Research on the Risk Management of Shantytown Renovation Project Based on Grey Clustering Method

Yanli Jiang[a], Qinqin Tu*

Liaoning University of Engineering and Technology, School of Business Administration, Huludao, Liaoning, China

ABSTRACT: In this paper, the risk evaluation model of shantytown transformation is constructed with the second area shantytown transformation project of Q city as a research case. Firstly, the brainstorming method and Delphi method are used to determine the risk evaluation index system of shantytown transformation, secondly, the weights of the evaluation model are determined by a linear combination of the C-OWA operator assignment method and entropy weighting method, which reduces the subjective influence of the assignment, and finally, the grey clustering method is used to assess the risk level of the shantytown transformation, and relevant measures are proposed to reduce the risk of the shantytown transformation according to the results, which reduces to a certain degree the the possibility of risk occurrence in the process of shantytown transformation, providing theoretical guidance for the shantytown transformation project in Q city.

1 Introduction

Shantytowns generally refer to areas with high building density, long service life, poor housing quality, many safety hazards, and full supporting facilities [2] . In recent years, shantytowns have gradually become a hidden danger in the city, hindering the development of the city, affecting the living environment of urban residents, and reducing the effective use of urban resources. Therefore, the problem of shantytown renovation has become more and more prominent. Unlike general urban construction, shantytown transformation involves a wide range of departments and complex personnel, and scientific risk evaluation of shantytown transformation is of practical significance in guiding the implementation of shantytown transformation projects[7]. Tradition risk evaluation methods are based on hierarchical analysis and fuzzy comprehensive evaluation method to construct a risk evaluation model, for example, Li Yongfu (2021) used hierarchical analysis and fuzzy comprehensive evaluation method to evaluate the old neighbourhood renovation project [5] , Jin Changhong (2015) used hierarchical analysis and fuzzy comprehensive evaluation method to evaluate the risk of the contract energy management in the energy-saving renovation of the shantytown in the risk assessment of the risk of the [3] , in addition to this, Li Qiong (2015) used the Delphi method combined with hierarchical analysis to establish a risk evaluation model for urban renewal in assessing urban risks [6] , and Ma Liqiang(2020) used Social Network Analysis (SNA) combined with Bayesian Network in the evaluation of urban shantytown renovation [8] .

This paper uses the brainstorming method and Delphi method to identify the possible risk factors in shantytown transformation, through the C-OWA operator assignment method and entropy weight method linear combination, can be in the complex project can be simple to analyse the importance of each risk factor, and grey cluster analysis method is in the pre-evaluation of the evaluation of the evaluation of the development of the method, the method will be applied to the shantytown transformation risk assessment, and According to the evaluation results of the shantytown renovation targeted optimization of management measures, in order to reduce the risk of shantytown renovation .

2 Constructions of the risk evaluation index system

Risk identification is a prerequisite for project risk evaluation is also an important part of this paper[10], the use of brainstorming and Delphi method for shantytown renovation project risk identification, after the brainstorming method of eight experts will be a preliminary determination of the risk factors, to establish a preliminary list of risk factors, followed by the use of the Delphi method, the shantytown renovation of the preliminary list of risk factors to be distributed to the hands of the experts Secondly, using the Delphi method, the preliminary list of risk factors for shantytown renovation will be distributed to the experts, and then after anonymous statistical feedback, the experts' opinions will be summarized and collated, and then fed back to the experts to ask for their opinions, and the cycle will be

[a]2721201745@qq.com, *490087515@qq.com

repeated many times, and finally the experts will score the risk list to determine the main risk points of shantytown renovation[11].

Through the collation can be constructed shantytown transformation of the risk assessment indicator system of the meaning of each secondary indicator system is shown in Table 1.

Table 1. Risk evaluation index system for shantytown renovation

Level 1 indicators	Secondary indicators	Meaning of the indicator
Policy risk A_1	Unclear definition of title deeds	The ownership of land involved in shantytown redevelopment is relatively complex, and some of the land is difficult to clearly define ownership
	Policy environment risk	The cycle of shantytown renovation projects is long, and the national policy on shantytown renovation is always being adjusted
	Inadequate relevant systems	Compensation policies and standards for shantytown redevelopment are inconsistent from region to region
	Complex approval process	Shantytown renovation involves many departmental units and complex processes, and there are inconsistencies in the approval of various departments
social risk A_2	social stability	The community is highly concerned about land acquisition and relocation projects, and villagers are very concerned about their own interests, which can easily lead to conflicts.
	Demolition compensation and resettlement risk	How villagers are rehoused in the process of shantytown redevelopment and the risks arising from the difference between the actual compensation for demolition and the expected compensation for villagers
	Risk of villagers' willingness	Risk of project progress being affected by the unwillingness of some villagers to be evicted for their own reasons and for external reasons
	Social security risks for villagers	After the transformation, villagers relying on land income lacked comprehensive social security such as health insurance and pension insurance.
Engineering risks A_3	Risk of project delays	Force majeure factors occurring during the construction phase resulted in an extension of the construction period, affecting the progress of the project
	Housing quality risk	Whether the constructor meets the construction requirements and whether the construction programmer is realistic
	Master planning risk	Whether the planning of the project is reasonable, whether the relevant ancillary facilities are perfect and whether they are in line with the expected values of the villagers
	Construction technology risk	Whether the construction is standardized and operated in strict accordance with the drawings
economic risk A_4	Risk of fund-raising	Availability of funds needed for shantytown renovation projects
	cost risk	Increased costs due to increased expenditures resulting from irregularities in the retrofitting process
	Bidding and management risk	Contractors exploiting loopholes in the law to win bids resulting in losses during the construction of the project
	Other force majeure risks	Affected by force majeure factors such as disease, natural disasters, etc.

3 Grey clustering method evaluation model

Risk evaluation model of shantytown renovation project, first of all, the C-OWA operator assignment method and entropy weight method linear combination to determine the weight of risk indicators, and then use the grey clustering method to determine the risk level, the construction of the whitening weight function, the calculation of the grey clustering matrix of the first level and second level indicators of the weight, and finally, through the centroid vector and the grey clustering matrix is calculated to arrive at the shantytown renovation project's comprehensive evaluation value to determine the risk assessment level, and the risk assessment level.

3.1 Combined weights assignment method to determine the weights of risk evaluation indicators.

3.1.1 C-OWA operator assignment method

(1) Collection of evaluation data for risk indicators and reordering.

Invite m experts from relevant industries to score the importance of each risk indicator within each indicator layer, and the score obtained for the indicator is

proportional to its importance, so as to obtain the evaluation data of the risk indicator. $A = a_1, a_2, \cdots, a_j, \cdots a_m$ The evaluation data of the indicators are rearranged in descending order to get $B = b_0, b_1, b_2, \cdots b_j \cdots b_{m-1}$ The evaluation data of the indicators are rearranged in descending order to get$b_0 \geq b_1 \geq b_2 \geq \cdots \geq b_j \geq b_{m-1}$.

(2) Calculated by the formulab_j the weights of theα_{j+1}

$$A = \frac{C_{m-1}^{j}}{\sum_{k=0}^{m-1} C_{m-1}^{k}} \quad (1)$$

where $i = 0,1,2,\cdots,m-1, C_{m-1}^{j}$ is the number of combinations of j data from m-1 data.

$$\sum_{j=0}^{m-1} \alpha_{j+1} = 1 \quad (2)$$

(3) Based on the obtained weighting vectorα_{i+1} the absolute weights of the risk indicators are calculated$\overline{\omega_i}$.

$$\overline{\omega_i} = \sum_{j=1}^{m} \alpha_j \cdot b_j \quad (3)$$

where $\alpha_j \in [0,1], i \in [1,n]$,n is the number of indicator factors.

(4) Calculate the relative weight values of risk indicators$\overline{\omega_i}$:

$$\overline{\omega_i} = \frac{\overline{\omega_i}}{\sum_{i=1}^{m} \overline{\omega_i}}, i = 1,2,\cdots,m \quad (4)$$

3.1.2 Entropy weighting method to determine weights.

(1) Determine the matrix of indicators based on the results of the expert scoring.$R = (\gamma_{ij})_{m\times n}$. Whereγ_{ij} denotes the value of the jth expert's rating for the ith indicator, with a total of m experts and n evaluation indicators.

(2) normalization is performed to obtain the standard matrix $R' = \frac{\gamma_{ij} - min(\gamma_i)}{max(\gamma_i) - min(\gamma_i)}$ (5)

(3) Perform normalization were. $p_{ij} = \frac{\gamma_{ij}}{\sum_{j=1}^{m} \gamma_{ij}}$. (6)

(4) Calculate the entropy value of the$i$ entropy value of the first indicatore_i of the indicator.

$$e_i = -\frac{1}{ln(n)} \sum_{j-1}^{m} p_{ij}\, ln\, p_{ij} \quad (7)$$

(5) Calculate the entropy weight of the i entropy weight of the indicator. $\omega_i' = \frac{1-e}{\sum_{i=1}^{n}(1-e_i)}$ (8)

3.1.3 Linear weighted combination method for determining weights.

1. Calculation of composite weights using the linear weighted combination method

$$\overline{\omega}_i = \alpha\omega_i + (1-\alpha)\ \omega_i' \quad (9)$$

Where ω_i is the weight value obtained by the C-OWA operator assignment method assignment method, andω_i' is the weight of the indicator obtained by the entropy weighting method, the $\overline{\omega}_i$ is the weights of the linear weighting method of the indicators.α is a constant to be determined (range of values:$0 < \alpha < 1$). The constant to be determinedα represents the preference choice of the assigner. Whenα takes a large value, it represents the empoweree's preference for normative empowerment.

The above steps can be used to assign the indicators scientifically and reasonably in the risk evaluation index system of the shantytown transformation project.

3.2 Grey clustering method

Grey clustering method is there Deng Ju long professor proposed, the study of uncertainty in the case of relatively little data and information to make a systematic analysis of the problem[1] . The grey assessment coefficient matrix is obtained by whitening the risk factor rating criteria, and then the index weight vector aggregation is used to judge the risk level of the rated object.

(1) Determining the risk level

According to the evaluation indicator system, the evaluation criteria were divided into five levels, i.e., five grey categories, and experts were invited to determine the values for the risk levels of the evaluation indicators, as shown in table 2 below.

Table 2 Risk Level Criteria

[0,2]	(2,4]	(4,6]	(6,8]	(8,10]
lower	relatively low	moderate	relatively high	very high

(2) Constructing an evaluation matrix

Based on the scoring criteria for the risk level, G experts are invited to score the level II indicators, K represents the value of the kth expert's risk evaluation, and$i$ represents the first level indicator, anda_{ijk} is the value of the expert's evaluation of the second-level indicator under the first-level indicator.

$$D = \begin{bmatrix} a_{111} & \cdots & a_{1jk} \\ \vdots & \vdots & \vdots \\ a_{i11} & \cdots & a_{ijk} \end{bmatrix} \quad (10)$$

(3) Determine the whitening weight function

In this paper, we are applying the model of centroids to construct the whitening weight fictionize., $U = \{9,7,5,3,1\}$, which determines five grey categories based on the five risk levels identified, i.e.,$e = \{1,2,3,4,5\}$, setting the whitening weight function for each grey class. as shown in table 3 below.

Table 3. Grey whitening weight function for risk assessment of shantytown reconstruction

ash	grey matter	whitening weight function
$e = 1$	$\otimes_1 \in [0,\ 9,\ \infty]$	$f_1[a_{ijk}] = \begin{cases} \frac{a_{ijk}}{9}, a_{ijk} \in [0,9] \\ 1, a_{ijk} \in (9,\infty] \\ 0, a_{ijk} \notin [0,\infty] \end{cases}$
$e = 2$	$\otimes_2 \in [0,\ 7,\ 14]$	$f_2[a_{ijk}] = \begin{cases} \frac{a_{ijk}}{7}, a_{ijk} \in [0,7] \\ 2 - \frac{a_{ijk}}{7}, a_{ijk} \in (7,14] \\ 0, a_{ijk} \notin [0,14] \end{cases}$

$e=3$	$\otimes_3 \in [0,\ 5,\ 10]$	$f_3[a_{ijk}] = \begin{cases} \frac{a_{ijk}}{5}, a_{ijk} \in [0,5] \\ 2-\frac{a_{ijk}}{5}, a_{ijk} \in (5,10] \\ 0, a_{ijk} \notin [0,10] \end{cases}$
$e=4$	$\otimes_4 \in [0,\ 3,\ 6]$	$f_4[a_{ijk}] = \begin{cases} \frac{a_{ijk}}{3}, a_{ijk} \in [0,3] \\ 2-\frac{a_{ijk}}{5}, a_{ijk} \in (3,6] \\ 0, a_{ijk} \notin [0,10] \end{cases}$
$e=5$	$\otimes_5 \in [0,\ 1,\ 2]$	$f_5[a_{ijk}] = \begin{cases} \frac{a_{ijk}}{1}, a_{ijk} \in [0,1] \\ 2-a_{ijk}, a_{ijk} \in (1,2] \\ 0, a_{ijk} \notin [0,2] \end{cases}$

(4) Construct grey clustering weight matrix

The evaluation sample was calculated according to Table 4 a_{ijk} The whitening value with respect to e $f_e = [a_{ijk}]$,

x_{ijk} is a risk evaluation indicator a_{ijk} the clustering coefficients belonging to the e grey category.

$$x_{ije} = \sum_{k=1}^{G} f_e(a_{ijk}) \tag{11}$$

$X_{ijk}$is the overall risk evaluation factor

$$X_{ij} = \sum_{e=1}^{5} x_{ije} \tag{12}$$

The grey clustering weight vector is.

$$r_{ije} = \frac{x_{ije}}{X_{ij}} \tag{13}$$

The grey clustering weight matrix is then obtained by Eqs. (11) (12) (13):

$$R_i = \begin{bmatrix} r_{i11} & r_{i12} & r_{i13} & r_{i14} & r_{i15} \\ r_{i21} & r_{i22} & r_{i23} & r_{i24} & r_{i25} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ r_{ij1} & r_{ij2} & r_{ij3} & r_{ij4} & r_{ij5} \end{bmatrix} \tag{14}$$

Synthesize the clustering evaluation matrix, where ρ_i is the secondary indicator weight matrix.

$$W = \rho_i R_i \tag{15}$$

In the evaluation of the comprehensive clustering of level 1 indicators, thenη_i is the first level indicator weight matrix.

$$M = \eta_i \times \mathrm{M} \tag{16}$$

(5) Determine the evaluation value.

The risk evaluation rating vector Z is a description of the degree of grey class of the evaluation results, and the center vector U = (9,7,5,3,1), and the combination of the two can be measured as a composite value of the risk evaluation of the shantytownsS .

$$S = \mathrm{M} \times U^T \tag{17}$$

4 Applications of the risk evaluation model for shantytown renovation

4.1 Subject of evaluation

Q city to create a landscape idyllic cultural city, enhance the overall effectiveness of the city, will be transformed snow lake park containing snow lake, south lake and learning lake three pieces, the construction of the snow lake park can be managed black odor water, to create a livable and swimmable urban space. The inherent limitations of the shantytowns and the goal of building a harmonious city is in serious conflict, part of the shantytowns in the important landscape area, according to the overall urban planning of Q City, to completely change the shantytown construction form the impact of Q City to build a civilized and ecological development of the city, it is necessary to renovate the poor quality of the environment, there are hidden safety hazards in the shantytowns.

The transformation is divided into four areas, including the second area: east against the snow lake road, south and west are offset with the snow lake park area (a) shanty project land, north against the submerged sun road; Bihoyuan surrounding area, around the Bihoyuan community, south against the happiness road, east, west and north are offset with the snow lake park area (a) shanty project land; Q part of the secondary school dormitory and the former Labour and Employment Bureau.

4.2 Determination of risk evaluation indicator weights

Targeted use of linear weighting method for Q City, the second area of shantytown renovation project comprehensive risk evaluation index system comprehensive weighting calculation, in which the linear weighting preference coefficient to take 0.5, the results of the calculation are as follows Table 4.

Table 4. Indicator weights for risk assessment of squatter settlements

Level 1 indicators	Tier 1 indicator weights	category B norm	secondary refers. weight	synthesized weights	Ranking of indicators
Policy risk	0.2466	Unclear definition of title deeds	0.2297	0.0566	9
		Policy environment risk	0.2795	0.0689	5
		Inadequate relevant systems	0.3500	0.0863	3
		Complex approval process	0.1408	0.0347	14

social risk	0.3635	Social stability risk	0.5169	0.1879	1
		Demolition, resettlement and compensation risks	0.1743	0.0634	7
		Risk of villagers' willingness	0.1254	0.0456	10
		Social security risks for villagers	0.1834	0.0667	6
Engineering risks	0.2472	Risk of project delays	0.2994	0.0740	4
		housing quality safety risk	0.1515	0.0375	13
		master planning risk	0.1752	0.0433	12
		Management risk	0.3739	0.0924	2
Economic risk	0.1427	Risk of fund-raising	0.1756	0.0251	15
		cost risk	0.4206	0.0600	8
		Bidding and contract risks	0.3127	0.0446	11
		Risk of force majeure	0.0911	0.0130	16

According to the analysis of the above table, it is concluded that the social stability risk has the highest weight, accounting for 0.1879, followed by the engineering safety risk, accounting for 0.0924, the relevant system is not perfect, the risk of project delays, the risk of the policy environment are among the risk factors that account for a relatively high proportion of the second approval process is complex, the ecological environment risk and the force majeure risk weight account for a relatively low proportion, accounting for a proportion of respectively 0.037, 0.0251 and 0.0130.

4.3 Grey clustering evaluation

A total of six experts, including shantytown project leaders and villagers' representatives and project management related personnel, were invited to form an expert group for risk evaluation of shantytown renovation in the second area of Q City, to score the risky secondary indicators of shantytown renovation in the area and obtain the grey clustering evaluation matrix.

$$D_1 = \begin{bmatrix} 6 & 5 & 6 & 6 & 5 & 7 \\ 8 & 5 & 6 & 7 & 6 & 4 \\ 6 & 5 & 8 & 5 & 6 & 6 \\ 7 & 9 & 6 & 5 & 7 & 6 \end{bmatrix} D_2 = \begin{bmatrix} 9 & 7 & 6 & 6 & 8 & 7 \\ 6 & 5 & 8 & 9 & 6 & 7 \\ 8 & 7 & 7 & 5 & 8 & 9 \\ 6 & 7 & 8 & 5 & 7 & 8 \end{bmatrix}$$

$$D_3 = \begin{bmatrix} 8 & 6 & 6 & 5 & 8 & 7 \\ 9 & 8 & 6 & 5 & 5 & 6 \\ 7 & 6 & 5 & 7 & 6 & 6 \\ 8 & 6 & 6 & 5 & 7 & 5 \end{bmatrix} D_4 = \begin{bmatrix} 6 & 4 & 4 & 3 & 2 & 4 \\ 5 & 4 & 2 & 5 & 5 & 3 \\ 6 & 5 & 4 & 4 & 4 & 3 \\ 4 & 6 & 1 & 4 & 3 & 4 \end{bmatrix}$$

The grey clustering matrix collated by the expert scoring is compared with the corresponding evaluation grey class and the whitening weight function, and grey evaluation coefficients for the secondary indicators, see table 5.

Table 5. Grey evaluation coefficients for the risk assessment of squatter settlements

Secondary indicators	$e=1$	$e=2$	$e=3$	$e=4$	$e=5$	Total evaluation coefficient
Unclear definition of title deedsa_{11}	3.8889	5.0000	5.0000	0.6667	0.0000	14.5556
Policy environment riska_{12}	4.0000	4.8571	4.6000	1.0000	0.0000	14.4571
Inadequate relevant systemsa_{13}	4.0000	4.8571	4.8000	0.6667	0.0000	14.3238
Complex approval processa_{14}	4.4444	5.1429	4.0000	0.3333	0.0000	13.9206

Social stability riska_{21}	4.7778	5.2857	3.4000	0.0000	0.0000	13.4635
Demolition, resettlement and compensation risksa_{22}	4.6667	5.0000	3.8000	0.3333	0.0000	13.8000
Risk of villagers' willingnessa_{23}	4.6667	5.1429	3.2000	0.3333	0.0000	13.3429
Social security risks for villagersa_{24}	4.5556	5.2857	3.8000	0.3333	0.0000	13.9746
Risk of project delaysa_{31}	4.4444	5.1429	4.0000	0.3333	0.0000	13.9206
Housing quality riska_{32}	5.5714	4.7143	4.2000	0.6667	0.0000	15.1524
master planning riska_{33}	4.1111	5.2857	5.4000	0.3333	0.0000	15.1302
Management riska_{34}	4.1111	5.0000	5.4000	0.6667	0.0000	14.3778
ecological riska_{41}	2.5556	3.2857	4.2000	3.6667	0.0000	13.7079
cost riska_{42}	2.6667	3.4286	4.8000	3.3333	0.0000	14.2286
Management riska_{43}	2.8889	3.7143	4.8000	3.3333	0.0000	14.7365
Risk of force majeurea_{44}	2.4444	3.1429	4.0000	3.3333	1.0000	13.9206

The grey clustering weight matrix is

$$R_1 = \begin{bmatrix} 0.2672 & 0.3435 & 0.3435 & 0.0458 & 0.0000 \\ 0.2767 & 0.3360 & 0.3182 & 0.0692 & 0.0000 \\ 0.2793 & 0.3391 & 0.3351 & 0.0465 & 0.0000 \\ 0.3193 & 0.3694 & 0.2873 & 0.0239 & 0.0000 \end{bmatrix}$$

$$R_2 = \begin{bmatrix} 0.3549 & 0.3926 & 0.2525 & 0.0000 & 0.0000 \\ 0.3382 & 0.3623 & 0.2754 & 0.0242 & 0.0000 \\ 0.3498 & 0.3854 & 0.2398 & 0.0250 & 0.0000 \\ 0.3260 & 0.3782 & 0.2719 & 0.0239 & 0.0000 \end{bmatrix}$$

$$R_3 = \begin{bmatrix} 0.3193 & 0.3694 & 0.2873 & 0.0239 & 0.0000 \\ 0.3677 & 0.3111 & 0.2772 & 0.0440 & 0.0000 \\ 0.2717 & 0.3493 & 0.3569 & 0.0220 & 0.0000 \\ 0.2859 & 0.3478 & 0.3199 & 0.0464 & 0.0000 \end{bmatrix}$$

$$R_4 = \begin{bmatrix} 0.1864 & 0.2397 & 0.3064 & 0.2675 & 0.0000 \\ 0.1874 & 0.2410 & 0.3373 & 0.2343 & 0.0000 \\ 0.1960 & 0.2520 & 0.3257 & 0.2262 & 0.0000 \\ 0.1756 & 0.2258 & 0.2873 & 0.2395 & 0.0718 \end{bmatrix}$$

Multiply the weight vector of each secondary indicator with the grey clustering rating matrix according to equation (15) to get the grey clustering evaluation matrix of consistent indicatorsW;

$$W = \begin{bmatrix} 0.2814 & 0.3435 & 0.3256 & 0.0495 & 0.0000 \\ 0.3460 & 0.3838 & 0.2585 & 0.0117 & 0.0000 \\ 0.3058 & 0.3490 & 0.3102 & 0.0350 & 0.0000 \\ 0.1888 & 0.2428 & 0.3237 & 0.2381 & 0.0065 \end{bmatrix}$$

According to Equation (16), the risk evaluation vector M of the first level indicator of the shantytown renovation project can be found.

$$M = [0.2911 \quad 0.3451 \quad 0.2971 \quad 0.0591 \quad 0.0009]$$

By multiplying the comprehensive evaluation vector with the centroid vector U, the comprehensive risk evaluation value of the M village renovation project can be calculated.

$$S = M \times U^T$$

$$S = [0.2911 \quad 0.3451 \quad 0.2971 \quad 0.0591 \quad 0.0009] \times \begin{bmatrix} 9 \\ 7 \\ 5 \\ 3 \\ 1 \end{bmatrix} = 6.7591$$

At the same time, the comprehensive evaluation index for risk evaluation of each level 1 indicator in the second area of Q city was calculated, and the corresponding risk evaluation level of the level 1 indicators is shown in Table 6.

$$S_{A_1} = M_1 \times U^T = 6.7136 \quad S_{A_2} = M_2 \times U^T = 7.1282$$

$$S_{A_3} = M_3 \times U^T = 6.8512 \quad S_{A_4} = M_4 \times U^T = 5.7381$$

Table 6. Evaluation results of level 1 indicators for risk evaluation of the transformation of the second area of Q city

Level 1 indicators	appraise value	risk level
Policy riskA_1	6.7136	Higher risk
social risk	6.1282	Higher risk
Engineering risks	6.8512	Higher risk
Other risks	5.7381	Medium risk

4.4 Analysis of results

Through the calculation and analysis to get the comprehensive evaluation value of the shantytown renovation project in the second area of Q city is 6.7591,

and the result of the comprehensive evaluation grade is in a relatively high-risk level, which may affect the normal progress of the project, and necessary risk countermeasures should be taken for it.

4.4.1 Policy risk control

There are many relevant departments involved in the process of shantytown transformation in the second area of Q City, and the government dominates the process. In order to improve the efficiency of the approval and speed up the approval process, a comprehensive transformation office can be set up to coordinate the relationship between various units and departments, specializing in dealing with various approval procedures regarding shantytown transformation, so that when residents and developers have problems of various kinds, the various departments can deal with the relevant matters quickly, so that the problems can be solved effectively [4].

As the second area of Q City shantytown project lasts for a long time, the government may adjust the relevant policies during this period, in order to cope with the risks brought by the policy change, firstly, we should closely follow the relevant national documents and policies involving shantytown transformation, interpret these documents and policies in detail, and understand the state's attitude towards the shantytown transformation, and, secondly, after studying the relevant national policies on shantytowns, we have to Secondly, after studying the relevant national policies on shantytowns, make short-, medium- and long-term planning for the policies on shantytown transformation, so as to lay a good foundation for the promotion of the project.

4.4.2 Social risk control

The social risk of the second area of Q city mainly comes from the residents' dissatisfaction with the demolition and resettlement, and the society is highly concerned about the public opinion that may be brought by the second area of Q city shantytown renovation project. During the process of renovation of the second area of Q city, the government units are located in the dominant position of renovation, and in the process of renovation, the government departments should make a detailed document of land acquisition and compensation according to the policy and should take the actual needs of the local residents into consideration fully[4]. Relevant government departments should do a good job of publicizing and guiding the renovation projects, visit and pay attention to the ideas of residents, play the coordinating role of community neighborhood committees, and solve the practical problems of residents with difficulties in a timely manner. Whether or not the relocation programmed for the second area of Q City can satisfy the villagers is one of the keys to the success of the project, and the shantytown renovation project is not only a simple engineering project, but also involves the villagers' requirements for living comfort and safety. Therefore, the government in the process of relocation should adhere to the people-oriented, put the interests of the residents in the first place, enhance the voice of residents, improve their participation and sense of identity, so that the second area of Q City shantytown renovation project can really meet the needs of residents, improve the happiness and comfort of residents[9]..

In order to solve the risk of social instability brought about by the eviction process, the government can invite a third-party agency to make an assessment of each resident's house, and publicize through the relevant media that the residents' living environment and economic interests will be greatly improved after the shantytown renovation of the second area of Q City, and let the residents understand the advantages and necessity of shantytown renovation and the urgency of it, as well as co-ordinate the community committee to play a communication and Coordinate the role of community committees to enhance local self-confidence in the shantytown renovation project.

4.4.3 Engineering risk control

Due to the excellent location and high population density of the second district of Q City, the relevant departments should carry out rational planning to ensure that the project can be implemented as soon as possible and stimulate the economy of the neighborhood. In the project from planning to implementation to completion, the developer must do a good job of scientific and use of planning, surrounding facilities should be complete, to meet the needs of residents. The construction side and the construction side should carry on good communication, jointly analyze and solve the relevant problems in the construction process and take measures to deal with them in a timely manner.

The second area of the Q City squatters' project could not have been carried out without the involvement of the management staff. From the planning of the programmed to the final completion and delivery, there will be a variety of problems if the management is not in place. For the management of the project, it is necessary to have good coordination and decision-making ability, and to establish a corresponding information management system, which can obtain the corresponding information in the construction of the project in a timely manner, to accurately and quickly formulate the relevant measures to deal with the various problems that arise .

Project constructor to ensure the project quality and safety of the shanty reform project, first of all, we have to establish the quality and safety management of the relevant responsibility system, to achieve quality and safety engineering can be traced back to the operation of the site construction personnel must strictly comply with the operating specifications and strengthen the management of its level of operation, in order to avoid improper operation caused by the quality and safety of the project, in addition to the strict control of raw materials procurement, in accordance with the relevant procurement and bidding process for raw materials gatekeeper. The process of raw materials for the gatekeeper.

4.4.4 Economic risk control

At present, most of the projects are selected through bidding to choose suppliers and builders, according to the timeframe and scale of the second area of Q city squatter project, reasonable selection of suitable contractors. The qualification examination of the bidding unit should be carefully and comprehensively, from the organization of the bidding, bid opening, bid setting to the final construction stage, the principle of fairness, openness and impartiality should be adhered to and the reasonable and scientific construction period and construction quality requirements should be formulated. The final winning unit must be a unit with strong comprehensive capabilities such as quotation and construction level to ensure the smooth implementation of the project. The key to project completion is to control costs and avoid overspending. It is necessary to take the project budget as the basis, and constantly adjust the cost with the changes of the market and control it within the scope of the project budget. Secondly, the managers should implement dynamic management of the Q City renovation project, and should have clear entries for raw materials, labor and machinery and equipment to avoid unnecessary waste.

Q City, the second area of the shantytown reform project as a key concern of the shantytown renovation project, we must make reasonable use of the national government's support in terms of funding, taxation, to achieve the earmarking of funds. Q City, the second area of the shantytown reform project can be applied to the financial sector for project grants, to enjoy the project's relevant policy concessions, to ensure the smooth implementation of the project.

5 Conclusions

(1) This paper constructs a risk evaluation index system for the second area of Q city squatter area renovation project and proposes a risk evaluation based on the hierarchical analysis method and grey clustering method, which to a certain extent can improve the accuracy and scientific of the risk evaluation.

(2) This paper has sorted out 16 risk factors that may cause shantytown transformation, involving four aspects, such as policy, society, engineering, and economy. However, due to the complexity of the risk caused by shantytown transformation, more factors affecting the risk factors summarized in this paper is not comprehensive, but also need to be combined with the case of further generalization and summary, so that the risk evaluation is closer to reality.

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