# The Application of Hypothetical Development Method in the Value Assessment of Sea Areas Uses Rights: a Case Study of the Sea Use for Tourism Infrastructure

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**Abstract:** Marine spatial resources are the important guarantee for China to achieve sustainable development. With the accelerated reform of China's resource management system, the state has adopted economic instruments to strengthen the management of marine resources, and the market-oriented allocation of China's marine resources has been the dominant way. Moreover, the basis of the implementation of market-based allocation of sea area is the accurate assessment of the price of the right to use sea area. Among the numerous evaluation methods, the hypothetical development method is very suitable for the current situation of sea area use right evaluation. In this study, the entertainment sea area in D city is taken as an example, and the sea area price is calculated in detail by using the hypothetical development method. The value of this sea area is 75.91% higher than the sea area price calculated by the fee standard issued by the government. By analyzing the calculation process and results, this paper further discusses the application and limitations of the hypothetical development method in the field of sea area price is calculated by the fee standard issued by the government.

## 1. Introduction

Marine resource is a spatial resource and an important guarantee for China to achieve sustainable development. However, with the growth of coastal economy, problems such as rough exploitation of marine resources and excessive scale of reclamation have become increasingly prominent, leading to the destruction of marine resources and environment. With the accelerated reform of China's resource management system, the state has adopted economic instruments to strengthen the management of marine resources, and the market-oriented allocation of China's marine resources has been increasing <sup>[1]</sup>. At the national level, a series of policy documents have been issued to clarify the "comprehensive implementation of the auction of sea area servitude, and improve the market-based allocation". At the local level, the main coastal provinces have promulgated the management measures for the bidding, auction of the right of using sea area to regulate such behaviors <sup>[2]</sup>. It can be seen that the market-based allocation of sea area has gradually become the main way of sea area transfer; and the basis of the implementation of market-based allocation of sea area has gradually become the main way of sea area transfer; and the price of the right to use sea area.

Among the many methods of evaluating the price of sea area servitude, the hypothetical development method is the most widely used. This method has been used by the domestic and foreign appraisal industry to assess the value of unfinished or undeveloped real estate and land use rights for a long time, and has accumulated rich lessons and rich practical experience. The hypothetical development method applies the principle of most efficient use to calculate the value by assuming that the developing and undeveloped sea area is in a "completed state", which is very suitable for the current state of the sea area before the market transfer, and has become the most common appraisal method in the field of the right to use sea area.

This study selects the sea for tourism infrastructure in city D as an example and uses the hypothetical development method to calculate the price of this parcel sea; through the analysis of the measurement process and results, the application and limitations of the hypothetical development method in the field of sea area price assessment are discussed.

#### 2. Research Method

The hypothesis development method is a method to estimate the sea area price by value balance after deducting the expected normal development cost, profit and interest, etc., on the basis of the expected normal market price of the sea area project after the completion of development. The formula is as follows:

P=V-Z-I(1)

In the formula: P is the price of the sea area project on the evaluation base date; V is the price of the sea area project after the completion of development; Z is the development cost of the sea area project after the evaluation base date until the completion of development; I is the development profit.

## 2.1 Overview of the Sea Area to Be Assessed

Sea area S to be evaluated is located in city D, which is used for the construction of floating wharf for pleasure boats. The first type of sea use is for tourism and entertainment, and the second type is for tourism infrastructure. The sea is used to construct the sea for water permeation. Its parcel sea is 5.7993 hectares. The use period of the sea is 25 years. The degree of development of the sea is vacant, there are no sea facilities and other appurtenances, no preliminary work has been carried out, and there is no compensation for sea stakeholders.

## **2.2 Measuring Process**

#### 2.2.1 Price after Project Development is Completed (V)

The price of the completed development of the sea area is the price of the floating dock for the cruise ship of the S project, and it is assumed that this sea use is the best development method. The revenue method is used to determine the total price of the real estate after the development is completed. The sea use of the parcel sea in this project belongs to tourism and recreation sea use, and the sea use life is 25 years, and the construction period is 12 months, so the income generating life is set to 24 years.

1)Calculate annual net return (a<sub>i</sub>)

Annual net income = annual rental income - annual total expenses

(1) Calculate annual gross income  $(Y_i)$ 

After the project is completed, the profit model will be operated by collecting boat tickets. That is to say, in the form of collecting boat tickets, tourists will be brought to the sandbar in the middle of the sea for leisure and sightseeing. According to the communication with the competent authorities, the cruise terminal has the exclusive right to operate this sandbar. According to the design capacity calculation of the pier: the pier is designed with 6 berths, the route distance from the land boarding point is 2.5km, through the researcher site survey, the cruise ship round trip is about half an hour. A day according to the operating hours of 9:00-18:00, each boat set to carry 10 passengers, then a boat a day theoretical carrying tourists 180 people, then the maximum theoretical daily number of tourists received by the project is:  $180 \times 6 = 1080$ .

The better operating season for marine recreation is about April 1 to October 31, during which the typhoons and high winds affect an average of 15 times a year, and the number of days affected at a time is about 3 days, then excluding the number of days affected, the number of days available for operation is about 166 days a year. Then the maximum theoretical number of visitors to the project can reach 180,000. Taking into account the number of domestic and foreign tourists received by City B in recent years and the carrying capacity of the project, the evaluators set the number of visitors at the initial stage of the project to 100,000; after the operation of the project, the

number of visitors will maintain a high growth rate with the development of the project, and the annual growth rate is set at 5.8%; from the 6th to 10th years, the number of visitors will continue to increase year by year, but the growth rate will decrease and is set at 2.9%; In years 11 to 15, the growth rate is set at 1.45%, and in years 16 to 25, the growth rate is set at a stable 0.725%.

After the operation of the project, the fee is set at 80 RMB per person per trip. However, as the project operates and the social environment changes, the fee rate will continue to change. In this paper, the admission price is set to be adjusted to 100 RMB per person per visit in years 6 to 10; Ticket price for years 11 to 15 will be adjusted to 130; For years 16 to 25, the ticket price will be adjusted to RMB 160 per person.

The annual income during the operation period of the project can be calculated by multiplying the ticket price by the number of tourists received each year.

(2) Calculate the total annual cost  $(C_i)$ 

Total annual costs include management fees, energy, water and electricity operating costs, marketing costs, finance costs and taxes.

Management expenses are the costs of necessary management of the cruise terminal. They include property costs, corporate office costs, business execution costs, etc. Based on the results of the evaluators' research on similar projects, the annual management expenses are calculated here at 5% of the total annual revenue.

Energy and water power operating costs namely water, electricity, natural gas, fuel and other costs and labor wages, general maintenance and upkeep costs, daily repair costs, business execution costs. This project mainly uses cruise ship to pick up and send tourists. This is calculated at 35% of gross income.

Marketing expenses include expenses for advertising and promotion of sales, commissioned marketing agency fees, marketing incentive fees, etc. Here, the annual marketing expenses are calculated at 5% of the total annual revenue.

The financial cost is the cost of capital employed during the operation of the project. The profit margin set in this study is set as own capital (no interest due to loans); i.e., the profit margin is actually the sum of interest and net profit after deducting interest. Therefore, to avoid double counting, the interest (finance costs) is set to zero here, and the actual interest is considered together in the profit calculation process.

Tax refers to the relevant taxes and fees paid to the tax authorities according to the regulations. The main consideration here is VAT, and all kinds of additional taxes, etc. Value-added tax has been implemented since May 1, 2016. Considering this project as a general taxpayer, the VAT rate is 6%. At the same time, considering other taxes, the comprehensive tax burden is set at 6.723%.

The total annual cost can be calculated by adding up the above expenses.

(3) Calculate the annual profit of the operator  $(I_i)$ 

The operator profit, generally based on the total revenue of the sea area, is calculated based on the return on investment in the sea area determined by the type of sea area use, the development cycle and the socio-economic conditions of the place where it is located. Referring to the *Enterprise Performance Evaluation Criteria Value* (2019 edition)<sup>[6]</sup>, and combining the average value of tourism business profit as well as the development cycle and the results of field consultation and research by the appraisers, 4.2% was used as the annual operator profit of the sea area under assessment.

(4) Calculate the annual net return  $(a_i)$ 

The annual return can be obtained by subtracting total expenses and operator profit from total revenue. See Table 1 for details.

YR	Revenue	Cost	Profit	Earning	After	YR	Revenue	Cost	Profit	Earning	After
					reduction						reduction
1	0.00	0.00	0.00	0.00	0.00	14	1881.42	973.13	79.02	829.27	351.03
2	800.00	413.78	33.60	352.62	320.49	15	2349.17	1215.06	98.67	1035.44	411.27
3	846.40	437.78	35.55	373.07	318.16	16	2366.20	1223.87	99.38	1042.95	388.69

4	895.49	463.17	37.61	394.71	315.85	17	2383.35	1232.74	100.10	1050.51	367.36
5	947.43	490.04	39.79	417.60	313.55	18	2400.63	1241.68	100.83	1058.13	347.19
6	1218.63	630.31	51.18	537.14	378.43	19	2418.04	1250.68	101.56	1065.80	328.13
7	1253.97	648.59	52.67	552.71	365.38	20	2435.57	1259.75	102.29	1073.53	310.12
8	1290.34	667.40	54.19	568.74	352.78	21	2453.23	1268.88	103.04	1081.31	293.10
9	1327.76	686.76	55.77	585.24	340.61	22	2471.01	1278.08	103.78	1089.15	277.01
10	1366.26	706.67	57.38	602.21	328.87	23	2488.93	1287.35	104.53	1097.04	261.81
11	1801.89	931.99	75.68	794.22	406.97	24	2506.97	1296.68	105.29	1105.00	247.43
12	1828.02	945.51	76.78	805.74	387.40	25	2525.15	1306.08	106.06	1113.01	233.85
13	1854.53	959.22	77.89	817.42	368.77						

2) Determined rate of reduction  $(r_1)$ 

The maritime reversion rate is the rate used to reduce the net income of the maritime area to the price of the maritime area. In this evaluation, the sum of the safe interest rate plus the risk-adjusted value is used for calculation. Safe interest rate: The average of the latest three-year time deposit rate (2.75%) and three-year treasury bill rate (4%), i.e. 3.375%. Risk adjustment value: Based on the comprehensive analysis of the use of the valuation object, the economic development of City D, the current situation and policies of the tourism industry development and the natural environment conditions, the appraisers scored the risk value of the sea use project and took the risk adjustment value as 3.2%. Then the reversionary interest rate is determined:  $r_1=6.575\%$ .

3) Calculate the price after the development of the sea area (V)

On the basis of 6.575% reversionary interest rate and according to the principle of dynamic hypothesis development method, operating income is set to continue to flow every year, and the reduction time of income in the second year is 1.5 years, and so on. The total price after sea area development is obtained by adding the annual net income after reduction in each year: V = 80,425,180,000 Yuan.

#### **2.2.2 Cost of Development (Z)**

The development cost includes sea area acquisition fee, sea area compensation fee, project cost and development interest.

Maritime Acquisition Fee. Sea area S has not set the right to use the sea area, and the acquisition fee mainly takes into account the preliminary fees of relevant professional acquisition of the sea area, including Marine environmental assessment, sea area demonstration, geological exploration, navigation safety demonstration and other contents. The estimation of each professional preliminary work fee is determined on the basis of the corresponding fee standard. The final estimated result is set at 500,000 yuan. Maritime compensation fees. Sea area S is vacant and there are no sea facilities and other appurtenances, and there is no compensation for sea area stakeholders. Therefore, the sea area compensation fee is set to 0. Engineering cost is the cost of construction of the project. According to the Project Engineering Feasibility Study Report, the total engineering cost is 71.5 million RMB. Financial cost is the cost of capital occupation during the construction period of the project. As mentioned above, this paper is set with own capital (there is no interest due to loans). The actual interest is considered together in the profit calculation process. Adding up the acquisition fee, sea area compensation fee, engineering cost and financial cost, we can get the total development cost: Z = 50+0+7150+0=72 million yuan.

## 2.2.3 Development Profit (I)

The project development profit is calculated based on the price (V) after the sea area development, and the sea area investment rate of return determined comprehensively according to the type of sea area use, development cycle and social and economic conditions of the place. The parcel sea of this project is located in city D, which is used for tourism and entertainment. Combined with the average operating profit margin and development cycle of the tourism industry, 7.2% is taken as the overall development profit of the sea area by referring to the average operating profit margin of tourism enterprises in the Enterprise Performance Evaluation Standard Value (2019 Edition) <sup>[6]</sup>.I=5.184 million yuan.

#### 2.2.4 Price of Sea Area (P)

The price of the appraised sea area can be obtained by deducting the cost of investment and objective development profit after the development of the sea area is completed: P=V-Z-I=2.9585 million yuan.

#### 3. Results and Discussion

Based on the hypothesis development method, this paper evaluates the sea use for the amusement park of S project in D city (the type of sea use is tourism infrastructure; the area of the sea area is 5.7993 hectares; the use period of the sea area is 25 years) the sea price is 2.9585 million yuan. According to the latest sea use fee levy standard issued by the Ministry of Finance and the State Oceanic Administration<sup>[7]</sup>, the grade of sea area in the area where the S project is located is 6, and the corresponding sea use fee standard for the sea use of permeable structures is RMB 11,600 /ha-yr, so the base sea use fee calculated according to the sea use fee standard is RMB 1.681797 million (according to the actual management situation of the Marine administrative department, it is not necessary to consider discount when the annual sea area use fee is set to be changed to one-time collection). The price of the sea area calculated by the hypothetical development method in this paper is 75.91% higher than the price of the sea area calculated by the sea area royalty standard.

From the whole calculation process, the final evaluation result of the sea area is mainly influenced by the price after the development of the sea area is completed and the development cost of the sea area. The price and development cost of the completed sea area need to be judged based on the projects to be built in the sea area. In this paper, for example, the price after the development of the sea area is directly influenced by the fee model after the completion of the project; the development cost of the sea area is directly influenced by the construction process, the type of facilities and the number of facilities. Due to the professional and special nature of the water playground design, the type of tourism infrastructure needs to be judged in the evaluation process based on the relevant engineering design report. This reflects the three limitations of the hypothetical development method in the current field of sea area price assessment. They are as follows.

(1) In the context of market-based transfer of sea area use rights, the hypothetical development method has a certain "intentionality". In actual operation, the price assessment of sea area use right is mainly applied to the market transfer of sea area use right, and the assessment result is used as the reserve price for bidding, auction and listing. For the market-based transfer of the right to use the sea, in the strict sense, the bid owner of the sea area is not clear, the use of the sea area program and construction content is also not clear, different intention to use the sea will exist different specific engineering program design of the use of the sea<sup>[2]</sup>. The application of the hypothetical development method needs to first clarify the object and utilization mode of the sea area to be estimated after the development is completed (in the case of this paper, it corresponds to the type of tourism infrastructure and construction process, etc.); due to the complexity of the development and utilization of the sea area, it is difficult to frame the utilization mode of the non-reclaimed project like land development setting the greening rate and volume ratio, etc., so we can only use The Project Feasibility Study report of the pre-intended unit Assumptions about the value of the completed development of the sea. This undoubtedly has a certain "intentionality".

(2) The most effective use principle is applied to calculate the value in the hypothetical development method, but it is difficult to achieve objectively in the sea area valuation. The hypothetical development method maximizes the value of real estate to be built in the valuation sea area in the future under the principle of legal and most efficient use, but in practice, it is difficult to judge which planning scheme is the most efficient use due to the complexity of sea area development and use [8]. Taking the case of this paper as an example, it is difficult for the appraiser to define how to lay out the tourism infrastructure in the construction process as the optimal way. In practice, it can only be judged according to the design plan of the preliminary intention unit, which also leads to the problem of "intentionality" mentioned in the previous limitation.

(3) After the completion of the project development, the charging mode will directly affect the value of the sea area after development. In this case, the setting of an entrance fee has a direct impact on the value of the sea area. However, due to the lack of the same type of operation model, the charging standard can only rely on the experience of the appraiser.

## 4. Conclusion

The evaluation of the price of the right to use sea areas is the basis for the implementation of the marketization allocation of sea areas. The evaluation results serve as the base price for the marketization transfer of the right to use sea areas, and are the positive revision of the standard for the fee of using sea areas. In the case of this paper, the sea area price calculated by the hypothesized development method is 75.91% higher than the sea area price calculated by the gold standard. This, to some extent, improves the efficiency of maritime space utilization and guarantees the benefits of state-owned resources, which is an important guarantee for China's sustainable development. At the same time, Marine price evaluation can monetize the ecological attributes of Marine resources, which is an important practice for realizing the value of ecological products.

The theory of the hypothetical development method is mature, and the hypothetical development method can be well applied to the price appraisal of sea areas in practice, and has become the most commonly used appraisal method in the field of appraisal of sea area use rights, and should also be used as the optimal choice of method in the appraisal work of the price of sea area use rights. However, because the value of the appraisal object is mainly determined by its value component factors and value influencing factors, the appraisal of different appraisal objects, even under the same appraisal base date and appraisal purpose, the appraisal conclusions derived from the same appraisal method may not be the same. Therefore, attention needs to be paid to distinguishing the characteristics of specific objects in the appraisal process. In addition, considering the complexity of sea area development and utilization, the hypothetical development method is often applied with reference to the Project Feasibility Study Report of the pre-intentional unit to assume the value of the completed sea area development as well as to calculate the development cost. In a strict sense, this approach does not fully adapt to the requirements of market-oriented configuration. This requires Marine administrative departments to make a breakthrough in the system and further improve the marketization allocation system and related technical norms.

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