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ARTICLE

Research on Marine Pollution Problems and Solutions in China from the Perspective of Marine Tourism

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ABSTRACT

Based on the perspective of marine tourism, this paper integrates various types of marine pollution, and puts forward high-quality development solutions and future extension direction of marine tourism. Through the research, it is found that the main culprits of marine pollution mainly include the following seven points: human activities produce garbage; white pollution; ship pollution; exploration of marine oil and gas resources and mineral pollution; land reclamation; pollution in mariculture industry and new estrogen pollution. The causes of marine pollution and countermeasures are discussed.

1.Introduction

1.1 Development Status of Marine Tourism

Marine Tourism refers to a series of activities such as marine travel, entertainment, and vacation based on the ocean and meeting people's spiritual and material needs under certain social and economic conditions [1]. According to the distance of the road area as the classification standard, it can be divided into coastal tourism, offshore maritime tourism and ocean tourism [2]. At present, coastal tourism is the dominant tourism mode in China.

At present, the marine tourism industry occupies a pivotal position in the world tourism industry. Coastal countries and regions account for 23 of the top 25 tourism revenues in the world. It can be seen that coastal countries and regions play a significant role in the development of marine tourism. In Spain, Australia and other countries, marine tourism has become an important pillar industry of the national economy. Tropical and subtropical regions have formed many world-class marine tourism destinations, occupying a dominant position in the world marine tourism industry. With the continuous update of tourism products and the gradual maturity of the tourism market, the world's marine tourism industry will show a development trend of diversification, ecology, leisure and innovation.

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1.2 Marine Tourism Shifts to High-quality Development

According to the "World Tourism Economy Trend Report (2020)", the total number of global tourism (including domestic and inbound and outbound tourists) in 2019 was 12.31 billion, and the total international tourism revenue was US$5.8 trillion [3]. The output value of China's coastal tourism industry has been steadily increasing year by year, and by 2019, it achieved an add value of 188.6 billion yuan. Although the output value of coastal tourism will decline in 2020 due to the impact of the New Crown Pneumonia Virus, tourists will retaliate consumption with the development of the new economic normal after the epidemic. The marine tourism industry will usher in a new round of development and reform. In the future, the marine tourism industry will develop in a more casual, smarter, and more humane direction. The proportion of self-guided tours and self-driving tours will increase significantly. With the development of 5G, the promotion of smart tourism applications such as VR tourism and cloud tourism will also accelerate significantly.

1.3 Marine Pollution-The Bottleneck Restricting the Development of Marine Tourism

Marine pollution refers to pollution caused by humans changing the original state of the ocean, destroying the marine ecosystem and causing harmful substances to enter the marine environment. The lack of supervision of land-based sewage outlets, and the large amount of waste generated by human life flowing into the ocean; the development of traditional marine industries such as coastal tourism has caused very serious white pollution to the ocean; the inefficient use of fishery resources, worn fishing ropes, fishing nets and worn-out fishing gear being thrown into the ocean, causing seawater pollution, lack of supervision of marine fishery fishing operations, excessive pollution in the marine aquaculture industry, serious seawater eutrophication; substandard oil and sewage discharge from ships, frequent oil leakage problems; oil and gas resource exploration and exploitation technology immature, limited exploration scale, low efficiency and serious pollution; land reclamation has caused serious damage to the ecosystem, the hydrodynamic environment has been changed, and the ecological carrying capacity has declined; the discharge standards for estrogen substances have not yet been perfected, all of which are harmful to the marine tourism industry development has serious impacts, and the potential threats to the marine ecological environment and humans are immeasurable.

According to data from the State Oceanic Administration, in 2019, the sea areas under Chinese jurisdiction (the Bohai Sea, the Yellow Sea, the East China Sea, and the South China Sea) have a total area of 89,670 square kilometers [4]. At present, the water quality in the coastal waters of Shanghai and Zhejiang is relatively good. As a national key tourist city and the largest cruise home port in Asia, it is necessary to fully implement the maritime application management system, focus on solving the coastal water management problem, and effectively protect the marine ecological environment.

1.4 Review of research status at home and abroad

This article focuses on the high-quality development of marine tourism and its constraints, mainly studying marine pollution and its impact. After clearly defining the concept and category of the research object, this article determines the keyword list as shown in Table 1.

Table 1. Keyword search plan list

keywords						
	Marine travel			**Marine pollution**		
	Ocean travel	Beach recreation		Micro-plastic	marine litter	Coastal pollution
Or	Coastal Tourism		Or	plastic	plastic debris	Maritime shipping
	Coastal resources;			Fibres	Ocean pollution	Marine plastic debris
				Storm-water pollution		

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The second step is research positioning. This article first chooses to search online from the SSCI and SCI core databases in Web of Science. Based on the table keyword search plan, search by subject. The collection time is up to March 2020, and the papers are selected article. After deleting conference documents, books and other informal documents, and excluding duplicate documents, a total of 68 English documents were collected in this process. The third step is to evaluate and select. First, read the title and abstract of the literature, and select the literature based on the following principles: (1) Eliminate relevant papers that study chemicals or microorganisms in the ocean; (2) Pay attention to marine pollution or the relationship between marine pollution and economic development; (3) Non-academic documents such as book reviews, editorials, and journal solicitation. In accordance with the above principles, 54 relevant documents are published and 14 are remaining. Secondly, manually search the mainstream high-quality journals in the field of "marine environmental protection" from Wanfang database, such as Journal of Oceanography, Ocean Science, Journal of Ocean University of China, Marine Environmental Science, etc., to consult and supplement the literature 2 articles related to marine pollution in these journals. Through the above process, this paper finally obtained 16 documents.

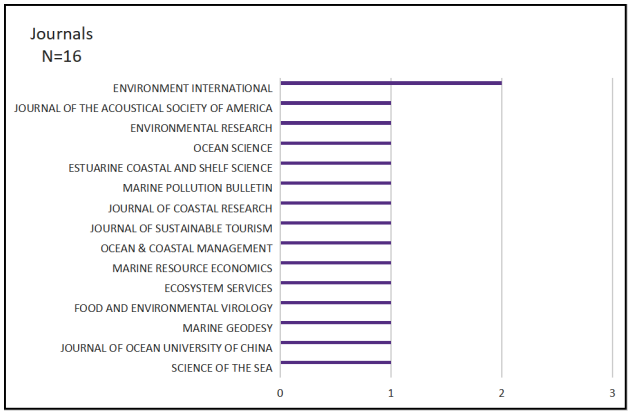

Figure 1. Main sources of literature journals

There are many factors in the causes of marine pollution, but most domestic and foreign scholars mainly discuss from one aspect of marine pollution, and the research mainly focuses on marine plastic pollution and the impact of environmental pollution on the economy. At present, the problem of marine pollution is mainly focused on microplastics pollution and the impact on marine life. Typical research results mainly include 7 articles. It can be seen that most scholars are focusing on the impact of microplastics on marine life, and the research focuses on marine pollution. There are five articles related to economic development, one article researching noise pollution, and one review article. The journal sources of 16 articles are shown in Figure 1. Two of the articles reviewed in this article are from Environment International, and the remaining articles are from Marine Science, Journal of Ocean University of China, Marine Geodesy, Food and Environmental Virology, Journal of the Acoustical Society of America, Ecosystem Services, Marine Resource Economics, Ocean&Coastal Management, Journal of Sustainable Tourism, Journal of Coastal Research, Environment Research, Marine Pollution Bulletin, Estuarine Coastal and Shelf Science, Ocean Science, four articles published in 2017 Articles, there are only two articles in 2020. It can be seen that there have been few studies on marine pollution in recent years.

Marine pollution not only affects the balance of the marine ecosystem, but also severely limits the sustainable development of China marine tourism industry. Therefore, we should pay more attention to the problem of marine pollution, make rational use of resources, and promote the high-quality development of marine tourism. Through research, this article found that the types of marine pollution mainly include the following: Human activities produce garbage; White pollution; Ship pollution; Exploration of marine oil and gas resources and mineral resources; Land reclamation; Pollution in mariculture industry; New estrogen pollution. The sources and methods of each type of pollution are different, as shown in Table 2.

2. Types of Marine Pollution

2.1 Human Activities Produce Garbage

The sources of waste generated by human activities mainly include industrial waste, domestic waste and medical waste. The marine pollution caused is mainly discharged through coastal sewage outlets, dumped into the ocean, merged into the ocean through rivers, and deposited in the atmosphere. According to data released by the Ministry of Ecology and Environment in 2019, large and medium-sized cities generated 1.55 billion tons of general industrial solid waste, 21.473 million tons of domestic waste, 817,000 tons of medical waste, and monitored 453 pollution source discharge outlets. The comprehensive sewage outlet has the largest discharge volume, the industrial pollution source is the second, and the domestic pollution source is the smallest [5]. The discharge points of waste into the sea are mainly land-based sewage outlets. Generally, shore discharge and offshore deep-sea discharge are selected [6]. It can be seen that the supervision of pollution source discharge outlets should be strengthened, and waste discharge standards should be strictly controlled. In addition, nutrients, heavy metal

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Table 2. Causes of marine pollution

Types of marine pollution	Source of pollution		Pollution patterns
Human activities produce garbage	Industrial waste		Land source sewage outfall: Shore discharge; Offshore deep sea emissions
	Household garbage		Dump directly
	Medical waste		Rivers carry pollutants; Atmospheric deposition
White pollution	Land source input		Wind action, rain washing, surface runoff
	Coastal tourism		Tourists discarded
	Ship transportation		Ship transport and discard
	Fishing and breeding		Damaged and abandoned plastic fishing gear
	Atmospheric deposition		Fiber sedimentation
Ship pollution	Cruise ship	Domestic garbage and sewage; Solid Waste	Operational contamination
	Tanker	Oily sewage and toxic gas; Shipwreck(oil spill)	Sudden pollution
Exploration of marine oil and gas resources and mineral resources	Development and mining of solid mineral resources		Muddy sand; Improper handling of chemical substances, releasing radioactive substances
Land reclamation	Land reclamation		Sand disaster; Change coastal structure and tidal movement characteristics; Changes in the hydrodynamic environment
Pollution in mariculture industry	Nutrients; Sulfide; drug		The discharge of Nitrogen (N), Phosphorus (P), Chemical Oxygen Demand (COD), etc. leads to hypoxia
New estrogen pollution	Industrial production		River and lake transportation
	human activity		Atmospheric deposition

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elements, and acid rain can be imported into the ocean through atmospheric deposition and have a greater impact on the ocean.

The industry directly affected by garbage discharge to the ocean is marine tourism. Cultivating environmental awareness, rationally discharging garbage, creating a green marine tourism atmosphere, and promoting the high-quality and sustainable development of marine tourism require the joint efforts of all members of society.

2.2 White Pollution

White Pollution is an image term for the phenomenon of waste plastics polluting the environment. It refers to the pollution caused to the ecological environment by plastic products that are randomly thrown away after use and are difficult to degrade. Its pollution sources to the ocean mainly include: land-based input, coastal tourism, ship transportation, fishing and breeding, atmospheric deposition. According to the Bulletin of the State of China's Marine Ecological Environment in 2019, tourism and leisure areas, agriculture and fishery areas, port and shipping areas and adjacent sea areas are the areas with the most marine debris distribution. Among them, floating garbage on the sea, beach garbage and seabed garbage, plastic garbage accounted for 84.1%, 81.7% and 92.6% respectively [4]. The beach and the sea are areas with a high concentration of tourists, and are the "front" of marine tourism. Therefore, the degree of environmental protection of beaches and sea areas directly affects the development of marine tourism. It can be seen that white pollution is an important factor hindering the development of marine tourism. Strengthening sea surface supervision, improving environmental protection measures, and improving the quality of tourists are to reduce white pollution.

Land-based input is the main pollution source transported from rivers to the ocean. It is washed by wind, sewage and rain, and enters the river and marine environment through surface runoff, which causing pollution. Due to the current monitoring data in China, it is impossible to estimate the flux of marine plastic waste input and the sources of plastic waste in different marine activities [7]. So we searched for ocean plastic pollution in foreign countries. According to the 2020 report of the International Union for Conservation of Nature (IUCN), 12 million tons of plastic are leaked into the ocean every year [8]. According to a survey conducted by Schmidt and his team in 2018, rivers dump 0.47 to 2.75 million metric tons of plastic into the ocean every year, and more than a quarter of plastic waste flows into the ocean from 10 rivers, 8 of which are in Asia [9].

At seaside tourist attractions such as densely populated beaches, tourists discarded plastic packaging bags, mineral water bottles and other plastic garbage, forming microplastics into the marine environment, and causing marine pollution [10]. The discarding of plastic garbage into the ocean by passing ships at sea is also an important source of white pollution. According to UNEP estimates, the amount of plastic garbage imported into the ocean during global ship transportation in 2005 reached 5 million tons [11]. The specific classification and pollution methods of ship pollution will be discussed in detail in the next section.

In fishing activities, worn fishing ropes, fishing nets and worn-out fishing gear will be thrown into the ocean, thereby increasing the content of microplastics in the waters. The 2019 "Marine" Ghost Fishing Gear "Pollution Research Report" shows that there are about 800,000 tons of fishing gear debris discarded in the ocean every year, accounting for 10% of the total marine plastic pollution [12]. Fishing gear fragments are extremely harmful to marine biodiversity. Marine life may be entangled in fishing gear and unable to get out and eventually lead to death, causing damage to the marine ecological balance and hindering the development of submarine tourism.

Another important source of marine plastic pollution is atmospheric deposition. Dris et al. analyzed the composition of atmospheric sediments and found that 50% are natural fiber sediments, 21% are artificially processed natural fibers, 17% are man-made plastic fibers, and 12% are man-made mixed fibers [13]. This proves that fiber sediment can also cause marine pollution.

2.3 Ship Pollution

Ship pollution refers to the entry of various harmful substances into the ocean due to ship manipulation, maritime accidents, and dumping at sea via ships, thereby disrupting the balance of the marine ecosystem. Marine ship pollution mainly includes cruise ship pollution and tanker pollution. There are two main ways of pollution:operational pollution and sudden pollution. Operational pollution is mainly the pollution produced by the ship in the process of traveling, and the sudden pollution is the pollution caused by the sudden maritime accident of the ship during the traveling.

2.3.1 Cruise Ship Pollution

The main sources of pollution from cruise ships are domestic garbage, sewage, and solid waste. According to its source, it can be divided into four types: black water, gray water, oily bilge water and ballast water [14]. Black water, that is untreated ship sewage, generally consists of

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medical waste and human waste [14]; gray water generally comes from showers, sinks, and dishwashers; marine fuel oil and mechanical waste such as engines and steam engines form oily bilge water; cruise ship ballast water is the water loaded to ensure the balance of the cruise ship. Solid waste mainly includes many domestic wastes such as plastic waste and food waste.

According to foreign data, a cruise ship will produce approximately 50 tons of garbage, 1 million US gallons of gray water, 210,000 US gallons of sewage and 25,000 US gallons of oily water during a one-week journey [15] (according to Chinese national standards GB3102.1-1993, 1 gallon (US) = 3.785412 liters). Different from land-based pollution, the waste discharge supervision of marine cruise ships is insufficient, and the detection technology is immature. Due to the uncontrollability of cruise ships, it passes through multiple countries and regions each time, and the laws and regulations of each country and region have different sewage discharge standards that cannot be unified. The development of cruise tourism has been booming in recent years. On October 19, 2019, China's first large-scale domestic cruise ship officially started construction and is scheduled to be delivered and operated in 2023. Once cruise tourism develops in China, cruise pollution is an inevitable topic. Therefore, we should realize that the solution to the problem of marine pollution is imminent.

2.3.2 Tanker Pollution

The main sources of oil tanker pollution are oily sewage, toxic liquids, and marine accidents (oil spills). The oily sewage, ballast water, and tank washing water of oil tankers contain a large amount of oil. Emergency discharge of cargo and oil spills from tanker cargo warehouses will cause toxic liquid leakage. Excessive oily sewage discharge will cause marine pollution. At present, each country has its own oily sewage discharge standards, but in view of the wide range of coverage and poor operability, it is difficult to implement. Oil spill-the super killer of the marine environment, its pollution is mainly sudden pollution. After the toxic compounds contained in oil leak into the ocean, they quickly enter the food chain, and no creatures from lower to higher are immune. It will have a serious impact on the marine tourism industry, especially the cruise tourism industry.

According to statistics, the amount of oil and petroleum products released into the ocean through various channels amounts to 2 million to 10 million tons each year. The petroleum pollutants discharged into the ocean by shipping amount to 1.6 million to 2 million tons, and the most prominent pollution is caused by the death of a tanker [16]. There are about 500 marine oil spill accidents in China every year. Oil will form a large area of oil film on the sea, causing serious marine pollution, destroying the marine ecological environment, and causing serious impact on marine tourism. At present, the main methods of dealing with the leakage of offshore crude oil include oil containment method, combustion method, dispersant method, adsorption method, and microbial ingestion method [17]. But no matter which method has its own advantages and disadvantages, the degree of recovery of the marine environment is also different. Once an oil spill occurs, the pollution to the ocean is still serious and difficult to predict. Therefore, rather than remedial measures, it is more important to prevent problems before they occur.

2.4 Exploration of Marine Oil and Gas Resources and Mineral Resources

The ocean has very rich resources-oil and gas resources and mineral resources. According to the assessment of the United States Geological Survey (USGS), the world (excluding the United States) has 54.8 billion tons of undiscovered petroleum resources (including condensate) and undiscovered natural gas resources. 78.5 trillion cubic meters [18], there are 7 sedimentary basins with petroleum prospects in China, with a total area of about 700,000 kilometers. Therefore, China's marine oil and gas resources and mineral resources have huge development potential, and prospects for exploration are good.

The comprehensive indicator of China's marine development is 3.4%, mainly based on mineral resources [19]. China is still immature in terms of mineral resource mining technology and laws and regulations. Uncontrolled mining and irregular systems have led to serious environmental pollution problems, muddy seabed sediments, improper handling of chemical substances in mineral resources exploration, and release of radioactive substances, these will threaten the survival of marine life. For example, in the mining of seaside placers, due to the imperfect system and immature technology, uncontrolled mining leads to waste and serious environmental pollution [20]. Therefore, it is necessary to formulate corresponding laws, regulations and policies, increase government intervention, cultivate talents related to marine resource exploration, improve mining technology, and carry out sustainable mining.

2.5 Land Reclamation

Land reclamation refers to the act of transforming the original sea area, lake area or river bank into land through artificial technology. From the 1950s and 1960s, China began to reclaim land from the sea. By the end of the last

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century, the area of land reclamation from the sea reached 12,000 square kilometers. Land resources continue to be in short supply, and the new impetus to promote economic growth in coastal areas has become a demand for land from the sea. However, uncontrolled and unscientific continuous reclamation of the sea will change the coastal structure and hydrodynamic environment, and marine resources will be drastically reduced. Large-scale reclamation activities not only affect important ecosystems such as coastal wetlands, mangroves, and bays, but also destroy the habitats of marine life, resulting in a significant reduction in biodiversity.The destruction of oceans and marine resources by reclamation activities and becoming more and more scarce, how to talk about the development of marine tourism.

2.6 Pollution in mariculture industry

In recent years, China has moved from rapid development to an era of high-quality development. People's income levels have continued to increase, and the types of seafood have become more and more abundant. The production of crustaceans and shellfish has increased year by year, accounting for 79.47% of the total, as shown in Figure 2, the composition and proportion of national fishing in 2016 to 2018. Although the proportion of marine fishing has been declining year by year, it can still be clearly seen that marine fishing accounts for as much as 70% of the national fishing. The increasing amount of seafood farming has caused serious pollution in offshore waters. The seawater has become eutrophic, and the spawning grounds and habitats of fishery organisms have been destroyed, which has seriously affected the water environment of the offshore waters and the sustainable development of coastal tourism.

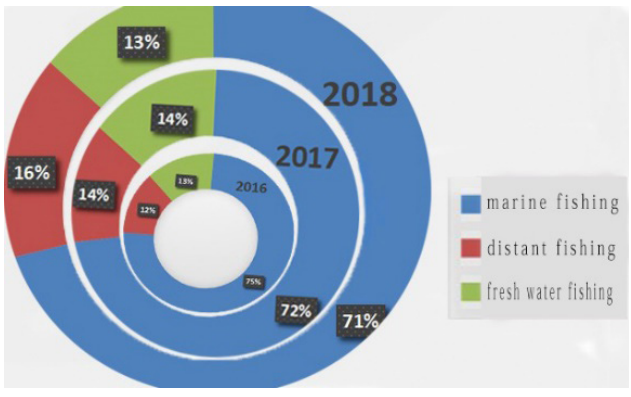

Figure 2 Fishing composition and proportion in 2016-2018

Data source: China Fishery Statistical Yearbook 2019

Mariculture can cause serious chemical pollution [21]. Nutrient salts and other components will be deposited on the bottom of the water, resulting in hypoxia, which is not conducive to the growth of marine life and causes serious marine pollution. The marine environment is closely related to the survival of organisms, and it is also related to the long-term development of marine tourism. Therefore, it is very important to do a good job in the prevention and control of pollution in the marine aquaculture industry, establish a reasonable marine aquaculture plan, unify marine aquaculture specifications, and cut off the source of pollution. Only in this way can we better protect the marine environment and promote the ecological and healthy development of marine tourism [22].

2.7 New Estrogen Pollution

The last type of marine pollution-New Estrogen pollution. Environmental Estrogens refers to the presence of chemicals in the environment that have estrogen-like effects in the body or block the effects of androgen [23]. After it enters the body, it can interfere with the synthesis, release, transportation, binding, and metabolism of normal endocrine substances in the body, thereby destroying the compounds that maintain the stability and regulation of the body, and produce various toxic effects on the organism. It belongs to environmental endocrine disruptors [24].

Estrogen substances enter the environment, enter the marine environment through the transportation of rivers, lakes, and atmospheric deposition. After being absorbed by marine organisms, they will in turn endanger humans. At present, most new estrogens lack a regulatory mechanism and have not formed a corresponding environmental standards [25]. In recent years, research on new estrogen in foreign countries has gradually increased, but domestic research is relatively insufficient. Therefore, the improvement of new estrogen-related emission standards, the study of the migration law of new estrogen in the ocean and the impact on humans, are important for protecting ocean water. The development of resources, environment, marine tourism, and human physical and mental health have very important practical significance.

3. Causes of Marine Pollution

China's current laws and regulations on the discharge of marine garbage are not perfect, the relevant departments have insufficient supervision, the incomplete establishment of supervisory institutions, the lack of personnel and the inability to fundamentally implement the responsibility of ecological environmental protection; the prevention and control of land-based pollution is relatively difficult, and it is difficult for the sewage outlets to enter the sea. Inadequate supervision of rivers requires

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coordinated treatment of industrial pollution, agricultural pollution and many other sources of pollution, which has increased the difficulty of treatment. The sources, types and quantities of marine garbage are not monitored in place. The waste recycling industry chain has not yet been formed, and garbage treatment technology needs to be improved; in some coastal areas, the illegal discharge of black water and garbage enclosing the sea are prominent and have not been effectively resolved, which seriously affects the publics quality of life and tourist pro-sea demand; some companies fail to assume the responsibility for ecological and environmental protection. Production and neglect of environmental protection. In order to reduce costs, equipment processing waste materials are not up to standard, stolen to the sea and leaked to the sea, illegally exploited in marine protected areas, sea sand areas, etc.; beach garbage classification measures are not yet complete, cruise waste disposal supervision is insufficient, tourists are in the ocean ecological and environmental protection awareness is still insufficient, self-discipline needs to be improved, and green and sustainable lifestyles and consumption patterns need to be formed. These series of factors have caused pollution problems in the ocean.

4. Solutions

4.1 Improve Laws and Regulations and Strengthen Supervision

As the main body, the government should promulgate corresponding laws and regulations to control the total discharge of marine pollutants, and place marine environmental protection work in key and prominent positions [26]. Establish relevant regulatory departments, improve marine garbage discharge standards, and formulate mandatory measures and punishment mechanisms to restrict people's dumping of marine garbage, minimize the impact of man-made marine pollution, and effectively protect the marine environment [27]; relevant enterprises perform their own obligations to achieve transparency in their waste discharge; increase maritime law enforcement agencies to supervise various marine activities and rationally use marine resources; make corresponding regulations on the scope of fishery and aquaculture seawater, and establish aquaculture standards, and regulate plastic fishing gear carry out unified recycling and reuse, and fully implement the responsibility of protecting the ecological environment of the sea.

4.2 Strengthen Publicity and Raise Public Environmental Awareness

Raise the public's awareness of marine ecological and environmental protection, conduct marine environmental protection publicity and corresponding training, make the public aware of the harm caused by marine pollution, and actively participate in marine environmental protection activities. Learn from Japanese garbage classification and recycling measures, encourage the public to consciously carry out garbage classification and recycling, and organize the cleanup of garbage on the beach. Conduct marine environmental protection education for young people to form a green lifestyle and consumption model. Citizen travel should be a behavior that relieves their own pressure and is conducive to economic growth. They should respect the construction of the local ecological environment, minimize damage to the environment, and carry out sustainable and responsible tourism.

4.3 Use New Technologies to Promote the High-quality Development of Marine Tourism

Based on the scientific development background, the use of marine environmental pollution information intelligent image detection technology to monitor the source, type, quantity and destination of marine garbage [28]; innovative development models such as "Marine Tourism + Internet", "Marine Tourism + Big Data", promote sustainable tourism, eco-tourism and other tourism concepts, improve tourism quality, and promote the construction of smart marine tourism; improve the marine intelligent monitoring platform, use big data technology, VR technology, etc. So as to realize the sharing and coordination of marine resources. In the future, the marine tourism industry will pay more attention to the personal experience of tourists and meet the needs of tourists' participation. Innovative tourism experiences such as underwater adventures and robot guides will be satisfied. Live tourism, tourism product delivery, full-time tourism, educational tourism, etc. This traveling methods will appear. With the development of 5G, the advancement of smart travel applications such as VR travel and cloud travel will also be greatly accelerated.

5. Conclusion

In the past ten years, as the country's economic strength has continued to increase, China has moved from rapid development to an era of high-quality development. The economic structure is undergoing tremendous changes, and tourism has become a normal and rigid demand for the people. However, for a long time, marine pollution caused by wanton destruction of the marine environment has seriously hindered the development of marine tourism. The innovation of this article is to explore the seven

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sources of marine pollution and pollution methods from the perspective of the bottleneck of marine tourism development. Activities generated garbage; white pollution; marine ship pollution; marine oil and gas resources and mineral resources exploration pollution; land reclamation; marine aquaculture industry pollution; new estrogen pollution, and studied the causes of marine pollution and solutions. In addition, we proposed the future direction and goals of high-quality development provide important support for the realization of a maritime economic power and the development of sustainable marine tourism.

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