An evaluation system for suitability of urban public rental housing construction in Chongqing

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Abstract: A social problem that low-income people are unable to purchase houses in urban areas has been focused in recent years and the housing security system has also become an important part of the social security system. In recent years, public rental houses appeared as a new type of affordable houses. The national government took the construction of public rental houses to the national strategic level. Currently, there are many problems in the public rental house construction. For example, policy mechanisms are inadequate, the use of funding is not in an efficient way, the location of public rental houses is far away from the downtown, the plot ratio is too high, and facilities are incomplete. There are no appropriate indicators to comprehensively evaluate the public rental house construction. Based on the livable evaluation system in Chongqing, we selected four aspects of relevant indicators as the economic suitability, environmental suitability, social suitability, and life suitability to establish the public rental house construction suitability evaluation system.

Keywords: public rental house; evaluation system; environmental suitability; social suitability; life suitability

1 Introduction

1.1 Importance of housing security

With the transition of economic structure and deepening of reform and openness, P. R. China undergoes different phases from welfare housing to house marketing, and finally to housing security phase (Fig. 1). Meanwhile, the urbanization process is speeding up in China. The house market regulation system is incomplete, however. For low-income people in cities, the house price is high, and they have no residential places because of the incomplete housing security system. The phenomenon gives tremendous pressure to the society, economy, environment, and urban development and management. The Habitat Agenda and the Istanbul Declaration on Human Settlements published in 1996 by the United Nations proposes governments’ responsibilities and obligations of providing housing for all citizens to ensure the housing rights of residents. In other words, the core task of a government is to ensure the homeownership. Therefore, the housing security issue is very hot in recent years. Local governments actively explore new models of housing security. Public rental housing is an innovative practice to improve China’s urban housing security system.

1.2 Status of public rental house construction in the “livable Chongqing”

Public rental housing is a protection promoted and implied by government for the sandwich layer people...
in the city. [1] Chongqing public rental housing supply in housing construction is a key ring, having the characteristics of low-rent housing before and affordable housing, and it extends to the sandwich layer people who cannot have the low-rent housing or afford a commodity house. Chongqing public rental housing system integrates public rental housing, low-rent housing, and affordable housing. It effectively solves the housing problem of low-income people. As the focus of livelihood and for the realization of basic building livable goal of Chongqing, Chongqing municipal government will offer $4 \times 10^7$ m$^2$ public rental housing to about $2 \times 10^6$ urban low-income persons in 3 years. The construction quantity and rate increases year by year (Figs. 2 and 3). Meanwhile, the construction of public rental houses is in the first place of the “Ten livelihood projects of Chongqing” in 2010, which shows its important status in Chongqing.

![Fig. 1 Development of China’s housing system](image1)

2 Problems

2.1 Level of policy

Policy objectives are not unified and relevant provisions also need improvement. There are four aspects: 1) Due to the lack of a unified policy guidance in a national level in the management of public rental houses, [2] some specific systems are not clear and their coverage is inconsistent. 2) Public goods attribute of the public rental houses has led to a single provider. The government, market and companies do not cooperate effectively with each other. 3) The mechanism of accessing and exiting is not perfect. It can not adapt to market changes and the affordable housing can not play the coordination and stability in markets. The atmosphere is not conducive to the formation of community. 4) Financing mechanism is the key factor which effects stability and durability of public rental house supply. Development of public rental houses requires availability of land and construction funds, but the cost of long-term housing maintenance is huge and takes a long cycle. Because of the characteristics of welfare, the construction management of public rental houses must adhere to the principle of protecting the low-income people. Circulation of funds for construction is very slow, and it is hard to form a virtuous circle of financial inputs and outputs.

![Fig. 2 Building capacity of public rental house](image2)

![Fig. 3 Government goal of building various housing](image3)

2.2 Level of society

With the development of housing market, new living contradictions and social conflicts are increasingly prominent. As the emergence of a large number of low-income people in cities who can not afford to buy a house and the rural population into cities in urbanization process, the gap between rich and poor is
increasingly concentrated in urban areas. [3] Public rental house is a highly social security livelihood project. Because of land costing, the object of protecting, and supply constraints, the site of public rental house is often in the suburbs. Meanwhile, due to the existence of an independent way of settlements, it is easy to speed up the polarization. The public rental tenants are not entitled to urban public resources, formatting residential segregation, which cause the decline of urban function and trigger corresponding social problems.

2.3 Level of planning and construction

As a residential, the public rental housing is unique. Therefore, the planning and construction at the same time meeting the features of protection should also meet the design specifications, life, and spiritual needs of rental groups. [4] At present, the construction and planning of public rental house only meet some basic living needs of residents. In the macro-level, planned land site is improper, which locates in remote areas and surrounding transportation facilities and related supports are not perfectly matching. In the meso-level, the rate of cell volume is high, 3.5 to 4.0 generally. There are mainly high-rise tower buildings, which gives a sense of spatial enclosure, poor identification, and the feeling of depression. In the micro-level, the architecture color, dimensions, and identification are single, and the family-configuration is not reasonable to meet the needs of public rental tenants.

2.4 Causes

The current construction of public rental house is to meet the basic housing needs of low-income persons in some extent. It still at the exploratory stage. Relevant policies, social, and other aspects of planning and construction are not yet well established. The current study of construction of affordable housing is almost remain in the policy and economic level, which is neglected in sociological research level and planning level. Most importantly, there is no perfect evaluation system to comprehensively evaluate and summarize the construction of existing public rental housing settlements, which can not properly guide the development of public rental housing and construction. Therefore, we must introduce a suitability evaluation system of public rental housing construction.

3 Public rental housing construction suitability evaluation system

3.1 Construction principle

1) Goal-oriented. The indicators must be able to fully reflect the requirements and targets. The indicator system should be targeted as the center, as comprehensively as possible to reflect the essential characteristics of evaluation objects and maintain a high degree of consistency with the evaluation objects.

2) Scientific and objective. The choice of evaluation must be scientific and objective. The indicator system must be able to objectively reflect the suitability of public rental housing construction and components of the content. It should measure the construction of public rental housing situation on a scientific basis and as concise as possible.

3) Systematic and targeted. The evaluation system should be designed with the perspective of “livable Chongqing”, taking public rental housing tenants’ satisfaction as the fundamental point to measure the construction of public rental housing suitability and highlighting the economic, social and environmental dimensions of indicators. Meanwhile, any indicators of a unit should have a high degree of generality, which can accurately and sensitively reflect the construction of public rental housing fitness.

4) Operational principles. The selected indicators can be used to express the same time with quantity and the data source should also be noted. Data that are easy to be quantified, accessed, and compared should be chose to accomplish the calculation.

3.2 Evaluation indicators

Based on reported studies on the livable cities and livable relevant evaluation index system of Chongqing, considering the residents’ basic needs for work and life and the idea of “livable Chongqing”, we took the public rental housing estate as the research level and built a three criterion-level indicator system including the system level - the target level - the structure level using AHP. In this paper, the construction of public rental housing fitness is decomposed into economic suitability, environmental suitability, social suitability, and life suitability as the target layers (Table 1).
System layer | Target layer | Rule layer | Interpretation
---|---|---|---
| Economic suitability | | | Average land transfer of area of public rental housing. Including building materials, decoration, landscaping, and roads, excluding the cost of land in order to calculate the cost per unit area.
| | | The operation and maintenance costs per unit area in the building life cycle.
| | | Settlements plot ratio = floor area/land area, mainly reflecting the capacity of residential buildings.
| | | Area rents of public rental house to the average family income, reflecting the household ability to pay for housing. The higher the ratio is, the lower capacity to pay. Calculated as: rent to income ratio = total household rent price / total household income; (1) total household rent price = rent per unit area × area of residential housing; (2) total household income = average population per household × total annual income per capita.
| | | Commuting costs, to reflect the travel impact of residents of public rental house caused by the location of settlements.
| | | Living space per capita = residential housing area/settlements in the number of inhabitants, mainly reflecting the settlement of public rental housing comfort. Reflects the capacity and the construction of public rental housing settlements comfort, calculated as: building the base building density = area/land area.
| | | Means a safe disposal of domestic waste accounts for the total area percentage of rubbish.
| | | Calculated as: per square area = total area of settlements Square/Settlements number of inhabitants.
| | | Satisfaction = (the number of people satisfied with a more satisfactory × 100 + the number of general satisfaction × 60 + the number of general dissatisfaction × 40 + the number of more dissatisfaction × 20)/survey sample size × 100%
| | | Demographic composition of the community.
| | | Mainly reflects the incidence of traffic accidents within the community.
| | | Mainly reflects the community to set the internal situation of disaster prevention and mitigation facilities.
| Life suitability | | | The average distance to transport terminals
| | | Area of educational facilities per capita
| | | Area of commercial facilities per capita
| | | Area of medical facilities per capita
| | | Residents satisfaction with community living facilities
| | | Reflects the area within the primary school, kindergarten per capita rate.
| | | Refers to the per capita health facilities within the district area, to reflect the residents can enjoy within the cell whether the extent of medical protection standards.
| | | Satisfaction = (the number of people satisfied with a more satisfactory × 100 + the number of general satisfaction × 60 + the number of general dissatisfaction × 40 + the number of more dissatisfaction × 20)/survey sample size × 100%

Table 1 Evaluation form
3.3 Case study

The public rental housing named Minxinjiayuan is the first public rental housing project in Chongqing. It provides 12,195 sets of low-rent houses and 5,681 units for public rental. Its range covers the Jiangbei District, the Yubei District, the North Zone and the Yuzhong District.

3.3.1 Economic suitability

The project is located in the heart of new urban areas and the land price is very high. There is no combined point for the land costs and the construction of affordable housing. Therefore, the rent is high, which is close to the internationally recognized rental income ratio of 20% to 30% (Table 2). The project has no advantage compared with the existing settlements in the old city rental housing, causing various degrees of pressure to the low-income people. Due to the large amount of public rental housing construction, it is easy to recover funds. Compared to high-rise residential buildings, the floor area ratio is high. Meanwhile, because the location of public rental housing is far from the workplace of lessee, their daily transport costs are relatively high.

<table>
<thead>
<tr>
<th>Economic suitability</th>
<th>Price of land</th>
<th>3,000 RMB/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction costs</td>
<td>1,200 RMB/m²</td>
</tr>
<tr>
<td></td>
<td>Operation and maintenance costs in the building life cycle</td>
<td>150 RMB/m²</td>
</tr>
<tr>
<td></td>
<td>Plot ratio</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>Rent to income ratio</td>
<td>1:3</td>
</tr>
<tr>
<td></td>
<td>Per-capita traffic consumption</td>
<td>10 RMB/d</td>
</tr>
</tbody>
</table>

3.3.2 Environmental suitability

It can be seen from the data that 65% people are satisfied with the environment (Fig. 4). From an environmental point of view, the suitability index analysis showed that the environment of the project is good and the resident satisfaction is high (Table 3). However, from the planning point of view, there are many high-rise residential buildings of mostly 25 to 33 floors in Minxinjiayuan, which led to a feeling of depression. The green indicator per capita is low, mainly caused by the construction group model.

3.3.3 Social suitability

Fig. 5 shows that 56% people are satisfied with the community atmosphere and Fig. 6 shows that 60% people are satisfied with the property management. Based on the social indicators of suitability analysis, the community atmosphere of the project is general and residents’ satisfaction is not high. It is mainly caused by the operation of public rental housing mechanisms. Since public rental housing system costs a long time from the application to allotment, the residents can not follow their own will to choose the right house. Social suitability evaluation form is shown in Table 4. The ratio of outside the local household registration population to the local household registration population in the project is moderate. Therefore, it basically solved the housing problem of migrants which is conducive to social stability and development. This is related to the policy of no restriction on the household registration in Chongqing.
1) Enhance the level of economic suitability
   The single housing and money supply model of the public rental housing should be got rid of gradually. The real estate business can be joined in to increase the amount of housing facilities and update existing settlements in order to save land resources, while to improve residents’ trip convenience.

3.3.4 Life suitability

Table 5 shows that the project life is good fitted and the resident satisfaction is high. However, unsatisfied cases mainly are long waiting time in public transport and medical facilities not perfect (Fig. 7).

3.3.5 Summary

According to livable standards analysis of Chongqing, the overall assessment of the construction of public rental housing named MinxinJiayuan is good. There are some problems in the construction, however, which should be noted as follows:

- Enhance the level of economic suitability
  - Appropriately reduce the floor area ratio and building height of the public rental house to reduce people’s suppressed feelings.
  - Diversify designs to meet the needs of different people.
  - In the process of construction, we should increase the green land ownership per capita and pay attention to green groups development.

- Enhance the level of social suitability
  - Gradually simplify and improve the application and exit mechanism, reduce application time, and improve the community atmosphere according to...
wishes of residents. The site of public rental housing should be fully considered. Hierarchical mixture of various ethnic groups live in the same site together, which is a good class integration to promote social stability and avoid the phenomenon of “slum”. [7]

4) Enhance the level of life suitability

Further improve the construction of settlements around public transport. Reduce the waiting time of public transport to minimize the impact of location. Strengthen community and cultural facilities and the construction of medical facilities.

4 Conclusion

With the gradual improvement of housing security system, the construction of public rental housing will gradually mature and become the basic conditions of urban development. Therefore, we should use the livable Chongqing perspective to study the current construction of public rental housing suitability evaluation system. It can be adopted to analyze the problems in the process of building by comparison of the indicators. Proposed construction of public rental housing is more conducive for development to address urban problems in low-income housing and promote further development of the city.

References


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