

REVIEW

Evaluation and Research Analysis of Marine Ecological Suitability

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ABSTRACT

Whether in the past, present and future, marine ecological environment is the most important part in the history of human development, we can call it the "patron saint" of mankind. It provides all kinds of resources and energy needed for social production, and plays an irreplaceable role in species diversity and ecological balance. However, the weakening of self-purification ability of marine ecosystem, the decline of pollution purification ability, the deterioration of marine ecological environment, and the decline of biological resources and biodiversity ,etc. all these bring fatal impact to coastal areas and even the whole terrestrial ecosystem, it is imminent to strengthen ecological protection. It is our bounden duty to protect the living environment of human. We have the right to enjoy the convenience brought by the natural environment, so we should fulfill the obligation to protect it.

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1. Introduction

Our life originates from the ocean. The ocean is not only the resource treasury for the development of human civilization, but also the largest and most abundant treasury of gene storage. Marine ecology is an organic system of marine creatures, ecology and their interaction . Three points of land seven points of ocean, the quality of marine ecological environment will be related to the stability of the earth's ecological civilization, to the sustainable and coordinated development of human production and life as well as the living nature.

In the face of a series of marine ecological problems caused by industrial technology innovation and unreasonable development of resources in recent centuries, such as retrograding of shoreline, water pollution in coastal areas, destruction of biological diversity and so on , the marine

ecological problems in coastal areas have attracted more and more attention, new understandings and requirements have been put forward for marine protection and governance.

2. The Concept and Principles of Ecological Suitability

2.1 Concept for Ecological Suitability

Ecological suitability refers the impact on the living creatures of the space and environment in which creatures live ^[1]. To conduct objective and reasonable evaluation and analysis on it is the primary premise for formulating a reasonable development plan of regional ecological environment and protecting the ecological environment ^[2].

Whether it is appropriate to establish evaluation indi-

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cators system in the ecological suitability evaluation of geological environment is the biggest concern. The determination of evaluation indicator system of ecological suitability of geological environment can be generally confirmed as three steps: (1) Identify the ecological factors that affects the subject; (2) Determination of all geological factors that affect these ecological factors; (3) Taking the main geological factors that affect the ecological factors as the evaluation indicators by system analysis on the ecological geological environment characteristics of the study area ^[3].

2.2 Principles for Ecological Suitability

Ecological suitability analysis is based on regional ecological surveys, to evaluate the ecological condition of the region and its development and utilization conditions with the qualitative and quantitative methods, scientifically predict the possible impacts of development and utilization, visually reflect the possibilities and potential of regional development and utilization ^[4]. In principle, we should consider both natural attributes and social economic factors and follow the principles of comprehensiveness, dominance, difference, incompatibility, restriction and quantification when choosing analytical factors ^[5].

3 Current Situation and Analysis of Marine Ecological Protection

3.1 Current Situation of Marine Ecological Protection

Life activities is inseparable from water, and ocean is the main source of water vapor transport in water cycle. The ocean accounts for 71% of the earth's area, it provides a large amount of water vapor for the land, regulates the climate, and purifies the pollution. Plants in the ocean absorb solar energy and produce oxygen for the earth through photosynthesis. In addition, the ocean absorbs carbon dioxide in the atmosphere. The ocean floor is rich in oil and natural gas. Marine ecology has been affecting our lives since ancient times. Protect the marine ecology and reasonable development of it is the best protection for ourselves. At present, the destruction of ecosystems has led to the degradation of some in-adaptable creatures, which poses a threat to the survival of underwater creatures, the destruction of coastal vegetation affects the effectiveness of ocean self-purification ^[6]. Seagrass is one of the most abundant vegetation in the ocean, seagrass bed is one of the most productive ecosystems in the earth's biosphere ^[7], and has the highest service function.

Seagrass is the most common vegetation in the ocean.

The annual growth rate of seagrass bed in the world has dropped to 7% since 1990. Up to now, about 29% of seagrass has disappeared, and about 14% (10 species) of seaweed species are at risk of extinction ^[10]. Therefore, seagrass research is becoming the focus of marine ecology and conservation. Coastal countries have carried out seagrass distribution monitoring, species surveys, restoration and reconstruction studies. Information on the distribution of seagrass in all seas of the world is constantly improving. China has carried out few research since 1970s. Due to mariculture, sand mining and other human disturbances, the degradation rate of seagrass beds in China is much higher than the world average since the new century. As a result, in recent years, seagrass beds have received more attention than in the past ^[8]. Many research and government agencies have been involved in the investigation and protection of seagrass resources in China. For instance, the Key Laboratory of Marine Ecology and Environmental Sciences of the Institute of Oceanology of the Chinese Academy of Sciences, the Mangrove Research Center of Beihai, Guangxi, and the Marine Environmental Monitoring Center of the State Oceanic Administration.

In recent years, the deterioration of marine environment has gradually awaken people the importance of environmental protection ^[9]. The Marine Environmental Protection Law has been implemented actively. We have also achieved some great results through persistent efforts, however, if we only rely on legal and ethical constraints to restrict some harmful behaviors to the environment, it will still bring some obstacles to people's production and life although it can get results, moreover, legal norms can only ease the situation from the source, it does not improve the process and results of pollution, and the pollution level of some coastal waters is still very serious ^[10]. Environmental problems in coastal waters, such as the overloading of resource and environment, and the severe eutrophication of seawater. In the field of sea area management, many relevant coastal areas have not been effectively integrated into sea areas management, management methods and efforts are obviously weak. The inadequate implementation of the paid use system of sea areas, and the level of law enforcement and supervision needs to be further improved. The harsh reality indicates it is urgent to strengthen the protection of the marine environment.

3.2 Problems in Marine Ecology

Waste from production and living invades the ocean directly or indirectly, the ocean was regarded as a huge "trash can". Existing monitoring results show that, in 2014, large-scale garbage of China's marine floating

garbage ^[6] averaged 30 / km², small and medium-sized garbage averaged 2206 / km², and beach garbage averaged 50142 / km². First, pollution from land is the main source of marine pollution, accounting for nearly 80% of all marine pollution sources, the pollutants, including domestic garbage in daily life, are directly thrown into the ocean without treatment or improper treatment. There are also some coastal cities with mature tourism industry and large flow of people, more garbage is produced, and these garbage are dumped into the ocean unprocessed, pollutes coastal areas ^[7]. Besides, there are wastes from agricultural and industrial production. Plastic and foam are common pollutants in coastlines of China, and the pollution range is relatively large because most areas of China locate in the monsoon area. Second, pollution caused by ship transportation, as well as pollution caused by marine accidents. Among them, the pollution caused by oil spill is the most serious. China's coastal areas are rich in oil and natural gas, in order to speed up the development and utilization of resources, mining is very frequent, oil and gas leakage accidents often occur due to poor management ^[8]. In the event of an oil spill, it will be very difficult to solve due to the difficulty of construction on sea, and the consequences may be severe. Therefore, in the development and utilization of resources, we must follow relevant laws and regulations and the rules of nature. Don't make the situation worse for the small profits at the moment, actively promote the green transformation of marine ecological economy industry and realize sustainable development.

3.3 Characteristics of Marine Pollution

3.3.1 Wide Range of Pollution Sources

The pollution sources of the ocean are wide. The pollution caused by human activities such as fishing and oil & gas development will cause more damage than the land with the flow of sea water, in addition, changes in natural weather like rainfall and snowfall may cause atmospheric pollution such as acid rain.

3.3.2 Wide Spread of Pollution

The integrity of the ocean determines the extent of its spread, oceans are connected, and the flow of water greatly accelerates the spread of pollution, the diffusion is very fast, and general pollution control measures cannot manage effectively at all. On the one hand, we should establish fast and effective prevention measures, and the key point is to strengthen the control of pollution sources, and cut off the source is once and for all.

3.4 Analysis of Important Sources of Marine Pollution

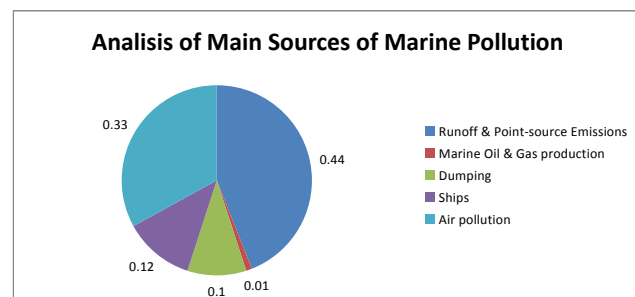


Figure 1. Analysis of main sources of marine pollution

From Figure 1, we could intuitively see that main sources of marine pollution, among which runoff and point source emissions account for 44%, air pollution 33%, dumping 10%, and ship pollution 12%, offshore oil and gas production accounting for only 1%, this shows that the direct pollution caused by people's production and life far exceeds other forms of pollution. The most difficult problem for marine pollution in life should be plastic products which are the most difficult to be degraded and last the longest, plastic was one of the greatest inventions of the 20th century, but with people's increasing demand for it, and the inadequate understanding of garbage disposal and marine protection at that time, the destruction of marine ecology by plastics has caused people's panic, posed a huge threat to the survival of marine life ^[12]. Plastics that extremely hard to be decomposed can be found in freshwater lakes, Arctic sea ice and even deep in the Pacific Ocean ^[13]. Plastics exist all over the world and should be taken seriously by human. The presence of plastics has been detected at any level of the waters. The influence of plastics on waters can not be ignored.

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4. Impact of Ecological Suitability on Marine Ecological Environment

4.1 Application and Countermeasures of Ecological Suitability in Marine Ecological Environment

There are two most suitable methods for evaluating ecological suitability at present, namely the ecological factors superposition method and the minimum cumulative resistance model method ^[14]. More than 30 authors, including Halpern, have jointly issued articles in the Journal << Nature >> on the new concept of ecosystem health: Human beings are part of the marine ecosystem, a healthy marine ecosystem means that it can provide all the resources the human needs now and in the future, therefore, sustainability is very important ^[15], only when the marine ecosystem

is sustainable can it continuously provide resources for human production and life and better play the role of the ocean.

Superimposition of ecological factor: It is a comprehensive suitability evaluation method ^[16] that integrates the factors of many different fields such as nature, society, economy and so on according to certain models, more widely used methods are weighted superposition method and so on., clarified the objectives and development demand factors of different aspects, has made significant progress and innovation in quantitative technology and spatial analysis technology.

Minimum cumulative resistance model method: This method starts with the construction of landscape level process, emphasizes the impact and control of landscape patterns on ecological process, it is a breakthrough of ecological suitability evaluation in the study of horizontal ecological process ^[17].

These two evaluations are analyzed in different ways. The most prominent manifestation of the ecological factors superposition method is comprehensiveness, to achieve the quantitative analysis on objectives based on this ^[18]. The ecological suitability evaluation starts from the inherent conditions of the ecosystem itself, to overcome a series of existing problems so as to protect the ecological environment and realize sustainable development. Marine ecological environment protection is the premise to ensure the sustainable development of marine economy, we should improve the way of local unregulated and over-development of marine resources, strengthen management and ensure the implementation of relevant marine ecological protection policies as soon as possible. Combine the development and utilization of marine resources industry with the land industries, realize ecological transformation. Changes in the marine ecological environment makes more and more people aware of the concept of marine ecosystem protection ^[19], in the development of the ocean, people have increased the protection of the ocean, realized the importance of the ocean for development, and the thought of sustainable development has gradually been incorporated into as well. Only by protecting the marine ecology from being destroyed, can we make better use of productive labor to exploit the assets endowed by the oceans, the vast resources of the oceans will be developed to provide energy for people and serve people's lives.

4.2 Evaluation of Ecological Suitability in the Application of Marine Ecological Environment

The sea water is a closely connected whole that moves along with the cold and warm current, therefore, the

evaluation of marine ecological suitability should fully consider the movement and interaction of seawater, that is, the horizontal ecological process. Considering the evaluation method of ecological suitability ecological factor and minimum cumulative resistance model as well as the integrity of the ocean, further objective analysis is needed to maintain and manage the ecological environment, to grasp the essence from the overall situation, we need to know that the various ecosystems in the ocean doesn't exist in isolation ^[20], they interact through the hydrodynamic force, interconnect with each other, and affect the ecological suitability of the whole ocean. In the future, our marine ecological protection work will be mainly based on the requirements of marine ecosystems, protect and repair damaged marine ecosystem structures, improve the self-healing capability of marine ecosystems, improve the ecological pattern of the marine area and eventually achieve the sustainability of the marine ecosystem.

5. Conclusion

As an important tool for space planning, the evaluation of ecological suitability has been applied on land for longer than on ocean, however, there are still many problems in the development and utilization of ocean, along with the complexity of the marine environment, the requirements for ecological adaptability are higher than those of land. In consequence, its requirements still need further research. Pay attention to the integrity of the ocean and deepen the research on its ecological suitability, and start from the whole, this will have important significance for the improvement of marine ecosystems and the healthy development of sustainable development, and then solve the contradiction between the exploitation of marine resources and the ecological protection, improve the efficiency of the development and utilization of resources, at the same time, it is necessary to strengthen the protection of the environment, rationally develop and utilize resources under the guidance of sustainable development thought, promote the integrity of the marine ecosystem.

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