "satisfied", and "Neither satisfied nor unsatisfied". Neither satisfied nor unsatisfied", "unsatisfied", and "very unsatisfied". The survey results are as follows.

Table 6-2 Residents' basic evaluation of sub-variables (1) % (N=408)

Explanatory variable	Very satisfied	satisfied	Neither satisfied nor unsatisfied	unsatisfied	very unsatisfied
Housing space design					
H1 Living spaces	22.55	65.69	10.78	0.98	0
H2 Indoor support spaces	21.81	52.70	20.10	5.39	0
H3 Private outdoor space	24.02	41.18	30.39	4.17	0.25
Physical environment					
P1 Thermal comfort	19.36	51.96	23.77	4.66	0.25
P2 Daylighting	48.5	44.9	6.6	0	0
P3 Acoustic insulation	53.7	46.1	2	0	0
P4 Indoor Air Quality	67.4	32.4	2	0	0
Building Safety					
BS1 Protection Safety	53.2	42.6	3.9	2	0
BS2 Structural safety	44.1	46.3	9.1	5	0

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Explanatory variable	Very satisfied	satisfied	Neither satisfied nor unsatisfied	unsatisfied	very unsatisfied
BS3 Fire safety	44.4	44.6	2.9	0	0
BS4 Anti-theft security	43.6	46.3	9.8	2	0
BS5 Geo-security	68.9	30.1	1	0	0
Building durability					
BD1 Envelope enclosure	18.9	60	17.6	3.4	0
BD2 Finishing quality	14	52.7	29.7	3.7	0
BD3 Waterproof and Moisture-proof	3.9	45.1	44.5	5.9	5
BD4 Equipment and Pipeline	61.1	39.1	0	0	0
Infrastructure					
I1 Transport facilities	57.1	39.7	3.2	0	0
I2 Production facilities	42.4	44.9	8.3	3.9	5
I3 Public service facilities	63.1	35.8	1.2	0	0
I4 Municipal public facilities	60	39.2	7	0	0
I5 Commercial facilities	47.8	43.6	8.6	0	0
Environmental Livability					

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Explanatory variable	Very satisfied	Satisfied	Neither satisfied nor unsatisfied	Unsatisfied	Very unsatisfied
E1 Ecological environment	58.8	35.5	5.4	2	0
E2 Social environment	57.4	37.3	5.4	0	0
E3 Greening environment	62.7	35	2.2	0	0
E4 Planning layout	30.1	55.1	10.5	4.2	0
E5 Traffic convenience	39	52	8.6	5	0
Regional Features					
R1 Minority architectural style	28.7	49.3	18.1	3.2	7
R2 Minority cultural customs	18.6	57.8	18.6	4.2	7
R3 Local building materials	32.6	47.3	18.6	1.5	0
R4 Local landscape gene	62.3	34.1	3.7	0	0

To further illustrate the findings and to make them more observational, the above statistics were processed using a five-level scale assignment method (Very satisfied = 5, Satisfied = 4, Neither satisfied nor unsatisfied = 3, Unsatisfied = 2, Very unsatisfied = 1) and the total rating values of the seven dimensions were calculated by averaging. The results were obtained as follows.

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Housing for Minorities

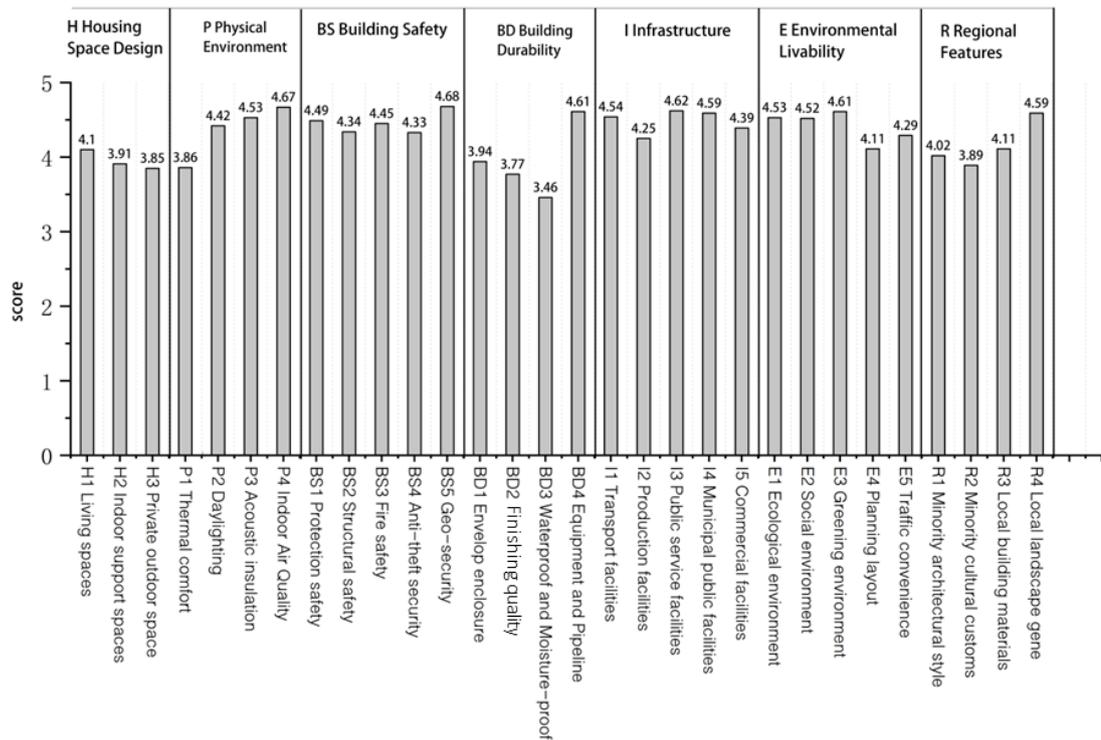


Figure 6-2 Satisfaction score of sub-variable.

Table 6-3. Residents' basic evaluation of sub-variables (2) (N=408)

Explanatory variable	Mean	Std. Deviation
H1 Living spaces	4.10	0.60
H2 Indoor support spaces	3.91	0.79
H3 Private outdoor spaces	3.85	0.84
Housing space design	3.9513	0.5796
P1 Thermal comfort	3.86	0.79
P2 Daylighting	4.42	0.61
P3 Acoustic insulation	4.53	0.50
P4 Indoor Air Quality	4.67	0.48
Physical environment	4.3701	0.48438
BS1 Protection Safety	4.49	0.59

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Explanatory variable	Mean	Std. Deviation
BS2 Structural safety	4.34	0.66
BS3 Fire safety	4.45	0.56
BS4 Anti-theft security	4.33	0.66
BS5 Geo-security	4.68	0.49
Building Safety	4.458	0.4467
BD1 Envelop enclosure	3.94	0.71
BD2 Finishing quality	3.77	0.73
BD3 Waterproof and Moisture- proof	3.46	0.69
BD4 Equipment and Pipeline	4.61	0.49
Building durability	3.9461	0.5291
I1 Transport facilities	4.54	0.56
I2 Production facilities	4.25	0.81
I3 Public service facilities	4.62	0.51
I4 Municipal public facilities	4.59	0.51
I5 Commercial facilities	4.39	0.64
Infrastructure	4.478	0.4544
E1 Ecological environment	4.53	0.61
E2 Social environment	4.52	0.60
E3 Greening environment	4.61	0.53
E4 Planning layout	4.11	0.75
E5 Traffic convenience	4.29	0.64
Environmental Livability	4.412	0.482
R1 Minority architectural style	4.02	0.81
R2 Minority cultural customs	3.89	0.77

Explanatory variable	Mean	Std. Deviation
R3 Local building materials	4.11	0.75
R4 Local landscape gene	4.59	0.56
Regional Features	4.1526	0.63828

Among the above 30 factors, residents rated 12 items, including BS5 Geo-security 4.68, P4 Indoor Air Quality 4.67, I3 Public service facilities 4.62, BD4 Equipment and Pipeline 4.61, E3 Greening environment 4.61, I4 Municipal public facilities 4.59, R4 Local landscape gene 4.59, P3 Acoustic insulation 4.53, I1 Transport facilities 4.54, E1 Ecological environment 4.53, E2 Social environment 4.52, P3 Acoustic insulation 4.53, as the highest, all above 4.5, which is a very good grade and represents villagers' positive attitude towards these aspects of the built environment. As for Waterproof and Moisture (3.46), Envelop enclosure (3.94), Finishing quality (3.77), Indoor support spaces (3.91), Private outdoor spaces (3.85) and Minority cultural customs (The six items, such as Indoor support spaces (3.91), Private outdoor spaces (3.85) and Minority cultural customs (3.89), were rated low. This indicates that these indicators are not performing well in the surveyed cases.

It can be seen that there is some variability in the internal satisfaction of the Habitat Environment System of the minority poverty alleviation resettlement housing, and the residents have different satisfaction statuses with different Habitat Environment Systems. However, in general, PAR provides a comfortable and healthy living environment.

6.3 Spatial analysis of residential satisfaction

6.3.1 Overall residential satisfaction spatial differentiation

The comprehensive evaluation score of housing satisfaction in poverty alleviation and relocation resettlement areas in Pu'er City is 4.01 points, which is in the satisfaction level. However, through the table of comprehensive evaluation scores of housing satisfaction in poverty alleviation and relocation resettlement areas of each county, it is obvious that the evaluation of housing in poverty alleviation and relocation resettlement areas of each village is different from each other: the difference between the highest value and the lowest value is 0.27 points. Therefore, through the table of satisfaction scores of housing evaluation of poverty alleviation and relocation

resettlement areas, combined with the distribution map of comprehensive evaluation scores of housing satisfaction of poverty alleviation and relocation resettlement areas in each county, a more targeted analysis of the differences in housing satisfaction of poverty alleviation and relocation resettlement areas in each county was conducted.

Table 6-4. Housing satisfaction evaluation ranking of each village resettlement area

Village Name	Satisfaction score	Ranking
Ma Anshan	4.27	1
Dai Gela	4.19	2
Shang Manqing	4.11	3
Wo Yang	4.1	4
Xin Zhai	4	5
Yao Jiashan	3.99	6
Ping Zhang	3.79	7
Mi Qiedi	3.65	8

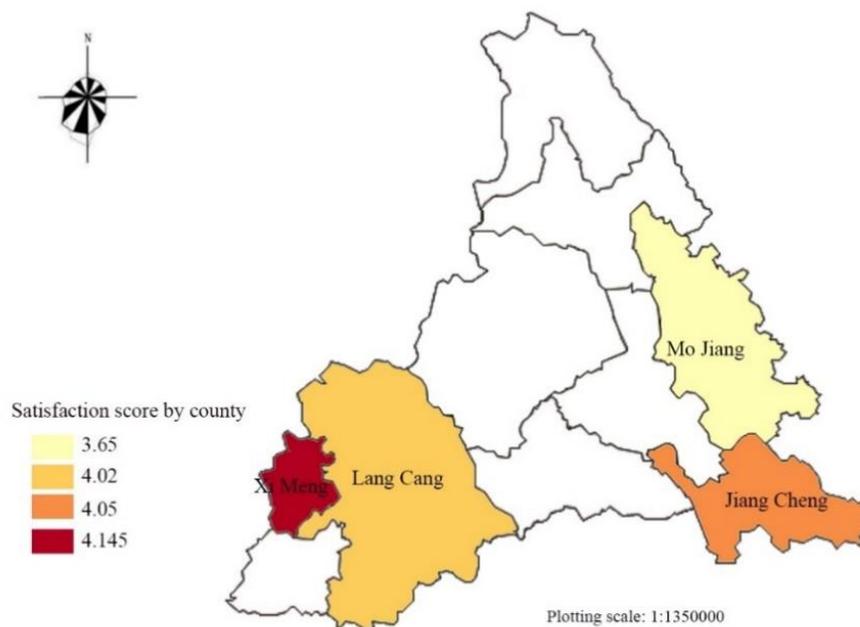


Figure 6-3 Diagram of the satisfaction score of each county settlement area.

The distribution of the overall satisfaction scores shows that Ximeng County is the first place in terms of residents' satisfaction, with a score of 4.15 and a satisfaction rate

(the proportion of the number of interviewed residents who chose very satisfied and satisfied to the total number of residents) of 78.6%; Jiangcheng County is the second place, with a score of 4.05 and a satisfaction rate (the proportion of the number of interviewed residents who chose very satisfied and satisfied to the total number of residents) of 68.6%. The overall evaluation score of satisfaction with the living environment in the two places is higher than the overall evaluation score of satisfaction with the living environment of residents in other resettlement areas, and the satisfaction rate shows that most residents are satisfied with the living environment. The third place is Lancang County, and the last place is Mojiang County. It is worth noting that in terms of spatial distribution, Jiangcheng and Ximeng counties are the two counties with the longest national borders, 183 km, and 89.33 km respectively, while Mojiang County has no borders with foreign countries. Therefore, it can be seen that the two counties with higher rankings are areas with deeper cross-border minority influence, and their bordering countries are poorer countries with inland development. Due to the constraints of natural geography, as well as the low level of social development, poor production conditions, and the lack of popularization of science and technology and cultural knowledge, the development is relatively backward, and the production and living conditions in these minority areas are still quite difficult, and there are still some minority people whose food and clothing problems have not been solved. Since the mid-1980s, when China launched a large-scale organized and planned poverty alleviation work, the border minority regions have always been the key target of state support, and the state has invested a lot of construction funds and introduced many policies to benefit the people.

Therefore, the special support policies of these two counties have enabled them to obtain a large number of resources for the construction and improvement of their habitat, whether in terms of housing environment, infrastructure, public services, or ethnic culture, which ensures a positive development of the habitat and thus a high level of satisfaction with the habitat. It also proves that the poverty alleviation and development of China's ethnic minorities are more effective.

Secondly, the reason for Ximeng County's high residential environment satisfaction also lies in its positioning of ethnic culture industry development in urban and rural development. Ximeng County, the Wa Autonomous County, which is a step from the end of primitive society into a socialist society, has preserved its unique ethnic culture in a more complete way. A large number of myths and epics, poems and proverbs, costumes, songs and dances, and residential customs are the treasures of the

motherland's national cultural treasury, and the unique cultural advantages have laid a solid foundation for Ximeng County to build ethnic cultural industry. In recent years, relying on the unique cultural advantages, Ximeng County has comprehensively improved the quality of tourism, cultivated and expanded the ethnic culture industry, and built a provincial special ethnic town. The prosperity of the regional industry has guaranteed the development of the region while meeting the employment needs of the residents, and indirectly had a positive effect on the improvement of the satisfaction of the living environment.

Further analyzing the spatial differences in satisfaction among counties, among the eight resettlement areas studied, Dai Gela and Woyang belonged to Ximeng County, Yao Jiashan and Shang Manqing belonged to Jiangcheng County, Ma Anshan, Xin Zhai, and Ping Zhang belonged to Lancang County, and Mi Qiedi belonged to Mojiang County. From the score distribution chart, it can be seen that the two adjacent villages in Ximeng County have little difference in scores, Dai Gela 4.19 and Woyang 4.1 respectively; the two adjacent resettlement areas in Jiangcheng County also have little difference in scores, Yao Jiashan 3.99 and Shang Manqing 4.11 respectively. However, there is a big difference between the scores of the two resettlement areas in Lancang County, with Xin Zhai at 4 and Ping Zhang at 3.79. It can be seen that there is a big difference in the habitat construction of the resettlement areas in Lancang County, which has a large population and a total area of 8807 square kilometers, the second largest county in Yunnan Province. The task of the resettlement area construction project and the improvement of the living environment in Lancang County is very difficult.

Mojiang County, which has a low overall satisfaction evaluation score for resettlement area residences, has a total satisfaction evaluation score of 3.65 and a satisfaction rate of 49.7%. The satisfaction rate is 49.7%, and the difference between the satisfaction rate and other counties is large. In terms of spatial distribution, Mojiang County does not belong to the border counties, and the state's support and financial investment in the county is less than several other border counties, and Mojiang County borders many Han areas, so there is less awareness of cultural protection for ethnic minorities compared with other border counties. Due to the financial investment and less awareness of protection, deficiencies in the construction of the habitat environment are inevitable. During the research, it was found that the construction of resettlement areas also saw contractors running away with the money, and the construction of the human living environment is in a relatively late stage, so the satisfaction of their houses

is relatively low. At the same time, the commuting distance to the urban area also affects the satisfaction of the residents with the living environment. The commuting time between the resettlement area and the urban area is two hours, and the longer commuting distance within the county area affects the residents' satisfaction with the habitat environment of their residence.

6.3.2 Spatial variation of sub-variable habitat satisfaction

Residential satisfaction in resettlement areas consists of seven dimensions: Housing space design, Physical environment, Building Safety, Building durability, Infrastructure, Environmental Livability, and Regional Features. By comparing the system-level satisfaction differences among counties, we analyzed the residential satisfaction status of ethnic minority resettlement areas in different regions, to reveal the micro characteristics of residential satisfaction in ethnic minority resettlement areas in Pu'er City more comprehensively.

Table 6-5. Comprehensive evaluation score of satisfaction with relocation housing for Poverty alleviation in each village

	Housing space design	Physical environment	Building Safety	Building durability	Infrast ructure	Environment al Livability	Regional Features
Shang Manqing	4.11	4.20	4.16	3.66	4.35	4.39	4.18
Yao Jiashan	3.52	4.46	3.99	4.43	4.73	4.52	4.13
Wo Yang	4.22	4.50	4.36	4.00	4.56	4.60	4.27
Dai Gela	4.23	4.24	4.24	3.92	4.39	4.34	4.23
Ping Zhang	3.97	4.28	4.12	3.82	4.13	4.04	4.08
Ma Anshan	4.03	4.41	4.22	4.17	4.40	4.44	4.51
Xin Zhai	4.01	4.41	4.21	4.07	4.57	4.48	4.01
Mi Qiedi	3.79	4.10	3.95	3.31	4.23	4.15	3.83

According to the residential satisfaction score, it is obvious that the villages form a large gap in the sub-variable satisfaction comprehensive evaluation score, and the ranking of high and low sub-variable satisfaction scores is approximately the same as the ranking of total satisfaction townships, and the spatial differences of satisfaction are also large. Therefore, to be able to accurately and specifically analyze the differences in residential satisfaction scores in each county resettlement area and reveal the spatial variation of satisfaction, the sub-variable satisfaction scores of residential satisfaction in each county resettlement area are visualized and the spatial map of satisfaction scores at the system level is obtained.

In the spatial diagram of sub-variable satisfaction evaluation scores, Housing space design satisfaction shows the east-west difference, unlike before, Housing space design satisfaction shows a clear trend of high west and low east. The high-value area of Housing space design satisfaction includes Ximeng County and Lancang County, and the low-value area is Jiangcheng County and Mojiang County. the highest value of Housing space design satisfaction appears in Ximeng County, with an evaluation score of 4.23; the lowest value is in Mojiang County, with an evaluation score of 3.79.

The reason is that Ximeng County is the earliest and most deeply researched area in the study of Wa residential houses in Pu'er City, and more scholars and experts have visited Ximeng for many years, contributing to the investigation of the form of Ximeng minority residential houses and the protection and inheritance of residential culture.

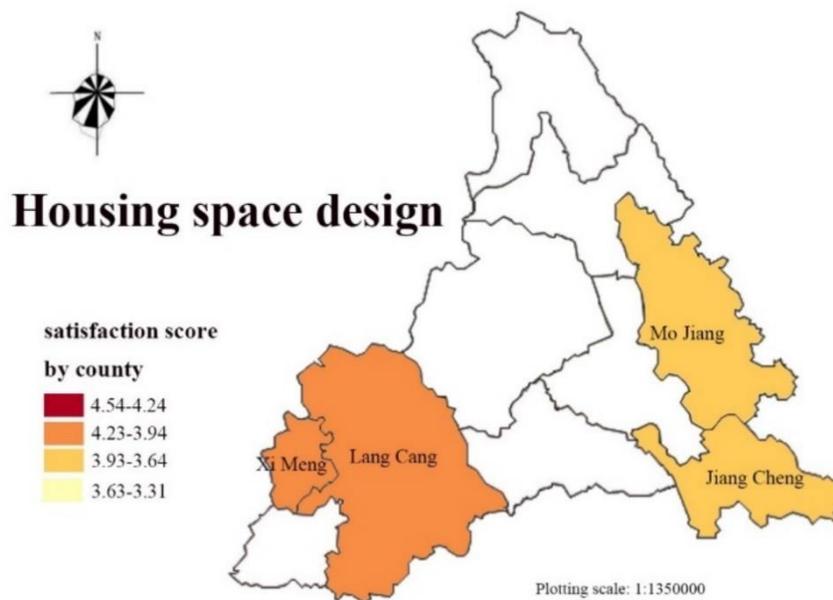


Figure 6-4 Housing space satisfaction score diagram

Therefore, the Ximeng resettlement area can get more academic reference resources in residential design and construction, so that the residential forms of Ximeng minority dwellings can be developed a long way. In contrast, the Hani dwellings in Mojiang County were influenced by the Han dwellings earlier, the form changed earlier, the spatial design of the dwellings was more confusing, and the form of the dwelling space lacked reference materials, so the design could not meet the needs of the ethnic minorities.

Physical environment satisfaction is highest in Xi Meng, Lang Cang, Jiang Cheng, and Mo Jiang, with the highest value in the west being Xi Meng County with an evaluation score of 4.37, and the lowest value in the east being Mo Jiang County with an evaluation score of 4.10. The overall satisfaction in the east is low. However, the difference in satisfaction with the physical environment in each county is not significant, because the resettlement houses basically use the same construction material - reinforced concrete, and the construction area is similar, so the users' feelings are not very different.

The highest value of Building Safety satisfaction is still found in Ximeng County, with an evaluation score of 4.3; the lowest value is in Mojiang County, with an evaluation score of 3.95, and the difference between high and low is obvious. It can be seen that the design of Building Safety has a great correlation with the design of residential buildings, and the low score of the Building Safety dimension will affect the personal safety of residents in daily life, which is not conducive to the healthy development of human living environment and deserves attention.

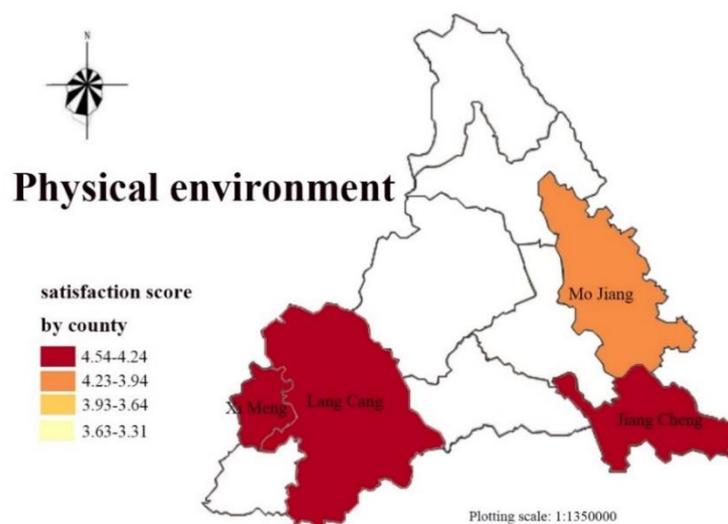


Figure 6-5 Physical environment satisfaction score diagram



Figure 6-6 Building Safety satisfaction score diagram

The overall satisfaction with Building durability is low, unlike before, the highest value of Building durability satisfaction is 4.05 in Jiang Cheng County, the second highest value is in Lang Cang County, and the lowest value is in Mo Jiag County with an evaluation score of 3.31. The quality of housing in all counties is not high due to the low cost of resettlement housing.

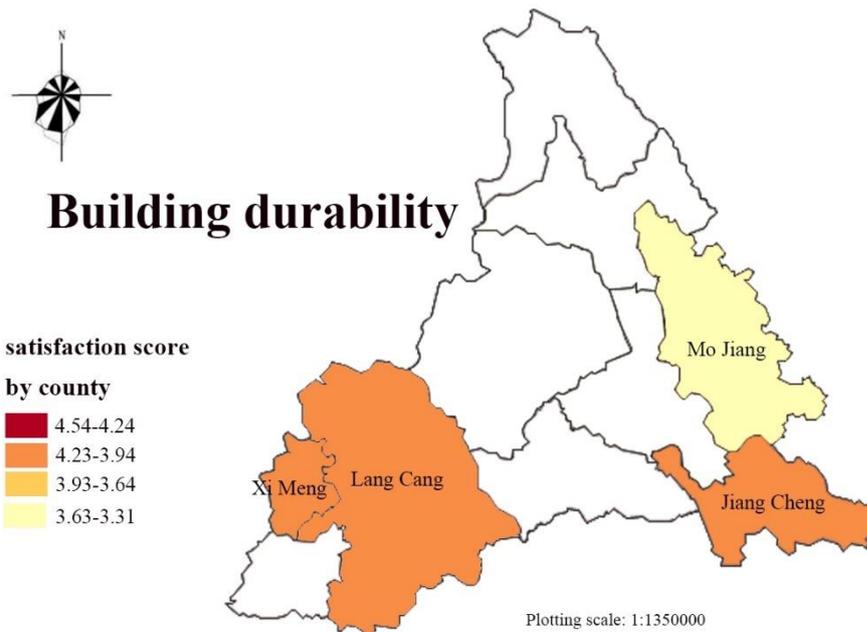


Figure 6-7 Building durability satisfaction score diagram

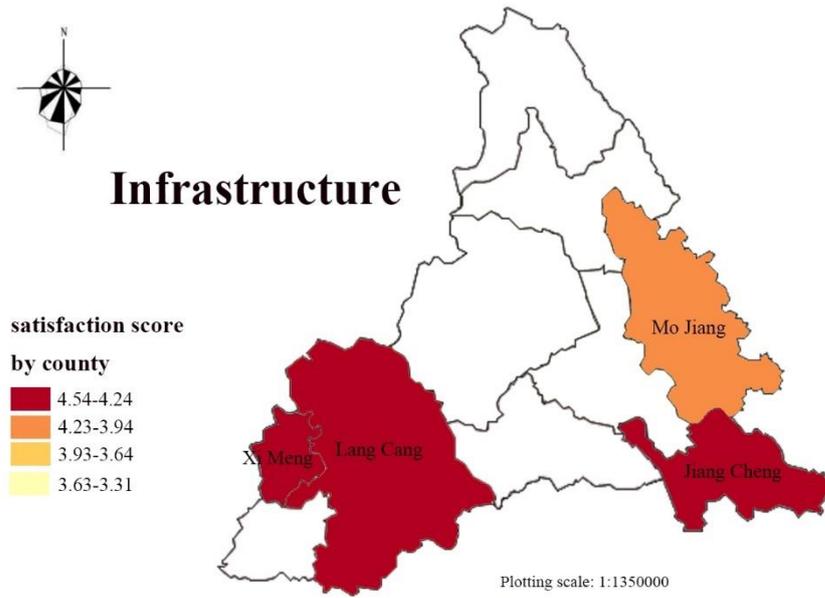


Figure 6-8 Infrastructure satisfaction score diagram

The satisfaction score of infrastructure in Jiang cheng county is 4.53, and the overall satisfaction score is above 80%. It can be seen that the infrastructure in the resettlement area of Jiangcheng County is well-developed, and the infrastructure coverage is comprehensive and meets the daily needs of the residents.

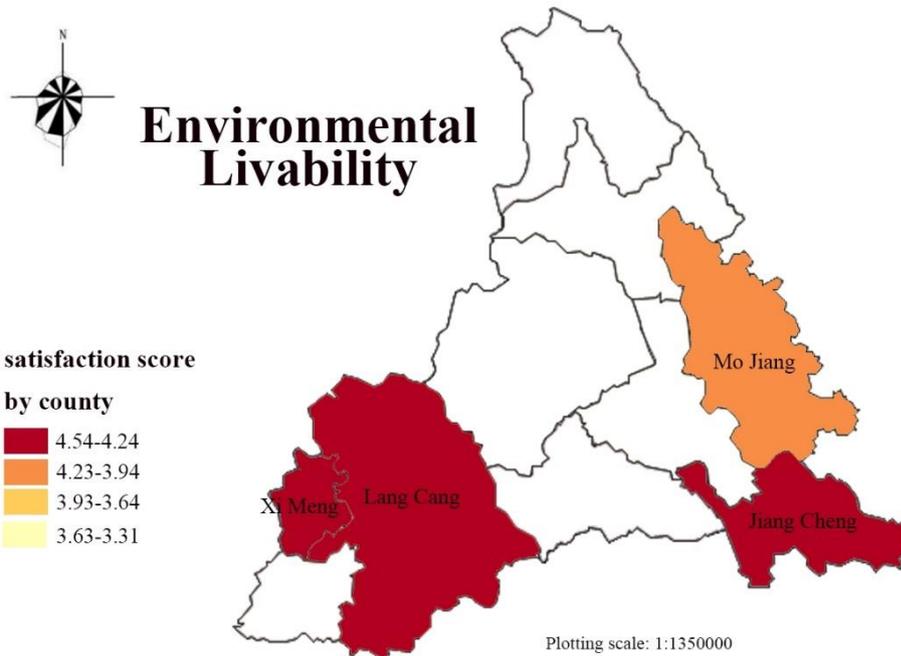


Figure 6-9 Environmental Livability satisfaction score diagram

The highest value of Environmental Livability satisfaction is found in Ximeng County, with an evaluation score of 4.47; the lowest value is in Mo Jiag County, with an evaluation score of 4.15. In the survey, it was found that the resettlement areas are well landscaped, and all counties are dominated by low-pollution industries such as agricultural production, farming, and tea and coffee processing so that the ecological environment can develop positively.

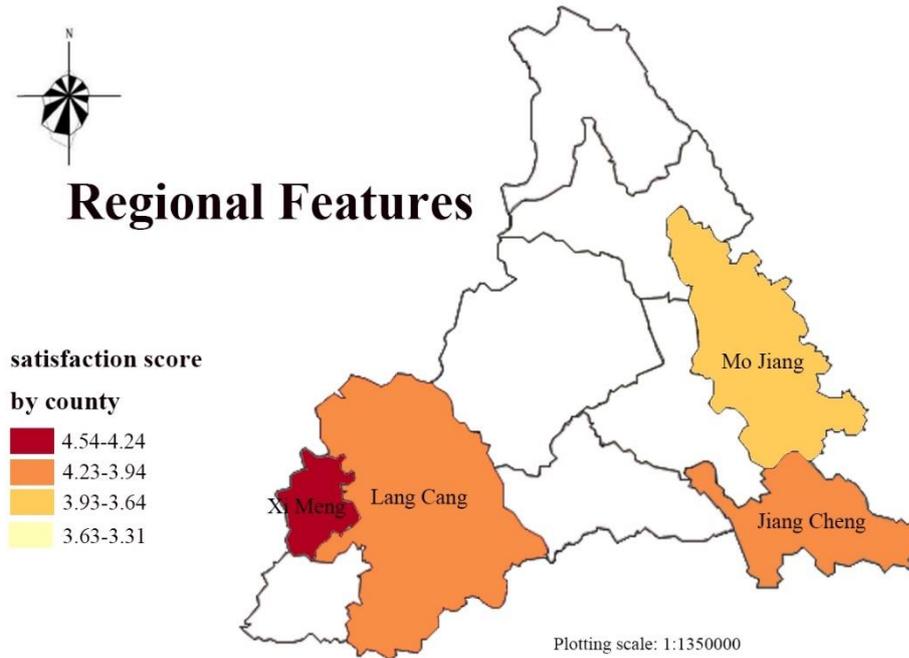


Figure 6-10 Regional Features satisfaction score diagram

The difference between the highest and lowest value of satisfaction with Regional Features is obvious, and the high value of satisfaction with Regional Features includes Xi Meng County, Lang Cang, and Jiang Cheng County. Xi Meng County can fully retain the customs and habits of the original villages, and form a cultural atmosphere similar to that of the original villages, and the residents can quickly adapt to the life of the new resettlement area.

6.4 Influence of sub-variable satisfaction elements on overall satisfaction

6.4.1 Correlation analysis of residential sub-variable satisfaction in settlement areas

People's emotional world is a subtle and complex reflection of the objective world, but it is never a simple equivalence. For example, in the above study, the factors that people rated most highly were not necessarily the factors that also affected their community satisfaction the most. Therefore, after understanding the overall community satisfaction of residents and their subjective evaluations of the factors that make up the overall environment of the settlement, we still need to explore the deeper links between them.

In order to understand the influence of sub-variable factors on the overall residential satisfaction, a correlation analysis was conducted on the valid sample to explore the correlation between the satisfaction of different areas of the resettlement area and the overall satisfaction of the resettlement area. First, we conducted correlation analysis on the collected data to understand the correlation and influence between the rated values of these specific factors and the overall settlement satisfaction of residents, and the following table shows the Pearson correlation coefficients of all variables.

Table 6-6. Pearson correlation test between residential satisfaction.

Explanatory variable	Mean	Std.	Pearson's (r)	P-value
H1 Living spaces	4.10	0.60	.430**	0.00
H2 Indoor support spaces	3.91	0.79	.527**	0.00
H3 Private outdoor space	3.85	0.84	.572**	0.00
Housing space design	3.9513	0.5796	.667**	0.00
P1 Thermal comfort	3.86	0.79	.708**	0.00
P2 Daylighting	4.42	0.61	.440**	0.00
P3 Acoustic insulation	4.53	0.50	.430**	0.00
P4 Indoor Air Quality	4.67	0.48	.362**	0.00
Physical environment	4.3701	0.48438	.628**	0.00

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Explanatory variable	Mean	Std.	Pearson's (r)	P-value
BS1 Protection safety	4.49	0.59	.487**	0.00
BS2 Structural safety	4.34	0.66	.501**	0.00
BS3 Fire safety	4.45	0.56	.354**	0.00
BS4 Anti-theft security	4.33	0.66	.442**	0.00
BS5 Geo-security	4.68	0.49	.489**	0.00
Building Safety	4.458	0.4467	.602**	0.00
BD1 Envelop enclosure	3.94	0.71	.544**	0.00
BD2 Finishing quality	3.77	0.73	.561**	0.00
BD3 Waterproof and Moisture-proof	3.46	0.69	.609**	0.00
BD4 Equipment and Pipeline	4.61	0.49	.375**	0.00
Building durability	3.9461	0.5291	.660**	0.00
I1 Transport facilities	4.54	0.56	.308**	0.00
I2 Production facilities	4.25	0.81	.553**	0.00
I3 Public service facilities	4.62	0.51	.358**	0.00
I4 Municipal public facilities	4.59	0.51	.336**	0.00
I5 Commercial facilities	4.39	0.64	.263**	0.00
Infrastructure	4.478	0.4544	.502**	0.00
E1 Ecological environment	4.53	0.61	.443**	0.00
E2 Social environment	4.52	0.60	.438**	0.00
E3 Greening environment	4.61	0.53	.369**	0.00
E4 Planning layout	4.11	0.75	.529**	0.00
E5 Traffic convenience	4.29	0.64	.352**	0.00
Environmental Livability	4.412	0.482	.561**	0.00
R1 Minority architectural style	4.02	0.81	.595**	0.00
R2 Minority cultural customs	3.89	0.77	.674**	0.00
R3 Local building materials	4.11	0.75	.572**	0.00

Explanatory variable	Mean	Std.	Pearson's (r)	P-value
R4 Local landscape gene	4.59	0.56	.469**	0.00
Regional Features	4.1526	0.63828	.665**	0.00

***Significant at.01 levels,

** significant at.05 levels

* significant at.10 levels.

The correlation analysis was calculated to show that all variables had a significant effect on the overall level of residential satisfaction. Under the basic assumption of covariance diagnosis, the variables were normally distributed. Thermal comfort (0.708) had the firmest effect on overall satisfaction, which is consistent with scholarly research [11]. Specifically, in the housing space design layer, indoor auxiliary space (0.527) and private outdoor space (0.572) had a stronger effect on overall satisfaction than living space (0.430), while in the physical environment dimension, all variables except thermal comfort had a lower effect on satisfaction. As for building safety, structural safety (0.501) had a higher correlation than the other variables. In the building durability dimension, water and moisture resistance (0.609) have a strong correlation, envelope (0.544), and finishing quality (0.561) have a moderate positive correlation, and people are not very satisfied with equipment and plumbing. At the infrastructure level, production facilities (0.553) had the highest correlation, similarly, at the environmental level, planning layout (0.529) had the highest correlation with satisfaction, while at the level of the regional characteristics, ethnic minority architectural styles (0.595), cultural practices (0.674) and local building materials (0.572) showed high correlations.

From the previous basic evaluation of residents' satisfaction with different areas of the resettlement area, it can be seen that there are differences in residents' satisfaction with various aspects of the community. Relatively, residents were more satisfied with BS5 Geo-security 4.68, P4 Indoor Air Quality 4.67, and I3 Public service facilities 4.62. However, whether these aspects are correlated or correlated more with people's overall satisfaction with the community needs to be analyzed and compared.

The statistics show that there is a positive correlation between all the 30 factors listed and overall satisfaction with the resettlement area recognized by the statistical value (significance of 0.05), indicating that specific evaluations and attitudes towards each aspect may influence residents' overall satisfaction with the resettlement area and that these aspects are constituent factors that influence people's attitudes towards the

resettlement area. However, it is not necessary that the higher the evaluation of some aspects, the higher the correlation value with overall satisfaction. It illustrates in another way the difference between the part and the total and the complexity of subjective perceptions.

The results of the data analysis show that aspects rated highly by residents, such as BS5 Geo-security 4.68, P4 Indoor Air Quality 4.67, and I3 Public service facilities 4.62, are not the most important aspects influencing residents' ratings of overall satisfaction with the community. The correlation between these aspects and the overall evaluation was inverse low. Residents rated Waterproof and Moisture (3.46), Envelop enclosure (3.94), and Finishing quality (3.77) as less important, however, they had higher correlations with residents' overall satisfaction with the community. This intriguing inversion phenomenon reflects the variability between the overall and the local and the complexity of people's subjective perceptions, and also shows some important reasons that limit the satisfaction of resettlement areas in China.

As an organic whole, all aspects of the resettlement area have an impact on the overall environmental quality of the community, which in turn affects people's community satisfaction. The table data also shows that the evaluation factors of residential satisfaction in resettlement areas are the key and core elements that affect people's community satisfaction among other environmental factors, and their importance is irreplaceable.

6.4.2 Regression analysis of residential sub-variable s satisfaction in resettlement areas

The relationship between urban residents' specific evaluations of different areas of the community and overall satisfaction with the settlement area and its correlations can be understood from the settlement area satisfaction measure and its correlation analysis. The study shows that all seven dimensions are positively correlated with overall satisfaction, and it can be said that the overall satisfaction of residents with the resettlement area is influenced by the residents' evaluation of different areas of the community. The results of the correlation analysis allow us to see the influence of each factor on the satisfaction of urban residents in the community, and if we need to analyze these influences while taking into account the influence between the various factors for the analysis, we need to further use regression analysis. To find the pattern from a large number of indicators, we use regression analysis to analyze the variables related to the seven dimensions. Therefore, this work further uses the least squares

(OLS) method for regression analysis.

It was shown that the significance of the variance test for this regression analysis was <0.01 level, the VIF values were all less than 5, and there was no multicollinearity between the variables; moreover, the R-squared was 0.624, indicating that the model had good explanatory power.

The table shows the results of the multiple linear regression model, where physical environment, building safety, infrastructure, and environmental livability, although positively related to housing satisfaction, were not significant influencing factors. It is worth noting that housing space design, building durability, and regional characteristics have a significant positive effect on residential satisfaction, which indicates that residents value these three aspects more.

Table 6-7. Regression analysis of seven dimensions influencing overall satisfaction

Variable	Coef	Std. Error	t	Sig.	VIF
(Constant)	0.027	0.188	0.141	0.888	
Housing space design	0.324***	0.043	7.542	0.000	2.168
Physical environment	0.079	0.063	1.262	0.208	3.238
Building Safety	0.018	0.073	0.250	0.803	3.739
Building durability	0.248***	0.055	4.517	0.000	2.945
Infrastructure	0.062	0.072	0.855	0.393	3.782
Environmental Livability	0.087	0.074	1.180	0.239	4.432
Regional Features	0.156***	0.042	3.666	0.000	2.566
F-value			94.974***		
R-squared			0.624		

6.5 Influence of socio-demographic variables on overall satisfaction

6.5.1 Analyzing the satisfaction of different social groups

In terms of basic social demographic information, the summary statistics presented in Table 2 show that 56.6% of the respondents are men, with a relatively

balanced ratio of men to women. In terms of family structure, two generations (47.8%) predominate, followed by three generations (35.3%). Additionally, 77.5% of the respondents received education in primary school or under, 16.2% of them had received a junior high school education, and only 1.7% of the respondents had received a university education or above, indicating a low level of education in poor minority areas. Vil-lagers are mainly engaged in the planting (56.6%) and breeding industry (22.5%) as their main source of income. Among the respondents, 43.6% of them have an average annual income higher than 10,000 yuan, 40.2% earn between 5000 and 10,000 yuan, and there are no people who earn less than 3000.

Table 6-8. Basic social demographic information of respondents.

Variable	Attribute	Percentage (%)	Mean	Std. Dev.
Gender	Male	56.60	1.43	0.5
	Female	43.4		
Age	15-29 years	15.9	2.36	0.84
	30-44 years	39.2		
	45-59 years	37.5		
	≥60 years	7.4		
Education	Primary school or under	77.5	1.31	0.64
	Junior high school	16.2		
	Senior high school	4.7		
	College or above	1.7		
Household income	≤3,000 yuan/year	0	3.27	0.72
	3,001-5,000 yuan/year	16.2		
	5,001-10,000 yuan/year	40.2		
	>10,000 yuan/year	43.6		
Income source	Planting industry	56.6	1.92	1.24
	Breeding industry	22.5		
	Out-migration for work	18.4		

Variable	Attribute	Percentage (%)	Mean	Std. Dev.
	Self-employed	2		
	The rest	0.5		
	Single	4.2		
	Married without child	6.1		
Family size	Two generations	47.8	3.34	0.86
	Three generations	35.3		
	Four generations	6.6		

The study took the personal characteristics of the residents, such as gender, age, education level, and other factors, and applied the five-level scale assignment method to the questionnaire (very satisfied = 5, more satisfied = 4, can't say = 3, not very satisfied = 2, very dissatisfied = 1) and took their average values, and the variability of the evaluation of each item of satisfaction in the resettlement area and overall satisfaction, respectively, to obtain the relevant data in the following table.

Table 6-9. Comparison of ratings of each dimension and overall satisfaction by gender.

	Male	Female	Overall
Housing space design	4.01	3.88	3.95
Physical environment	4.41	4.32	4.37
Building Safety	4.49	4.42	4.46
Building durability	3.98	3.91	3.95
Infrastructure	4.49	4.45	4.48
Environmental Livability	4.44	4.37	4.41
Regional Features	4.19	4.10	4.15

	Male	Female	Overall
Overall Satisfaction	4.06	3.97	4.02

The above table shows that men rated the overall satisfaction of the resettlement area higher than women, except in Housing space design where women rated it lower than men, the ratings of residents of different genders were close in the evaluation of 30 items in the community. Therefore, further research is needed to determine whether there are differences in the evaluation of resettlement satisfaction among residents of different genders.

Table 6-10. Comparison of the evaluation of each dimension and overall satisfaction among residents of different ages

	15-29	30-44	45-59	≥60	Overall
Housing space design	4.12	4.02	3.99	2.99	3.95
Physical environment	4.45	4.42	4.41	3.76	4.37
Building Safety	4.52	4.55	4.54	3.97	4.46
Building durability	4.19	4.01	3.91	3.28	3.95
Infrastructure	4.46	4.53	4.53	3.98	4.48
Environmental Livability	4.53	4.51	4.37	3.93	4.41
Regional Features	4.59	4.42	3.93	2.92	4.15
Overall Satisfaction	4.37	4.09	3.99	3.07	4.02

In the overall satisfaction rating of the resettlement area, residents aged 15-29 were higher than the other groups. In the evaluation of 30 items in the resettlement area, 15-29-year-olds gave the highest rating to Regional Features, 30-44 and 45-59-year-olds gave the highest rating to Building Safety, while residents over 60 years old gave the highest rating to Infrastructure; in terms of Building In terms of durability, residents of different age levels have low ratings. In terms of Regional Features, residents over

60 years old have the lowest ratings, which may be related to the fact that older people feel more deeply about traditional ethnic culture and old residential buildings.

Table 6-11. Comparison of the evaluation of each dimension and overall satisfaction among residents of different education

	College/Undergraduate and above	High School/Secondary School	junior high school	primary school and below	Overall
Housing space design	3.89	4.08	4.18	4.52	3.95
Physical environment	4.34	4.47	4.36	4.82	4.37
Building Safety	4.44	4.49	4.47	4.83	4.46
Building durability	3.88	4.14	4.16	4.57	3.95
Infrastructure	4.48	4.47	4.37	4.71	4.48
Environmental Livability	4.38	4.51	4.51	4.94	4.41
Regional Features	4.36	4.51	4.49	4.86	4.15
Overall Satisfaction	3.93	4.24	4.47	4.86	4.02

From the table, it can be seen that the overall satisfaction evaluation of the resettlement area varies greatly among residents with different education levels, and those with a college education or above have the lowest satisfaction. For the evaluation of Housing space design, the evaluation of those with a college education or above is significantly lower than that of those with primary education and below, which may be because people with higher education have more insight and thinking about the spatial design of housing; on the evaluation of Regional Features, those with lower than primary education and below are significantly higher than the evaluation of other groups, which may be because people with education This may be due to the fact that people with lower education levels pay less attention to this area, thus affecting their evaluations.

Table 6-12. Comparison of the evaluation of each dimension and overall satisfaction among residents of different revenue

	Below 3000	3001-5000	5001-10000	> 10000	Overall
Housing space design	-	3.49	3.81	4.26	3.95
Physical environment	-	3.98	4.37	4.52	4.37
Building Safety	-	4.08	4.47	4.59	4.46
Building durability	-	3.44	3.96	4.12	3.95
Infrastructure	-	4.11	4.57	4.53	4.48
Environmental Livability	-	3.96	4.47	4.52	4.41
Regional Features	-	3.54	4.06	4.46	4.15
Overall Satisfaction	-	3.41	4.03	4.24	4.02

The table shows that residents with incomes of 3001-5000 have the lowest overall satisfaction ratings in the community. In the evaluation of each factor of the subsystem, residents with incomes of 3001-5000 are mostly rated the lowest, roughly showing a trend of higher incomes being rated higher, the specific significance of which needs further study.

Table 6-13. Comparison of residents' evaluation of various aspects and overall satisfaction by different income sources

	crop farming	Aquaculture	Migrant workers	self-employed	others	Overall
Housing space design	3.83	4.09	4.11	4.46	4.33	3.95
Physical environment	4.34	4.36	4.44	4.72	5.01	4.37

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	crop farming	Aqu acult ure	Migrant workers	self- employed	others	Overall
Building Safety	4.44	4.11	4.52	4.78	4.91	4.46
Building durability	3.86	3.95	4.12	4.69	4.51	3.95
Infrastructure	4.48	4.42	4.51	4.73	5.01	4.48
Environment al Livability	4.37	4.41	4.51	4.71	5.01	4.41
Regional Features	3.98	4.17	4.62	4.38	4.75	4.15
Overall Satisfaction	3.89	4.11	4.24	4.51	5.01	4.02

The table shows that for residents of different income sources, residents of crop farming have better overall satisfaction with the resettlement area. In the factor evaluation of the subprojects, crop farming, and self-employed residents rated Building Safety the highest. aquaculture rated Infrastructure the best, and Migrant workers rated Regional Features high.

Table 6-14. Comparison of the evaluation of aspects and overall satisfaction among residents of different household sizes

	single	couple	two generations	three generations	four generations	Overall
Housing space design	4.37	4.08	4.13	3.79	3.09	3.95
Physical environment	4.54	4.34	4.52	4.28	3.69	4.37
Building Safety	4.59	4.43	4.55	4.41	3.96	4.46
Building durability	4.17	4.16	4.07	3.87	3.17	3.95

	single	couple	two generations	three generations	four generations	Overall
Infrastructure	4.51	4.35	4.56	4.89	3.97	4.48
Environmental Livability	4.55	4.44	4.54	4.33	3.79	4.41
Regional Features	4.54	4.61	4.43	3.94	3.11	4.15
Overall Satisfaction	4.53	4.32	4.17	3.88	3.07	4.02

The table shows that for residents of different family sizes, residents of four generations of families are less satisfied with the resettlement area in general. It is possible that in households with more members, the limited size of resettlement housing is difficult to meet the demand. In the factor evaluation of the subprojects, residents of four generations households basically have the lowest evaluation of all factors.

6.5.2 Regression Analysis of Indicator Measures of Demographic Social Variables

People of different genders differ in many aspects such as psychology, values, communication style, cognition, and response. So their cognition and response to residential satisfaction in ethnic minority resettlement areas may differ to some extent, so it is necessary to determine the influence of residents' attributes on residential satisfaction in ethnic minority resettlement areas and explore the role of demographic social variables related to total satisfaction.

In this study, the path analysis model was designed as shown below:

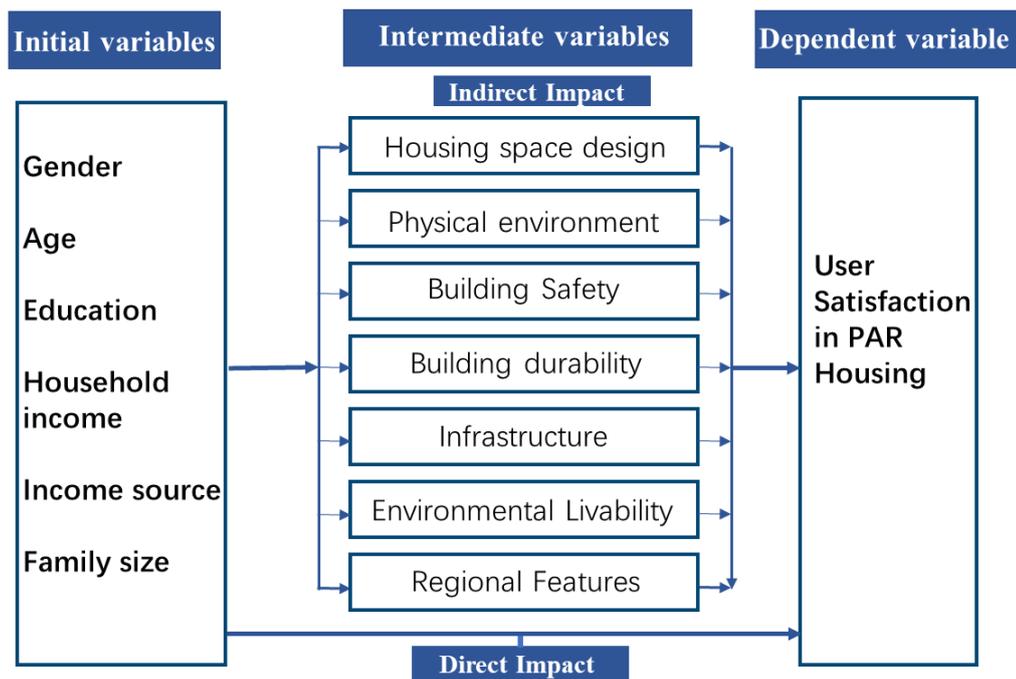


Figure 6-11. Path analysis model

This study argues that the evaluation of sub-variables directly affects overall satisfaction, while the socio-demographic characteristics of residents indirectly affect overall satisfaction mainly by influencing sub-variables. Therefore, we used residents' evaluations of the seven tiers as intermediate variables and sociodemographic characteristics as initial variables to reveal the influence process of initial and intermediate variables on overall satisfaction through path analysis. Table 15 shows the results of the regression analysis of the initial variables on the intermediate variables as well as overall satisfaction. In addition, the F-test shows that the significance is less than 0.05, indicating that the predictor variables have a significant effect on the dependent variable, and the variance inflation factor tests for multicollinearity, with VIF values less than 5, indicating that there is no multicollinearity between the variables. And the F-value indicates that the degree of direct explanation of overall satisfaction by the initial variables is about 36%, which is significantly lower than the degree of explanation of overall satisfaction by the intermediate variables, indicating that our predetermined research framework is reasonable.

From the regression results, age, income, and household size had a direct effect on overall satisfaction, and **Figure 6-12** shows the scoring of socio-demographic variables on overall satisfaction. On the other hand, all socio-demographic variables have effects on housing space design, except for income source and education, while the variables

that affect the physical environment are household income, income source, and family size. It is interesting to note that only household income and income sources affect building safety. Similarly, only age and household income affect building durability. Additionally, age, education, and household income have effects on infrastructure, while environmental livability is influenced by age, household income, and income source. Moreover, age, education, household income, and family size have a significant effect on regional features.

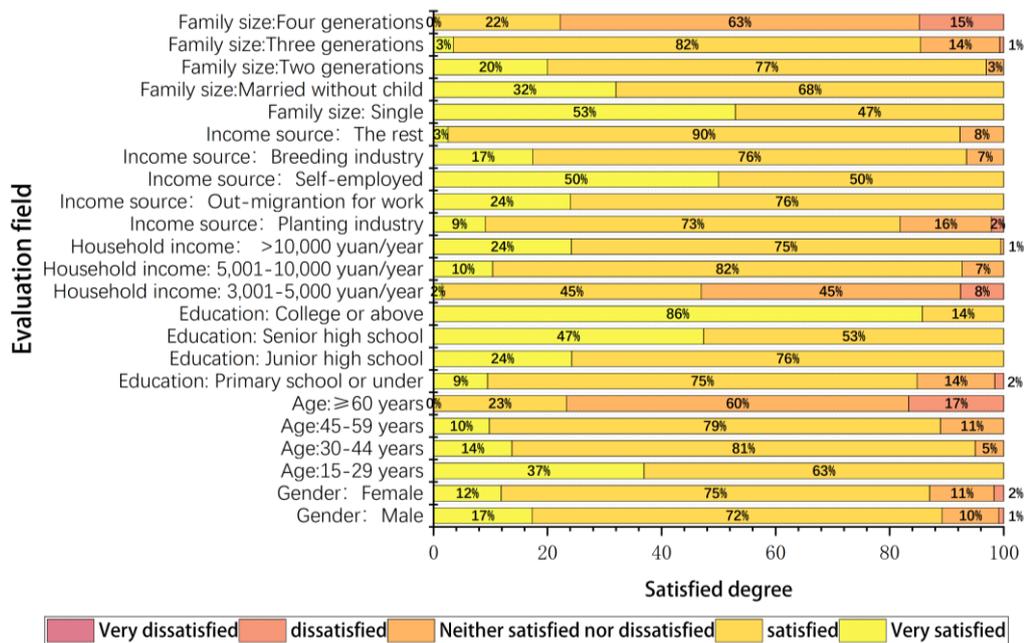


Figure 6-12 The scoring of the socio-demographic variables on overall satisfaction.

Table 6-15. Influence of socio-demographic variables on satisfaction.

Housing Space Design	Physical Environment		Building		Building Durability		Infrastructure		Environmental Livability		Regional Features		Overall Satisfaction	
3.857***	4.327***	3.985***	3.759***	4.299***	4.288***	5.09***	4.109***							
-0.103*	-0.069	-0.052	-0.058	-0.045	-0.06	-0.076	-0.06							
-0.094*	-0.049	-0.001	-0.122**	-0.072*	-0.087*	-0.392***	-0.149***							
-0.088	-0.039	-0.003	0.000	-0.098*	-0.005	-0.214***	0.038							
0.345***	0.24***	0.268***	0.242***	0.198***	0.224***	0.243***	0.251***							
-0.065	-0.092*	-0.102**	-0.034	-0.054	-0.082*	0.031	-0.059							
-0.132***	-0.097**	-0.045	-0.053	-0.005	-0.052	-0.141***	-0.128***							
29.568***	15.164***	13.039***	19.336***	7.111***	13.514***	72.116***	36.065***							
0.307	0.185	0.163	0.224	0.096	0.168	0.519	0.350							

The overall effect of the initial variables on overall satisfaction can be explored using path analysis. The overall impact value is equal to the sum of the indirect and direct impacts, and regression coefficients with p-values greater than 0.05 are not included in the model.

Indirect impact = coefficient of the initial variable on each intermediate variable *
coefficient of that intermediate variable on the dependent variable

Total impact = indirect impact + direct impact

In contrast, from the previous study, only housing space design, building durability, and regional features were found to be significantly positively related to overall satisfaction, so only these three indicators were included in the final model. Table 6 shows the results of the path analysis, with the highest positive effect of household income on overall satisfaction, indicating that higher income has a higher satisfaction level. This is followed by a significant negative association of age and family size with overall satisfaction with residence, implying that the larger the family size and the older the age, the lower the overall satisfaction. It is worth noting that, in previous studies [12], the type of occupation had an effect on satisfaction with living, but in this study, the effect of income type was not significant, while gender has a negative impact on overall satisfaction, mainly through housing space design, while education affects overall satisfaction through regional features.

Table 6-16. Path analysis of socio-demographic variables on overall satisfaction

	Overall Impact	Indirect impact			Direct impact
		Housing space design	Building durability	Regional Features	
Gender	-0.033	-0.033	-	-	-
Age	-0.27	-0.03	-0.03	-0.061	-0.149
Education	-0.033	-	-	-0.033	-
Household income	0.461	0.112	0.06	0.038	0.251
Income source	-	-	-	-	-
Family size	-0.193	-0.043	-	-0.022	-0.128

6.6 Discussion and recommendations

In this work, through the POE survey analysis of eight PAR minority villages, we found that the respondents were satisfied with their PAR villages. In particular, the living space per capita of PAR housing meets the standard, and it provides residents with safe, convenient transportation and relatively good public facilities and living environments, meaning that it can be said that PAR has improved the original living conditions of ethnic minorities in poor areas. However, it is worth noting that the satisfaction level of the housing space design layer is low, among which the satisfaction level with the auxiliary space and courtyard space is the lowest. To prevent the poor villagers from relocating into debt, the government set the limit of construction area per capita, but it was found in the survey that some respondents thought their residential kitchen space was too small, and some thought the storage space was lacking or insufficient, and some thought the courtyard space was lacking or inadequate, so the designation of residential policies needs to be more segmented[13]. On the other hand, in the physical environment dimension, thermal comfort satisfaction is poor, which is due to the fact that new houses mainly use ordinary concrete materials, which have poor insulation performance in subtropical regions. Likewise, in the building durability dimension, the performance in water and moisture resistance is poor, probably because the low cost of construction reduces the quality of housing. In the facilities dimension, satisfaction with production facilities was low, with some respondents expressing dissatisfaction at the fact that there were not enough land resources to meet their agricultural needs [14] or because of the distance of the production land from the resettlement area. Meanwhile, in terms of the dimension of the regional feature, the resettlement areas are low-income public housing, while the cost of building new homes with ethnic characteristics is high, and so the new homes are often in a simple form. Middle-aged and older respondents believe that the homes do not meet their cultural practices, probably because most of the new resettlement houses have eliminated the firepit, which in the old homes belonging to ethnic minority cultures is closely related to daily life, and modern kitchens do not meet their needs in some aspects.

On the other hand, this study found through regression analysis that housing space design, building durability, and regional features directly affect overall satisfaction, and age, household income, and household size also directly affect overall satisfaction, while gender and education level indirectly affect overall satisfaction through

intermediate variables. Specifically, with the increased household income, villagers have more financial resources to renovate their living environment, while the older the age, the lower the overall satisfaction, which may be due to the fact that, the older the age, the more accustomed to the previous living habits and bad living conditions they are, and moving to a new environment makes them feel a lot of dissatisfaction. In terms of residential design satisfaction, women are less likely to be satisfied than men, probably because women spend more time in the home, such as housework, cooking, gardening, knitting activities, etc. Interestingly, previous studies have suggested that education level is positively related to satisfaction [15], but this study found a negative relationship between them because placement in residence can only meet the basic needs of survival, and a higher education level may increase the thinking about the living environment, leading to their dissatisfaction.

Regarding this, combining the questionnaire and the environmental status survey, the results of the comprehensive research and analysis are proposed to improve human settlements of minority PAR communities as follows:

(1) Improvement of dwelling units

The study shows that housing space design has the strongest correlation with overall satisfaction, but it performs poorly in terms of satisfaction, while the household size and income are significant influencing factors. In the future design, designers should consider reserving space for expansion, which can allow residents to add on the second floor or other spaces when they have the financial ability. In addition, villagers pay more attention to outdoor private space and auxiliary space than living space, and future design should consider breeding space, planting space, storage space, and parking space for agricultural machinery to maximize space utilization. To solve the problem of the physical environment, we can try to adopt high science and low technology construction technology [16] and combine modern materials with traditional materials [17] to improve thermal comfort performance and reduce energy use and thus the burden on homes [18]. Likewise, building durability is an important factor in improving satisfaction, and resettlement houses, which perform poorly in terms of water and moisture resistance and renovation quality, should be inspected and monitored throughout the building construction phase. In PAR construction, good housing quality contributes to integration into the new community [19]. A regional approach appropriate to the rural character is used and the planning of the user attributes of such housing is emphasized by enhancing the subsistence spaces in the

housing.[20]

(2) Perfection of community environment

The ESPAR project relocates poor people to areas with better living conditions, and the villagers are more satisfied with the performance of infrastructure and environmental livability. It is worth noting that production facilities strongly correlate with overall satisfaction, so it is necessary to consider planning adjacent production land planning or planning new production methods in the village design to achieve the goal of PAR increase and livelihood restoration [21]. As for the regional characteristics, we should deeply interpret the characteristics of the traditional houses of ethnic minorities, adopt the strategy of "local technology, local materials, and local labor" [22], train local craftsmen, and build new houses with ethnic characteristics while reducing economic pressure. Furthermore, the future design should pay more attention to the local attachment needs, living habits, and cultural customs of ethnic minorities, such as preserving and improving the space of fire pits and inheriting the landscape genes, etc., and continuously explore economically affordable and technically feasible ways to update the built environment and ethnic culture, so as to prevent the relocation of relocated people who have not adapted to the environment and experience homesickness.

6.7 Summary of this chapter

Over the past two decades, post-occupancy evaluation methods have been widely adopted as an important tool for assessing resident comfort and satisfaction. As for the analysis of occupancy satisfaction, many existing studies do not distinguish between direct and indirect factors of satisfaction and analyze all these factors as direct influencing factors. Against the above background, this study takes the minority region of southwest China as the study area, starts from the concept of the living environment, is guided by the connotation of POE, and adopts a path analysis method to combine living environment theory with post-occupancy evaluation, and then evaluates the living satisfaction of minority people regarding rural PAR housing. The conceptual model of this paper is based on the evaluation of the sub-variables that directly affect overall satisfaction, while the socio-demographic characteristics of users indirectly affect overall satisfaction mainly by influencing the sub-variables, and the influence process of each factor is analyzed. By identifying multiple determinants that may affect satisfaction with the living environment of minority resettlement housing, we propose strategies for improving minority resettlement housing. field questionnaires and in-

depth interviews were conducted between 2021 and 2022, using eight typical migrant resettlement villages in Pu'er City, Yunnan Province, as the study sample.

This chapter, combined with the summary analysis of the POE evaluation results in the previous chapter, first uses survey data to describe the current housing situation and housing satisfaction in resettlement areas of ethnic minority areas in southwest China and explores the variability in space, followed by an analysis of the process of influencing factors on the satisfaction of living in PAR housing. Using post-use evaluation as a guiding method, correlation analysis and path analysis are used to explore the factors affecting satisfaction with PAR housing in seven dimensions. The results of the study indicate that the main factors influencing the overall satisfaction of PAR housing are building durability, housing design, and regional characteristics, while the socio-demographic characteristics of the residents mainly influence the overall satisfaction by affecting the sub-variables. It is worth noting that improving the architectural quality of PAR homes is a key issue in improving satisfaction. By identifying the factors that affect satisfaction with PAR housing, this chapter suggests strategies to improve the habitat at both the "dwelling unit" and "community environment" levels and proposes strategies to improve the resettlement housing for ethnic minorities. This chapter provides a reference for the improvement and design of minority ESPAR communities.

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Chapter 7 Conclusion

The main elements of this study are as follows:

Chapter 1, introduces the background of the selected topic, defines the scope of this paper's research, and lays the foundation for the thesis to be carried out by sorting out the significance as well as the necessity of architectural environmental assessment of pro-poor resettlement housing for ethnic minorities in China.

Chapter 2, there is the research basis of the thesis, which examines the theory of habitat environment, post-use evaluation, and the theory of built environment assessment system, explores the current research status of poverty alleviation relocation housing and also compares the origin, concept, type, and characteristics of poverty alleviation housing to provide the theoretical basis for the following in-depth study.

Chapter 3, the overview of the research sample is analyzed and the current situation of the rural environment in the region is described. Then data collection, research methods, and analysis techniques are introduced.

Chapter 4, through the above basic research, the thesis uses the literature research method and expert evaluation method, and finally constructs an evaluation index system from seven levels: residential space design, physical environment, building safety, building durability, infrastructure, environmental livability, and regional characteristics, followed by a case application, post-use evaluation from subjective and objective aspects, to verify the applicability of the evaluation system.

Chapter 5, based on the post-use evaluation method, the thesis investigates the current situation of the built environment in minority settlement areas. Field questionnaires and in-depth interviews were conducted with eight typical relocation villages in Pu'er City, Yunnan Province as the research samples. The feedback information was studied and analyzed to summarize the desirable features at the architectural design level, and then to consider the prevalent problems.

Chapter 6, the overall evaluation results are analyzed by combining the theory of living environment with post-occupancy evaluation through the path analysis method, and the process of influencing factors on the satisfaction of living in PAR housing is investigated. By identifying multiple determinants that may affect satisfaction with the living environment of minority resettlement housing, the thesis proposes strategies for the improvement of minority resettlement housing.

Chapter 7, Summarized the full text and proposed some goals for future research.

In recent years, with the completion of Poverty alleviation relocation work,

research related to Poverty alleviation relocation housing has gradually become a hot spot. The research on Poverty alleviation relocation housing is mainly based on management, sociology, and other disciplines. there is less evaluation involving architecture. On the other hand, the traditional design method research is often the subjective experience and inheritance of architects, and less comprehensive judgment is made from the perspective of people and the environment. Therefore, it is necessary to construct a POE study of Poverty alleviation relocation housing from an architectural perspective and guide the design strategy of Poverty alleviation relocation housing. This study takes Poverty alleviation relocation housing as the research object, summarizes the relevant theories and research results, analyzes the characteristics of Poverty alleviation relocation housing, and establishes the POE of Poverty alleviation relocation housing through expert inquiry method, literature statistics method, and questionnaire method. Poverty alleviation relocation housing was evaluated by using the post-use evaluation index set, and Poverty alleviation relocation housing in eight typical villages in Pu'er City was used as a case study for investigation, evaluation, and research. Through the analysis of the survey information and data, the problems and learnable points of the evaluation objects are summarized, and the factors affecting the satisfaction of Poverty alleviation relocation housing are explored with the starting point of people and environment.

(1) The findings of the dissertation are as follows.

First, the history of the development of Poverty alleviation relocation housing and the current status of development is analyzed by means of literature research. The concept and characteristics of Poverty alleviation relocation housing are summarized, and a theoretical review of post-use evaluation methods is conducted.

Second, a set of post-use evaluation indicators of Poverty alleviation relocation housing is constructed and the weights are calculated. A survey of Poverty alleviation relocation housing in eight villages with typical Poverty alleviation relocation housing was conducted to verify the applicability of the Poverty alleviation relocation housing POE method. The applicability of the method was verified.

Thirdly, based on the field research and problem analysis, the feedback information and data were summarized and analyzed to extract the desirable features of the design and analyze the countermeasures for the exposed problems. The main factors influencing the satisfaction of Poverty alleviation relocation housing and their importance are explored from seven aspects.

By introducing the POE method to guide the proposed Poverty alleviation

relocation housing strategy, is different from the traditional binary mode of thinking about the design object by the design subject, and explores the design research of Poverty alleviation relocation housing from the starting point of people and environment, which is This is a more scientific research method. It is a more scientific research method. It has certain reference values for both theoretical research and design method research of Poverty alleviation relocation housing design.

(2) Questions for further follow-up research by the author in this study.

The thesis tries to establish a set of Poverty alleviation relocation housing POE evaluation methods for the scientific and effective proposal of Poverty alleviation relocation housing design strategies. But this is only a stage result, the thesis from the systematic establishment of the evaluation system to the practical application of the case, and then to the summary of the feedback information comparison study, to explore the factors affecting the satisfaction, which there are certainly still omissions, but this paper from the Poverty alleviation relocation housing as the focus of the study, the research method has been tested, and The research method has been tested and has some reference value. This paper is only a process to introduce the design of Poverty alleviation relocation housing as a basis for future in-depth research.

From the analysis and summary of theoretical literature, the construction of the evaluation system, the distribution of questionnaires to experts and users one by one to the investigation of practical evaluation cases, my knowledge, research level, and depth are still shallow, and This study has not yet fully integrated and understood the content of what This study has learned and studied. This study was not fluent enough in writing and expression, so the depth of this paper is still lacking, and there are inevitably mistakes and oversights that need to be improved continuously.

Appendix

Part1

知情同意书

Research Informed Consent

您好，我是北九州大学国际环境工程学院巴特教授指导下的博士生，我正在进行一项关于住房设计满意度的学术研究，邀请您的调查参与。本知情同意书将向您介绍该研究的目的、步骤、获益、风险、不便或不适等，请您仔细阅读后慎重做出是否参加研究的决定。如有任何疑问您可以随时向研究人员提问，并让研究人员向您解释，直至您对本项研究完全理解之后再做决定。

Hello, I am a doctoral student under the supervision of Professor Bart, School of International Environmental Engineering, Kitakyushu University, I am conducting academic research on housing design satisfaction, and I invite you to participate in the survey. This informed consent form will introduce you to the purpose, steps, benefits, risks, inconvenience or discomfort, etc. of the research. Please read it carefully before making your decision on whether to participate in the research. If you have any questions, you can always consult the researcher and get an explanation until you fully understand the study before making decisions.

研究项目/ Research Projects:

通过使用后评价探讨影响少数民族扶贫搬迁住房使用满意度的因素

Exploring the Factors Affecting User Satisfaction in Poverty Alleviation Relocation Housing for Minorities through Post-occupancy Evaluation

主要研究者/ Primary researcher

白雪 /Xue Bai, 谢肇宇/Zhaoyu Xie, Bart Julien Dewancker

研究目的/ Research purposes:

本研究旨在通过使用者的评价，探讨影响扶贫搬迁住宅的建筑设计因素，并针对不同维度提出改进策略，为社区的可持续发展提供参考。

The purpose of this study is to explore the architectural design factors affecting the relocation of poverty alleviation housing through user evaluation and to propose improvement strategies for different dimensions, so as to provide a reference for the sustainable development of the community.

研究过程/ research process:

这项研究采用量表问卷调查，问卷将采取匿名形式。这次的问卷共含有 2 个部分，请您按照自己的真实情况和想法，在每道题选项中选择最合适的一项，题目回答没有对错之分。

第一部分, 您将需要选择有关您个人、家庭、经济等一般情况的问题。第二部分, 您需要对住宅设计的各个部分进行满意度评分。整个调查大约需要 2-3 分钟完成。

This study uses a scale questionnaire, which will be anonymous. There are 2 parts to this questionnaire. Please choose the most suitable item from each question according to your own situation and thoughts. There is no right or wrong answer to the question.

For the first part, you will need to fill in questions about your personal, family, financial, and other general circumstances. In the second part, you need to rate your satisfaction with various parts of the home design. The entire survey takes about 2-3 minutes to complete.

参与调查的益处/ Benefits of taking a survey:

虽然本次调查可能对您没有直接的益处，但您的答案可以帮助研究人员更多的了解影响扶贫搬迁住宅设计的因素，为今后的设计与维护提供参考。

Although this survey may not be of direct benefit to you, your answers can help researchers learn more about the factors that affect the design of relocation houses for poverty alleviation and provide references for future design and maintenance.

研究风险/ research risk:

完成此次调查没有任何已知的风险，您可以拒绝回答一切问题，如果您感到不适可以随时终止您的问卷填写。

There are no known risks to completing this survey, you may refuse to answer all questions, and you may terminate your survey at any time if you feel unwell.

调查的保密性/ Confidentiality of Investigations:

问卷将采取不记名形式，对您的日常生活不会有任何的影响。如果您决定参加本项研究，您参加本调查及在调查过程中的个人资料将严格保密，可以识别您身份的信息将不会透露给研究组以外的成员。

The questionnaire will be anonymous and will not have any impact on your daily life. If you decide to participate in this research, your personal data regarding your participation in this survey and in the course of the survey will be kept strictly confidential, and information that could identify you will not be disclosed to members outside the research team.

联系方式/ Contact details:

如果您对本次研究有任何疑问，或者如果您或您的家人觉得自己处于危险之中，请随时联系温州大学谢肇宇老师，北九州大学白雪博士 18223098893.

If you have any questions about this research or feel that you are in danger, please feel free to contact Professor Xie Zhaoyu of Wenzhou University and Dr. Bai Xue of Kitakyushu University tel:18223098893.

自愿参加/ volunteer

本次研究是自愿的，是否参加研究完全取决于您的意愿。如果您决定参加这项研究，请您在“知情同意书”的“同意”一栏打勾。在您签署了同意书后，您仍然可以在任何时候退出，而无需给出理由。退出这项研究不会影响您与研究人员之间的关系，您的数据将被退还给您或销毁。

This study is voluntary, and participation in the study is entirely up to you. If you decide to participate in this study, please tick the "Consent" box on the "Informed Consent". After you have signed the consent form, you can still opt-out at any time without giving a reason. Withdrawing

from this study will not affect your relationship with the researcher and your data will be returned to you or destroyed.

知情同意申明/ Informed Consent Statement

1. 我已阅读并理解上述有关本项研究所提供的信息，并有机会提出疑问。/I have read and understood the information provided above regarding this study and have had the opportunity to ask questions.
2. 我知道参加本研究可能产生的风险和受益。/I am aware of the possible risks and benefits of participating in this study.
3. 我明白我的参与是自愿的。/ I understand that my participation is voluntary.
4. 我可以在任何时候自由退出，而不需要给出理由，不会受到歧视或报复。/ I am free to withdraw at any time without giving reasons and without discrimination or retaliation.
5. 我将得到一份这份同意书的副本。/ I will be given a copy of this consent form.

我对上述说明知情并决定同意参加本次问卷调研（或已监护人知情及监护下同意参加）。/I am aware of the above description and decide to agree to participate in this questionnaire (or have consented to participate under the knowledge and supervision of my guardian).

是（请在方格内打勾）

/Yes (please tick the box)

签名如下：

(Respondent's signature)

（注：如果参与者不识字时需要见证人签署，如果参与者未成年时则需监护人签署）
(Note: if the participant is illiterate, a witness signature will be required, if the participant is underage, the guardian signature will be required)

研究人员签名：

(Researcher's Signature)

日期：

(Date)

Part2

扶贫搬迁安置房使用后满意度评价问卷

Satisfaction Evaluation Questionnaire For Poverty Alleviation Relocation Housing

您好！我是北九州大学的一名博士生，正在进行扶贫搬迁安置房的使用后评价的研究，论文需要您配合调研。本次调研采取不记名的形式，调研内容仅用于研究分析,不涉及任何商业活动，您所填的所有内容会进行保密。衷心感谢您抽出宝贵的时间来填此问卷，谢谢您！

Hello! I am a doctoral student at Kitakyushu University, and I am conducting research on Exploring the Factors Affecting User Satisfaction in Poverty Alleviation Relocation Housing for Minorities through Post-occupancy Evaluation. So we require your cooperation in the research.

This survey is in an anonymous form, and the survey content is used for research and analysis only which does not involve any commercial activities. All the content you fill in will be kept confidential.

Sincerely thank you for taking the time to fill out this questionnaire, thank you!

请在符合您的“基本信息”下勾选（注意：如若勾选了“其他”这一选项，请您根据自己情况做补充）

Please tick under the "Basic Information" that matches you (Note: If you tick the "Other" option, please add it according to your own situation)

年龄 age	15-29	30-44	45-59	60 及以上 60and above	性别 gender	男 male	女 female
学历 educational background	大专/本科及以上 College/Undergraduate and above		高中/中专 HighSchool/Secondary School		初中 junior high school	小学及以下 primary school and below	
家庭人均可支配 年收入 Annual per capita disposable income	Below 3000		3001-5000		5001-10000		大于 10000/ Above10000
家庭主要收入来 源 Your household's main source of income	种植业 crop farming	养殖业 Aquaculture	务工 Migrant workers		个体经商 self-employed	其他 others	
家庭人口组成 family composition	单身 single	夫妇 couple	两代人 two generations		三代人 three generations	四代人 four generations	

下列为搬迁房评价满意度等级表，请在您觉得适当的等级内打“√”

The following is a scale of satisfaction rating for relocation housing, please tick the scale with “√” that you think is appropriate

factor item 因素项目	Evaluation item 评价项目	specific description 描述	specific description 描述	Evaluation level 评语等级					Specific description 描述
				5	4	3	2	1	
住宅空间设计 Housing space design	起居空间 Living spaces	房间、客厅等数量大小 尺度情况 Quantity and size of rooms, living rooms, etc.	适宜 suitable						不适宜 unsuitable
	室内辅助空间 Indoor support spaces	卫生间、厨房等数量大 小尺度情况 Quantity and size of bathrooms, kitchens, etc.	适宜 suitable						不适宜 unsuitable
	私人户外空间 Private outdoor space	院子大小数量设计满意 度 Yard Size Quantity Design Satisfaction	适宜 suitable						不适宜 unsuitable
物理环境 Physical environment	热舒适 Thermal comfort	房间温度、湿度、通风 舒适程度 Room temperature, humidity, ventilation comfort	舒适 comfortable						不舒适 uncomfortable
	日照 Daylighting	房子自然光线适宜度 The suitability of natural light in the house	充足 Sufficient						不充足 Insufficient
	隔音 Acoustic insulation	房间隔音状况 Room soundproofing	好 Good						不好 Bad
	室内空气质量 Indoor Air Quality	室内空气质量状况 Indoor Air Quality Status	好 Good						不好 Bad
建筑安全性 Building Safety	防护安全 Protection safety	防护栏、防滑设施，无 障碍设置 Guardrails, anti- skid facilities, barrier-free settings	到位 Set						不到位 unset
	结构安全 Structural safety	房子结构安全，抗地震 The house is structurally safe and earthquake resistant	安全 safe						不安全 unsafe
	防火安全 Fire safety	防火装置设置、疏散距 离 Fire protection installation, evacuation distance	安全 safe						不安全 unsafe
	防盗安全 Anti- theft security	庭院封闭状况、村子监 控系统 Courtyard closed	安全 safe						不安全 unsafe

factor item 因素项目	Evaluation item 评价项目	specific description 描述	specific description 描述	Evaluation level 评语等级					Specific description 描述
				5	4	3	2	1	
		condition, village monitoring system							
	地质安全 Geo-security	没有山体滑坡、地基下沉等 No landslides, foundation sinking, etc.	安全 safe						不安全 unsafe
建筑耐久性 Building durability	Envelop enclosure 外围护构件	门窗及其他外围护构件质量好坏 The quality of doors, windows and other external protective components	好 Good						不好 Bad
	Finishing quality 装修完成质量	房子外观和内部装修质量 Exterior and interior quality of the house	好 Good						不好 Bad
	Waterproof and Moisture-proof 防水防潮	房间防水防潮质量 Room waterproof and moisture-proof quality	好 Good						不好 Bad
	Equipment and Pipeline 设备和管道	设备和管道材料质量 Equipment and piping material quality	好 Good						不好 Bad
基础设施 Infrastructure	交通设施 Transport facilities	停车位、路灯、标识等设置 Parking spaces, street lights, signs, etc.	到位 Set						不到位 unset
	生产设施 Production facilities	安置耕地或畜牧场地或工厂 Settling arable or livestock farms or factories	到位 Set						不到位 unset
	公共服务设施 Public service facilities	教育设施、娱乐设施、医疗站、社区中心等。 Educational facilities, recreational facilities, medical stations, community centers, etc.	到位 Set						不到位 unset
	市政公共设施 Municipal public facilities	供水、电力、网络系统、公厕、卫生设施等 Water supply, electricity, network system, public toilets, sanitary facilities, etc.	到位 Set						不到位 unset
	Commercial facilities 商业设施	商店, 市场, 集市等商业设施 Commercial facilities such as shops, markets,	到位 Set						不到位 unset

factor item 因素项目	Evaluation item 评价项目	specific description 描述	specific description 描述	Evaluation level 评语等级					Specific description 描述
				5	4	3	2	1	
		bazaars							
环境宜居 Environmental Livability	生态环境 Ecological environment	生态、污染、禁忌 ecology, pollution, taboo	好 Good						不好 Bad
	社会环境 Social environment	社会治安及组织度等 Social security and organization, etc.	好 Good						不好 Bad
	绿化环境 Greening environment	绿化景观营造 green landscape construction	好 Good						不好 Bad
	规划布局 Planning layout	村子的规划布局 The layout of the village	好 Good						不好 Bad
	交通环境 Traffic convenience	村子到外面的交通便利 性 The convenience of transportation from the village to the outside	好 Good						不好 Bad
地方性 Regional Features	民族建筑风格延续 Minority architectural style	住宅造型符合当地建筑 The shape of the house matches the local architecture	符合 Match						不符合 Mismatch
	民族风俗习惯延续 Minority cultural customs	住房设计尊重民族风俗 习惯 Housing design respects national customs	符合 Match						不符合 Mismatch
	地方材料选用 Local building materials	该住宅对地方材料使用 状况 The residence's use of local materials	到位 Set						不到位 unset
	当地的景观基因 Local landscape gene	当地的景观基因的设计 The design of local landscape genes	到位 Set						不到位 unset

感谢您的支持与参与! **Thanks for your participation!**

Expert consultation questionnaire

Dear professor:

Thank you very much for being able to accept expert advice on this subject. In this paper, the literature research method was used to make word frequency statistics, and combined with the supplement of semi-structured interview keyword screening, and "**Satisfaction Evaluation index set of minority resettlement areas**" was preliminarily obtained, including 7 first-level indicators and 30 second-level indicators, as shown in the following table.

Target layer	Factor layer (First level)	Index layer (Second level)
Satisfaction evaluation index set of the minority resettlement area	Function design	F1 Planning layout F2 Room-scale F3 Number of functional rooms F4 Yard design
	Physical environment	P1 Room temperature and humidity P2 Daylighting P3 Ventilation P4 Sound insulation
	Building safety	B1 Slip and fall prevention B2 Structural safety and anti-seismice B3 Fire safety B4 Antitheft design
	Infrastructure	I1 Transportation facilities (parking Spaces, street lights, signs) I2 Farmland or livestock fields I3 Medical and sanitation facilities (clinic, public toilets, garbage and sewage treatment) I4 Educational facility I5 Recreational and sports facilities
	Construction quality	C1 Waterproof, damp proof C2 Quality of doors and Windows C3 Appearance and decoration C4 Quality of building materials C5 Community road quality
	Living environment	LE1 Transportation convenience LE2 landscape engineering LE3 Community policing LE4 Surrounding environment (scenery, pollution, noise, disaster, taboos)
	Locality	LO1 Regional architectural style LO2 Continuation of national custom LO3 Local material selection LO4 Community attachment

Please give your valuable opinions and suggestions, and sincerely thank you for giving me guidance and help!

If you think this indicator is not needed, please indicate "×" in the column of "Modification Suggestions"; If you think the description of the indicator name and grade judgment basis is inaccurate, please write down your modification suggestions in the "Modification Suggestions" column; If you think there are indicators not considered in this indicator set, please add in the "Indicators to be added" column.

Sample

First level indicators	Second level indicators		ok ○	Not ok ×	If not ok Modification Suggestions
Function design	F1	Planning layout	○		
	F2	Room-scale		×	Modified to "XXX"
	F3	Number of functional rooms		×	Deleted, because...
	F4	Yard design	○		
	F5	← Indicators to be added		
	...				

First level indicators

Satisfaction Evaluation index set of minority resettlement areas

First level indicators		ok ○	Not ok ×	If not ok Modification Suggestions
1	Function design			
2	Physical environment			
3	Building safety			
4	Infrastructure			
5	Construction quality			
6	Living environment			
7	Locality			
8		← Indicators to be added		
...				
Other Suggestions				

Second level indicators

First level indicators	Second level indicators		ok O	not ok ×	If not ok Modification Suggestions
Function design	F1	Planning layout			
	F2	Room-scale			
	F3	Number of functional rooms			
	F4	Yard design			
	F5		← Indicators to be added		
	...				
Physical environment	P1	Room temperature and humidity			
	P2	Daylighting			
	P3	Ventilation			
	P4	Sound insulation			
	P5		← Indicators to be added		
	...				
Building safety	B1	Slip and fall prevention			
	B2	Structural safety and anti-seismic			
	B3	Fire safety			
	B4	Antitheft design			
	B5		← Indicators to be added		
	...				
Infrastructure	I1	Transportation facilities (parking Spaces, street lights, signs)			
	I2	Farmland or livestock fields			
	I3	Medical and sanitation facilities (clinic, public toilets, garbage and sewage treatment)			
	I4	Educational facility			
	I5	Recreational and sports facilities			
	I6		← Indicators to be added		

	...				
Construction quality	C1	Waterproof, damp proof			
	C2	Quality of doors and Windows			
	C3	Appearance and decoration			
	C4	Quality of building materials			
	C5	Community road quality			
	C6		← Indicators to be added		
	...				
Living environment	LI1	Transportation convenience			
	LI2	landscape engineering			
	LI3	Community policing			
	LI4	Surrounding environment (scenery, pollution, noise, disaster, taboos)			
	LI5		← Indicators to be added		
	...				
Locality	LO1	Regional architectural style			
	LO2	Continuation of national custom			
	LO3	Local material selection			
	LO4	Community attachment			
	LO5		← Indicators to be added		
	...				
Other Suggestions:					

Sincerely thank you for giving me guidance and help!