Discussion on Evaluation Index and Weight of Resettlement after Flood Control Project of the Yellow River

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Abstract. The resettlement evaluation system for the recent flood control projects in the lower Yellow River consists of many economic indicators, social indicators, resource indicators and environmental indicators. Although the design of quantitative indicators is the main one, many of them are still used in order to better reflect the evaluation objectives. Qualitative and fuzzy indicators, traditional methods and means have been difficult to be competent in the comprehensive analysis of multi-factor and multi-level in the production and living system of immigrants. Yaahp software, based on the basic research method of AHP, constructs a hierarchical structure model, and assigns weights and calculations to post-immigration evaluation indicators.

1. Research background and significance
The recent flood control project (Shandong section) on the lower reaches of the Yellow River covers about 50% of the total investment. The resettlement works include attachment compensation, house demolition compensation, land acquisition and land occupation. The demarcation and confirmation of land rights, production and living resettlement, land reclamation, professional project reconstruction, etc. The land acquisition and resettlement of the project occupy a large amount of work. The area affected by the project is wide and the population is large. It has obvious linear distribution characteristics. Based on the characteristics of the recent flood control project resettlement in the lower Yellow River, a scientific and reasonable post-evaluation index system is constructed. For many evaluation indicators, how to determine the weight value of each layer of indicators is the key content of the analytic hierarchy and the key factor affecting the evaluation results.

2. Evaluation Index System for Resettlement of Recent Flood Control Projects in the Lower Yellow River
The resettlement system of the recent flood control project on the lower Yellow River is a multifaceted and complex system. Post-evaluation of its implementation effect requires the establishment of a scientific and reasonable post-evaluation index system [1]. Based on the research of domestic and foreign post-evaluation theories and analysis methods, this paper draws on the theory and practice of post-evaluation of other projects in China, and combines the characteristics of resettlement of the project according to relevant laws and policies of resettlement in China. Guided by
resettlement goals, the resettlement of the recent Yellow River flood control projects as shown in Table 1 is established Post-evaluation index system.

**Table 1.** Evaluation Index System for Resettlement of Recent Flood Control Projects in the Lower Yellow River.

| Target layer                          | Criterion layer | Subcriteria layer                                                                 | Indicator layer                                                                 |
|---------------------------------------|-----------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Post-resettlement evaluation index system | Economic indicator layer | Production conditions                                                                 | Quality of arable land, irrigable proportion, per capita arable land area, acreage of arable land, farming radius |
|                                       |                  | living condition                                                                  | Housing quality, per capita housing area, rural garbage disposal rate, per capita water consumption, per capita electricity consumption, mobility tool penetration rate, household appliance penetration rate, domestic gas penetration rate, and central heating penetration rate |
|                                       |                  | Income consumption level                                                          | Per Capita Net Income, Per Capita Consumption Expenditure, Food, Food, Living and Transportation Consumption, Culture and Education Consumption, Healthcare Consumption, Engel Coefficient |
|                                       | Social indicator layer | population                                                                        | Labor force ratio, low-income population ratio                                 |
|                                       |                  | social relationship                                                                | Relations with villagers in resettlement areas, closeness of kinship, richness of social life, and satisfaction of immigrants with social relations |
|                                       |                  | Political influence                                                                | The soundness of policies and regulations, the state of social order in the immigration area, the psychological capacity of immigrants, and the trust of immigrants in the government |
|                                       |                  | infrastructure                                                                     | Tap water penetration rate, power supply guarantee rate, telephone penetration rate, cable TV coverage rate, external traffic conditions, village traffic road conditions |
|                                       | Resource indicator layer | social service                                                                     | Nine-year compulsory education penetration rate, school-age population enrollment rate, medical institution density, NCMS participation rate, rural endowment insurance participation rate |
|                                       |                  | Water resources                                                                    | Water supply guarantee degree, water resource development rate |
|                                       |                  | land resource                                                                       | Per capita arable land area, Land resource utilization |
|                                       | Environmental indicator layer | Water Environment                                                                  | Water quality, Drainage conditions |
|                                       |                  | Atmospheric Environment                                                            | Air quality, Annual average number of wind and sand weather |
3. Determination of indicator weights

3.1. analytic hierarchy process
Analytic Hierarchy Process (AHP) is a decision analysis method that combines qualitative and quantitative methods to solve complex problems with multiple objectives [2]. This method combines quantitative analysis with qualitative analysis, uses the experience of decision makers to judge the relative importance between the standards that can measure the achievement of goals, and reasonably gives the weight of each standard for each decision plan. The weights are used to determine the pros and cons of each scheme, and they are more effectively applied to issues that are difficult to solve with quantitative methods. They are effective tools in social and economic system decision-making [3].

The use of analytic hierarchy process to determine the weight of each evaluation index can be divided into the following six steps: identify the problem and establish a hierarchical structure model; construct a judgment (pair comparison) matrix; calculate the weight vector; hierarchical single ordering and consistency check; Hierarchical total sorting; Consistent detection of hierarchical total sorting [4].

3.2. Use yaahp software to determine indicator weights
Yaahp software is a kind of analytic hierarchy process (AHP) auxiliary software, which provides the help of model construction, calculation and analysis for the decision-making process using AHP [5].

Specific steps are as follows:
(1) Hierarchical model drawing.
The goals of decision-making, factors to consider, and decision-making objects are divided into the highest layer, the middle layer, and the lowest layer according to their mutual relationship, and a hierarchical structure diagram is drawn. Using yaahp to draw the hierarchical model is intuitive and convenient to change.

(2) Compare the importance of each system based on the goals of each level.
By understanding and grasping the design documents, combining the actual process and conditions of the resettlement project implementation, and consulting the relevant resettlement experts, designers, and field staff, the importance of each level of indicators was compared, The opinions of all parties were synthesized, a judgment matrix was established, and consistency judgment was performed on each judgment matrix. The consistency check results of the overall evaluation system are shown in Table 2.

Table 2. Consistency test results of the overall evaluation system.

| Consistency ratio | Weighting of the overall goal | λ_{max} | 4.1257 |
|-------------------|-------------------------------|---------|--------|

| Post-resettlement evaluation index system | Economic indicator layer | Social indicator layer | Resource indicator layer | Environmental indicator layer | W_i |
|------------------------------------------|--------------------------|-----------------------|--------------------------|-------------------------------|-----|
| Economic indicator layer                 | 1                        | 3                     | 5                        | 6                             | 0.5559 |
| Social indicator layer                   | 1/3                      | 1                     | 4                        | 4                             | 0.2753 |
| Resource indicator layer                 | 1/5                      | 1/4                   | 1                        | 2                             | 0.1010 |
| Environmental indicator layer            | 1/6                      | 1/4                   | 1/2                      | 1                             | 0.0678 |

(3) The ranking weights of the alternatives are calculated, as shown in Table 3.
Table 3. Weights of evaluation indicators after implementation of resettlement.

| Options                                    | Weights | Options                                    | Weights | Options                                    | Weights |
|--------------------------------------------|---------|--------------------------------------------|---------|--------------------------------------------|---------|
| Arable land quality                        | 0.1434  | Water consumption per capita                | 0.0153  | Air quality                                | 0.0042  |
| Irrigation ratio                           | 0.0908  | Food, clothing, housing, travel            | 0.0152  | Central heating penetration rate            | 0.0041  |
| Labor force ratio                          | 0.0903  | Annual average number of wind and sand weather | 0.0137  | Cable TV coverage                         | 0.0039  |
| Per capita arable land area                | 0.0784  | Penetration rate of mobility tools          | 0.0137  | Immigration mental capacity                | 0.0038  |
| Relations with villagers in resettlement areas | 0.0588  | Soundness of policies and regulations      | 0.0112  | Engel coefficient                         | 0.0038  |
| Water supply guarantee                     | 0.0482  | Electricity consumption per capita         | 0.0100  | Medical institution density                | 0.0037  |
| Farmland yield per mu                      | 0.0477  | Consumer expenditure per capita            | 0.0094  | External traffic conditions                | 0.0027  |
| Housing quality                            | 0.0373  | Tap water penetration                      | 0.0092  | Drainage conditions                       | 0.0026  |
| Low-income population                      | 0.0301  | Household appliances penetration rate       | 0.0085  | Healthcare spending                       | 0.0026  |
| Housing area per capita                    | 0.0291  | Water quality                              | 0.0079  | Nine-year compulsory education penetration rate | 0.0024 |
| Tilling radius                             | 0.0267  | Richness of social life                    | 0.0076  | Social security situation in the resettlement area | 0.0023 |
| Per capita net income                      | 0.0223  | Per capita arable land area                | 0.0065  | Village traffic road conditions            | 0.0022  |
| Rural waste treatment rate                 | 0.0211  | Immigration trust in government            | 0.0065  | Rural pension insurance participation rate | 0.0021  |
| Land resource utilization                  | 0.0196  | Power supply guarantee rate                | 0.0064  | Telephone penetration                     | 0.0011  |
| Closeness of relatives                     | 0.0188  | Cultural education consumption             | 0.0059  | NCMS participation rate                   | 0.0007  |
| Immigration satisfaction with social relations | 0.0185  | School-age enrollment rate                 | 0.0056  |                                         |         |
| Water resource development rate            | 0.0181  | Life gas penetration rate                  | 0.0056  |                                         |         |

From Table 4, it can be seen that the quality of arable land, irrigable area, labor force ratio, per capita arable land area, and the weight of villager relations with the resettlement area are in the top five of all indicators. The total of the five items accounts for 46.17%, which is in line with the recent flood control project of the lower Yellow River. Characteristics of project resettlement.

4. Conclusion
The Yellow River is the second largest river in China. Land acquisition and resettlement is an important part of the construction of the Yellow River flood control project, and it is also the prerequisite and foundation for the implementation of the project. The issues involved in the
Resettlement of the Yellow River flood control project are long-term and complex. They directly affect the interests of the resettles along the Yellow River. Post-evaluation cannot be based on post-evaluation of construction projects. "Happy River" call, insist on equal emphasis on project construction, resettlement and ecological protection, select typical indicators, determine the weight of evaluation indicators, and make post-evaluation work more practical and effective.

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