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Interactive Transmission Mechanism of Eco-environmental and Social Benefits in Sustainable Urban Regeneration

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Abstract
The lack of eco-environmental and social benefits in old city reconstruction has always been a problem restricting sustainable urban regeneration. In order to obtain interactive transmission mechanism of ecological and social benefits in old city reconstruction, the work analyzed Tanhualin reconstruction by Amos path analysis with questionnaires. The results showed that: firstly, there was significant positive correlation between eco-environmental evaluation and social evaluation, with path coefficient of 0.98; secondly, the most important factor influencing eco-environmental benefits evaluation was history culture, followed by tourism development and environment greening; thirdly, public service facility was the most important factor influencing social benefits evaluation, followed by traffic and living conditions. Therefore, traditional evaluation system of reconstruction effect should be changed to focus on the dominance of eco-environmental environment and detailed sustainable development, thus promoting sustainable urban regeneration.
Keywords: SUSTAINABLE URBAN REGENERATION, OLD CITY RECONSTRUCTION, ECO-ENVIRONMENTAL BENEFITS, SOCIAL BENEFITS, INTERACTIVE TRANSMISSION MECHANISM

1. Introduction

At present, there are many new social and ecological problems in cities, along with rapid development of economy and promotion of urbanization. However, the intervention effect of traditional urban planning is not significant, sustainable urban development is a

matter of great urgency. Sustainable urban regeneration is an important aspect of promoting sustainable urban development [1-3], since it achieves sustainable urban development and innovation through multi-party sharing and coordination of interest in old city reconstruction. Old city reconstruction is not a simple demolition and reconstruction. Further, it emphasizes on realizing co-ordination of economic, social and eco-environmental benefits under the premise of satisfying demands of multi-stakeholder, especially for public interest. Therefore, social harmony will be perfectly integrated with urban landscape conservation, historical and cultural precipitation, as well as architectural features reservation.

As an effective means of vitalizing urban land and urban landscape and promoting sustainable urban regeneration, old city reconstruction has economic, eco-environmental and social benefits in general. With the expanding range of old city reconstruction, its effect on sustainable urban regeneration has not been widely recognized by the public. One of the reasons is the absence of eco-environmental and social benefits considerations. Currently, the evaluation and improvement of eco-environmental and social benefits in old city reconstruction have attracted more attention and in-depth study of scholars. Based on previous studies, the work conducted a questionnaire survey on the old city reconstruction of Tanhualin in Wuhan. Then, Amos path analysis was used to study the coordinating and improving mechanism of eco-environmental and social benefits. The purpose is to improve the effect of old city reconstruction. Finally, valid empirical recommendations will be provided for achievement of coordinated development of eco-environmental, social and economic benefits, thus promoting sustainable urban regeneration.

2. Overview of Old City Reconstruction in Sustainable Urban Regeneration

Generally, the effect of old city reconstruction can be divided into economic, social and eco-environmental benefits according to the contents. The requirements of different interest subjects should be considered to achieve harmony and unity of the three effects [4]. Therefore, the research should be conducted on coordination among different interest subjects and benefits. Currently, relevant interest subjects in old city reconstruction mainly are composed of government, real estate developers and the public. The focus of different interest subjects in the three effects has significant differences. Economic benefit refers to the input-output ratio of old city reconstruction project, which is more focused by government and real estate developers [5]; measured with relevant evaluation index system and public reaction, social benefit mainly refers to consequences and implications of old city reconstruction on society[6]; eco-environmental benefit mainly emphasizes on aspects of ecosystem balance and sustainable development of economy and resources. In old city reconstruction, eco-environmental benefit is mainly reflected on environment greening, tourism development, history and culture. Meanwhile, it can also be measured by the reaction of different interest subjects on these aspects. Government and real estate developers focus on economic efficiency, while the public is more concerned about major social and economic benefits. Currently, inadequate eco-environmental and social considerations have led to low level of public satisfaction and greatly restricted development of sustainable urban regeneration. In addition, public satisfaction degree will affect the viability of subsequent old city reconstruction and enthusiasm of public participation; meanwhile, it is not conducive to stability and unity of society, thus it should be taken seriously enough.

Based on views of many scholars, the evaluation indexes of eco-environmental benefits in old city reconstruction mainly include aspects of historical and cultural reservations, urban landscape inheritance, quality of natural ecological environment, and tourism development; the evaluation index of social benefits is reflected on aspects of improvement of traffic conditions, public service facilities, and living conditions, as well the renewal effect [7]. From the constitution of evaluation indexes of eco-environmental and social benefits, it is possible for contents of indexes to generate mutual influences in theory. For example, living conditions are related to improvement of natural ecological environment, history protection and urban landscape inheritance; in addition, these benefits can be measured by public satisfaction. Therefore, in addition to analyzing public satisfaction of one index or unilateral benefit, it is important to explore potential coordinating mechanism of eco-environmental and social benefits. Currently, some issues remain to be solved: what is the interaction relationship between eco-environmental and social benefits? Are there any conduction mechanisms? How to improve the comprehensive effects of old city reconstruction using interaction and conduction mechanisms to promote urban innovation and sustainable development?

3. Study Area Overview and Analysis Method

In public evaluation on the effect of old city reconstruction, the object is to analyze coordinating and improve mechanism of eco-environmental and social benefits. Social evaluation generally adopts the degree of public satisfaction. Public satisfaction degree

was adopted in measurement of eco-environmental benefits to maintain the unity of data.

3.1. Study Area

The work selected Tanhualin old city reconstruction project, which was the representative historic district in Wuhan, Hubei. Tanhualin was located in an old east-west lane of Qing Dynasty, along the northern foothills of Huayuan Mountain in old Wuchang. In history, Tanhualin referred to post-east area connecting the outlet of Gejiaying. In 1946, original Zhengwei Street and Youjia Lane were incorporated collectively into Tanhualin, and this name had been followed so far. Due to its geographical position and historical accumulation, Tanhualin had been one of well-known characteristic historic districts with cultural integration of ancient city, religion, education, street culture and architectural culture [8]. Its reconstruction project had started since the second half of 2005. Now, it had been completed with new look. The recognition of the public, especially on satisfaction of social and eco-environmental benefits, was a key factor constraining sustainable urban regeneration.

To analyze public evaluation on effect of reconstruction projects, 338 questionnaires were randomly distributed in April 2013. There were 321 valid questionnaires of the total, and the effective recovery rate was about 95%. In the questionnaire, respondents were asked to conduct attitude measurement for related contents of eco-environmental and social benefits.

3.2. Analysis Method

Path analysis of SEM (Structural Equation Modeling) was adopted in the work. SEM was a confirmatory method. Its working procedures were described as follows: firstly, a hypothetical causal model was built through theory guidance; then, the sample data was conducted for parameter estimation using corresponding estimation methods; finally, the matched degree of model was tested with covariance analysis, thus achieving measurement of the relationship among multiple variables and dependent variables. In establishment of theoretical causal model, if there was appropriate matched degree between the model and observational data, the path-direction relationship of variables could be verified. Amos (Analysis of Moment Structures) was a common visualized module software used for SEM and correlation analysis. Amos17.0 was used in the work for path analysis.

4. Empirical Analysis on Interactive Transmission Mechanism of Eco-environmental and Social Benefits

Path analysis of Amos was used to analyze coordination and interaction between eco-environmental and social benefits, combined with theoretical studies. Procedures and results of the analysis were described as follows:

4.1. Theoretical Model

The analysis aimed at exploring coordination between eco-environmental and social benefits, thus the theoretical model selected eco-environmental evaluation and social evaluation as two potential variables. Each potential variable had appropriate observation variables. The observation variables of eco-environmental evaluation were corresponding evaluation indexes of eco-environmental measuring variables, namely satisfaction degrees of respondents on history reservation, tourism features and environmental greening. The observation variables of social evaluation were satisfaction degrees on traffic conditions, living conditions, public service facilities and the effect of old city reconstruction. In addition, environment greening was correlated with living conditions and the effect of reconstruction; tourism feature was also related to public's recognition on reconstruction effect. Thus, when observation variables set error variables, the relationship among respective error variables was defined as correlation. Theoretical model was constructed as follows:

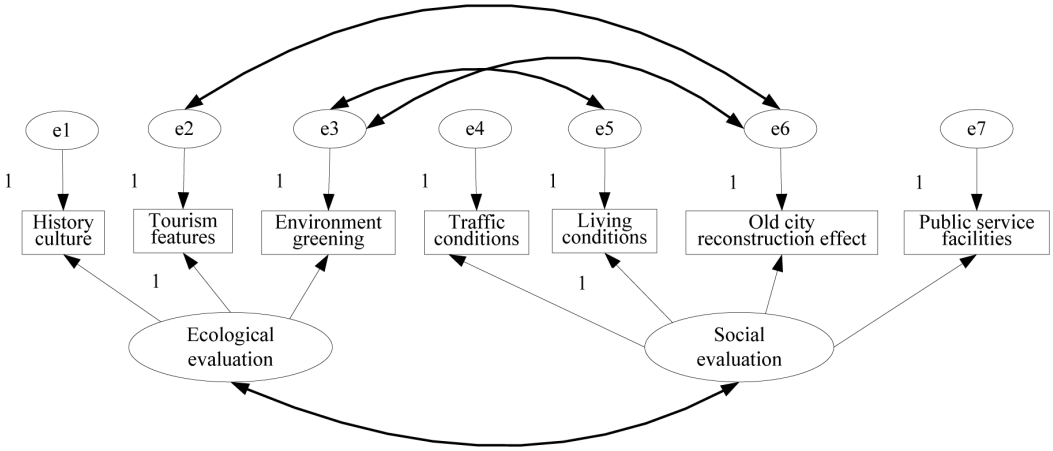

Figure 1. Initial Path Analysis of Interactive Transmission Mechanism of Eco-environmental and Social Benefits

4.2. Path Analysis

Figure 2 showed estimated values of parameters obtained from path analysis using Amos Software. In path analysis, significant probability value p= 0.354> 0.05, so the null hypothesis was accepted. It indicated that the theoretical model could fit observed data. Meanwhile, freedom ratio of chi-square was 1.104, indicating that the matched degree between hypothetical model and sample data could be accepted. In addition, among overall matched degree values of the model, the value of RMSEA was 0.018< 0.050, GFI = 0.991> 0.900, and AGFI= 0.974 >0.900, indicating the causal model could fit observed data. Therefore, the matched degree between model and sample data was appropriate. According to non-standardized regression coefficients of Amos and its significance test (Table 1), the relationship between eco-environmental evaluation and environment greening was not significant, but it was significant between other potential variables and observation variables. Based on covariance and covariance significance test (Table 2), correlation coefficients were significant between eco-environmental evaluation and social evaluation, as well as tourism features and reconstruction effect; they were not significant between environment greening and living conditions as well as reconstruction effect (significance level was 0.05). Figure 2 showed standardized regression coefficients between variables, which were named path coefficients of path analysis.

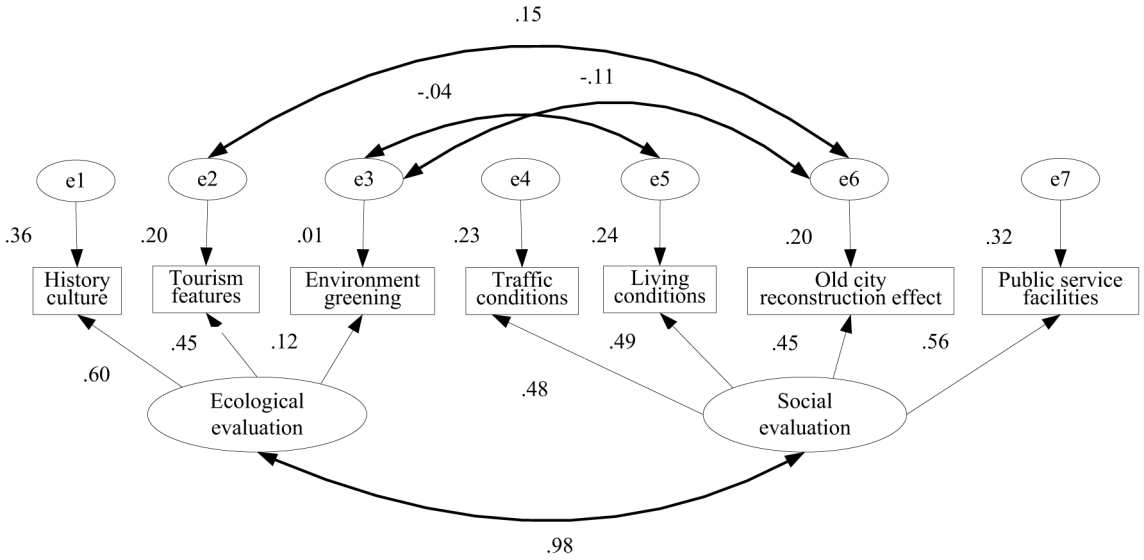

Figure2. Path Coefficients in Default Model

Table 1. Summary of Regression Weights and Its Significance Test

			Estimate	S.E.	C.R.	P	Label
Environment greening	<---	Eco-environmental evaluation	0.202	0.121	1.667	.095	
Old city reconstruction effect	<---	Social evaluation	0.950	0.188	5.042	***	
History culture	<---	Eco-environmental evaluation	1.000				
Traffic conditions	<---	Social evaluation	1.000				
Public service facilities	<---	Social evaluation	1.189	0.207	5.741	***	
Tourism conditions	<---	Eco-environmental evaluation	0.745	0.139	5.355	***	
Living conditions	<---	Social evaluation	1.037	0.193	5.375	***	

Table 2. Summary of Covariance and its Significance Test

			Estimate	S.E.	C.R.	P	Label
Eco-environmental evaluation	<-->	Social evaluation	0.280	0.051	5.514	***	
e3	<-->	e6	-0.094	0.052	-1.799	.072	
e2	<-->	e6	0.118	0.055	2.148	.032	
e3	<-->	e5	-0.035	0.053	-0.664	.507	

After removing non-significant paths, new path diagram was obtained in Figure 3.

In the final path analysis, significance probability value p= 0.230> 0.05, thus the null hypothesis was still accepted. It indicated that theoretical model could fit observed data; meanwhile, the freedom ratio of chi-square was 1.258, indicating that the matched degree between hypothetical model and sample data was acceptable. In addition, among overall matched degree values of the model, RMSEA= 0.028 <0.050, GFI = 0.986> 0.900, and AGFI = 0.969> 0.900, indicating the causal model could fit observed data. These indexes showed the matched degree between the model and sample data was appropriate. Table 3 showed new non-standardized regression coefficients and its significance test, and Table 4 showed covariance and covariance significance test. The tables indicated significant relationships between all variables.

Based on above analysis, conclusions can be drawn as follows:

(1) There is significant correlation between eco-environmental benefits and social benefits. Based on the results of Amos path analysis, the covariance of eco-environmental evaluation and social evaluation could pass significance test. The path coefficient between them reached up to 0.98, illustrating the close relationship.

(2) According to regression coefficients and standardized regression coefficients of path analysis, history and culture reservation is the most important factor influencing eco-environmental benefits, followed by development of tourism features and environmental greening. This results are inseparable from role definition of the old city project. As a famous historic district in Wuhan, Tanhualin's accumulation and reservation of history and culture have become

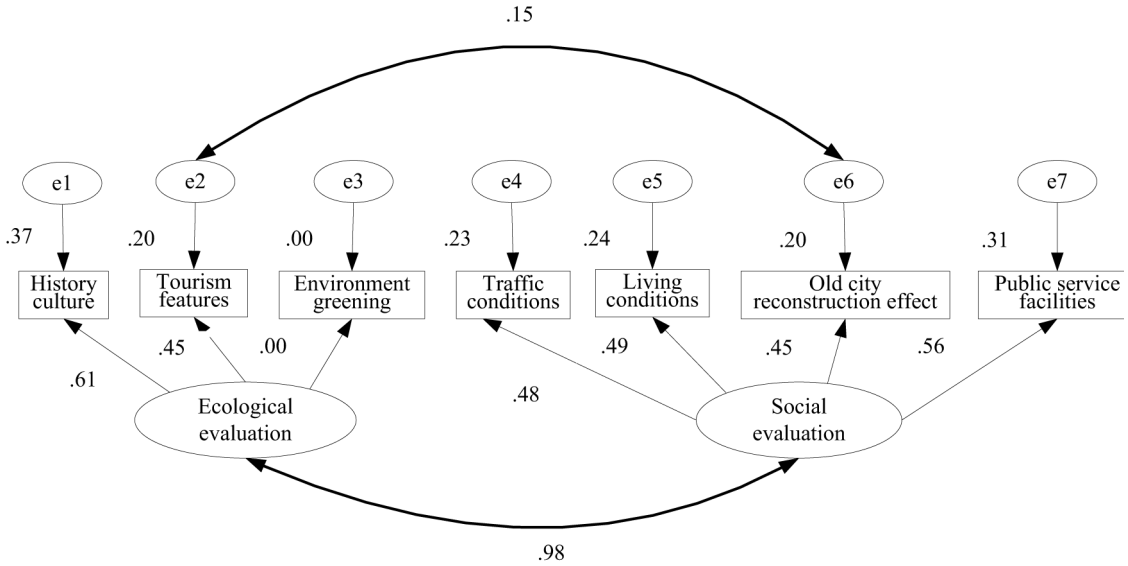

Figure 3. Final Path Analysis of Interactive Transmission Mechanism of Eco-environmental and Social Benefits

Table 3. Summary of regression weights and its significance test

			Estimate	S.E.	C.R.	P	Label
Environment greening	<---	Eco-environmental evaluation	0.000				
Old city reconstruction effect	<---	Social evaluation	0.942	0.186	5.064	***	
History culture	<---	Eco-environmental evaluation	1.000				
Traffic conditions	<---	Social evaluation	1.000				
Public service facilities	<---	Social evaluation	1.162	0.203	5.714	***	
Tourism features	<---	Eco-environmental evaluation	0.745	0.140	5.319	***	
Living conditions	<---	Social evaluation	1.026	0.190	5.393	***	

Table 4. Summary of covariance and its significance test

			Estimate	S.E.	C.R.	P	Label
Eco-environmental evaluation	<-->	Social evaluation	0.283	0.051	5.538	***	
e2	<-->	e6	0.118	0.055	2.153	0.031	

the focus of public attention. Driven by economic benefits, Tanhualin project contains many tourist routes of former residences of celebrities, religious buildings, and traditional streets. Thus, its tourism positioning plays a relatively important role in eco-environmental evaluation. The role of environment greening is weakened by incline of role definition and related policies.

(3) Similarly, based on relevant indicators of path coefficients, the most important factor influencing social evaluation is improvement of public service facilities, followed by traffic conditions and living conditions. Public service facilities are related to interests of residents and tourists, so their impact on social evaluation is the most significant; the weaker impact of traffic conditions may be related to geographical location of the project. In addition, according to the results of questionnaire survey, comments of respondents on transportation improvement were mainly focused on insufficient parking positions and narrow roads. Therefore, centralized direction of public views should be considered in the influence of traffic conditions improvement on social evaluation.

5. Empirical Recommendations on Coordination and Improvement of Eco-environmental and Social Benefits

Based on the above analysis and results, brief recommendations were proposed for current old city reconstruction projects similar to Tanhualin, thus promoting sustainable urban regeneration.

5.1. Reforming Traditional Effect Evaluation System of Old City Reconstruction

The high correlation between eco-environmental and social benefits should be emphasized in old city reconstruction. Traditional effect evaluation system, which was divided by the contents, can not reflect the best results of old city reconstruction. Ultimate effects of old city reconstruction are determined by weighing structure of economic, social and eco-environmental benefits. The weighing structure depends on interest game among different interest subjects . In the work, according to the high correlation between eco-environmental and social benefits obtained from empirical investigation, the final effect may be transformed due to position of interest subjects. Weak position of the public usually affects overall effect of old city reconstruction because of coordination and interaction of eco-environmental and social concerns [9-10]. In addition, it is also a political issue that should be paid enough attention. Therefore, people can establish effect evaluation system of eco-environmental and social benefits with cross-integration or from division of different interest subjects.

5.2. Giving priority to eco-environmental indicators in reconstruction of historical and cultural blocks

Old city reconstruction in sustainable urban regeneration is not a simple two-party interaction between government and residents. It also involves integration and coordination of multiple interest subjects and industries of city image, tourism industry, history and culture. Old city reconstruction tends to develop harmony and unity of scientific transformation, as well as arts and humanities. Therefore, in role positioning and reconstruction process, the focus of different projects and indicators are likely to have impacts on final results of sustainable regeneration. According to above results of path analysis, enough attention should be paid to weak position of environment greening in ecological evaluation, and its weak correlation with living conditions. In above analysis, the top few path coefficients of factors are relevant aspects of history and culture, as well as tourism features. This has a certain relationship with role positioning of the reconstruction project. Ecological indicators of environmental greening should be positioned at the foundation in reconstruction projects of historic or tourism district, because their position and role will be weakened or hidden.

5.3. Strengthening Sustainable Reconstruction of Important Details under Role Positioning

Many reconstruction projects seem successful from general appearance. However, if they hope to obtain long-term sustainable development and recognition from major interest subjects, especially from the public, they should work hard on sustainable development of small details. The path coefficients of observation variables for social evaluation indicate the necessity of improvement of public service facilities, followed by living conditions and traffic conditions. Reconstruction of these aspects can learn from foreign experience. For example, improvement of public toilet and sitting chairs should reflect integration of natural ecological environment; transport needs of people and bicycles should be considered in block design [11-12]; traffic configuration should be comprehensively combined with external accessibility and internal transportation. Transportation of historic districts similar to Tanhualin is not entirely influenced by external geographic location. The location of Tanhualin is excellent with convenient public transportation, so its evaluation on traffic conditions is more reflected on internal traffic. In the questionnaires, public proposals of limiting access of private cars and reasonable diversion of vehicles and people should be properly considered.

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