

# Research on Coupling Mechanism of Land-Sea Coordination of the Development of Chinese Ocean Economy

Liu Yiyang<sup>1,\*</sup>, Zhang Xiaoli<sup>1</sup>

<sup>1</sup>Institute of Marine Science, Shanghai Ocean University, Shanghai, China, 201306

\*Corresponding Author: Liu Yiyang

**Keywords:** Land-Sea Coordination, Coupling Power, Coupling Mechanism, Coupling Patterns

**Abstract.** The strategy of land-sea coordination is significant to the development of Chinese economy and society as well as the realization of the “Sea Power”. From the perspectives of the two systems of land and sea, this paper analyses the coupling mechanism of land-sea coordination from three levels of coupling power, coupling mechanism and coupling patterns based on the theory of dissipative structure. This paper demonstrates the features of dissipative structure of land-sea coordination. This paper believes the coupling power derives from the communalism and mobility of land and sea industries and the potential differences of every subsystem. Coupling mechanism refers to the competition cooperation mechanism of subsystems of land and sea industries. Coupling patterns include the coupling of management system, major function oriented zoning, geographical unit, land and sea industries and population, resource and environment.

## Introduction

At present, the rational exploitation and utilization of marine resources have become an important way to solve the problem of global resource shortage, population expansion and environmental degradation. *The 13th Five-Year Plan for National Economic and Social Development* issued by Chinese government clearly put forward the concepts of "adhering to the land-sea coordination, expanding marine economy, scientifically developing the marine resources, protecting marine ecological environment, safeguarding China's maritime rights and interests and building marine power. This paper analyses the coupling mechanism of land-sea coordination, coordinate and balance the ocean and land two subsystem as the key of the implementation of land and sea overall strategy to achieve land economy healthy development.

The concept of "land-sea coordination" was firstly proposed by Chinese scholars. It is the focus of academic research in recent years in China. Aiming at the problems of land-sea coordination and this paper analyses the coupling mechanism of land-sea coordination from three levels of coupling power, coupling mechanism and coupling patterns and puts forward the corresponding countermeasure proposals. This paper stresses the joint and complementary mechanism as well as the elimination of the malignant competition between the land industries and the sea industries in China's coastal areas in order to achieve the objective of the perfect coupling of land and sea industries systems, that is to say, the overall coordinated and sustainable development of land and sea industries systems in China's coastal areas.

## Features of Dissipative Structure of Land-Sea Coordination

As the carrier of regional industrial economic development, the land-sea coordination system is a complex system, including a large number of factors. It is an open system, which exchange the material, energy and information between the external environments. Land-sea coordination is associated with the presence of all factors and land industry refers to the collection. From the analysis of regional trade and the era of economic globalization points of view, the development of land and marine industries cannot be isolated. Land and sea industries make use of both domestic and overseas resources and markets to promote the forward development of its land and marine industries systems through the regional division of labor.

Land-sea coordination system is a dynamic system. The state parameters such as the total output value of marine industries and land industries will change time and spaces. The development of marine industries subsystem and land industries subsystem are unbalanced. The land industry output value accounted for the marine industry output value of the proportion is always larger. There is an obvious difference between marine industry system and land industry system. In the coastal area of our country, the overall economic system is divided the marine economy subsystem and land economy subsystem according to the significant differences. Accordingly, the land-sea coordination system can be divided into subsystem of marine industries and subsystem of the land industries.

There is a nonlinearly positive and negative feedback mechanism between the marine industries subsystem and land industries system. On one hand, the land industries development can expand the demand of marine resources and energy. On the other hand, it can promote the technology spread to the field of the ocean exploitation to promote the development of marine industry. The development of marine industries provides plenty of factor inputs and broad space for land industries development, and further it promote the development of land industries. The marine industries and land industries are not completely opposite. They are an organic systems operating as a whole.

There are tiny and random fluctuations in land-sea coordination system. The environment of land and marine industries system is complex and diverse, including natural ecological environment, social cultural environment, scientific technology environment, legal and policy environment and so on. In the interaction process and environment, land and marine industries system is inevitably influenced by the external environmental factors, resulting in the random and tiny fluctuations.

### **Coupling Power of Land-Sea Coordination**

The communalism and mobility of production factors are the coupling power of land-sea coordination. From the point of view of the green GDP, we analyze the factor inputs, including the comprehensive survey of the population, capital, science and technology, energy resources and the ecological environment five aspects. At the same time, the GDP of marine industries and land industries is the output value. At the macro-control level, owing to the lack of clarity of property rights, externality and market failure in energy resources and ecological environment, the government should formulate the industrial policies to guide the rational flow of factors of production to realize the energy intensive use of resources. Meanwhile, the government should promote the capability of independent innovation and industrialization of science and technology to ultimately make the input factors in land and marine industries system configuration to achieve Pareto optimal state.

The potential difference derived from energy gradient between the subsystems is another coupling power factor of the land-sea coordination system. Both of the land and marine industries system have their own energy systems. The energy is due to the internal factors of industry system arising from the interaction of accumulated. Due to the coordination sub system in many aspects,

such as development history, space vector, natural resource endowment and the economic base is weak exist obvious differences, resulting in both not only on the total energy of the system there is a difference, in the specific allocation of energy are also different. It is caused by the gradient energy potential difference, making the sea land systems form various flows and forces to support the coupling interaction of land-sea coordination.

### **Coupling Mechanism of Land-Sea Coordination**

First of all, the land and marine industries have the basic correspondence. For a long time, the human considered the land as the main place of production and life. The land economy has been very good development and accumulated a solid material foundation. Accordingly, many industries in the land also entered the mature stages. As a result of years of development of land resource, space utilization of the land under the population, resources and environmental pressures, human development of the eyes toward the ocean, and especially the rapid development of science and technology for human development and utilization of marine provides a powerful support, make the land a mature industry will continue to extend to the sea. From the perspective of the division of industrial structure, land and marine industry is basically corresponds, in the first, the second and the third industry can embody. Secondly, land industries and marine industries are complementary. Land and marine industries are the complementary relationship in many aspects. The marine industries have the advantage of long industrial chain and good extension. There will be many industry chains in the inner parts of marine industries and the land industries. All the industry chains formulate the network of industries, relying on the input and output relations of each other.

The essences of production such as the labor, capital, resources and energy are scarce. There is the opportunity cost in the allocation of factors. If it has been used in one purpose, it has lost its use in other areas. Therefore, land industry system there is fierce competition in the use of production factors. At the same time, the main industry in the coastal area, land layout, space utilization in the coastal zone is also increasingly tense situation. The space between land and marine industries competition is a significant competitive relationship. As the land industries in heavy and chemical industries transferred to the coastal areas, the vigorous development of the marine industries needs to establish a stable land base, making the land and marine industry functional areas docking problem increasingly prominent in the coastal areas.

### **Coupling Patterns of Land-Sea Coordination**

The land and marine industries management systems coexist in the coastal area. Due to the different spaces, the two management systems are also different. Compared to the land industries management system, there are the phenomena of confused management and the absence of management in the marine industry field. Therefore, it is necessary to establish a comprehensive coastal zone management system, making the central government management and local government management an organic whole. At the same time, we should formulate the scientific objectives, tasks and content of the management of the coastal zone to the coupling of management of the land industries system and the marine industries system.

The concept of Major Function Oriented Zoning (MFOZ) was firstly put forward by Chinese scholars. With the development of the marine industry economy, it is necessary to divide the ocean into the optimal development zoning of the sea, the key development zoning of the sea, the limitation development zoning of the sea and the forbidden zoning of the sea. As the ocean is flowing water, it has the characteristics of openness and mobility, which is significantly different from the land.

Therefore, the influence of land must be considered in the process of the dividing of MFOZ of marine. The dividing should follow the principle of land-sea coordination. Likewise, the measure of the influence of the adjacent sea area must be considered in the process of the dividing of MFOZ of land. It is necessary to carry out in the framework of the coupling of MFOZ of the land and MFOZ of the sea.

The marine economy in our country is spread throughout the 11 provinces (cities and districts) which are the coastal zone, the sea island and the vast sea area. Since 1990s, the central government and local governments in the coastal areas have regarded the developing marine resources as an important part of the national and regional development strategy. They considered the development of marine economy as a major measure to revitalize the regional economy. But at present, the marine industry in various geographical units, such as repeated layout, port disorder construction, etc., still exist, the lack of local characteristics of the economic development of the marine industry. The main reason lies in the lack of close coordination and communication mechanism between regional units. Therefore, we should make the sea-front Industries have the diversified developments in their respective spaces to make full play of complementary advantages. At the same time, we should build the flow mechanism of production factors in different regions and make rational use of foreign capital to realize the spatial coupling. It will help the land and marine industries system to evolve towards the overall orderly coordination direction in the coastal area of our country.

The external environment of the land-sea industries system can be divided into three parts: population, resources and ecological environment. Population represents the social and cultural environment, resources and ecological environment is the representative of the natural environment. The development of land-sea industries system cannot be divorced from the social and natural environment and exist independently. According to the theory of dissipation structure, only land and marine industry system and the external environment appropriate exchange material, energy and information. Only we inject the negative entropy flow to offset the internal system of positive entropy from the external environment, the system can develop orderly toward the direction of time, space and function. Therefore, the coupling and coordination of the land-sea industries and the external population can enhance the development potential of the system. It is necessary and important to put the development potential into the coordinated development. It is crucial to consider the relationships between spaces and populations, the sea and populations, the resources saving and the environmental friendship for the sustainable development of land and marine industries coupling system.

## **Acknowledgement**

This research was financially supported by Institute of Marine Science of Shanghai Ocean University (Grant No.A1-0209-15-10019), the Foundation of Doctoral Scientific Research of Shanghai Ocean University in 2015 (Grant No.A2-0203-00-100354) and the Foundation of Development on Science and Technology of Shanghai Ocean University in 2016 (Grant No.A2-0203-00-100468).

Fund Project: Open Project of Institute of Marine Science of Shanghai Ocean University (Grant No. A1-0209-15-10019) Project Supported by the Foundation of Doctoral Scientific Research of Shanghai Ocean University in 2015 (Grant No. A2-0203-00-100354) Project Supported by the Foundation of Development on Science and Technology of Shanghai Ocean University in 2016 (Grant No.A2-0203-00-100468)

## **References**

- [1] Mitchell C L. Sustainable oceans development: the Canadian approach[J], Marine Policy, 1998, 22(4):393-412.
- [2] Rutherford R J, Herbert G J, Coffen-Smout S. Integrated ocean management and the collaborative planning process: the eastern scotian shelf integrated management (ESSIM) initiative [J]. MarinePolicy, 2005, 29:75-83.
- [3] Luis sua'rez de V J. The European vision for oceans and seas-social and political dimensions of the green paper on maritime policy for the EU [J]. Marine Policy, 2007, 31:409-414.