

# Legal System Research on the Protection and Development of Blue Carbon in China

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**Abstract:** China has set the goal of peaking its carbon footprint by 2030 and achieving “carbon neutrality” by 2060, which is in line with the values of China's ecological civilization construction in the new era and the trend of global climate governance. Given that Marine carbon sinks are an important part of the Earth's carbon sink, improving the carbon sink capacity of marine ecosystems is an important way to achieve “carbon neutrality”. It is found that the establishment of a sound legal system is the key to the protection and development of blue carbon resources, which needs to take into account the interests of ecological environment protection, economic sustainable development and social equity. By analyzing the relevant legal systems and cases in the world, the possible paths and feasibility of protecting and developing blue carbon resources are discussed. It is of great theoretical and practical significance to further refine the research on the path and method of establishing the legal system of blue carbon protection.

**Keywords:** Blue Carbon; Ocean Carbon Sink; Legal Protection; System.

## 1. Introduction

### 1.1 Definition of the Concept of Blue Carbon

In December 2020, State Economic Work Conference proposed that China's carbon dioxide emissions should peak by 2030 and achieve a steady decline thereafter; and strive to achieve carbon neutrality by 2060<sup>[1]</sup>. “Reducing sources” and “increasing sinks” are the two basic paths to achieve carbon peaking and carbon neutrality. In terms of increasing carbon sinks, more attention has been paid to

land plants. Land plants absorb and store carbon dioxide from the atmosphere through photosynthesis, often referred to as “green carbon”. However, marine ecosystems actually have superior carbon sequestration properties and are more efficient at fixing and storing atmospheric carbon dioxide, which is referred to as “blue carbon” and is the best example of a “sink”. The blue carbon sink accounts for less than 0.2% of the total seafloor area, but it alone accounts for 50% of the total organic carbon buried in marine sediments, making it one of the most powerful carbon sinks in the biosphere [2]. It is one of the most powerful carbon sinks in the biosphere. In particular, mangrove forests, seagrass beds and salt marshes in the coastal zone are known as “coastal blue carbon ecosystems” because of their excellent carbon sequestration and storage capacity [3]. Coastal Blue Carbon Ecosystems Coastal blue carbon sinks are the processes and mechanisms by which coastal blue carbon ecosystems absorb and store large amounts of carbon dioxide through plants and soils [4].

In recent years, there has been a growing interest in the concept of “blue carbon”. “Blue carbon was originally developed as a cross-border collaboration between the United Nations Environment Programme (UNEP), the Food and Agriculture Organization of the United Nations (FAO) and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO). Intended to emphasize the importance of the oceans in sequestering carbon, the term “blue carbon” was included in Blue Carbon: Carbon Fixation in Healthy Oceans - A Rapid Response Assessment Report. The report shows that the majority (55%) of all organic matter taken up

globally is ocean-based, a phenomenon known as “blue carbon”, and that specific types of vegetation such as mangroves and brackish wetlands along land margins form an important part of this, covering about 0.5% of the total area of the oceans. They cover about 0.5% of the seabed and are widely distributed over the vast expanse of the sea. In addition, these specialized ecosystems contribute more than half of the carbon stocks in the deep ocean sediment, and may contribute as much as 71 percent. Plant interactions with seawater provide stability and support to ecosystems, and these habitat types are important tools for studying global change and ecology. Although they account for only 0.05% of the total plant life on Earth, the cumulative amount of carbon stored annually is comparable, and they are therefore considered to be one of the most powerful carbon sinks on Earth [2].

On September 25, 2019, the United Nations Intergovernmental Panel on Climate Change (IPCC) released a document titled Special Report on Oceans and Cryosphere in a Changing Climate (SROCC) that highlights the role of blue carbon in mitigating natural processes in the ocean. In addressing climate change, it is essential to include carbon stocks driven by biological activities, such as mangroves, seagrass beds, coastal salt marshes, and macroalgae, in manageable ocean systems and categorize them as blue carbon in coastal zones under Category IV. Although blue carbon emphasizes “manageable” characteristics that require human intervention, this does not mean that it is applicable only to a particular category. In practical applications, further exploration and definition of the exact definition and scope of blue carbon is necessary in order to gain a deeper understanding of its function in combating climate change. Such an approach not only meets the practical need to avoid blindly expanding the scope of blue carbon, but also offers the possibility of further deepening the understanding of blue carbon science and broadening its scope in the future. The study not only highlights the importance of blue carbon from a scientific perspective and the complexity of its assessment, but also provides concrete recommendations for the establishment of an international environmental legal regime for blue carbon protection.

## **1.2 Role of Blue Carbon Sinks in Realizing the “Double Carbon Goal” and the Dilemma of Reality**

Blue carbon, in a narrow sense, refers to the behavior of marine organisms in absorbing carbon dioxide and storing it in the deep ocean over long periods of time [5]. In a narrower sense, blue carbon refers to the act of marine organisms absorbing carbon dioxide and storing it in the deep ocean for long periods of time, while in a broader sense, blue carbon refers to the processes and activities of the ocean that result in the absorption of atmospheric carbon dioxide and its long-term stabilization in marine ecosystems [6]. The term blue carbon refers to the processes and activities by which the ocean absorbs atmospheric carbon dioxide and stores it stably over time in the marine ecosystem. Through these processes and activities, marine ecosystems are able to effectively reduce atmospheric carbon dioxide concentrations, thereby mitigating the effects of global warming. The most important climate-resilient coastal ecosystems cover less than 0.5% of the seabed, and these areas are covered with features such as mangroves, salt marshes, and seagrasses, which are responsible for capturing and storing about 70% of the permanent carbon in the ocean domain [7]. Each year, blue coastlines and river systems absorb and store about 235-450 trillion grams of carbon, an amount equal to almost one-half of the carbon emissions generated by the world's transportation sector (about 1,000 trillion grams of carbon per year) [8]. The amount is almost one-half of the carbon emissions generated by the world's transportation sector (about 1,000 trillion grams of carbon per year). Furthermore, while carbon released from the soil and stored may be held for decades or even centuries, biological carbon in marine ecosystems can be stored for millennia. Therefore, it is essential to actively adopt a series of appropriate environmental protection measures and tap into the blue carbon resources in marine ecosystems to play a key role in mitigating global climate change and reducing greenhouse gas emissions. This is of great significance to the sustained development of the Earth's ecosystem and an important means for mankind to achieve sustainable development.

Despite its key role in reducing greenhouse gas emissions, the blue carbon sink has not received sufficient attention from the public and society, which has led in part to serious damage to marine ecosystems, which are receding at a rate that exceeds that of all other ecosystems, and can even quadruple the rate of tropical rainforests in some cases. Currently, marine carbon sinks are under serious threat. The annual rate of loss ranges from about 2% to 7%, a figure that is seven times higher than has been seen in more than fifty years. This is seven times more than has been seen in more than fifty years. Most of these vital ecosystems could disappear completely in the next two decades if aggressive actions are not taken to protect them. The ability to store carbon in coastal vegetation environments is a central function. The world's blue carbon stores are concentrated within ecosystems such as seagrasses, mangroves and brackish wetlands. These coastal vegetation effectively accumulate carbon to the bottom of the seabed, making them highly efficient carbon reservoirs. However, recent studies show that nearly 1/3 of the world's seagrass areas have already been destroyed, and the process is accelerating with no signs of slowing down. As a result of global climate change and human activities, about a quarter of the world's brackish wetlands no longer exist and are receding at a rate of one to two percentage points per year. Since the 1940s, two thirds of the world's mangrove areas have been eroded at a rate of about one to three percentage points per year. These data indicate that the blue carbon pool areas of the world have already been lost, and those that remain are under extreme threat. What remains is under threat. Therefore, it is necessary to take effective measures to protect these precious wetland resources in order to maintain the ecological balance and human living environment. According to researchers, most of the sea areas around China are characterized by severe eutrophication, frequent red tides, and ecosystem imbalance, and large-scale oxygen-poor areas have been formed. For example, the Pearl River and Yangtze River estuaries are characterized by perennial hypoxia. In addition to these visible environmental catastrophes, there is also a hidden problem of reduced carbon storage in near-shore areas. Large amounts of nitrogen and phosphorus cause the MCP (Marine

Microbial Carbon Pump) to become less effective, which in turn affects the carbon storage function of seawater [8]. The blue carbon sinks are becoming more and more important. As the blue carbon sink dwindles, its impact on species richness and coastal environments increases, suggesting that natural carbon sinks are being depleted and fading, which in turn is further reducing the ability of the biosphere to draw man-made carbon dioxide from the atmosphere.

### 1.3 Rationale for Blue Carbon Conservation

The principle of joint liability in international environmental law is the theoretical basis for blue carbon protection. Joint liability implies that individual States are liable for damage caused by pollution under the terms of the law. The philosophy of “one size does not fit all” advocates close cooperation between States and mutual technical and economic support. Within the framework of international and national laws, blue carbon rights are recognized as a key environmental asset. In addition, in China's legal system, the relevant theories on property rights in civil law have had a multi-dimensional impact on blue carbon protection. Therefore, when reviewing the current legislative situation in China, it is essential to establish a blue-carbon related legal system centered on joint liability. In this legal system, the theory of land-sea coordination plays a crucial role in guiding the protection of blue carbon, which is mainly located at the land-sea interface.

#### 1.3.1 Theory of Shared Responsibility

Based on the integrated nature of the Earth's ecosystem, all countries should fulfill their ecological conservation obligations. Any ecological and environmental conservation behavior or pollution incident in any country will trigger changes in the Earth's ecosystem. This can be seen in global climate change, which affects oceanic islands in a manner similar to the “butterfly effect”. Therefore, even a landlocked country has a shared responsibility for the protection of the global oceanic island ecosystems [9]. Unfortunately, many countries are overly focused on the protection of the ecology of oceanic islands. Unfortunately, the preoccupation of many countries with identifying and sharing responsibility for climate change has overshadowed their shared commitment to

protecting the planet's ecology. This has also led to a re-establishment of the notion of “national interest first” and to the abandonment of previous commitments, such as the decision of the United States to withdraw from the Paris Climate Change Agreement, which came into force at the end of 2016.

Each country has a responsibility to protect blue carbon, which is a shared responsibility to the international community as a whole. In contrast, each country benefits from the “general interest of the international community”. Based on this understanding, the importance of protecting blue carbon can be better appreciated. Although blue carbon is the property of a sovereign State within its territory, it is the responsibility of that State to protect it in order to ensure its continued development. However, the concept of “one size does not fit all” emphasizes cooperation among countries to provide the necessary technical and financial assistance for blue carbon protection. This emphasizes the importance of international environmental law and multilateral mechanisms in the face of climate change, as well as a heightened focus on blue carbon protection.

### 1.3.2 Relevant Property Rights Theory

For the conservation of blue carbon sinks, it is essential to emphasize the maintenance of the natural environment, such as salt marshes, mangroves, seagrasses, and seaweeds, as well as the safety and security of the shellfish aquaculture industry. In this process, it is necessary to clarify the links between the rights and interests of fisheries and forests and their property rights in civil law. Furthermore, as far as the legal status of blue carbon sinks is concerned, whether it is explored in terms of the choice of beneficial or quasi-property rights partly demonstrates the importance of how the basic theory of civil law can be used to make decisions on in-depth thinking and weighing between ecological and environmental benefits and economic benefits. Although the right to blue carbon sinks in the coastal zone possesses the core attributes of property rights, it also has some unique characteristics that typical property rights do not have, which makes it only be regarded as quasi-property rights, but not as typical property rights. This is mainly reflected in the

unique nature of the object of the right and, to some extent, the qualities of public power.

Ensure that the quasi-in rem definition of blue carbon sink rights on coastlines matches the existing theoretical framework of rights and thus meets the needs of practical application. However, such a definition is not infallible in the long run. Quasi-material rights are essentially regarded as a kind of “pocket right”, i.e., any rights and interests that have the characteristics of property rights but are different from traditional property rights can be included in the definition of quasi-material rights. In the context of social and economic progress, the emergence of various intangible property rights has made it difficult to deeply integrate them into the theory and legal framework of property rights. Therefore, with the further improvement of intangible property rights theory and legal framework in the future, it is expected that carbon emission rights, carbon sink rights, and other related interests can be incorporated into the intangible property rights system, establishing a new type of intangible property rights regulated by environmental laws. This approach is more in line with the direction of progress in theory and actual operation in practical application.

### 1.3.3 Theory of Land-Sea Integration

The concept of “sea-land integration” was first proposed by scholars in 2004<sup>[10]</sup>. With the passage of time, this concept has been continuously developed and improved. In the process of economic and social development, according to the characteristics of land and marine resources and environment, through the development of marine and land resources, industrial layout, ecological environmental protection and comprehensive management and other areas of overall adjustments, to take into account the economic, ecological and social functions of the land and the sea, in order to maximize the comprehensive benefits, and thus promote sustainable economic and social development, and to ensure that human beings and the nature of a harmonious coexistence. The above is a brief description of its basic connotation [11]. The above is a brief description of its basic connotation.

For the management of blue carbon sinks, the important elements include wetland areas adjacent to the sea (e.g., mudflats), mangrove forests, and aquaculture plant and animal communities in shallow waters, which are

closely interconnected and have high sensitivity to the land-sea interface. For example, in the natural mangrove swamp environment from the South China Sea to the northern part of Fujian Province, although its coverage is relatively limited, its carbon sequestration efficiency is high. However, this valuable red peat soil is now threatened with rapid degradation due to the invasion of an exotic species, *Spartina alterniflora* Loisel. In order to protect blue carbon, it is necessary to take into account the state of the land habitat as well as the environmental characteristics of the surrounding sea and apply the theory of land-sea integration in practice.

## **2. Challenges to the Protection and Development of Blue Carbon in China**

### **2.1 Lagging Legislative Concepts**

According to the National Environmental Policy Act of the United States, the State shall endeavor to preserve an environment in which there is a harmonious coexistence between mankind and nature in order to meet the economic, social and other needs of the present generation of citizens as well as those of future generations. According to Japan's Basic Law for the Environment, the State must take measures to protect the environment and to ensure the continued enjoyment of sound environmental resources by present and future generations, while at the same time maintaining the finite nature of environmental resources to ensure the continued survival of humankind. These legal provisions embody the concept of sustainable development and emphasize the harmonious coexistence of human beings and the natural environment [8].

As a natural resource that is difficult to regenerate and has a limited natural storage capacity, once damaged, marine carbon sinks will not only lead to the depletion of resources, but also cause damage to the overall ecological environment. This poses a threat to the sustainable utilization of marine carbon sinks and the coordinated development of the ecological environment. As the value of marine carbon sinks becomes more and more prominent, the kind of crude economic development model at the expense of the environment is no longer sustainable, and it is necessary to transform in a timely manner,

integrate the concept of sustainable development into the construction of the legal system, and seek a green, low-carbon development path. In order to realize long-term economic prosperity, it is necessary to ensure a healthy balance of the environment and ecology. In order to curb the production of greenhouse gases and slow down global warming, it is necessary to focus on how to manage carbon sources and improve the quality and effectiveness of carbon sinks. China's environmental protection laws are fundamental, but their coverage of the concept of sustainable development is inadequate, especially in the area of the use and maintenance of carbon sinks in natural resources and seas, where there is a lack of elaboration of the concept of sustainable development.

### **2.2 Lack of Specific Legislation for Blue Carbon Protection**

At present, the marine ecosystem is facing a serious situation, but the relevant laws and regulations have not enabled it to be adequately protected. Although China has introduced a number of laws to protect the safety and health of the marine ecosystem, including the Marine Environmental Protection Law, the Law on Prevention and Control of Air Pollution, the Law on Prevention and Control of Environmental Pollution by Solid Wastes, the Law on the Promotion of Cleaner Production, and the Regulations on the Administration of Prevention and Control of Pollution of the Marine Environment by Vessels, there have not yet been any specific provisions or measures implemented or enforced that specifically address blue carbon sinks. Further strengthening of the legal system for marine environmental protection is necessary to promote the sustainable development of the marine ecosystem.

Under China's vast marine legislative framework, two major categories of regulations related to the protection of the ocean's blue carbon sinks can be identified - one is the environmental conservation-oriented regulation based on the core content of the Marine Environmental Protection Law of the People's Republic of China, which mainly formulates corresponding provisions from the perspective of protecting the ecological

environment; the other is the Fisheries Law of the People's Republic of China as the dominant aquatic product source protection type of policy system, focusing on ensuring that the prosperity of fish is effectively guaranteed. The main focus of the law on marine environmental protection is on the two important aspects of protecting the marine ecological balance and preventing marine pollution. The Marine Environmental Protection Law, enacted in 1982, contains comprehensive provisions on the protection of the ecological environment, including measures closely related to marine blue carbon resources, such as the protection of coastal zones and coastal wetlands. For example, Article 20 of Chapter 3 of the Marine Environmental Protection Law provides for the protection of marine ecology: National relevant management and Coastal local governments at all levels along the coast shall take effective measures to protect typical and representative marine ecosystems such as mangrove forests, coral reefs, coastal wetlands, islands, estuaries, important fishery waters, and natural concentration and distribution zones of rare and endangered marine organisms, as well as marine ecosystems of important economic value, and to protect the marine ecosystems of the coastal zone and coastal wetlands. The natural distribution areas of rare and endangered marine organisms, the survival areas of marine organisms with important economic value, and marine natural historical sites and natural landscapes with significant scientific and cultural value. To address the issue of mangrove wetland protection, China has specially established Article 34 in the Wetland Protection Law of the People's Republic of China, which will be implemented on June 1, 2022, with the aim of upgrading the ecological function of wetlands and protecting wetland biodiversity. China has also formulated a series of specialized laws and regulations for marine environmental protection, including regulations governing the management of coasts, pollution from the construction of marine works, pollution from the dumping of marine wastes, and pollution from ships. The enforcement of these laws and regulations not only maintains the good condition of the marine ecological environment, but also lays a solid foundation for the sustainable existence of blue carbon

resources. At the same time, the Fisheries Law of the People's Republic of China also focuses on the reproduction and protection of fishery resources, and makes special provisions for the increase and protection of fishery resources in order to protect China's fishery resources. As an important part of the carbon sink of the marine ecosystem, the mechanism of fishery carbon sink is to promote the process of fishery organisms absorbing and storing carbon dioxide from the water through fishery production activities, so as to achieve the purpose of storing carbon sinks<sup>[12]</sup>. The mechanism of its action is to promote the process of fishery organisms absorbing and storing carbon dioxide from water through fishery production activities, so as to achieve the purpose of storing carbon sinks. Fishery production activities with the function of carbon sinks are collectively called "carbon sink fisheries", which is an effective way to reduce greenhouse gases and has a huge potential to increase carbon sinks. Therefore, promoting the development of carbon sink fisheries can more effectively demonstrate the role of marine ecosystems in climate control, increase the growth rate of fishery resources, and also help to increase the absorption and fixation of carbon, further expanding the coverage of blue carbon sources<sup>[13]</sup>.

At present, China has not yet reached a mature stage in terms of building the rule of law for the protection and development of blue carbon. From the point of view of overall legislation, the protection of marine carbon sinks has virtually no independent provisions in law, while protective legislation for marine carbon sinks is scattered throughout the legal system of environmental protection. Although the concept of blue carbon protection has penetrated into all corners of marine environmental protection laws, there is no comprehensive and systematic protection goal for the protection of marine carbon sink resources. By combing through the existing laws and regulations, one can find that there are currently no relevant legislative provisions dedicated to the protection and development of blue carbon within the existing framework of the rule of law in China. However, in the relevant environmental protection regulations, it can be observed that these norms are more or less related to the support and maintenance of blue carbon protection. For example, after

reviewing the Environmental Protection Law of the People's Republic of China, the Marine Environmental Protection Law, the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, or other similar regulations, this connection becomes evident. Unfortunately, this is not enough to form a complete and clear set of goals to systematically protect the sea's biomes and the blue carbon sinks they produce. In addition, the current policy documents do not recognize this particular energy source as one that requires special attention or protection. As a result, the legal neglect prevents the necessary protection of marine carbon sinks, and without a timely and effective solution to this dilemma, the impact of human activities on marine carbon sinks will continue to intensify, making it difficult to repair the damage. Therefore, it is imperative to take active measures to strengthen the protection of marine carbon sinks. Sustained damage will not only have a fatal impact on the marine environment, but also have a profound impact on global climate change, posing a permanent hazard to human development [8].

## 2.3 Inadequate Legal Content

### 2.3.1 Ambiguous Definition of the Subject of Public Interest Litigation for Blue Carbon Protection

China is still facing difficulties in the protection of marine blue carbon sinks, and public interest litigation continues to be very problematic. Article 55 of the Civil Procedure Law, as amended in 2012, clearly stipulates the relevant content: "For pollution of the environment, infringement of the legitimate rights and interests of many consumers and other acts detrimental to the public interests of society, the organs and relevant organizations as prescribed by law may bring a lawsuit to the people's court." The introduction of this law and regulations, to a certain extent, for the construction of a perfect marine environmental pollution public interest litigation laid the normative foundation and basis, but in its application there are some doubts, for example, the public interest referred to in the Civil Procedure Law and the concept of environmental public interest in the environmental law is not entirely consistent. Environmental public interest is different from other public interest, it is an important part of

public interest, with unique nature. The public interest involved in environmental law is crucial to the sustainable survival and development of mankind, and the scope of this interest is so broad, covering both time and space, that it is difficult for the general public to notice immediately when this interest is jeopardized. Although the law grants the relevant institutions and organizations the right to initiate litigation, it does not make clear provisions on the subject of public interest litigation on marine environmental pollution. Once it is realized that the blue carbon sinks in a certain sea area have been polluted and damaged, it will become difficult to identify the subject of the lawsuit. Therefore, it is necessary to further explore this issue in order to clarify the role of the relevant subjects in the public interest litigation of marine environmental pollution. According to the reasoning of Article 55 of the Civil Procedure Law, the subject of filing a lawsuit should be the institutions and relevant organizations according to the law. The conceptual definition of this subject is not clear, which may lead to difficulties in hearing marine environmental pollution public interest litigation cases in practice [8]. The concept of "public interest litigation" is not clearly defined.

2.3.2 Provisions on Legal Liability for Damage to Marine Carbon Sinks are too Light In China's current legal system for marine protection, which is centered on the Marine Environmental Protection Law of the People's Republic of China, the special protection of marine carbon sinks has yet to be strengthened. According to Article 76 of the Marine Environmental Protection Law of the People's Republic of China, if any violation of the provisions of this Law results in the destruction of marine ecosystems such as coral reefs, mangroves and other marine aquatic resources, or of a marine protected area, the department exercising the power of supervision and management of the marine environment in accordance with the provisions of this Law shall order rectification and remedial measures within a specified period of time, and shall impose a fine of not less than 10,000 yuan and not more than 100,000 yuan, and shall confiscate the illegal proceeds if there are any illegal proceeds<sup>[14]</sup>. The penalty shall be confiscated. Sub-rule 6 of the Criminal Law of China provides for the crime

of damaging the protection of environmental resources in Chapter 6, Section 6. At present, China has already set up management institutions related to the marine environment, including the Ministry of Transportation and Communications of the State Oceanic Administration, the Ministry of Agriculture, and local marine administrative organs at all levels, initially establishing a marine environment management system that combines the unified coordination and supervision of the competent department of marine administration with the division of labor and responsibility among relevant departments, and that combines centralized management with hierarchical management at the local level [8]. The system of management of the marine environment combines centralized management and local hierarchical management. Although China's current legal system for marine environmental protection has provided relevant legislative protection for marine blue carbon sinks, it is not difficult to see that such provisions alone are far from sufficient. Since blue carbon sinks can absorb carbon and bring the actual benefit of reducing greenhouse gases in the air, every citizen enjoys this benefit free of charge and is entitled to it. Therefore, when marine blue carbon sinks are damaged, they are penalized in accordance with the provisions of China's Marine Environmental Protection Law. The penalties are light, with fines ranging from 10,000 to 100,000 dollars not being able to make up for the damage done to marine blue carbon. And once the blue carbon sinks have been damaged, their restoration is a very difficult task. Merely ordering a deadline for correction is not enough to restore the damage to people's rights and interests brought about by marine carbon sinks, let alone allowing the individuals who have damaged the blue carbon to take remedial measures themselves.

### **3 Legal System Construction for Blue Carbon Protection in the New Era**

#### **3.1 Updating the Legislative Concept**

Broadly speaking, the core guidelines for sustainable development include the following: the principle of equity, the principle of continuity, the principle of coordination, the principle of public participation, the principle of ecological security and the principle of

resource value. The current legal system in China focuses on promoting economic development and thus plays an important role in protecting and delaying the loss of marine carbon sinks. It is imperative to look to the future and realize that sustainable economic development is closely related to environmental sustainability. Therefore, in formulating policies for the protection of marine carbon sinks, a more far-reaching perspective must be adopted, incorporating the core concept of sustainability to ensure that marine carbon sinks can survive and gradually increase their capacity to fix carbon dioxide, thereby effectively contributing to the reduction of greenhouse gases in the long term [8]. The ocean carbon sinks will contribute effectively to the reduction of greenhouse gases in the long term.

#### **3.2 Constructing Specialized Legislation for Blue Carbon Protection**

Blue carbon resources, as a natural resource, should be fully emphasized and safeguarded in terms of their juridical value. For example, near-coastal ecosystems such as mangrove forests, coastal wetlands and seagrass beds have unique ecological functions and biodiversity, and they are of great significance in maintaining the health of marine ecosystems and mitigating global warming. Therefore, the protection measures and management of blue carbon resources should be clearly defined at the legal level to ensure their sustainable utilization and effective protection. Considering the blue carbon source ecosystem as a part of the natural world requires the establishment of a set of legal and regulatory safeguard mechanisms on blue carbon protection. Take Australia as an example, a country that has the richest blue carbon resources in the world. In order to protect and continue to enjoy the benefits of this resource, the government of Australia has specifically targeted the protection of marine blue carbon resources, and in the 1990s, it introduced and implemented policies such as the Intergovernmental Agreement on the Environment (IGAE) and the National Wetlands Policy to protect and restore its coastal wetlands [15]. At the same time, in order to solve the problem of unclear division of labor between different levels of environmental protection agencies and to



alleviate the separation of environmental management and responsibility under the federal system, the above policies detailed how the various levels of administrative agencies deal with the management of this natural resource and also indicated their specific responsibilities in it [16]. The policy should be kept in mind in the national context, taking into account the specificities of the country. The legal status of blue carbon should be clarified on the basis of the inclusion of marine carbon sinks, taking into account national conditions and the experience of Australia, so that a legal framework for the protection of marine carbon sinks that is suitable for China can be rapidly established. The restoration and protection of marine carbon sinks is a complex issue, and the existing theoretical system does not fully meet the society's demand for theories. In order to better study this issue, fisheries law, carbon sink market trading law and carbon capture law should be incorporated into the legal theory system for systematic study.

Compared with general environmental protection laws and regulations, laws and regulations for the protection and development of blue carbon have their unique features in terms of setting objectives, regulating methods and regulating subjects. The construction of a legal system for the protection and development of blue carbon is the basis for realizing the rule of law on blue carbon. In order to maintain the safety of marine blue carbon sinks, it is necessary to formulate mandatory regulations at the legal level and include them in the scope of natural resources protection law. In addition, in-depth research on marine blue carbon sinks should be conducted to better understand their important role in protecting the environment and supporting economic development. Therefore, a proprietary legal framework for the management of marine ecosystems must be established to ensure their sustainable development and prevent any behavior that may lead to environmental damage. This will not only provide a solid foundation for China to reach its goal of zero emissions, but will also allow us to find an effective solution to the challenges posed by climate change. In order to accomplish this task, the construction of a legislative system for the protection of marine carbon sinks can start from two aspects:

first, to create a series of policies and regulations aimed at guaranteeing the sustainable development of marine carbon sinks, so as to avoid or minimize the occurrence of potentially environmentally harmful behaviors; and second, for the aquatic ecosystems that have already suffered damages, it is necessary to improve the relevant laws and regulations from the prevention of pollution to the treatment of the entire process afterward. The relevant rules and regulations for preventive measures and subsequent restoration work must clearly stipulate the specific programs and implementation methods for pollution prevention and control of marine carbon sink resources [17].

### **3.3 Improve the Relevant Legal System**

#### **3.3.1 Establishment of a Public Interest Litigation Mechanism on Blue Carbon Cases**

A new mechanism, civil public interest litigation for blue carbon damage, was established to safeguard people's public interest rights and interests in blue carbon damage issues. In accordance with the relevant provisions of the general environmental public interest litigation system, consideration can be given to integrating the institutional provisions of the civil public interest litigation for blue carbon damage into the Law on Combating Climate Change. Specific provisions include the following: the scope of the plaintiff's identity covers institutions exercising the right to supervise and manage blue carbon ecology, as well as environmental public interest organizations registered with the civil affairs department of the people's government at or above the municipal level of the district. These organizations must be exclusively engaged in environmental protection public welfare activities and have conducted such activities for at least five consecutive years without any record of violating the law. The loss of ecological service functions, permanent damage to ecological and environmental functions, the cost of damage investigation and assessment, the cost of cleaning up the pollution, the cost required for remediation, and the cost required to prevent the damage from occurring and expanding as a result of blue carbon emissions are all included in the scope of the civil public interest litigation claim for blue carbon emissions. The procedure of civil public interest litigation for

blue carbon ecological pollution damage may be conducted in accordance with the provisions of the Civil Procedure Law of the People's Republic of China and relevant laws and regulations. The ecological environment department at the municipal level of an area may act as the principal organ to exercise the right to sue for the right to supervise and manage the blue carbon ecological state.

With regard to the administrative public welfare of blue carbon, the procuratorate is obliged to assume the responsibility of actively supervising and discovering the illegal acts and negative attitudes of the blue carbon supervisory authorities, and to make appropriate procuratorial recommendations to ensure that the interests of the State and the well-being of the public are safeguarded. When the blue carbon regulatory authorities fail to fulfill their duties, the Procuratorate shall initiate blue carbon administrative public interest litigation in accordance with relevant laws and regulations [18].

### 3.3.2 Increase Penalties for Destruction of Marine Carbon Sinks

According to the Marine Environmental Protection Law of the People's Republic of China, in the case of damage to blue carbon resources, the relevant acts are penalized in accordance with the provisions on the assumption of legal responsibility. Although means such as "ordering corrections" can be taken, these measures can hardly make up for the damage done to the damaged resources, and their restoration and remediation are arduous and complex. The amount of fines stipulated is also far from its ecological value, and it is even more difficult to restore the carbon sequestration function, and may even lead to a series of ecological losses [19]. The fines imposed are far less than the ecological value of the carbon sequestration, and may even lead to a series of ecological losses. Such violations not only seriously affect the environmental resources, but also bring great harm to the environmental interests of the public.

To address the destruction of such precious and difficult-to-regenerate marine carbon sinks, increasing criminal penalties is necessary. Civil and administrative regulations rely heavily on financial penalties, which are almost inconsequential to perpetrators of financially powerful crimes, and instead allow

them to use their wealth even more recklessly for private gain at the expense of the loss of the public interest. Therefore, criminal penalties must be used to safeguard marine carbon sinks. As environmental interests are closely linked to the progress of human society, it is necessary to protect marine carbon sinks at the criminal level [20]. The criminal law is therefore necessary to protect ocean carbon sinks from the criminal law level. By penalizing offenders, not only can they be deterred from destroying marine carbon sinks for personal gain, but they can also serve as a warning to offenders who intend to make private gains at the expense of marine carbon sinks, thus raising the level of protection for marine carbon sinks.

## 4. Conclusion

This study uses literature review and case study methods to conduct an in-depth analysis of the legal regime for the protection and development of blue carbon, but there may be methodological limitations. Future research could explore other research methods, such as quantitative analysis or field surveys, to enrich research perspectives.

In this study, the legal system for the protection and development of blue carbon is deeply discussed, and some important conclusions are drawn. In order to achieve the goal of carbon peak and carbon neutrality, China should update its legislative concept, build special legislation for blue carbon protection, and improve the protection system of blue carbon ecosystem. At the same time, in order to perfect the relevant legal system, it is urgent to establish the litigation mechanism and increase the intensity of punishment.

The protection and development of blue carbon is an important support for China's carbon peak and carbon neutrality goals, and requires the joint efforts of the government, enterprises and all sectors of society to promote the smooth realization of carbon neutrality goals.

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