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# *Measurement of Marine Resources and Environmental Damping Effect and Spatial Differences in the Bohai Rim Region*

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***Abstract:*** In the Bohai Rim region, resources and environment are the important material basis for the survival and improvement of human society, and the basic marine environment and marine resources have always been the research hotspot. The purpose of this paper is to measure the damping effect and analyze the spatial differences of the marine resources and environmental conditions in the Bohai Rim region. In the experiment, according to the situation of marine resources and environment in the Bohai Sea, comprehensively collected data, combined with the actual situation of the coastal areas around the Bohai Sea and the characteristics of current economic and social improvement, the evaluation index of marine resources and environmental carrying capacity was constructed from the aspects of marine resources and environment. The system is used to determine the evaluation index of marine resources and environmental carrying capacity, so as to analyze the damping value measurement and calculate the damping value.

## 1. Introduction

The Bohai Rim region is centered on the Beijing-Tianjin-Hebei region. This region is an important comprehensive improvement zone in China's economic improvement, and is composed of the Beijing-Tianjin-Hebei strategic cooperation zone centered on Beijing, the Shandong Peninsula urban agglomeration and the Liaodong Peninsula urban agglomeration [1]. At present, through the orderly implementation of economic cooperation and resource sharing, it is not only an important support point to promote my country's sustainable improvement, but also an important transportation fortress in China. The Bohai Rim region also plays an important role in my country's foreign trade, not only for the country to achieve trade Income generation is also continuously improving my country's competitiveness in the field of import and export.

The Bohai Rim region is the center of the country's economic and social improvement. It consists of the Beijing-Tianjin-Hebei strategic cooperation zone centered on Beijing, the Shandong

Peninsula urban agglomeration and the Liaodong Peninsula urban agglomeration. Antunes D S shows in this study that complex eigenvalue analysis is used to predict squeal noise production from commercial drum brakes. By analyzing the model using complex eigenvalues, the Rayleigh damping property is added to computer simulations on ANSYS, and its implications and suggested calculations are discussed. The Rayleigh damping coefficients (α and β) were obtained from shock tests performed in commercial drum brakes. Three different damping level cases were simulated: (a) no damping condition, (b) damped - 0 bar, and (c) damped - 2 bar. Experimental test results show that, under damped conditions, increasing the brake pressure from 0 to 2 bar causes the resonant frequency to shift to higher values and increases the damping response of the drum brake system. The results of the complex eigenvalue analysis show that a large number of vibration modes appear in a narrow frequency range. This means that drum brakes are prone to modal coupling, which can lead to noise. The first model simulated by complex eigenvalue analysis (the undamped case) showed five instabilities [2]. Najar F investigated the nonlinear dynamic response of a device consisting of two electrically coupled cantilever beams. The microbeam vibrations triggered by electrical actuation cause the air flow to redistribute in the gaps separating them and create a damping effect known as squeeze film damping. This nonlinear dissipation mechanism is prominent when microstructures are packaged and manipulated at high air pressure. We propose different modeling approaches to analyze the effect of squeeze film damping on the dynamic behavior of the microsystem. Firstly, a nonlinear multiphysics model of the device is established, and the structural and fluid domains are discretized using Galerkin decomposition and differential quadrature methods, respectively. Another modeling method based on nonlinear analytical expressions to approximate the squeeze film damping force was also considered [3]. The analysis of marine resources and environmental carrying capacity combined with damping effect is more representative.

According to the general situation of the Bohai Rim region, this paper analyzes the current situation of the resources and environment in the Bohai Rim region, and finds the marine resources and environment problems in the Bohai Rim region. In the experiment, according to the situation of marine resources and environment in the Bohai Sea, comprehensively collected data, combined with the actual situation of the coastal areas around the Bohai Sea and the characteristics of current economic and social improvement, the evaluation index of marine resources and environmental carrying capacity was constructed from the aspects of marine resources and environment. The system is used to determine the evaluation index of marine resources and environmental carrying capacity, so as to analyze the damping value measurement and calculate the damping value.

## 2. Research on the Measurement of Marine Resources and Environmental Damping Effect and Spatial Differences in the Bohai Rim Region

### 2.1. Overview of the Bohai Rim Region

Taking the Bohai Rim region as the center, it spreads to the northeast, northwest and north China on three sides to the north and southwest. The Bohai Strait, which has a very important geographical location, is located in the east and joins the Pacific Ocean, and the west connects the northwest region with rich resources. The Eurasian Continental Bridge is a bridge connecting with Central Asia and Europe, with the vast northeast region in the north, the east China region in the southeast, and the central and southern regions in the southwest, and its strategic position is very important [4-5].

### 2.2. Analysis of the Current Situation of Resources and Environment in the Bohai Rim Region

The Bohai Rim region is rich in natural resources, its grain and aquatic product output ranks

among the top in the country, and it also has abundant energy reserves and mineral reserves. With a water area of one square kilometer, its marine resources are rich and diverse, ranking among the top in the country [6-7]. Several large and medium-sized oilfields led by Shengli Oilfield make the Bohai Rim region the largest energy output in the country, and its oil reserves are as much as 600 million tons, providing high-quality material reserves for its economic production and social improvement. Mineral resources are extremely rich. The largest open-pit coal mine in my country is located in Liaoning Province, and there are many high-quality coal mines in Hebei Province and Shandong Province. The iron ore reserves in Liaoning Province also rank first in the country, and Hebei Province also has many large iron mining areas. Its output of non-ferrous metals also ranks in the forefront of the country; Shandong Province is rich in rare metal output, providing abundant reserves for the Bohai Rim region[8-9].

### 2.3. Marine Resources and Environmental Problems in the Bohai Rim Region

The Bohai Rim region has serious resource and environmental problems, mainly marine pollution and industrial pollution[10-11]. In the economic and social improvement of the Bohai Rim region, people's understanding of marine resources is not rich enough, and the rich resources contained in the ocean have not been reasonably utilized, resulting in a lot of waste, breaking the ecological balance of the Bohai Rim, and causing the loss of many precious marine resources. Therefore, the problems of resource allocation and ecological damage in this region emerge in an endless stream[12-13]: First, the ocean is also a carrier of resources with vitality. The extent of improvement and damage has reached the bottom line that the marine environment can bear, and a large number of uncontrolled fishing has led to the depletion of fishery resources [14-15]. Second, the infinite exploitation of human beings has caused frequent outbreaks of various disasters in the Bohai Sea, among which the red tide is the most serious. A large number of pollutants are continuously discharged into the Bohai Sea, making the fragile Bohai Rim region unable to withstand such a heavy burden, forming the eutrophication of seawater and forming the necessary conditions for the occurrence of red tides, and the impact of red tides is very important [16]. Third, although human beings have a strong dependence on the resources of the Bohai Rim region, a more reasonable policy system has not been formed during the improvement process, that is, "just use it and leave it alone". Contradictory, and difficult to resolve in the short term [17-18].

## 3. Investigation and Research on Marine Resources, Environmental Damping Effect Measurement and Spatial Differences in the Bohai Rim Region

### 3.1. Research Ideas

According to the situation of marine resources and environment in the Bohai Sea, comprehensively collect data, combined with the actual situation of the coastal areas around the Bohai Sea and the characteristics of current economic and social improvement, an evaluation index system for marine resources and environmental carrying capacity is constructed from the aspects of marine resources and environment to determine The evaluation index of marine resources and environmental carrying capacity, so as to analyze the damping value measurement and calculate the damping value.

### 3.2. Research Methods

The total "growth damping" in marine economic growth is equal to the sum of the damping effects of resources and the environment on economic growth. This assumption includes two

situations: First, in the long run, it is assumed that the total environmental holding capacity owned by a unit of labor always remains If the total amount of resources and resource carrying capacity remain unchanged, the damping value of resources to marine economic growth can be obtained, that is, the difference between the growth rate of unit labor output when marine resources are unrestricted and restricted. The formula is as follows :

$$Drag_R = \frac{(1-\alpha-\beta-\gamma)g}{1-\alpha} - \frac{(1-\alpha-\beta-\gamma)g-\beta n}{1-\alpha} = \frac{\beta n}{1-\alpha} \quad (1)$$

Second, from a long-term perspective, assuming that the total amount of resources owned by a unit of labor remains unchanged, the total environmental accommodation capacity and environmental carrying capacity remain stable in the long run, and the environment will dampen economic growth, that is, the marine environment is not restricted and the environment is affected by The difference between the growth rates of output per unit of labor under the constraints is as follows:

$$Drag_E = \frac{(1-\alpha-\beta-\gamma)g}{1-\alpha} - \frac{(1-\alpha-\beta-\gamma)g-\gamma n}{1-\alpha} = \frac{\gamma n}{1-\alpha} \quad (2)$$

## 4. Analysis and Research on Marine Resources, Environmental Damping Effect Measurement and Spatial Differences in the Bohai Rim Region

### 4.1. Evaluation Index of Marine Resources and Environmental Carrying Capacity

Selection of the evaluation index system of resource and environmental carrying capacity Resource carrying capacity means that the environment has a certain carrying limit. Combined with the actual situation of the coastal areas around the Bohai Sea and the characteristics of current economic and social improvement, the evaluation index system of marine resources and environmental carrying capacity is constructed from the aspects of marine resources and environment, as shown in Table 1 and Figure 1, Table 2 and Figure 2:

*Table 1. Resource carrying capacity index*

| Index layer (type) / unit | AHP weight | Projection direction |
|---|---|---|
| Marine fishing (benefit type) / ten million t | 0.0548 | 0.8452 |
| Total energy production output (benefit type) / ten million t standard coal | 0.1521 | 0.0522 |
| Per capita seawater product output (benefit type) / kg / person | 0.1254 | 0.2542 |
| Sea area per capita (benefit type) / km / person | 0.0412 | 0.0078 |
| Per capita coastline length (benefit type) / m / person | 0.1123 | 0.0512 |
| Industrial wastewater discharge (cost type) / million t | 0.1548 | 0.3214 |
| Industrial solid waste production volume (cost type) / ten million t | 0.7854 | 0.0524 |

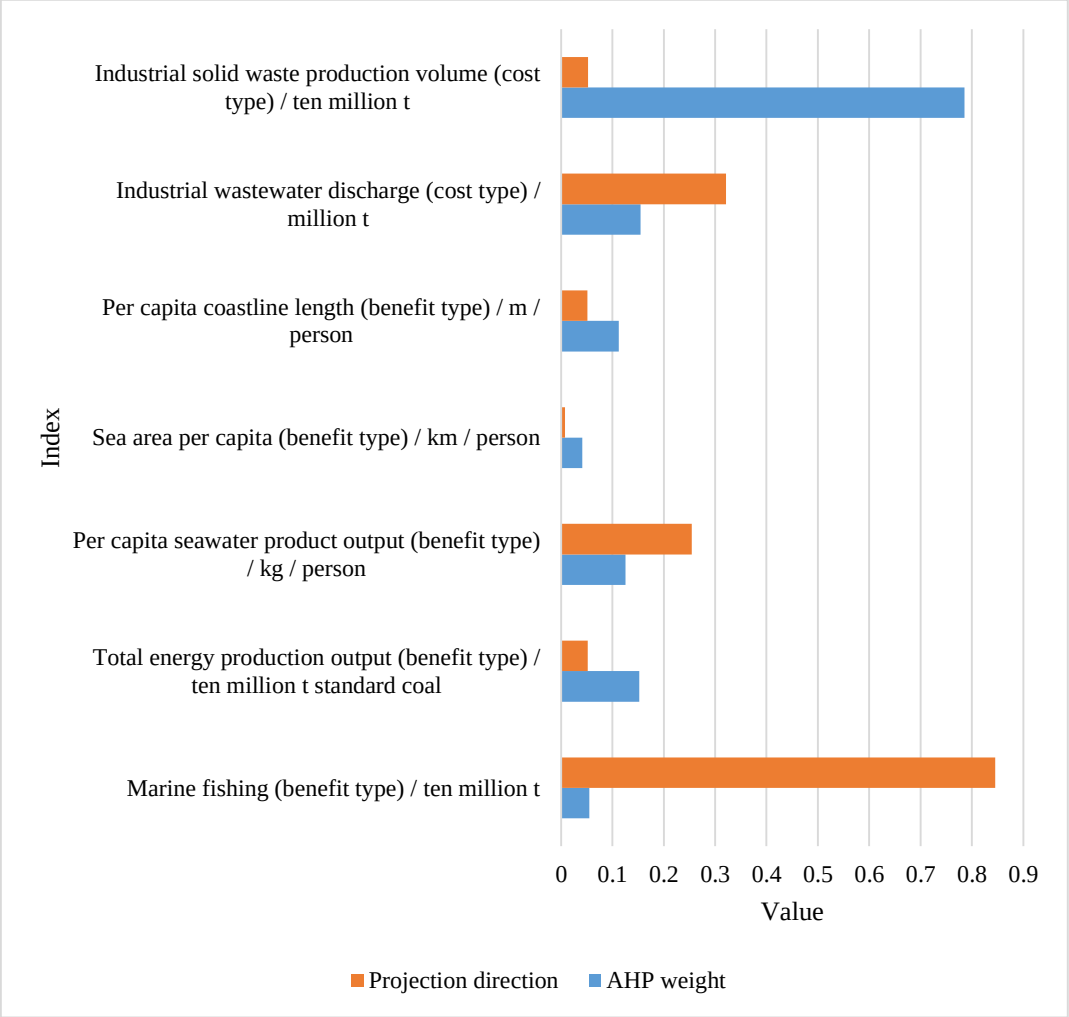


*Figure 1. Comparison diagram of the evaluation index system and the weight data*

*Table 2. Environmental bearing capacity index*

| Index layer (type) / unit | AHP weight | Projection direction |
|---|---|---|
| Outvalue of comprehensive utilization products (benefit type) / ten thousand yuan | 0.0254 | 0.0845 |
| Environmental carrying capacity of industrial wastewater discharge standard rate (benefit type) /% | 0.0896 | 0.8542 |
| Evaluation index of the comprehensive utilization rate of industrial solid waste (benefit type)% | 0.2512 | 0.0068 |
| Completed pollution control projects in coastal areas (benefit type) / unit | 0.0684 | 0.0758 |
| Urban domestic sewage treatment rate (benefit type) /% | 0.0369 | 0.4512 |

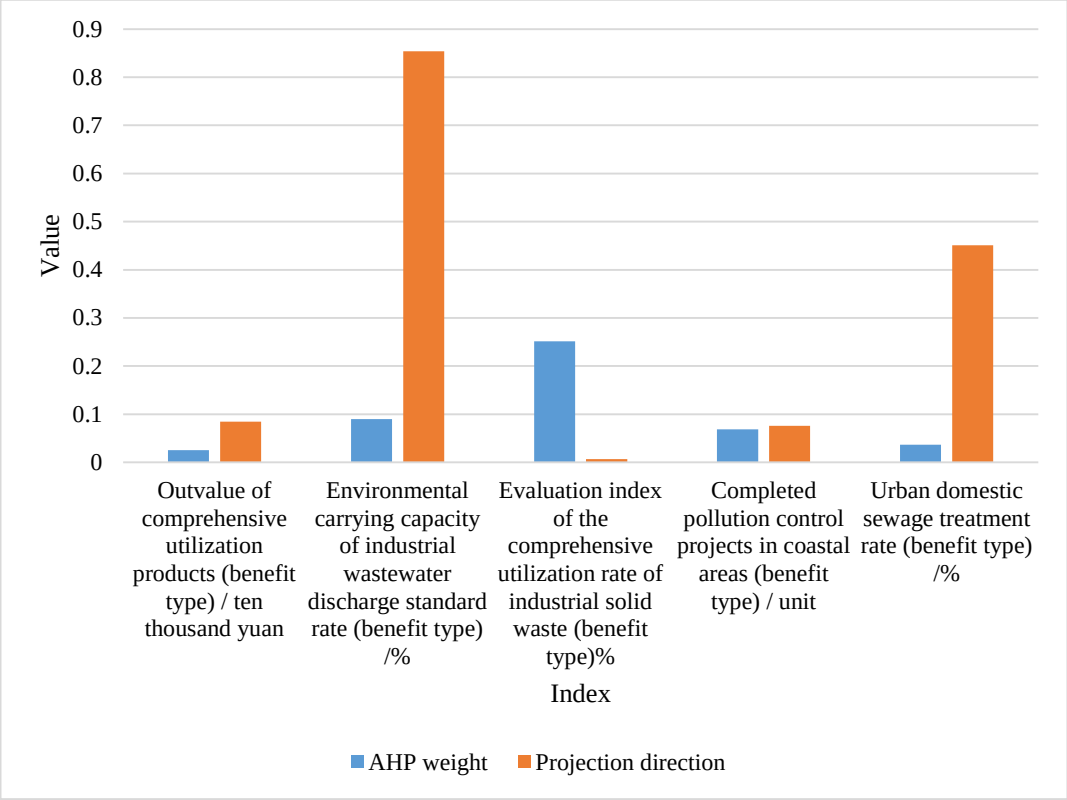


*Figure 2. Data comparison diagram*

## 4.2. Measurement Analysis of Damping Value

According to the calculation results, the calculation of damping value is carried out, and Eviews6.0 software is used in this paper for measurement analysis. Using SPSS17.0 hierarchical cluster analysis method, the urban damping results were clustered and divided into three categories, namely low constraint type (0<Drag<1.5%), high constraint type (1.5%<Drag<3%) and Strong constraint type (Drag>3%). In the table, "DragR" is the damping value of the resource bearing capacity; "DragE" is the damping value of the environmental bearing capacity. The damping effect measurement and results are shown in Table 3 and Figure 3:

*Table 3. The damping effect measure of marine resources and environment and classification result in the Bohai Sea Ring Area*

| City | DragR | DragE | Class |
|---|---|---|---|
| A | 0.095 | 0.147 | Low constraints |
| B | 0.362 | 0.698 | Low constraints |
| C | 1.364 | 1.621 | High constraints |
| D | 3.145 | 2.365 | Strong constraints |
| E | 1.365 | 1.652 | High constraints |

The results show that cities A and B belong to the type with low constraints on resources and environmental damping; cities C and E belong to the type with high constraints on resources and environmental damping; city D belongs to the type with strong constraints on resources and environmental damping.

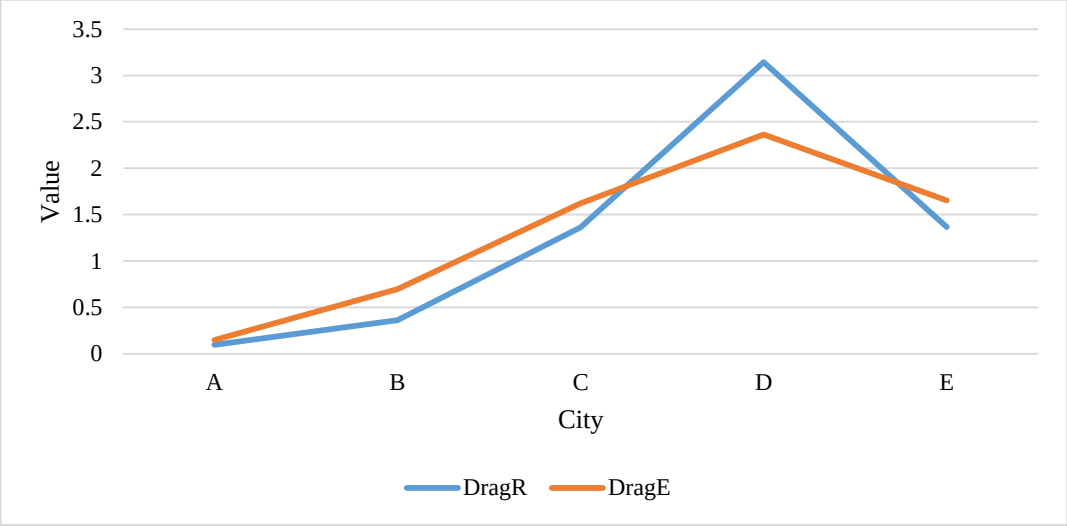


*Figure 3. Comparison diagram of the damping effect measure data*

## 5. Conclusion

As an important gathering place for national information, services and trade, the Bohai Rim region plays an important supporting role in my country's economic improvement. As the core area of national economic growth, it has its unique regional characteristics. Nowadays, the international economic center is constantly moving closer to the Asia-Pacific region. The Bohai Rim region has such a unique geographical advantage, which is conducive to domestic and overseas economic cooperation, and is more conducive to China's economic improvement and comprehensive national strength.

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## Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

## Conflict of Interest

The author states that this article has no conflict of interest.

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