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Research Article

Forest Carbon Sink Resource Asset Evaluation with Case Study of Fujian Province in China

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Since the Industrial Revolution, the productivity of human society has been qualitatively enhanced. At the same time, with the development of the social economy, the excessive pursuit of economic interests of mankind neglects the protection of ecological environment, the hole in the ozone layer, the rise of temperature, sea level rise, and other ecological problems. At the same time, the atmospheric carbon dioxide content has risen sharply, the global carbon cycle has lost its balance. The greenhouse effect is the most urgent ecological problem facing mankind. Against this background, countries have to start studying countermeasures to deal with global warming. Forest carbon sinks are important for mitigating global warming and offsetting carbon dioxide emissions. Forest carbon sink has low cost, and is easy to realize. The study of the economic value and impact of forest carbon sink factors can help provide government agencies at all levels and forestry management departments with a scientific and reasonable management basis, so as to improve the utilization rate of carbon sink and China's voice on global climate issues. How to quantify the asset value of carbon sink resources is a hot issue today, the follows will use the relevant knowledge theory of asset assessment to discuss the characteristics of forest carbon sink resources and value composition.

1. Introduction

Forest carbon sinks refer to forest plants absorbing carbon dioxide in the atmosphere and fixing it in vegetation or soil, thereby reducing the concentration of the gas in the atmosphere. Forests are the largest carbon pools in terrestrial ecosystems, and play a very important and unique role in reducing the concentration of greenhouse gases in the atmosphere and slowing down global warming. Expanding forest cover is an important mitigation measure that is economically feasible and low-cost in the next 30–50 years. Many countries and international organizations are actively using forest carbon sinks to combat climate change.

Climate warming has increasingly become a global environmental crisis recognized by the international community, with an unprecedented impact on economic and social development. Reducing the concentration of carbon dioxide and other greenhouse gases through the carbon sink function of forests is a globally recognized feasible method with significantly improved development potential. As a developing country, China has taken various effective measures to deal with climate change. China's strategic choice in dealing with climate change is to increase forestry carbon sinks.

Forestry ecological resources are mainly based on the accumulation of forestry carbon sink in response to regional climate change. Time sensitivity and additionality are the characteristics of forestry carbon sink. The more carbon sink resources are planted, the more carbon resources will be stored for future education. Forestry carbon sequestration also faces challenges and difficulties in the development of the social investment. First, with the promotion of mandatory emission reduction policies, enterprises' demand for forestry carbon sequestration will increase. However, the current level of tradable carbon sinks is too low to meet the needs of economic and social development. Another point is to actively encourage enterprises to invest in the sustainable construction of carbon sequestration forestry. Afforestation

activities should be encouraged by the government and actively participated by enterprises and citizens to fulfill their social responsibilities and improve citizens' awareness of climate change and climate protection. Therefore, it is very important to explore the investment outside the government to inject carbon sequestration forestry.

In recent years, with the development of the social economy, human beings grab the Earth's resources wantonly and ignore the protection of the ecological environment. Developing the economy results in the destruction of the forest ecosystem, the hole in the ozone layer, and the rise in global temperature. At the same time, the timely conversion of carbon dioxide produced by production and living also leads to climate warming, which leads to the melting of glaciers and the rise of global sea levels [1]. The induced environmental problems also threaten the production and life of human society, increasing the probability of natural disasters such as floods and droughts. Similarly, the severe natural disasters caused by the heavy rain in Zhengzhou this year is also a true portrayal of ecological environment changes. With the occurrence of natural disasters, the first impact is the country's agriculture, forestry, animal husbandry, sideline, fishing, and then affects the basic production and life of the society, threatens people's food security, and seriously affects the economic development of the whole country.

Jungles are one of the most important ecosystems on Earth and have an inestimable impact on the planet and human society. As the largest ecosystem on the Earth, it contains plants, soil, microorganisms and other species of biological populations, which are interrelated and restricted, playing a role in regulating the Earth's ecology. Known as the lungs of the Earth [2], these are the 1.5 billion tons of carbon dioxide that the world produces each year is picked up and cleaned up by the jungle. This natural storage capacity, known as forest carbon sinks, regulates the concentration of carbon dioxide in the air.

Under the double pressure of developing the economy and protecting environment, it is urgent to strengthen the protection of jungle ecosystem to promote sustainable development in today's world. At the end of the 1990s, "the concentration of greenhouse gases in the atmosphere needs to be kept at a reasonable level in order to prepare for catastrophic changes that pose a serious threat to human conservation" was announced [3]. Under the Kyoto Protocol, forests absorb carbon dioxide from the atmosphere while reducing the accumulation of carbon dioxide, and convert the absorbed carbon dioxide into organic carbon, which is stored in the form of organic carbon in plants or decomposed into soil by microbes. The function of the carbon sink is included in the Clean Development Mechanism (CDM) [4].

On the journey of global sustainable development, global warming is an unavoidable problem. A proper solution to this problem is of vital importance for global development. Therefore, the evaluation of forest carbon sequestration resources has significance. The pricing mechanism of carbon emission permits is shown in the following Table 1.

Vegetation receives carbon dioxide from the atmosphere, and then converts it into sugar and oxygen through photosynthesis, and carbon dioxide is stored in plants or in the form of litter such as withered flowers and willows, which are differentiated by microorganisms and stored in the soil. Jungle is part of the terrestrial ecosystem. The largest of the carbon library must belong to the jungle. If less take care of shelter forest resources, and make full use of natural vegetation influence to store carbon dioxide from the atmosphere, a carbon sink rather arbitrary cut-down trees, then the jungle have probably will be converted to "carbon source," will further aggravate the global climate change, coerce save mankind.

The valorization of residual biomass plays today a decisive role in the concept of "circular economy," according to which each waste material must be reused to its maximum extent. The collection and energy valorization at the local level of biomass from forest management practices and wildfire prevention cutting can be settled in protected areas to contribute to local decarbonization, by removing power generation from fossil fuels. Despite the evident advantages of bioenergy systems, several problems still hinder their diffusion, such as the need to assure their reliability by extending the operating range with materials of different origin. The Italian project "INNOVARE—Innovative plants for distributed poly-generation by residual biomass," funded by the Italian Ministry of Economic Development (MISE), has the main scope of improving micro-cogeneration technologies fueled by biomass [5].

2. Literature Reviews

Globally, scholars at home and abroad have carried out research activities on forest carbon sinks, but a closer look at the starting point of foreign research on forest carbon sinks is much earlier than domestic research. Referring to the sequence of relevant studies in authoritative journals and literature at home and abroad, this study briefly combs, and summarizes the research on forest carbon sinks in the recent period.

2.1. Foreign Understanding of Forest Carbon Sink. Around the end of the 1960s, when the International Council for Science (ICUS) began drawing up the United Nations Educational, Scientific and Cultural Organization, The International Biological Programmer (IBP), proposed by UNESCO, is the starting point for the International community to explore ecosystems on scale, and also the prelude to the study of forest carbon sequestration in terrestrial ecosystems. Later, in 1972, UNESCO (United Nations Educational, Scientific and Cultural Organization) further launched Man and the Biosphere Programmer (MAB) on the basis of the study of IBP. After that, some countries started to study the carbon balance of the forest ecosystem in the region and the carbon cycle relationship between the regional ecosystem and the global ecosystem, among which the prominent countries are the United States, the former

Table 1: Pricing mechanism of carbon emission permits.

Development stage of carbon emission pricing mechanism	The first stage	The second stage	The third stage
Pricing mechanism	Government pricing	Government and market mixed pricing	Market pricing based government oversight is supplemented

Soviet Union, Canada, Brazil, and some European countries [6]. In this process, many representative scholars emerged and they believed that uninvented carbon sinks probably existed in more areas around the world, not only in the northern hemisphere and forest areas in middle and high latitudes, for example, the tropical rain forest in Malaysia was probably a major carbon sink. Forest carbon sequestration has become an important means to cope with global climate change and reduce atmospheric greenhouse gas emissions led by carbon dioxide and confirmed that forest carbon sinks could be used to meet a country's emission reduction requirements for carbon dioxide and other greenhouse gases in order to further study forest carbon sinks. We recognize the important impact of forests on carbon dioxide absorption in the atmosphere and propose the use of forests to sequestrate carbon dioxide. Forests can play an important role in combating climate change, as is also recognized in the paper Forests in Russia to Combat climate change [7].

2.2. Foreign Studies on Forest Carbon Sink Assessment. Most of the research has focused on how forest ecosystems are involved in the atmospheric carbon cycle and its impact on it, as well as on the CO_2 uptake capacity of forests with diverse plant species. While it is certain that forest carbon sinks are a useful way to mitigate global warming, there has been little research into the biomass of forests to hold the concentration of greenhouse gases in the atmosphere at an appropriate level in order to prepare for catastrophic changes that pose a serious threat to human conservation [8]. The signing of the convention country complies with its promise and implement the agreed to control carbon emissions mission. Forest carbon sinks such craft a brief, low-cost way by the favor of people, but also mobilized carbon sink project to develop, and the relevant business deals on carbon sequestration of economic subject and business is more and more by people throughout the deposit as soon as possible. Many countries have launched CMD forest carbon sequestration projects, such as Brazil's Rainforest Planting Project, Russia's Vologda Regional Afforestation Project and Uganda's National Park Forest Restoration Project. Some countries have also started to measure the biomass of forests. For example, some scholars in Japan took the product of the total amount of carbon dioxide received by forests and the cost of carbon dioxide received by thermal power plants to imply the carbon sink benefit of forests. As early as the end of the 20th century, France's domestic forest biomass carbon sequestration was very high, carbon sequestration was as high as 860 million tons. The amount of forest carbon sequestration reached 1.14 billion tons, and the total amount of forest carbon sequestration was about 2 billion tons [9]. We studied the forest carbon sink in Poland, and found that the forest carbon sink gap ranged from 1.17 to 5.77 tons of carbon/ha/year by means of forest biomass and carbon flux, and found that the main source of carbon emissions in Poland's ecosystem was consumption residues generated after logging. Using the method of simulation function and combining various research results, the global terrestrial carbon uptake is estimated at 2.8 billion tons per year [10].

Some scholars also discussed the carbon sink price. We calculated the forest carbon sink item target for transaction costs \$0.57–\$2.96/ton C, Miami, Wisconsin, and three states of south Carolina forestry carbon sequestration average cost estimation, through a land of econometric model results, respectively, \$170/\$230/50 dollars/tons C [11].

2.3. Domestic Scholars' Understanding of Forest Carbon Sink. Domestic scholars are familiar with the forest carbon sink from the carbon cycle. Zhang [12] analyzed forest ecosystems in the global climate system and studied their role in the carbon cycle, Chen [13] stated that the carbon cycle is discussed and compared from two perspectives. The difference lies in the angle between land use conversion and net GHG emissions and terrestrial ecosystems. In the same year, Zhang [14], in his book *Global Ecology: Climate Change and Ecological Response*, studied China's forest carbon sink from the perspective of global ecology. Zhang [14], in the book Afforestation and Climate Change—A Study on Carbon Sinks, for the first time systematically discussed the social, agricultural, economic, and policy issues related to forest carbon sinks faced by domestic forestry after the signing of the Kyoto Protocol. In the same year, scholars Xu [15] discussed the great role of forest carbon sinks from the perspective of global weather change, and the concept and policy initiative of China in weather structure and response were discussed. Another scholar who discussed forest carbon sinks from the perspective of global weather structure and attitude was Zhang [16] and others. They are in the case of aggravated weather changes to its in-depth discussion. Xia [17] and Zhang [18], through the process of literature investigation in 2005, elucidated the special basis and evaluation methods of CDM afforestation and reforestation projects, which laid a foundation for the independent implementation of CDM afforestation and reforestation in China. Yang et al. [19] stated that the process of strengthening can increase forest carbon. They found that the implementation of coherent policies can solve the country forest resources current situation problems. They put forward some scientific and reasonable countermeasures. Hu [20] considered that forest carbon sink has three costs: economic cost, situation cost, and social cost, increasing the

publicity of forest carbon sink is the primary ability to improve the utilization level of forest carbon sink. From the low carbon economy and the growth of forest carbon sinks, forest carbon sinks is a low carbon economy growth pillar of strength in the future [21].

Since the Industrial Revolution, the rapid development of global industry, frequent human social activities, the use of a large number of fossil fuels, carbon monoxide, carbon dioxide, and other greenhouse gases in the atmosphere continue to accumulate, the increase of greenhouse gas concentration also makes the global carbon cycle out of balance. How to maintain carbon content at an appropriate level or use carbon sinks to alleviate global warming has become a hot topic in the international community. According to the detection and statistics of the Chinese Academy of Forestry, China's existing forest coverage rate is 195 million hectares. The total amount of carbon contained in the forest is 7.811 billion tons. The total amount of air pollutants reduced by forest absorption and purification is 32 million tons, the total amount of dust trapped in the forest is 5 billion tons, and the total economic value generated is about 10 trillion yuan. Therefore, it can be concluded that the in-depth understanding of carbon emissions by regulations will not only play a role in improving the global ecological environment, but also enjoy the huge economic value brought by it. This study has two purposes: one is to explore the basic methods of forest carbon sink assessment and study the practical operation of various methods. Second, take the three provinces in northeast China as an example, use the above methods to measure the value, and study the factors affecting the measure from reality [22].

Based on the relevant principles and theoretical basis of asset appraisal, this paper uses three basic analysis methods: market method, cost method, and income method to calculate and study the value of forest carbon sink resources. At the same time, the amount of forest carbon sink savings in Fujian province was determined according to the relevant measurement methods of forest carbon sink savings. Due to the particularity of the nature of forest carbon sinks, their price will change due to the negotiation between the two parties in the trading market. Therefore, when adopting the market method, this paper collected the transaction prices of carbon sinks in three relevant markets, and analyzed and calculated them according to their average prices as the basic price for evaluation.

3. Related Concepts and Theoretical Basis

Based on the relevant principles and theoretical basis of asset appraisal, this study uses three basic analysis methods: market method, cost method, and income method to calculate and study the value of forest carbon sink resources. At the same time, the amount of forest carbon sink savings in Fujian province was determined according to the relevant measurement methods of forest carbon sink savings. Due to the particularity of the nature of forest carbon sinks, their price will change due to the negotiation between the two parties in the trading market. Therefore, when adopting the market method, this study collected the transaction prices of carbon sinks in three relevant markets, and analyzed and calculated them according to their average prices as the basic price for evaluation.

3.1. Related Concepts

3.1.1. Carbon Sinks. At present, there are two viewpoints about the concept of carbon sink.

The capacity of trees to absorb and store carbon dioxide is what we call a forestry carbon sink and it's usually expressed in terms of the amount of carbon dioxide that they absorb and store. Some scholars believe that the absorption and storage of CO_2 by trees during growth is an effective carbon sink accumulation. They also point out that as forests in the region are over felled. Some of the carbon dioxides is released into the atmosphere and trees become a source of carbon. Secondly, in terrestrial ecosystems, carbon sink functions are mainly embodied in two forms, one is the storage of carbon pool, the other is the accumulation rate, and the carbon source is reflected in the intensity of carbon emissions. The "source" refers to the source and the "sink" refers to the attribution and process of receiving carbon dioxide. Therefore, carbon sink refers to the nature and process of transferring carbon dioxide.

To sum up, we refer to the definition of carbon sinks in the United Nations Framework Convention on Climate Change. Forestry carbon sink can be summarized as: A series of chemical processes of CO_2 removal in the atmosphere, or related mechanisms to complete the removal process.

3.1.2. Forestry Carbon Sink. According to the above definition of the carbon sink concept, a carbon sink is an activity that removes carbon dioxide. Therefore, forestry carbon sequestration is the general term for carbon dioxide removal in forestry activities. Specifically, forest carbon sequestration refers to the stabilization and increase of carbon sequestration supply and total storage through forestry production and operation activities such as tending, wetland protection, desertification prevention and control, afforestation, forest production, and forest harvesting. The process of a series of activities. Forest carbon sequestration has the usual natural property of regional forest and the value content of forestry commercial management.

3.1.3. Value Evaluation. Valuation is the process of estimating the value of a product or service in a certain environment. Generally speaking, under certain circumstances, it is a process of gradually evaluating the possible value of the subject to the object and recognizing the value of things. Since there is no uniform transaction price for forestry carbon sink projects in the market at present, this study adopts the average transaction price of the three trading markets for valuation.

3.2. Theoretical Basis

3.2.1. Sustainable Development Theory. The cognitive process of the concept of sustainable development has experienced a long period of time, since the 1970s. The rising of global green movement drives the development of the theory of sustainable development. The world Commission on environment and development (Brundtland themselves, WCED) in 1987 in "our common future" first formally describes the concept of sustainable development. Sustainable development is a focus on long-term development of the economic growth mode, both to meet the needs of modern people, and then without jeopardizing the ability of future generations to meet their needs [22]. The view of sustainable development exaggerates the fair and useful manipulation of capital. The definition given can be interpreted from three principles. First, it must be the urgency of human natural capital and the importance of protecting the natural environment together. That is the principle of commonality. Then, it discusses the principle of fairness. Contemporary people can not only look at the front, but also to coordinate the children, even the preservation and growth of different countries; In the future, there may be checks and balances on the relationship between human production activities and natural conditions, requiring economic development to protect natural resources and the conditions on which we live. This is the principle of sustainability. World environmental protection structure tries to make sustainable development around the world. Chinese authorities are also in the aspect of natural resources and environmental protection in response to a call to arms of the United Nations. In 1992, at the United Nations conference held in Rio DE Janeiro, Brazil, the call to arms to the nations involved in environmental protection, the Chinese authorities to respond to the call to arms, and make the promise to practice the "Agenda 21," and put it as a general counsel and countermeasure scheme based on sustainable development in our country. China has a large number of natural resources. Spread in fact is not balanced and the population base is big. Fast growth, environmental pollution, according to these signs, China must change the traditional pattern of only attaching importance to the growth of economic benefits, will firmly connect the sustainable growth strategy and economic growth go its own national conditions appropriate green low carbon mode, finally realize the great Renaissance of the Chinese nation. Forest vegetation carbon sequestration effects into full play.

3.2.2. Environmental Value Theory. The traditional view is that the situation capital does not contain the cost, because from the Marxist labor cost theory, the commodity is a double tool, including cost and use cost. The undifferentiated labor of man brings a cost to goods, and the cost of use of goods is better able to satisfy the basic needs of human production. However, the situation contains only the premise that it is possible to satisfy human beings and not the premise that it consolidates human beings' undifferentiated labor so that the situation has no value. Such traditional concepts initially influenced human thinking and led to tense results, with conditions shattered and capital depleted, and some countries confined to such traditional labor theory of value, especially in developing countries. Many developing countries seek rapid economic development, and neglect the topic of the situation. We have to start by thinking about this kind of traditional cost theory from the beginning, to establish the situation cost concept with the times, it is necessary to change the situation immediately, the unilateral traditional idea that capital has no cost. The present situation cost theory includes two aspects, one is that the situation is useful, and the other is that the situation is a kind of scarce capital. The reason why it is mentioned as scarce capital is that it is assumed that capital can be endlessly regenerated for human beings to use endlessly, then there will be no problem with the cost of the situation. If the thrifty capital is not taken care of and excessive spending is blind, any capital city will be exhausted one day. The emergence of the case cost theory gives inevitable guidance to the study of how to measure the carbon sink in the jungle. The forest carbon sink project carried out by the international director is the application of the case cost theory, which shows people's recognition and face up to this new concept.

3.2.3. Ecological Capital Theory. With people's attention to environmental problems and the transformation of the domestic economic growth model, the ecological capital theory has been discussed specifically. In today's world, the ecological environment has begun to transform from "natural" to "humanized natural." In essence, ecological capital is man-made natural assets, and capital can reflect its economic value through the process of land rent or shadow price to realize ecological capitalization [18]. In terms of the layout of the jungle ecosystem at present, its ecological cost mainly includes the following. The ecological potential of jungle resources, the quality of the jungle ecological environment, and the jungle ecosystem, as the mobilization of all kinds of animals and plants, can provide the necessary capital for all kinds of human production activities. The quality of the forest ecological environment, as a collection of various plants and animals, forest ecosystem can provide necessary resources for human production activities. With the continuous growth of society and the improvement of human living standard, the demand for the quality of the living environment is getting higher and higher. The ecological cost elucidated by the jungle is becoming increasingly obvious, and its ecological service effect has become one of the elements of human wealth creation, so the ecological resources of the jungle are capitalized.

4. Analysis of Influencing Factors of Forestry Carbon Sink Value

4.1. Basic Factors. The influencing factors of the total value of forestry carbon sink are inseparable from itself. The amount of forestry carbon sink and the value of carbon sink itself is directly determined. During the period of carbon

price determination, the total carbon sink value is determined mainly by the actual carbon sink storage content of local trees. Therefore, in the analysis of forest carbon sink value, the first consideration is to study and analyze the actual stock of forest carbon sink.

4.2. Impact of Different Analysis Methods on Value. After determining the base content of forest carbon sink artificial economic and technical analysis is also one of the factors affecting the price of forest carbon sink. According to the actual situation, there are roughly two popular analysis methods. One is an analysis based on the general empirical consensus of the author or the research group. For example, Li [4] uses several major factors, including "natural, social and economic," to assess carbon in China's Forestry Carbon Sink. Analysis of foreign exchange supply factors. In terms of nature, precipitation, temperature, topography, and geology all affect forest carbon sink storage. Social factors: buyers and sellers in the trading market, market trading situation; In terms of economy: the fluctuation of international interest rate will also affect the forestry carbon sink price due to the fluctuation of the international economic situation [16]. This analysis method based on researchers' experience has the advantage of being simple and easy to operate. Many steps are omitted in the evaluation process, and the evaluation conclusion can be drawn quickly. However, the results are subject to subjective influence by the assessors, and there is no accurate quantitative analysis of carbon sink savings and carbon price, so the data results obtained are biased.

4.3. Mathematical Model Analysis. We can use the mathematical regression method to construct the corresponding regression analysis curve model, and use the relevant theories of economic statistics to study the influence degree of its related factors on carbon sink. The classical linear regression model is generally used for fitting analysis, but the research using a comprehensive dynamic analysis method is relatively few. For example, Wan and Zhou [21] selected environmental factors such as temperature, area, and geographical location, and then used regression analysis model to analyze and draw some conclusions about forestry carbon sink. In recent years, more and more scholars have studied carbon sinks in different fields. Some scholars study the cost of carbon sinks from the perspective of carbon emissions and farmers. For example, Huang Zaisheng [22] studied the timber price, discount rate, and labor price during crop rotation as the cost factors.

5. Evaluation Method of Forest Carbon Sink Resource Value

5.1. Assessment Method of Forestry Carbon Sink

5.1.1. Remote Sensing Estimation Method. The state parameters of different vegetation samples were obtained by manipulating remote sensing technology, and the carbon sink of large area forest ecosystem was estimated according to the real-time series of forest vegetation spatial classification. This method requires high precision of instruments and relevant skills of staff.

5.1.2. Forest Stock Conversion Factor Method. The mathematical model between forest stock and measured forest biomass was established, and the carbon sink of forest biomass was estimated by the carbon content rate of the process, and then the carbon sink of understory vegetation and forest land was estimated by the proportional relationship of the process. This method was simple and feasible to operate.

5.1.3. Biomass Method. Therefore, forest biomass data is the fundamental carbon estimation method 0, which is usually divided into uniform biomass, the continuous function of conversion factor, and uniform conversion factor method according to the basis and method of calculation. The results of uniform biomass estimation usually overestimate the carbon sequestration of forest plants. The uniform conversion factor adopts a constant biomass conversion factor, which has a large deviation. However, the continuous function method of conversion factor can better estimate the regional forest carbon sequestration.

5.2. Assessment Method of Forest Carbon Sink Assets. Through the process of assets evaluation theory, carbon sink forest assets evaluation should be wore price theory, efficiency cost theory, market supply and demand theory, and capital cost theory as the basis. The assessment process should follow the expected return of bulk, the substitution principle, the principle of supply and demand, etc. At the same time, it is to belong to a part of the intangible assets.

5.2.1. Market Law. Market law requires an open, active trading market with comparable instances of the same or similar sinks as those being assessed in the vicinity of the assessment time. By adjusting the value of the assessed asset and the comparable transaction, the forest carbon sink price is obtained by evaluating the differences in transaction conditions, the amount of carbon sink per unit area, time, and other factors. Its calculation formula is as follows:

$$P = P_0 \times k_1 \times k_2 \times k_3 \times k_4, \quad (1)$$

P_0: Reference carbon sink transaction price (evaluation base date), k_1: Adjustment of trading conditions, k_2: carbon sink adjustment per unit area, k_3: Trade date adjustment, k_4: The forest carbon sink of the assessed asset.

5.2.2. Revenue Method. The income method is a commonly used method for forest carbon sink assessment. Its assessment idea is to estimate the value of the assessed assets by accumulating the net income of the assessed assets to the present value at a certain cost reduction rate every year in the future. Detailed assessment of forest carbon sink assets: the expected annual net income of forest carbon sink is fair and reasonable, and the appropriate cost rate is confirmed

according to the harm borne by forest carbon sink investment; the specific calculation formula is as follows:

$$P = \sum_{i=1}^{n} \frac{(A_t - C_t)}{(1+r)^t}, \quad (2)$$

A_t: annual revenue of forest carbon sink for year t, C_t: t year expenditure of forest carbon sink, r: discount capitalization rate, t: yield period of forest carbon sink assets.

5.2.3. Cost Method. The cost method of forest carbon sink is used, so the sum of all costs necessary to obtain the same or similar effect of forest carbon sink from the labor price and production capacity at the evaluation point, and the value of forest carbon sink can be obtained by deducting the depreciation amount before the evaluation point. Its formula is expressed as follows:

$$P = C - D, \quad (3)$$

P: assess the value, C: replacement price, D: depreciation.

Among the three evaluation methods mentioned above, the market method is the most direct one. Many evaluation institutions determine the price of the virtual market of carbon sinks by constructing transaction market hypothesis, inquiring about and investigating the willingness of different consumers to pay for services of different forest carbon sinks. The condition of using income assessment method is to accurately forecast the future income period and annual objective net income of forest carbon sink. It is usually used to evaluate the carbon sink value of medium or mature forests. The key to the application of the cost method is to determine the cost composition of forest carbon sink assets so as to reasonably determine their replacement cost [19].

6. Case Study of Forestry Carbon Sink Resource Value Evaluation in Fujian Province

6.1. Forestry Carbon Sinks in Fujian Province. Fujian Province is located on the southeast coast of our country. The islands facing each other across the sea, and excellent geographical location makes Fujian province an excellent natural ecological environment. Forest coverage rate is also very superior at the same time, according to the ninth search to identify forest resources, forest coverage in the province of Fujian province is about 811.58 square hectares, Tomlinson volume of 729 million cubic meters. The specific situation is shown in Table 2.

6.2. Estimation of Economic Value of Forest Carbon Sink. The economic value of the forest carbon sink means that the fixed forest carbon sink can be monetized through corresponding economic means, so that the forest carbon sink can be accurately measured. There are two influencing factors: forest carbon storage and unit price.

Its expression formula is as follows:

$$V = C * P, \quad (4)$$

V: represents the economic value of forest carbon sink, C: represents forest carbon storage, and P: represents the unit price of forest carbon sink.

6.3. Determination of Forest Carbon Sink Price. At present, there are many types of carbon sink price measurement methods. Due to its special nature, its price performance in the market is not fixed, and the two sides of the transaction mainly determine the final transaction price through negotiation. Therefore, this study adopts the market value method and selects the average price of the three trading markets as the trading price.

6.4. Estimation of Economic Value of Forest Carbon Sink in Fujian Province

6.4.1. Data Sources. The data comes from the national forest inventory results (1–9 times), and the economic value price of forest carbon sink comes from China Carbon Emission Trading Network, Beijing Environment Exchange, and Haixia Equity Trading Center.

6.4.2. Carbon Sink Measurement. Using the accumulation expansion method, the forest carbon sink can be calculated as follows:

$$C = C_1 + C_2 + C_3 = V \times \partial \times \rho \times y + \alpha V \times \partial \times \rho \times y + \beta (V \times \partial \times \rho \times y), \quad (5)$$

Where C represents the total forest stock. C_1 represents forest tree carbon sink. C_2 represents the carbon sink of understory plants. C_3 represents the carbon sink amount of forest land. V stands for forest stock. ∂ is the accumulation expansion coefficient. ρ represents volume density. Y represents carbon content. α represents the carbon conversion coefficient of understory plants. β represents the carbon conversion coefficient of forest land. The default values of the international IPCC (Intergovernmental Panel on Climate Change) for each coefficient are 1.9 for ∂, 0.5 for ρ, 0.5 for Y, 0.195 for α, and 1.244 for β.

The results obtained after substitution are shown in the following Table 3:

6.4.3. Economic Value Calculation. This study adopts the method of market value and selects the average transaction price of the three trading markets as the unit price, specifically, the transaction price of Fujian in 2019 is 17.83 yuan per ton, and that of Beijing Environmental Exchange is 10.93 yuan per ton, and that of Memory environmental energy Network is 13.92 yuan per ton. The economic value estimation results of carbon sinks in Fujian province are shown in the following Table 4:

Table 2: Forest resources inventory data in Fujian province over the years.

year	Forest coverage rate (%)	Forest area/ten thousand hm^2	Forest stock/100 m^3	Standing wood storage/ten thousand m^3
1978	48.5	472.75	3.13	24 330.00
1983	37	486.4	2.88	43 055.91
1988	41.18	547.05	2.81	37 888.24
1993	50.1	656.22	3.33	39 465.20
1998	60.52	735.37	3.65	41 763.62
2003	62.96	764.94	4.44	49 671.38
2008	63.1	766.65	4.84	53 226.01
2013	65.95	801.27	6.08	66 674.62
2018	66.8	811.58	7.29	79 711.29

Table 3: Historical data of national forest inventory results.

year	Standing wood accumulation/100 m^3	Forest carbon sink (t)
1978	2.433	28 186.91
1983	4.306	49 881.35
1988	3.789	43 894.47
1993	3.947	45 721.42
1998	4.176	48 384.20
2003	4.967	57 545.54
2008	5.323	61 663.66
2013	6.667	77 244.21
2018	7.791	84 500.07

Table 4: Historical data of estimated economic value of carbon sinks in Fujian province.

year	Forest carbon sink/Wan t	China carbon emission trading network (2019)/Ten thousand yuan	Beijing stock exchange (2019)/Ten thousand yuan	Fujian environment and energy trading platform (2019)/Ten thousand yuan
1978	28 186.91	502 572.61	308 082.93	392 361.79
1983	49 881.35	889 384.47	545 203.16	694 348.39
1988	43 894.47	782 638.40	479 766.56	611 011.02
1993	45 721.42	815 212.92	499 735.12	636 442.17
1998	48 384.2	862 690.29	528 839.31	673 508.06
2003	57 545.54	1 026 036.98	628 972.75	801 033.92
2008	61 663.66	1 099 463.06	673 983.80	858 358.15
2013	77 244.21	1 377 264.26	844 279.22	1 075 239.40
2018	84 500.07	1 506 636.25	923 585.77	1 176 240.97

7. Conclusions

The maturity of the forest carbon sink market and the gradual openness of carbon sink trading information require mature evaluation methods of carbon sink assets. In this paper, through the evaluation of assets appraisal basic, use market method, cost method and income method, studied the forest carbon sink value, through asset appraisal related economic and technical means to confirm amount of forest carbon sinks, confirmation forest carbon sinks savings is the basis of its economic value, carbon savings amount to calculate the related economic value. The calculation of the value of forest carbon sink is conducive to the utilization of forest carbon sink by relevant environmental protection departments, and can also provide data reference for the research on global ecological environmental protection.

It says demand for renewable energy sources, including wood biomass, continues to grow steadily. The value of the forest biomass resource also needs to be evaluated scientifically. In future work, we hope to find a way to assess the economical value of the forest biomass assets [5, 23, 24].

Data Availability

The data used to support the findings of this study are included in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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