The Research on the Construction of Monitoring and Evaluation System for the Operation of Marine Economy in Liaoning Province

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Abstract According to the needs of Liaoning province marine economic operation monitoring and evaluation system for capacity building in this paper, it proposes the concept of marine economy operation monitoring and evaluation system, and introduces the system construction content and its architecture, and discusses the key issues on the monitoring index system, evaluation index system, mechanism construction and system implementation. It will help to improve the Liaoning marine economic statistical informatization level and promote the innovation of marine economy in Liaoning, and expect to provide reference for the system construction of other coastal provinces' provincial marine economy operation monitoring and evaluation system.

Key words Marine economy, Indicator system, Monitoring and evaluation system, Marine management

1 Introduction

In July 2009, the State Council approved Liaoning Coastal Economic Zone Development Plan, in order to elevate the construction of Liaoning coastal economic belt to national strategy and boost the marine economy in Liaoning. In 2012, the coastal economic belt in Liaoning Province achieved GDP of 1.26755 trillion yuan, accounting for 45.33% of total provincial GDP, but with the rapid development of the province's marine economy, the constraints on healthy development of the province's marine economy increasingly loom large, and especially the comprehensive management capabilities of marine economy does not adapt to the development needs of marine economy. Firstly, the monitoring information collection capability of marine economy is inadequate. Currently, the operation of specific marine industry and key sea-related business in the province is not clear, and it is difficult to meet the needs for the regulation of marine economic decisions[1]. Secondly, the scope and content of monitoring system of marine economy need to be urgently expanded and extended. Restricted by marine information statistical system and statistical means, it lacks complete control and systematic analysis of operation status and laws of the province's marine economy, and it fails to find the unstable and unhealthy factors in the development of the province's marine economy. Thirdly, the operation monitoring evaluation system for marine economy needs to be improved, and marine economic development and constant changes in marine economy make it necessary to build the monitoring evaluation system for marine economy. The construction of operation monitoring and evaluation system for marine economy is a complex system project and also a new job. The current construction and research of system is still in its infancy, and there is no successful model for reference. Based on this, based on the actual construction work of operation monitoring and evaluation system for marine economy in Liaoning Province, this papers performs the analysis and research, in order to provide a reference for the provincial system construction of other coastal provinces.

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2 System overview

2.1 System definition With marine economic information monitoring and building of marine policy advisory service capacity as goal, the operation monitoring and evaluation system for marine economy is an integrated management information system for marine economy aims to promote integrated coordination of marine affairs and harmonious marine development[2]. It takes the marine economic operation data sharing and information service publishing platform as a carrier for marine economic information release. Guided by National Program on Evaluation System for Operation Monitoring of Marine Economy, the operation monitoring and evaluation system for marine economy in Liaoning Province is a provincial marine information public service platform, with the purpose of meeting the requirements of data exchange and information publishing concerning marine economic operation in Liaoning Province. It reflects the characteristics of marine resources and environment, marine management system and characteristics of regional marine economy in Liaoning Province.

2.2 Construction content The operation monitoring and evaluation system for marine economy in Liaoning Province is constructed in order to achieve the direct online submission of raw statistical data on key marine economic enterprises in Liaoning Province, improve the timeliness of ocean statistics, expand monitoring indicators and content, increase some indicators such as investment, exports, operating conditions, resources and energy consumption, corporate production activities and production factors, enhance the maritime economic information collecting and monitoring capabilities, promote the level of maritime economic informa-

tion management, improve marine economic product assessment, and enhance the marine economic management and policy advisory service capabilities.

2.3 Functional frame The operation monitoring and evaluation system for marine economy in Liaoning Province is composed of monitoring system for marine economy, GIS support system for marine economy and assessment system for marine economy. By the established three-level marine economic monitoring network and established information resource database for marine economy, it finally realizes the data sharing and exchange of marine economy, and data and information release of marine economy. The functional modules are shown in Fig. 1.

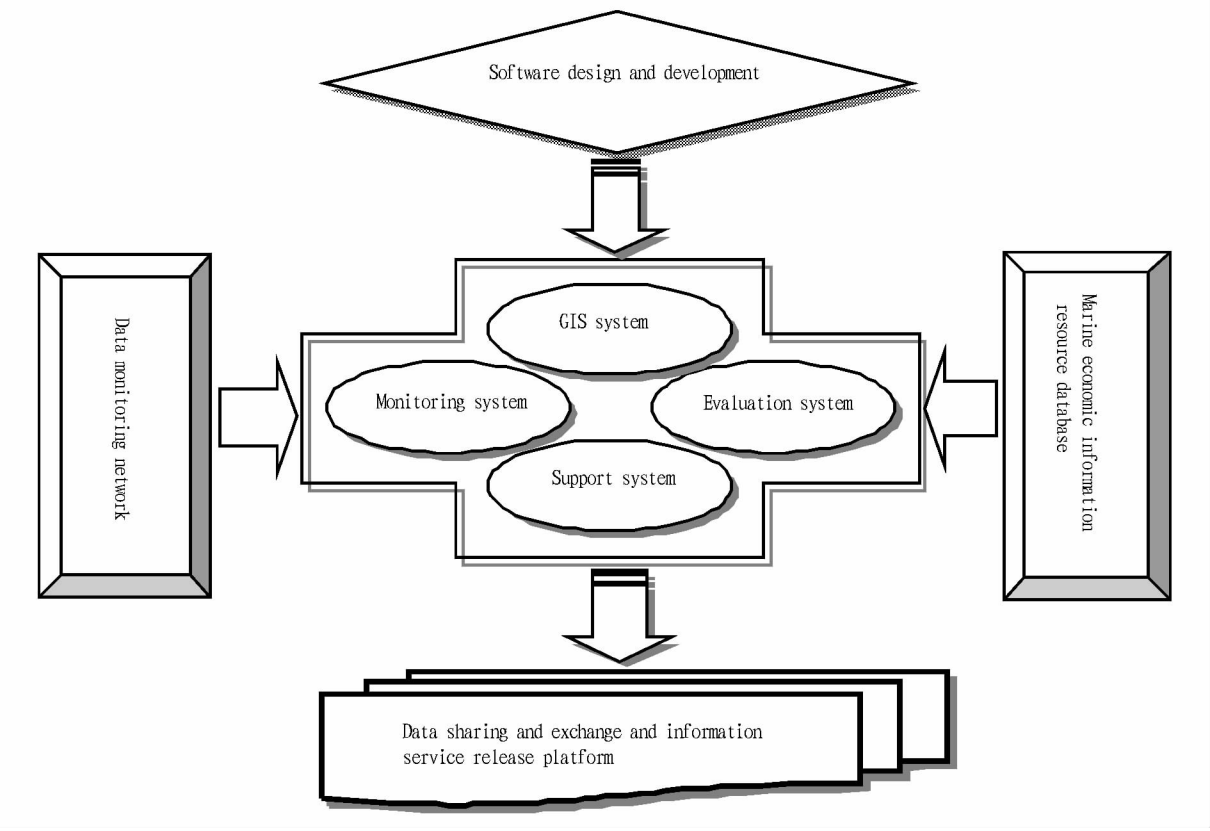


Fig. 1 Functional framework of system

3 Key technologies for system construction

3.1 Construction of monitoring indicator system

3.1.1 Indicator system. During the process of screening the monitoring indicators, it is necessary to fully consider the characteristics of marine economic development in Liaoning Province, and extract the monitoring indicators that can reflect the characteristics of marine economy in Liaoning Province. The monitoring indicator system for marine economy in Liaoning Province can be decomposed into the following first level indicators[3]: production inputs, production management, production capacity, influencing factors, marine resources, marine environment, marine disasters, marine science, marine education, integrated ocean management, marine services, marine culture, spatial information, economic index, social and livelihood indicators, and integrated regional indicators. Based on these first level indicators, the complete fourth level monitoring system for marine economy in Liaoning Province is established.

3.1.2 Monitoring business requirements. (i) Monitoring object and related industrial activities, including marine fisheries, offshore oil and gas industry, marine mining, marine salt industry, marine chemical industry, marine bio-pharmaceutical industry, marine power industry, seawater utilization industry, marine shipbuilding industry, marine engineering construction, marine transportation, coastal tourism, marine research and education management services and marine-related industries[4]. The main monitoring content includes the production activities of the above industries, including production capacity or service level, investment, economic efficiency of enterprises and industry price index. (ii) The monitoring of marine foreign trade. It mainly monitors the imports and exports of marine products and services. (iii) The monitoring of sea-related jobs. It mainly monitors the total amount of sea-related employees, industry distribution, regional concentration and personnel demand. (iv) The monitoring of development environment for marine economy. It mainly monitors the policy environment for the development of marine economy, regional economic development and natural environment. (v) The monitoring of the island economy. It mainly monitors the overall economic level, industrial activities, infrastructure, science and technology education in the island areas. (vi) The monitoring of typical

coastal economic zones. It mainly monitors the economic aggregate, industrial structure, project investment and sea use in the typical coastal economic zones.

3.1.3 Monitoring frequency. For different monitoring indicators, there is a need to develop the monitoring frequency that can meet the needs of different departments, different users and different service objectives. Specifically, there are five kinds of frequency: monthly monitoring, quarterly monitoring, semi-annual monitoring, annual monitoring and occasional monitoring.

3.2 Construction of system evaluation system From the perspective of economic analysis, the data simulation analysis is performed and the monitoring data are used for practice simulation based on the precondition that the mathematical model can be realized. The basic mathematical theory includes gray system theory, regression analysis, time series analysis, principal component analysis, Markov chain model, cluster analysis, data envelopment analysis, fuzzy mathematics, and subdivision algorithm. The mathematical simulation is mainly performed for the study of impact of marine economic growth on national economy in Liaoning Province, calculation of sustainable development capacity of marine economy in Liaoning Province, study of the relationship between development and environment of marine economy in Liaoning Province, evaluation of harmony between marine economic development and socio-economic development in Liaoning Province, study of the relationship between utilization & development and protection of marine resources in Liaoning Province, study of the relationship among primary, secondary and tertiary ocean industries in Liaoning Province, and research the balanced and coordinated development of coastal areas in Liaoning Province[5-7]. The features of content of marine economy assessment construction are that the modern data processing and analysis methods are used for the practice study on operation of marine economy in Liaoning Province, the data are horizontal data or longitudinal data, and the results can provide data analysis tools for non-professional model assessors.

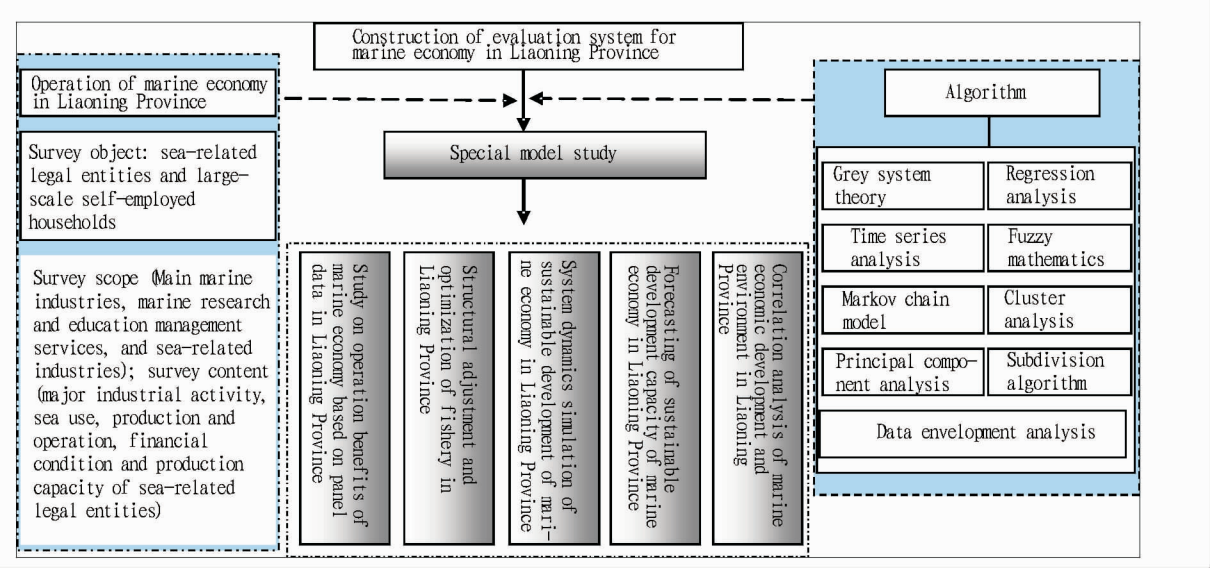


Fig. 2 The evaluation system for marine economy in Liaoning Province

3.3 Operation mechanism

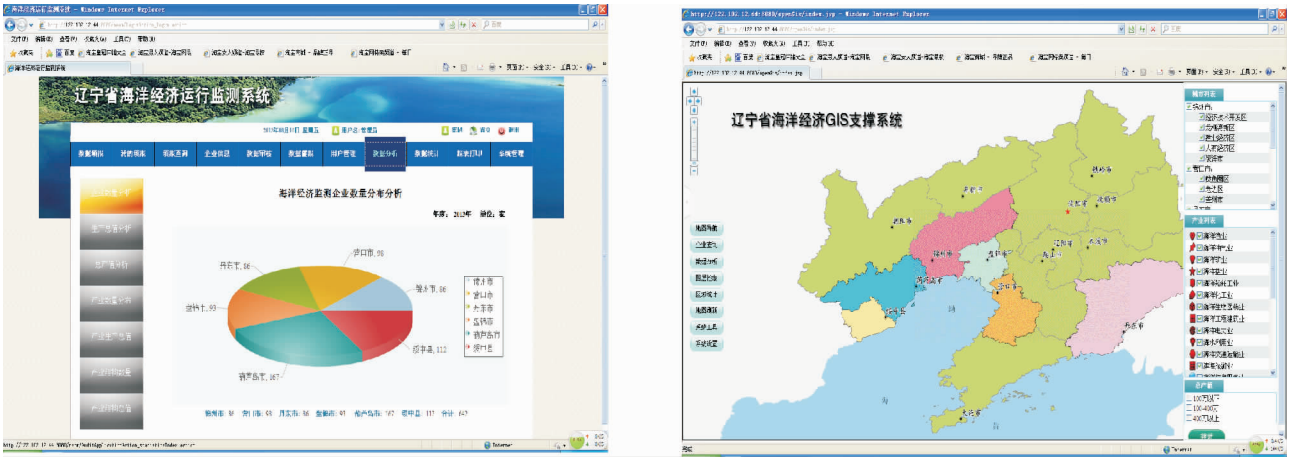
3.3.1 Construction of organizational security system. To ensure the successful implementation of monitoring work and accuracy of monitoring data, the marine economy leading group at the provincial level is established, and the members include Bureau of Statistics, Development and Reform Commission, Economy and Information Technology Commission, and other sea-related departments. By referring to the structure of the leading economic group at the provincial level, the corresponding leading groups of marine economy are established in 6 coastal cities, 10 counties and districts, and 11 industrial parks.

3.3.2 Construction of marine economy monitoring team. Due to the onerous tasks of operation monitoring and evaluation for marine economy, to ensure the smooth implementation of security work, the province establishes 1 monitoring and evaluation technology center, 1 assessment center, 6 municipal monitoring and evaluation centers, 10 county-level monitoring stations, and 11 park-level monitoring stations. According to the requirements of the State Oceanic Administration, it strives to build a stable marine economy monitoring team in the province in order to ensure the successful completion of monitoring work.

3.3.3 Construction of business data reporting security system. The Monitoring and Evaluation Technology Center for Marine Economy in Liaoning Province has developed the marine fishery enterprise network in Liaoning Province, and all enterprises incorporated into the monitoring system can publish all kinds of information for free through the marine fishery enterprise network. Through the establishment of marine economic business information alliance, it has prompted more large-scale enterprises to actively report the data related to the marine economy. In addition,

the Monitoring and Evaluation Technology Center for Marine Economy signs a data acquisition agreement with each enterprise included in the marine economic monitoring network, which stipulates the rights and obligations of both parties and ensures the continuity of the enterprise data reporting.

3.4 System implementation The BS architecture is used for system development, and JAVA is used as the development language. The technology used is the popular Strust2 + spring + myBatis, and the advanced component technology such as jquery is adopted. Application layer framework is divided into three levels, in line with the popular common hierarchical manner. It is easy to understand, simple and neat. The presentation layer uses a portion of portal technologies, including single sign-on, centralized authority control and personalized interface customization. The interface of main part of system is shown in Fig. 3. The system draws on Weblogic, Websphere and other commercial application servers to demonstrate a powerful function and high system stability[8-9].



(a) Monitoring system for marine economy (b) GIS system for marine economy

Fig. 3 The interface of main part of system

4 Social economic benefit analysis

4.1 Truly reflecting the supply and demand The monitoring and evaluation system can conduct monitoring and analysis of operation of marine economy in Liaoning Province, and truly reflect the supply and demand. With the rapid development of marine economy, some problems have become increasingly prominent, such as irrational industrial structure of marine economy, extensive mode of economic growth, decline of marine resources, environmental damage, irrational marine development space, excessive development in coastal waters and low level of conversion of marine high-tech achievements. Meanwhile, the periodic fluctuations in marine economy and historical evolution of the industrial structure layout, make it difficult to accurately assess the problems and causes of marine economy, thereby affecting the sustainable development of marine economy[10]. Through the monitoring and evaluation system, we can perform accurate analysis and forecast of operation trend of marine economy in Liaoning Province, and provide a feasible means to find problems in a timely manner.

4.2 Truly reflecting the distribution and stock of marine economic resources The monitoring and evaluation system can make multi-angle and multi-dimensional online analysis, and use charts, diagrams and other forms to truly reflect the distribution and stock of marine economic resources in Liaoning Province, in order to provide a decision-making basis for the provincial government and relevant departments.

4.3 Timely collecting the important basic data about the operation of marine economy The monitoring and evaluation system can timely collect the important basic data about the operation of marine economy in Liaoning Province, and these real-time data can make the provincial government and relevant departments accurately grasp the operation information of marine economy in Liaoning Province. In early 2010, due to the continuing impact of strong cold air and cold current, Bohai Rim went through the most severe sea ice disasters in latest 30 years, causing a certain impact on marine transportation, aquaculture, oil production and people's life around the coast[11]. Through system monitoring, the relevant departments can timely and scientifically assess the effects and trends of the event.

4.4 Providing multi-faceted, three-dimensional and visual convenient access interface Through data collection and forecasting analysis, the monitoring and evaluation system can provide multi-faceted, three-dimensional and visual convenient access interface for the provincial government and relevant administrative departments via portal and other media, in order to make them keep abreast of real-time operating data of marine economy in Liaoning Province and provide efficient channel for fast scheduling.

4.5 Enriching the adjustment means for the operation of marine economy The information sharing and integration of monitoring and evaluation system, as well as forecasting and early warning capabilities, will enrich the adjustment means for the operation of marine economy and improve work efficiency. In the course of responding to emergencies, it provides powerful information support for timely start of the contingency plans and implementation of macro-control measures, which can effectively ensure

the stable development of marine economy in Liaoning Province.

5 Conclusions

The construction of operation monitoring and evaluation system for marine economy in Liaoning Province is not only a need of development of marine economy in Liaoning Province, but also a need of overall operation monitoring and evaluation capability construction in China, so it is of important practical significance. System construction helps to fully grasp the province's comprehensive information on marine economic operation, grasp the province's actual situation of marine economic operation and ensure the implementation of the province's marine economic macro-control. At the same time, the study of operation monitoring and evaluation system for marine economy is pioneering research work, and the study results can provide scientific decision-making basis as well as effective operational means and methods for the operation management of marine economy in Liaoning Province. In the future, it is necessary to focus on the study of how to rationally use monitoring data, how to rationally assess the marine industry development trend in coastal areas in accordance with the monitoring data, and how to provide reasonable recommendations for government according to the monitoring and evaluation results.

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