

## Practice of Value Assessment of Highway Physical Assets

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**Abstract:** The aim of this study is to show the assessment for highway physical assets. According to the highway construction and development needs for the scientific value of physical assets to determine road, this valuation of physical assets on the road three basic ways: income approach, market approach, replacement cost analysis and comparison method was fully discussed Their real meaning and application of limitations, combined with the value of physical assets highway characteristics derived replacement cost method for valuation of physical assets Highway conclusions; and further to the replacement cost of the basic principles and application of a comprehensive exposition With specific evaluation example, how to apply the replacement cost of physical assets on the highway, made a detailed description of valuation for physical assets into a new rate of road to determine the characteristics of the more complex process, first proposed by highway components of physical assets. The importance of project cost and combined into a new consolidated to determine the rate of new ideas for the industry study.

**Key words:** Assessment methods, highway physical assets, replacement cost method

### INTRODUCTION

With the continuous development of China's market economy, the transport sector deepening reform of management system, involving road-asset investment, transfer, mortgage, restructuring, replacement of the assessment project, more and more, how to accurately determine the value of road assets has become important. The control highway construction investment risk, the best to raise financing options, optimal allocation of resources, an important link road. The aim of this paper is to show my personal opinion of assessment for highway physical assets. (Du, 2007) propose the highway construction cost analysis and give the sample details. (Hudson, 2005) introduce a public facilities asset management strategy. (Ye and Song, 2006) have a research of real estate valuation. (Rohee, 2007) give the assessment methods and techniques for highway. (Jing, 2006) propose the highway project financial management method.

### THE CHOICE OF ASSESSMENT METHODS

The basic method of asset valuation: income approach, market approach and the replacement cost method.

**The income approach:** Income approach is to be assessed by estimating the expected return of assets and their future be converted into present value, in order to determine the value of assets method. Most belong to the

state for road property critical infrastructure, with a clear policy, public welfare and regional, most of its future revenue to improve the overall economic benefits in the form of embodiment of the income needed to estimate the road property from the economic benefits of society as a whole The peel, which has greater uncertainty peel, so use the income approach to determine road property value will lead to considerable error.

**Market approach:** Also known as the market price comparison approach, is sold on the market recently with the same or similar assets are assessed based on the price of assets, sale of assets by comparing the difference between assets are assessed on the sale of asset price correction, be evaluated to determine the value of the assets of the method. From the definition, application of market approach requires a fully developed, the road producing active trading market similar to the frequent road property transaction, the transaction price to obtain, but China's socialist market economy and a late start, the road capacity as a national critical infrastructure, their plans and policy that it does not have a market-oriented, so the market value method does not apply to the assessment of road property.

**The replacement cost method:** Replacement cost method is being evaluated by the current replacement cost of assets reduced its losses to determine the value of the assets being evaluated methods.

The so-called replacement cost is the purchase under the existing conditions, re-construction of a new currency

assets to pay all of the total replacement cost method as more fully into account the loss of assets, so that assessment tends to be more equitable, but also conducive to individual assets and asset assessment for a particular purpose, so the replacement cost method is suitable for road property assessment.

**The use of replacement cost method to determine the value of road property:**

**Formula:** According to the definition of replacement cost method, the basic formula can be expressed as:

Be assessed road property assessment value =  
replacement cost-substantial devaluation-  
Functional depreciation - economic depreciation  
Of which:

- Substantial devaluation of the road property into use, the use of wear and the role of natural forces to continue to lower the physical properties caused by the gradual reduction of the value;
- Functional depreciation is due to highway design, construction promotion and application of new technologies to make existing road capacity and general community to promote production and use of the road compared to significantly behind in technology, performance degradation caused by the reduction in value;
- Economic depreciation is due to factors other than road capacity (political factors, macro-policy factors) caused changes in the value of reducing road property

Due to the depreciation of the current concept is still theoretical, difficult to quantify specific parameters, the actual work was calculated using the following formula to determine the assessment to be assessed road property value:

Replacement costs are assessed valuation of assets =  
ratio  $\times$  consolidated into a new rate

**Determination of replacement cost:** Replacement cost of the replacement cost can be divided into recovery and update the replacement cost.

Recover the replacement cost is the same way the use of products with the same material, construction or manufacturing standards, design, form and technology, the present price of the acquisition and construction of the new road rehabilitation expenditures incurred in production; update the replacement cost is use of new materials, and according to modern standards, design and format to the current price of production or construction of new road has the same function the cost of production, due to road construction in the new materials, new designs continue to be used, so the choice Reset should

choose to update the cost of the replacement cost. Road, generally the replacement cost of pre-production costs, total cost, other costs, capital costs of four parts.

Pre-construction costs represent the cost of the preparatory work, including feasibility study costs, design fees, land-use right acquisition fees, calculated according to the specific country to take into account the relevant provisions of highway construction.

According to the definition of replacement cost method, the basic formula can be expressed as:

The total cost, other costs that occur during the construction cost, concrete construction estimates obtained by calculating the amount, issued by the Ministry of Transportation and Communications "highway capital projects budget, budgeting," "Highway project budget fixed "and the provinces of the supplementary regulations issued calculable. Which works according to the following method of calculating the amount to take:

- **Re-budgeting method:** According to construction design, site survey and calculation of quantities of data. This method of precision strike in the works, but the larger workload.
- **Accounts adjustment act:** According to the accounts of the project the original project amount determined by adjusting the quantities. Adjustment accounts for the major attention to the integrity of the original, and because of design changes, construction errors caused by the unreasonable quantities removed. This method works to strike a relatively accurate, but the original budget of the project to be more complete.
- **Similar projects adjustment act:** Accordance with section size to be estimated road property, flat shape, the vertical alignment of the road property similar accounts of quantities, detailed differences determined by adjusting production quantities to be estimated road. This method is simple but less accurate.

Pre-construction costs represent the cost of the preparatory work, including feasibility study costs, design fees, land-use right acquisition fees, calculated according to the specific country to take into account the relevant provisions of highway construction.

Construction of the cost of capital for the normal working capital financing during the occupation of cost or opportunity cost of funds, by funding investment of time and the corresponding interest rate loans from financial institutions, is calculated as:

Cost of capital = (upfront fee+total cost  
+ other expenses)  $\times$  interest rate  $\times$  period

**To determine integrated into a new rate:** To determine the integrated into a new rate uses "life law" and "on-site inspection scoring assessment method" measurement.

**Determined by age into a new rate:** Identified according to site quality, design life, the actual construction quality, condition and repair and maintenance of the existing situation, identify the components of road remaining useful life, combined with the useful life has been designed into a new life to determine the rate; the components according to relative weight to determine the rate of the whole into a new road. The formula is:

$$\text{The entire road into a new rate} = \sum \text{various components integrated into a new rate} \times \text{weight of each component}$$

Weight of the components of which the various components of the budget by the value and importance. Evaluation by site inspection scoring method into a new rate.

Reference issued by the Ministry of Communications in 2004, "Highway Engineering Quality Inspection and Evaluation Standards" (JTG F80-2004), based on road property the actual quality of the various components of the situation, be quantified as a certain number of scores (standard scores of each component and for 100), and then with the corresponding weight coefficients obtained by multiplying the components into a new score; summary of the various components into a new score, and thus determine the production section of road into a new score. The formula is:

$$\text{The whole road property into a new score} = \sum \text{various components into a new score} \times \text{weight of each component the components which determine the weight coefficient method with the same period}$$

**Integrated into a new rate:** Rate is integrated into a new life into a new method of scoring rate, and site investigation into a new evaluation method for calculating the rate of the synthesized into a new rate formula is:

$$\text{Integrated into a new rate} = \text{rate assessed by on-site investigation into a new method to calculate the weight coefficient of} + \text{rate} \times \text{number of years calculated at the rate of} \times \text{into a new weight coefficient.}$$

In which the actual situation of the weight coefficients can be determined, usually on-site investigation into the scoring assessment method to calculate the weight coefficients of the new rate of 60%;

Table 1: Total cost of highway management

A. Total cost of which:	970,863,867 Yuan
Subgrade	360,359,460 Yuan
Road	389,393,124 Yuan
Bridge culvert	98,842,023 Yuan
Other works and facilities along the line	37,230,726 Yuan
Temporary work	4,600,371 Yuan
Construction and equipment costs	21,050,382 Yuan
Planned profit	28,067,175 Yuan
Tax	31,320,606 Yuan
B. Other expenses	24,864,000 Yuan

Table 2: Weight of the various components of the table

Project	Subgrade	Pavement	Bridge	Ancillary facilities
Weight	0.4068	0.4396	0.1116	0.0420

life into a new method to calculate the weight coefficient of the rate of 40%

### EXAMPLE OF ASSESSMENT OF THE VALUE OF A ROAD PROPERTY

**About road property state (abbreviated):**

**Replacement cost of the strike:** Replacement cost = upfront fee+ Total cost + Other expenses + Capital costs

**Upfront cost:** Pre-feasibility study costs, including fees, survey and design fees, land, young crops and other compensation and resettlement fees, according to the relevant provisions of highway construction and the actual cost of 113,635,620 Yuan prior period.

Where, a feasibility study fee: RMB 1,243,200. Survey and design fees: 16,146,000 Yuan Land, young crops and other compensation and resettlement fees: 96,246,420 Yuan.

**The total cost, other costs:** Adjustment Act through the accounts, the original budget of the project due to design changes in the quantities and construction errors caused by unreasonable quantities removed, according to the adjusted quantities issued by the Ministry of Transportation and Communications "highway capital projects budget, budgeting", " Highway project budget fixed" under the current fixed cost of standards and the various provinces and cities under the Supplementary Regulations issued calculable: Table 1-4 show the budget of the highway management.

**The cost of capital:** Take 2.5 years as a reasonable duration of the section of road to financial institutions in the assessment of the three-year benchmark lending rate at 6.03% as interest rate. In terms of total investment upfront cost for the calculation base, take the entire duration of the interest period; total cost, other costs are based on half of the total investment amount for the calculation of the base, take the entire duration of the interest period.

Table 3: Life table method into a new rate

Content	Design life	Have been useful life	Into a new rate calculated by the formula (%)	Weight	Into a new rate of weigh (%)
Subgrade	30	11	63.33	0.4068	25.76
Pavement	15	2	86.67	0.4396	38.10
Bridge	30	11	63.33	0.1116	7.07
Ancillary facilities	15	2	86.67	0.0420	3.64
Total				1	74.57

Table 4: Site into a new rate of scoring table

Content/projects	Subgrade	Pavement	Bridge	Ancillary facilities	Total
Live scoring	85	95	85	80	
Weight	0.4068	0.4396	0.1116	0.042	1
Weight score	34.58	41.76	9.49	3.36	89.19

Cost of capital = (upfront fee + total cost + other expenses) × interest rate × period  
 = 113,635,620 × 6.03% × 2.5 + (970,863,867 + 24,864,000) × 6.03% × 2.5 × 0.5  
 = 92,183,557.7 million  
 Rounded: 92,183,558 Yuan

$$= 74.57\% \times 60\% + 89.19\% \times 40\% = 80.42\%$$

**Integrated into a new rate of assessment of the value:**

Assessment of the value = replacement cost × consolidated into a new rate  
 = 1,201,547,045 × 80.42% = 966,284,133.59 Yuan  
 Rounded up to: 966,284,134 Yuan.

**Determination of replacement cost:**

Replacement cost = upfront fee + total cost + other expenses + capital costs  
 = 113,635,620 + 24,864,000 + 92,183,558 + 970,863,867 = 1,201,547,045 Yuan

**CONCLUSION**

This study aims to show the assessment for highway physical assets. According to the highway construction and development needs for the scientific value of physical assets to determine road, this valuation of physical assets on the road three basic ways: income approach, market approach, replacement cost analysis and comparison method was fully discussed Their real meaning and application of limitations, combined with the value of physical assets highway characteristics derived replacement cost method for valuation of physical assets Highway conclusions; and further to the replacement cost of the basic principles and application of a comprehensive exposition With specific evaluation example, how to apply the replacement cost of physical assets on the highway, made a detailed description of valuation for physical assets into a new rate of road to determine the characteristics of the more complex process, first proposed by highway components of physical assets. The importance of project cost and combined into a new consolidated to determine the rate of new ideas for the industry study.

**Integrated into a new rate:** According to the value of the various components of highway in the proportion of the total cost of the weight coefficient determined as follows:

**Determined by age into a new rate:** Rates of the various components into a new = Design life-Have been useful life/ Design life×100%.

The entire road into a new rate =  $\sum$  various components into a new rate × the weight coefficient of each component.

**Determined by on-site investigation into the new scoring rate:** Reference issued by the Ministry of Communications in 2004, "Highway Engineering Quality Inspection and Evaluation Standards"(JTG F80-2004), based on the actual road part of the quality of the state, to quantify a certain number of scores (standard scores of each component and for the 100) And then with the corresponding weight coefficients obtained by multiplying the components into a new score, and a summary of the various components into a new score to determine the section of road into a new rate. The calculation below:

**Integrated into a new rate:**

Integrated into a new rate = rate assessed by on-site investigation into a new method to calculate the weight coefficient of + rate × number of years calculated at the rate of × into a new weight coefficient

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