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The protection and development of marine resources under the perspective of the sustainable development concept

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Abstract

Purpose – In this study, suggestions on the protection and development of marine resources, sea area use and management, improvement of laws and regulations, monitoring of marine resources and impact assessment of marine environment are put forward.

Design/methodology/approach – Literature research method.

Findings – A major factor contributing to the decline in fishery resources is excessive fishing. At present, there are many problems to be solved in the exploitation and utilization of marine mineral resources in China. The pollution problem of marine tourism resources is becoming increasingly serious. Overmining of coastal sea resources has led to planning and management failures.

Originality/value – This paper discusses the current situation of marine resource exploitation and protection in China and analyzes the reasons for excessive resource exploitation from three aspects of marine concept, laws and regulations and marine management.

Keywords Sustainable development, Marine resources, Development, Protection

Paper type Research paper

Introduction

The natural and social attributes of marine resources determine the complexity of marine resources management, and various scholars have studied the development and protection of marine resources in China from different perspectives. At present, most of the Chinese scholars' research on the sustainable utilization of marine resources focuses on the systematic classification of marine resources and the exploration of the feasibility of sustainable development. In 2012, Wen Haiming published the study on the development and utilization of marine resources and environmental sustainable development; in recent years, the exploitation of marine resources has accelerated, but the management of these resources is not perfect. At the same time, due to limitations in mining technology, current marine resource mining has caused a certain degree of damage. Thus, a series of marine environmental problems is becoming more and more serious (Wen, 2012). He Yixiong put forward the new idea of establishing the "unity of three powers" of "separation of three powers" and put forward the idea of "separation of three powers" (He, 2010). Zhang Yi said that the construction of the marine ecological civilization demonstration zone is a complex, systematic and comprehensive project, and while making some achievements, there are also some new opportunities and challenges. In the face of the new situation, new challenges must continue to innovate the construction of ecological civilization system and mechanism to further optimization and improve, promote the transformation of production and lifestyle and



upgrade, make marine ecological civilization demonstration area construction and development can coruscate gives vitality and create a new economic growth point of Yi (2016). Huang and Lin (2013) proposed that the establishment of marine ecological civilization is an important path to promote the transformation of China's economic development mode, and the establishment of marine ecological civilization provides an ideological guidance for promoting the stable and balanced development of China's marine ecological environment and is also the key guarantee to achieve sustainable development (Huang and Lin, 2013). Scholar Liu Huirong discussed the application of Arctic international law in his paper in order to provide a theoretical basis for the treatment of Arctic Ocean issues from the perspective of ocean law (Car Yirong, 2022). The Maritime Council understands sustainable fishing as retaining sufficient fishing resources, maintaining its habitat and ensuring that people who depend on fishing can survive. In other words, the connotation of sustainable development of fisheries can be summarized as the expansion of human jobs, economic development and social civilization within a specific time and space. We can survive. That is, in other words, the connotation of sustainable development of fishery can be summarized as to expand human jobs, promote economic development and promote social civilization (Shao Optics, 2024; Yongjun *et al.*, 2024; Bai, 2024). The ocean is the grain production base of billions of people in the world, and fishery is the pillar industry of agriculture and rural areas in China, which is of great significance for ensuring food security and promoting the increase of farmers' income.

At present, most scholars at home and abroad have conducted systematic research on the development and protection of marine resources from different perspectives, such as property rights, assets and ecological environment. From the perspective of sustainable development, we should adhere to the view of sustainable development, i.e. on the premise of meeting the development needs of the current or the local people, we should take into account the development needs of the people of other countries and will not endanger the ability of future generations or the people of other countries to meet their own development needs. Sustainable development of marine resources includes not only the sustainable development of resources and ecological environment but also the sustainable development of economy and society.

The significance and importance of the sustainable exploitation and utilization of marine resources in China

First of all, China has a vast ocean territory, which contains rich and diverse resources in the blue area, which provides a solid material foundation and guarantee for the vigorous development of China's socialist cause. In recent years, in view of the excessive exploitation of land resources, leading to their gradual scarcity and even near exhaustion, marine resources, as an indispensable part of natural resources, are increasingly important and play an increasingly important role in the natural resource system (Ji *et al.*, 2024; Zhang and Li, 2024; Yang and Wang, 2024; Jia, 2012; Huang Shizhong and Ye Fengying, 2024). With the increasing demand and deepening dependence on marine resources, marine resources play an irreplaceable key role in promoting social and economic progress. At present, the in-depth development and efficient utilization of various kinds of marine resources have spawned diversified marine economic industries in coastal countries and regions and become a powerful engine, driving the rapid economic growth of coastal areas (Zhou, 2023; Jingyao and Chen, 2021). Furthermore, by expanding the coastal development areas and deepening the development activities, it can not only activate the development vitality of the coastal areas but also effectively radiate and drive the economic prosperity of the neighboring inland areas, thereby alleviating the social contradictions caused by the unbalanced economic development to a certain extent.

Secondly, the development and utilization of marine resources, as an important field for human beings to explore nature and expand their living space, cannot be separated from the strong scientific and technological support. Therefore, in the process of development, it is

necessary to deeply consider the abundant oil and gas and other mineral resources of the seabed, which are not only diverse but also have multiple values and functions. Therefore, we must master the advanced marine resource development technology, conduct a comprehensive exploration and analysis of the storage and value of resources in the region and realize the overall consideration and reasonable development of resources (Sun, 2022; Yao and Xu, 2023; Su, 2023; Liu, 2016; Zhang *et al.*, 2022). At the same time, it must ensure that other surrounding resources and environment are not destroyed in the development process, thereby ensuring the orderly development and comprehensive utilization of resources.

Finally, the development and utilization of marine resources still needs to build a solid policy and legal system as a solid backing. This means that we need to improve marine policies and laws to fully protect marine resources. Through these policies and laws, we can effectively prevent various risks that may occur in the process of the development and utilization of marine resources, eliminate potential risks in time when they occur and respond quickly to temporary dangers, thereby ensuring the continuous and good operation of the overall marine ecology, resources and environment (Jialin *et al.*, 2022).

The current situation of marine resources and environmental protection in China

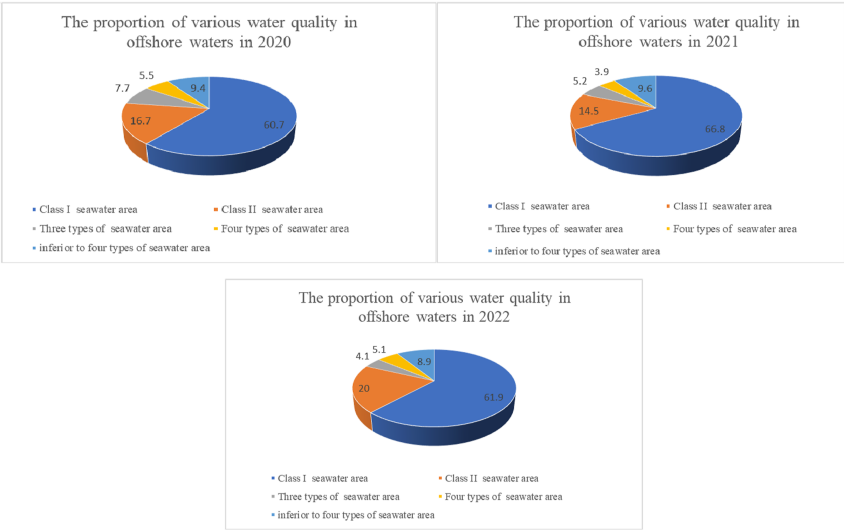
China has rich and diverse marine resources, including marine biological resources, marine space resources, marine mineral resources, energy resources, seawater resources, marine chemical resources and marine tourism resources. With the progress of marine science and technology, people's use of marine resources is getting higher and higher, and its economic value is becoming more and more obvious.

According to the statistical analysis of the Ministry of Environmental Protection (see Table 1), the area of class seawater in China fluctuates greatly, and the class seawater rises rapidly from 2020 to 2021, but the area of class seawater shows a serious reduction in 2022. In 2020, the area of the four types of inferior seawater has an increasing trend, indicating that the seawater environment in the waters under our jurisdiction is slightly polluted. However, the coastal environmental pollution is serious, the ecological environment is seriously deteriorated and the frequent red tide disasters lead to the sharp reduction of marine biological resources, mainly due to the discharge of sewage into the sea. In recent years, China's local government's "heavy development light protection" vigorously develops the marine economy, while it ignores marine resources and environmental protection, excessive reclamation and land reclamation; gives priority to develop heavy industry, coupled with industrial sewage and sewage discharge, and leads to the increase in offshore pollutants. Therefore, marine water pollution is serious. The change map of various water quality in the offshore waters from 2020 to 2022 can more intuitively reflect the change situation of various water quality in China's offshore waters (as shown in Figure 1).

Table 1. The proportion of various water quality in China's coastal waters from 2015 to 2022 (%)

	Class I seawater area	Class II seawater area	Three types of seawater area	Four types of seawater area	Inferior to four types of seawater area
2015	33.6	36.9	7.6	3.7	18.3
2016	32.4	41	10.3	3.1	13.2
2017	34.5	33.3	10.1	6.5	15.6
2018	54.1	17.2	8.8	6.4	13.5
2019	46.6	30	7	4.7	11.7
2020	60.7	16.7	7.7	5.5	9.4
2021	66.8	14.5	5.2	3.9	9.6
2022	61.9	20	4.1	5.1	8.9

Source(s): According to the China Coastal Sea Environmental Quality Bulletin in 2020–2022



Source(s): According to the China Coastal Sea Environmental Quality Bulletin in 2020-2022

Figure 1. Scale change chart of various water qualities in offshore waters from 2015 to 2022

According to the 2015–2022 of China’s coastal environment quality bulletin, from the time dimension, the discharge of sea wastewater is growing, and the number of sewage outlets near the coast with discharges of 100 tons or more presents a rising trend year by year, and sewage and industrial sewage discharge also present an increasing trend year by year. In 2022, the discharge of domestic sewage will increase by 72 million tons, and the total discharge of industrial sewage will increase by 319.01 million tons. It can be seen that domestic sewage and industrial sewage have a decisive impact on the environment near the coastal waters. Total comprehensive sewage discharge in 2022 was reduced by 18.95 million tons compared with 2020, as shown in the following [Table 2](#).

Table 2. Monitoring of direct sewage discharge in China from 2015 to 2022 (10,000 tons)

	Total amount of industrial sewage discharge	Total amount of domestic sewage discharge	Total comprehensive sewage discharge	More than or equal to 100 tons of sewage Number of discharge outlets
2015	204,645	62,268	357,728	401
2016	211,873	75,726	369,831	419
2017	162,033	73,385	400,624	404
2018	387,643	83,641	395,140	453
2019	258,511	126,023	416,555	448
2020	209,665	78,961	424,367	442
2021	246,135	80,602	401,051	458
2022	241,566	86,161	422,472	457

Source(s): According to the China Coastal Sea Environmental Quality Bulletin in 2015–2022

The development and utilization of marine resources in China

With the continuous development and utilization of marine resources, there are more and more marine industries, including not only traditional industries such as fishing fishery, aquaculture fishery and marine salt industry but also emerging industries such as marine biological industry, marine machinery manufacturing and marine new energy. With the rapid development of China's marine industry, the number of people engaged in maritime work in coastal areas is becoming more and more, and the proportion is also increasing (Guo *et al.*, 2022; Zheng *et al.*, 2021; Wang *et al.*, 2018). As shown in Table 3, from 2020 to 2022, the offshore oil and gas industry, marine chemical industry, offshore engineering and construction industry and marine transportation industry will develop rapidly with a significant growth rate. The marine pharmaceutical and biological manufacturing industry, marine power industry, marine mining industry and marine salt industry have also increased to varying degrees. The marine fishery industry, marine shipbuilding industry and marine tourism industry have a certain decreasing trend, while the outbreak of COVID-19 has caused a certain impact on the fishery industry and tourism industry.

(1) The status quo of fishery resources and their development and utilization in China

Our country is a vast country, with a large number of fishery resources. Currently, China's annual catch is between 2.8 million and 3.3 million tons. However, in recent years, with the continuous strengthening of national fishing efforts, large-scale and non-specification large-scale fishing, as well as the environmental pollution brought by the development of fishery, has brought a great impact on China's marine fishery.

A major factor contributing to the decline in fishery resources is excessive fishing. At the same time, it will also affect the overall survival structure of fish; in the case of overfishing, fish habitat, breeding and migration will be affected, especially some individual fishing operations, because the nets mesh too dense and narrow, causing a large number of young fish to be caught, thus disturbing the normal reproduction rate of fish and causing the whole fish groups and population quantity and quality, and it will not only affect the sustainable utilization of fishery resources but also destroy the original ecological balance (Su, 2023). Although the country is furthering the implementation of marine development strategy, it is limited by the levels of fishing boats, fishing and other science and technology development

Table 3. Development and utilization of various marine resources in China from 2020 to 2022

Index	2020 Total amount (RMB 100 million yuan)	2021 Total amount (RMB 100 million yuan)	2022 Total amount (RMB 100 million yuan)	Ensemble change
Marine fishery	4,712	4,117	4,343	−369
Offshore oil and gas industry	1,494	1,618	2,724	1,230
Marine mining	190	186	212	22
Marine salt industry	33	41	44	11
Marine ship industry	1,147	870	969	−178
Marine chemical industry	532	3,905	4,400	3,868
Marine pharmaceutical and biopharmaceutical industry	451	695	746	295
Marine engineering and construction industry	1,190	1893	2015	825
Marine power industry	237	327	395	158
The marine transportation industry	5,711	6,980	7,528	1,817
Marine tourism	13,924	14,162	13,109	−815

Source(s): According to the China Marine Economy Statistical Bulletin of 2020–2022

levels. High technology support under the fishery exploration level is not high enough, with small fishing boats as the main body of fishing. Therefore, at present, our country's fishery resource development is mainly concentrated on the coast, while the utilization rates of fishery resources are not high in distant areas. This caused the coastal and coastal waters exhaustion of fishery resources and the waste of resources.

(2) The status quo of China's mineral resources and their development and utilization

Marine mineral resources are dominated by the shelf and the ocean floor, and the shelf area is the most conducive to human exploitation. China's offshore land shelf area is a vast area with very rich marine mineral resources, including oil and gas, natural gas, coastal ore, coal and other metal minerals – a complete range of varieties. At present, the most important resources include domestic proven oil, natural gas, coastal sand mine and other proven resources and the offshore oil resources. At the same time, the country is also actively carrying out natural gas and seabed metal mineral resources exploration work. In recent years, the country has paid great attention to the development and utilization of marine mineral resources. From the country to the society, this emerging industry has developed rapidly and has a good prospect for development. But at present, there are still many problems to be solved in the development and utilization of marine mineral resources in China (Sun *et al.*, 2016).

(3) The status quo of tourism resources and their development and utilization in China

Since the reform and opening up, the level of national economic development has been continuously improved, and the people's requirements for the material quality of life have been continuously improved, thus effectively promoting the development of tourism. Marine tourism is a more advanced tourism activity; in recent years, more and more tourists favored and participated in this, forming a new force. China's natural marine tourism resources are very rich, with large water areas, long coastlines, many shoals and sandy beaches. It is the ideal choice for the development of marine tourism. At the same time, emerging marine tourism projects are also being launched successively, injecting new vitality into China's marine tourism industry. At the same time, marine tourism has also played a great role in promoting the development of marine economy. At the same time, the reasonable development of marine tourism resources can deepen the understanding of the ocean, enrich the human marine culture and enhance the human awareness of the protection of the marine environment.

Problems existing in the development and utilization of marine resources in China

(1) The shackles of ideology

First of all, transitioning from the planned economy of "marine resources value theory" to the market economy conditions of "theory of value", with the progress of marine science and technology, the economic value is gradually known by people. However, this also has the tendency of "excessive mining", if not controlled, which will cause adverse effects on its sustainable development. Second, due to the planned economy system by local protectionism and fragmented thinking, the flow of marine resources leads to excessive exploitation of sea resources in one area. This will directly affect the sustainable development of the region and the sustainable development of the waters of neighboring areas, leading to unstable relations between regions and countries (Zhou *et al.*, 2020; Sun *et al.*, 2021; Jialin *et al.*, 2022).

(2) Serious environmental pollution caused by poor development and operation management

At present, the pollution problem of marine tourism resources is becoming increasingly serious. The sources of pollution are diverse, involving multiple levels of marine natural tourism resources, marine historical relics and marine cultural resources. Specifically, these pollutions can be divided into four categories: industrial pollution, agricultural pollution,

service pollution and domestic pollution. Among them, traditional industrial pollutants such as industrial sewage and waste gas play a decisive role in affecting marine resources. In addition, oil spill and the improper use of pesticides and fertilizers also caused direct damage to the marine ecology. Marine environmental pollution is often caused by the unreasonable exploitation and use of marine resources. Due to the influence of economic interests, the excessive exploitation of marine resources in some areas has caused the coastal, coral reef degradation and the destruction of marine habitats. In addition, China's maritime supervision system is not perfect enough, which is also a factor that cannot be ignored. However, due to the lack of supervision, or the lack of corresponding institutional support, many illegal acts have not been stopped in time, leading to the deterioration of China's marine environment. In order to guarantee marine tourism resources and maintain the balance of marine ecology, in addition to enhancing the public awareness of environmental protection, we should further improve the relevant laws and regulations, build a stricter marine pollution control system and ensure the sustainable development of marine resources (Wang *et al.*, 2012; Jin and Cui, 2023; GMei *et al.*, 2018; Wenjing *et al.*, 2019). In the context of the rapid development of the national economy, the development, management and protection of marine tourism resources can no longer meet the needs of the development of tourism. The excessive development of the tourism industry, resulting in a large amount of waste of tourists, and the chemical waste generated due to the operation of the tourism facilities may pollute the surrounding ocean and land environment.

(3) Laws and regulations still need to be improved

First of all, in the marine resources development, national and local have adopted a "planned" mode; however, some areas for their own economic interests excessive exploitation of offshore resources, which caused the planning and management failure, for example, land reclamation planning management is often local interest groups "zero" destruction. Secondly, from the Constitution to the Property Law, from the Fisheries Law to the Mineral Resources Law and to the Environmental Protection Law, China, are all independent and lack of unified legislative norms, resulting in the sustainable development of marine resources.

Countermeasures and suggestions

On the basis of sustainable development, the development and protection of marine resources is to use the production mode in line with the concept of sustainable development and realize the protection of marine resources and ecological environment in the process of developing marine economy. In the long run, to promote the development of China's marine economy, we must achieve sustainable development. Ignoring the unreasonable development of marine ecological environment is an important factor restricting the healthy development of marine economy in China (Lai *et al.*, 2021; Sun and Zang, 2020).

(1) Break the ideological shackles on marine resources

By actively participating in global marine governance and promoting the building of a maritime community with a shared future, cooperation and coordination among countries in the development and management of marine resources can be promoted. For example, China can work with other countries to maintain the maritime order, resolve disputes over territorial sovereignty and maritime rights and interests through dialog and consultation and avoid conflicts and frictions. We will promote scientific and technological innovation to improve the utilization efficiency of China's marine resources. We will strengthen innovation in marine science and technology, improve the development capacity of marine resources and realize the sustainable utilization of marine resources. For example, to develop marine renewable energy sources, promote the development and application of offshore wind power, tidal power and other technologies and reduce the dependence on traditional energy sources. Enhance public awareness and education to solve the ideological shackles of marine resources. By

strengthening marine awareness education, the public's awareness and participation in marine resources protection should be improved, thus forming a good atmosphere for the whole society to pay close attention to and participate in marine resources protection.

(2) Countermeasures for the sustainable development and utilization of fishery resources

In view of the above problem of overfishing of fishery resources, the fishing license system and fishing moratorium system should be strictly implemented first. Secondly, it is necessary to make overall planning and reasonable layout. It is necessary to scientifically develop and utilize marine resources such as marine minerals, oil and gas, tourism and marine transportation according to the layout of the national and local governments, so as to maximize the utilization rate of these resources. Thirdly, when formulating the development plan of the marine economy, under the guidance of the concept of circular economy, we should establish a unified strategy including a series of goals, including the development of the marine economy, industrial development, economic benefits, marine science and technology education and ecological environment construction.

To ensure the public has a profound understanding of the development prospects of marine fishery resources and the protection of resources has a profound understanding, it is essential to strengthen the policy guidance of fishery. This includes paying attention to the fishery fishing, fishery science and technology and fishery managers, making the public of fishery resources industry understand the need for science and technology, the right way of fishing, healthy and sustainable development mode and the relevant policies and regulations and enhancing the understanding of the legal rational of fishery resources. In order to effectively prevent the occurrence of fishing activities, the monitoring and evaluation of fishery resources should be strengthened. In order to promote the sustainable utilization of fishery resources in China, the system of banning fishing is implemented to develop the aquaculture industry and promote the large-scale and intensive development of the aquaculture industry. There should be a focus on the protection of natural landscape, rare animal and plant resources, etc. Special marine reserves shall be established to protect the ecological environment of coral reefs and mangroves. There is a need to optimize the structure of the fishery industry, strictly control the size of the fishing boat, improve fishing technology content and fishing ability. The fishery development scope extended to the ocean improved the traditional way of fishing and fishing and promoted the combination of fishery production mode to alleviate the growing lack of fishery resources in China and ensure the sustainable development of fishery resources.

(3) Improve the coordination mechanism for the development and management of marine resources in China

In the process of the development and management of marine resources in China, there are many institutions involved, and the staggered of different starting points of each organization makes contradictions very easy to produce. Therefore, the State Oceanic Administration should play a leading role in establishing a comprehensive coordination office, strengthen the coordination among the various departments of marine development and management and strengthen the connection between the relevant departments in the development and management of marine resources. To coordinate the distribution of interests among various relevant departments, it is essential to implement unified management planning during the development and utilization of marine resources, improve the efficiency of the development and utilization of marine resources and ensure the comprehensive and coordinated sustainable development of marine resources.

(4) Strengthen education in marine ecological civilization and make rational use of marine tourism resources

We should strengthen marine science popularization education, improve the public's awareness of the ocean and improve the comprehensive quality of marine tourists. On this

basis, we should pay attention to the training and cultivation of marine talents, update the marine education courses of universities and carry out marine education of different majors and levels, so that the marine concept can take root and sprout in the growth of each person. We will pay attention to high-end marine talents and strengthen talent exchanges and cooperation with developed countries.

Reasonable development and utilization of marine tourism resources is also inseparable from the protection and support of laws. It is necessary to accelerate the legislation of marine tourism resources, formulate a perfect order for the development and management of tourism resources and formulate a complete legal system for marine resources to effectively protect marine tourism resources and ensure the sustainable and healthy development of marine tourism resources.

(5) Establish and improve a marine environmental pollution assessment system

Preventive, preventive and preventive measures should be taken to pollute the marine environment. We will strengthen the prevention and control of combined land and sea pollution. We will implement quantitative control of land pollutants discharged into the ocean, strengthen the prevention and control of pollution from marine production and marine transport and formulate contingency plans for emergencies. It is necessary to strengthen the monitoring and evaluation of marine environmental pollution and to strengthen the early warning and disposal of marine environmental pollution.

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