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[Jiemin LIU](#) , Xuejiao Su , Yuanmeng LIU , [Wei SHUI](#) *

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Review

A Review of Research on Progress in the Theory and Practice of Value Realization of Eco-Products

Jiemin Liu ¹, Xuejiao Su ¹, Yuanmeng Liu ² and Wei Shui ^{2,*}

¹ College of Architecture and Urban and Rural Planning, Fuzhou University, Fuzhou 350108, China

² College of Environment and Safety Engineering, Fuzhou University, Fuzhou 350116, China

Abstract: The realization of value in eco-products represents a rapidly advancing research theme. However, the clarity of relevant concepts, types and operational mechanisms remains elusive. A comprehensive review of current-stage research outcomes in eco-product value realization not only provides a novel approach to rejuvenating regional economies but also proactively contributes to the enhancement of local ecological environments. This article conducts a systematic literature review on the fundamental concepts, research scope and pathways for realizing the value of eco-products. The conclusions are as follows: (1) To clarify the basic concepts of ecosystem services and eco-products, the interrelationship between the two and the research scope of eco-products. (2) To elaborate the method for accounting the value of eco-products. (3) To demonstrate governmental path, market path and collaborative path for realizing the value of eco-products. (4) To review cases pertaining to the realization of value in public eco-products, quasi-public eco-products and operational eco-products both domestically and internationally. Building on this research foundation, the article identifies shortcomings in past research results and proposes key directions for future research progress.

Keywords: eco-products; value realization; ecological industry; value accounting

1. Introduction

"The Proposal adopted by the CPC Central Committee for Formulating the 14th Five-Year Plan for Economic and Social Development and Long-range Objectives Through the Year 2035 " put forward the following suggestions: Establishing a mechanism to realize the value of eco-products, improving market-based and diversified ecological compensation and promoting total resource management, scientific allocation, comprehensive conservation and recycling, fully implementing the strategy for rural revitalization, strengthening the use of industry to augment agriculture and enabling urban areas to lead rural areas. This approach will promote a new relationship type between agriculture and industry, wherein rural and urban areas complement each other, so as to develop in a coordinated manner and achieve mutual prosperity. Despite the nationwide implementation of theory that "lucid waters and lush mountains are invaluable assets," practical achievements have been limited. At present, the contribution of value realization of ecological products to rural industries is weak[1], farmers get less income from the value realization of ecological products, the supply variety of rural ecological products is limited, the payment of beneficiaries of rural ecological products is insufficient[2], and the market mechanism of value realization of ecological products is not perfect. In response, this necessitates an exploration of the realistic pathways for ecological product value realization to meet the strategic needs of the nation, embodying the unique interpretative theory of "Two Mountains" with Chinese characteristics and its practical application. To propel China's high-quality development and the realization of common prosperity, the objective is to construct a distinctive theoretical framework for ecological product value realization in China. This framework should be adaptable to uncertainties arising from factors such as deglobalization, the post-pandemic era and the international and domestic context of "dual circulation." It aims to contribute to the forefront of thought, theoretical foundations and practical guidance for the more

extensive promotion of shared prosperity and equitable development rights for urban and rural populations. Additionally, it seeks to contribute to the higher-level enhancement of rural spatial governance, aligning with cutting-edge trends, theoretical underpinnings and practical guidance.

2. Ecosystem Services and Ecosystems

2.1. Ecosystem Services

The concept of ecosystem services was first introduced by Ehrlich and colleagues in 1981[3]. Since then, it has gained widespread acceptance within academia. Western scholars define ecosystem services as a complex natural system, comprising ecosystems and ecological processes, which preserves the natural environmental conditions necessary for human existence and utility[4]. Ecosystem services also provide goods and services[5], enabling people to enjoy the benefits of provisioning, regulating, cultural and supportive services[6]. These services encompass all categories of unprocessed materials necessary for production and day-to-day functioning, as well as the components that establish and sustain the earth's eco-support system, thereby shaping the environmental circumstances imperative for human survival[7]. Furthermore, ecosystem services include the products and services that directly or indirectly maintain life, facilitated by their structure, processes and functions[8]. Research on ecosystem services in urban areas involves ecosystem service accounting, ecological certification, eco-labeling, forest tourism and assessment studies on the provision of these services [9–15].

2.2. Eco-Products

The concept of eco-products first emerged in 2001 as part of the "Millennium Ecosystem Assessment Board" project, organized by the World Health Organization (WHO), the United Nations Environment Programme (UNEP) and the World Bank. In the academic realm, the notion of eco-products is delineated into both a broad and a narrow sense. In its broad sense, eco-products encompass public, quasi-public and operational ecosystem services, including ecological material products[16,17], which also includes operational products with human labor issued by quality certification agencies[18,19]. In a narrow sense, eco-products specifically pertain to final products or services contributing to human well-being within the domains of industrial and agricultural products. This narrower definition encompasses items and services associated with positive externalities such as clean air, water, unpolluted soil, thriving forests and favorable climates[16][19]. Wang Jinannan has positioned eco-products within the fourth industry, emphasizing their role in promoting the sustainable well-being of both humanity and nature[12]. Notably, this conceptual framework excludes operational products with ecological premiums from the purview of Gross Domestic Product (GDP) accounting.

The research scope of eco-products can be further segmented based on multiple attributes. From the perspective of eco-product attributes, they are categorized into public products, quasi-public products and operational eco-products[16,12,20]. Considering the manifestation form and function, eco-products fall into three distinct categories: ecological material products, ecological and cultural services and ecological regulation services[21,22]. In the context of product supply, a nuanced taxonomy emerges, comprising natural elements, natural attributes, ecological derivatives and ecological labeling[23]. In addition, from the vantage point of human involvement in the production process, eco-products are stratified into primary eco-products and derivative eco-products.

2.3. Relationship between Ecosystem Services and Eco-Products

The conceptual definitions of eco-products and ecosystem services exhibit a considerable degree of overlap. In related research, the exploration initially focused on ecosystem services, characterized as "the benefits that human beings directly or indirectly receive from ecosystems, primarily encompassing universal access to clean air, water and other essential resources" [24]. This focus gradually transitioned towards the study of eco-products, positing that "ecosystem services

encompass a variety of valuable services provided by ecosystems for human beings, whereas eco-products place a greater emphasis on their commodity economic nature, representing a fusion of value and value in use"[25]. Chinese scholars align their studies of eco-products closely with the concept of ecosystem services. The value of ecosystem services is widely considered as a prerequisite and foundation for realizing the value inherent in quality eco-products.

In summary, eco-products arise from specific ecosystem structures and processes, including both market-oriented material products and non-market-oriented services, i.e. public and operational aspects. Under the premise of human consumption, it is necessary to ensure that the structure and function of the ecosystem are not damaged in the process of consumption, so as to meet the basic principles of sustainable development [26]. While the concept of ecosystem services underscores the independence of humans and ecosystems, ecological products emphasize their transformation into economic entities within human society through human labor. In certain instances, ecosystems generate eco-products by harnessing partial ecosystem services, such as carbon sequestration, oxygen release and the production of fresh air [27,28]. At this point, the relationship between ecosystem services and products is a process-outcome relationship (illustrated in Figure 1) [29,30].

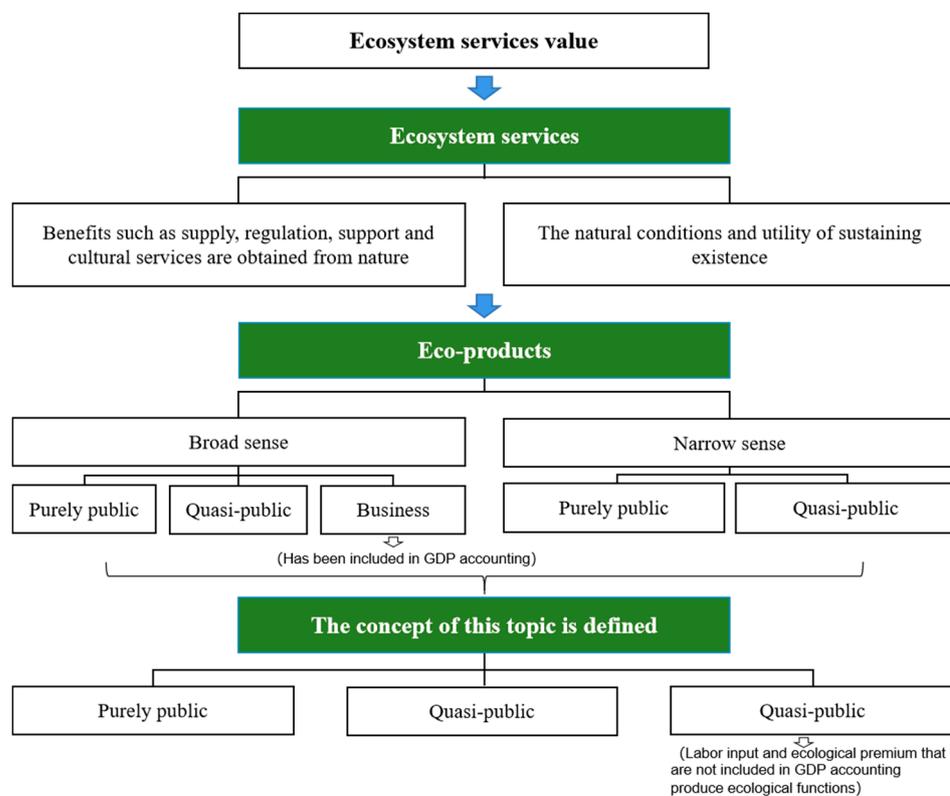


Figure 1. Conceptual framework of ecosystem serving ecological products.

3. Eco-Products Value Accounting and Value Realization

3.1. Eco-Products Value Accounting

Eco-products value accounting was introduced in "Agenda 21" in 1992 with the objective of enhancing techniques for measuring the worth of natural resources. The goal was to facilitate the adoption of a unified system of environment-economy accounting system, supplementing conventional methods of accounting for Gross National Product and output value. The concept of Gross Ecosystem Product (GEP) as first proposed in 2012, when Zhu Chunquan proposed to incorporate GEP into the accounting system for the assessment of sustainable development and to use GEP to assess ecological conditions[31]. The objective of eco-product appraisal is the computation of the GEP, which refers to the total sum of the final material products and services provided by ecosystems for human well-being, sustainable economic and social development (referred to as "eco-

products"), as compared to the concept of GDP. This includes physical commodities, regulatory services and cultural amenities. The process of GEP accounting entails calculating the monetary value of eco-products. It is based on quantifying the functional quantity of eco-products and the reference prices for different eco-products, using specific mathematical operations[32]. By establishing a national or regional GEP accounting system, it is feasible to evaluate the production values of diverse natural ecosystems, including forests, grasslands, deserts, wetlands and oceans, as well as human-made ecosystems such as farmland, pasture, aquaculture farms and urban green pockets. This assessment facilitates the measurement and demonstration of the various ecosystems' statuses and alterations[33,34].

Domestic scholars concentrate on eco-products, investigating the classifications of ecosystem services, their values and possible applications[35,36]. However, there is currently no consensus on the exact definition of the eco-product valuation object. Scholars, both domestically and internationally, primarily articulate their scientific understanding of the appraisal object in relation to national accounts and discussions on gross national product. In practice, eco-product utility accounting methods often center around aspects such as the quantity, flow and quality of ecological resources. Challenges arise in the assessment and pricing, primarily due to the inadequate categorization of ecosystem types. This inadequacy contributes to difficulties in precisely calculating the value of eco-products and the resulting evaluation lacks widely applicable reference points. To date, there has not been an internationally recognized and precise method for accounting for ecological value[37–40].

3.2. *Eco-Product Value Realization*

The definition of the value realization of eco-products draws from three theoretical sources: the labor theory of value, the utility value of service and the price theory of value of neoclassical school[41–44]. Marxist theory posits that natural eco-products without human processing lack value, possessing only use value. Therefore, only the introduction of human labor in the production process can produce both use value and value. Existing literature on the classification of the value of eco-products suggests a division based on the degree of availability into use value and non-use value[45], also termed theoretical value and potential realization value in some literature[46]. The use value can be further subdivided into the value of direct use and the value of indirect use. Regarding the way of value realization of eco-products, ecological product value encompasses ecological service value and ecological exchange value[47]. In terms of the value expression of ecological products, it can be divided into ecological capital value, product use value, performance incentive value and stimulation of employment value[48].

The value realization pathways of eco-products can be primarily categorized into three types: the government pathway, the coordinated pathway involving both market and government and the market pathway. In the current stage in China, the predominant approach for realizing the value of eco-products is government-led, complemented by market-oriented operations[49]. In certain regions, there have also been explorations of a market-based eco-product supply approach, utilizing government-guided enterprise investments as a means[16] (shown in Figure 2).

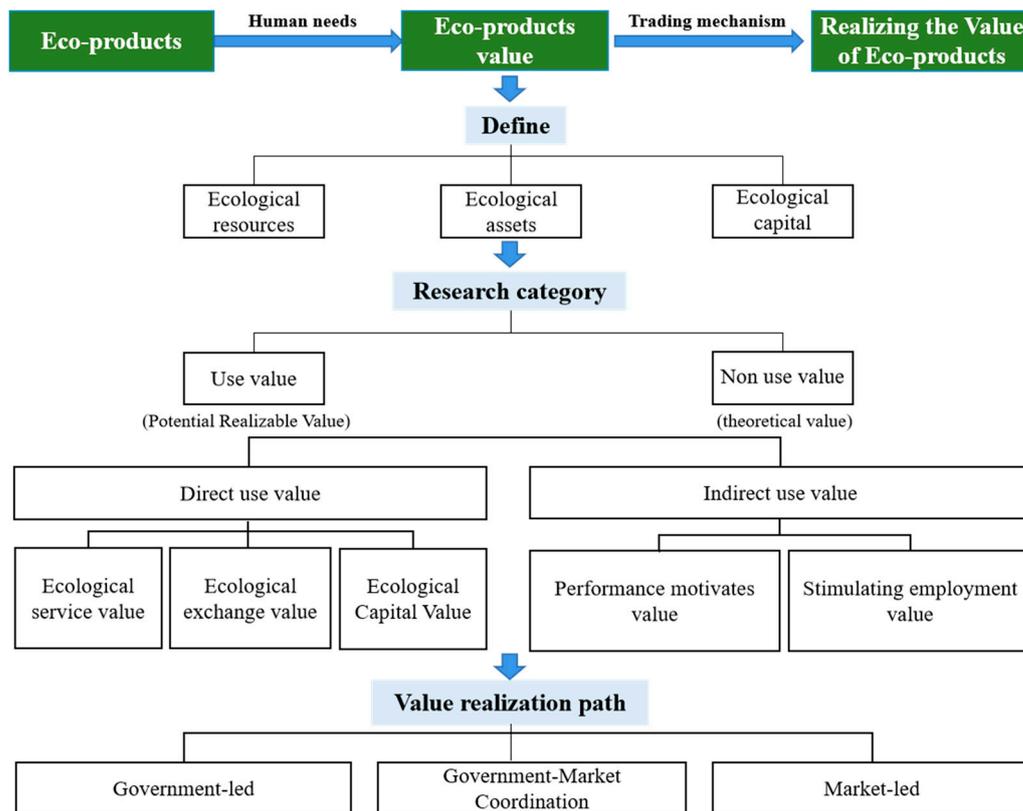


Figure 2. Types and ways to realize the value of eco-products.

At the present stage, China has carried out pilot work in Zhejiang, Fujian, Hunan, Jiangsu, Guizhou and Chongqing and achieved initial results. The relevant implementation path is shown below (shown in Figure 3).

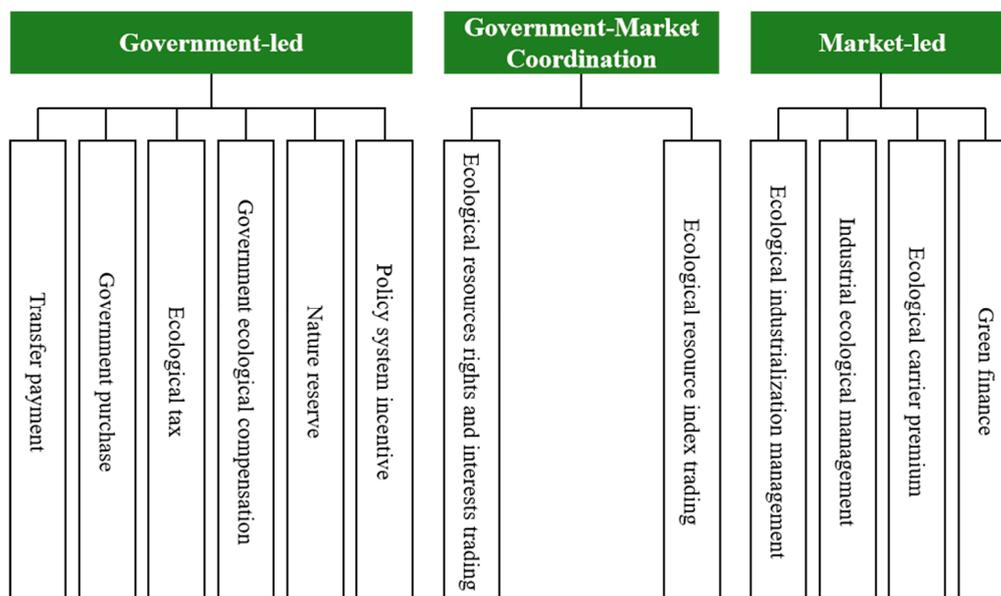


Figure 3. The practical mode of realizing the value of ecological products.

3.2.1. Government-Led Path

(1) Transfer payment mode: The government provides financial funds to different groups or units, aiming to achieve multiple goals such as social equity, economic development and social security through targeted financial distribution. For example, Beijing municipal government

provides financial support to farmers participating in the paddy field conversion project to dry land to encourage farmers' environmental behavior[50].

(2) Government purchase pattern: The government purchases projects and services related to the protection, restoration or improvement of the ecological environment through procurement procedures[51,52]. For example, by 2020, China has invested 508.3 billion yuan in natural forest protection projects and has completed 300 million mu of non-profit forest construction tasks[53,54].

(3) Ecological tax and fee model: the government guides enterprises and individuals to conduct environment-friendly behaviors through taxation and fee collection. At present, China's ecological taxes include resource tax, consumption tax, value-added tax, income tax, urban maintenance and construction tax and vehicle purchase tax[55].

(4) Government ecological compensation mode: The government compensates, restores and comprehensively controls the damage to the ecosystem and natural resources and the pollution to the environment caused by human social and economic activities. For example, Zhejiang and Anhui provinces in the upper and lower reaches of the Xin'an River in China clearly calculate the amount of ecological compensation among the provinces in the upper and lower basins through a formula and cooperate to protect water quality safety[56].

(5) Setting up a protected nature area mode: Through detailed environmental assessment, the government will designate sites with high ecological value or special natural resources as protected nature areas to prevent irreversible environmental damage and over-exploitation of resources. For example, China's Changbai Mountain National Nature Reserve has included ecologically sensitive areas and drinking water sources into the red line of ecological protection to enhance the supply capacity of ecological products.

(6) Policy and institutional incentive model: Higher level governments guide local governments to take actions in line with public interests and sustainable development goals through a combination of rewards and constraints under the regulatory framework. For example, the governments of Ezhou City in Hubei Province[57] and Nanping City in Fujian Province[58] incorporated ecological value accounting into the local government assessment system[59].

3.2.2. Government-Market Coordination Approach

(1) Trading mode of ecological resource rights and interests: the government shall formulate market rules, set up trading platforms and supervise trading activities to realize market trading of ecological resource property rights, development rights and pollution emission rights and so on. For example, Fuzhou City of Jiangxi Province adopts the property rights mortgage financing model, in which farmers can use the management rights of rural contracted land and the property rights of rural housing as collateral to obtain loans from banks[60].

(2) Transaction mode of ecological resources indicators: the government sets control requirements for the quantity of ecological resources and encourages local governments, enterprises or individuals in economically developed regions or in need of developing and occupying ecological resources to meet control requirements by purchasing indicators or quotas. For example, Chongqing government has built a trading platform based on forest coverage index while districts and counties that fail to meet the forest coverage index can purchase the coverage index of other districts and counties[57].

3.2.3. Market-Led Path

(1) Industrial ecological management mode: Enterprises integrate ecological concepts into production and economic activities through technological innovation, clean production, renewable energy application, etc., so that enterprises can be more environmentally friendly and sustainable in production and operation. For example, China's rice-fishery integrated cultivation technology utilizes the circular ecological mechanism of rice-fish symbiosis to build a three-dimensional circular ecological agriculture system[61].

(2) Ecological industrialization management mode: Enterprises or social management groups conduct industrial development and management of ecological resources on the basis of ensuring that the functions of the ecosystem are not destroyed. For example, Anji County in Huzhou City, Zhejiang Province[62] and Shadong Village in Xiangxi Autonomous Prefecture, Hunan Province[63] rely on the advantages of ecological background to develop characteristic farm music projects and karst landform tourism projects respectively.

(3) Ecological carrier premium model: The government attaches the value of ecological products to agricultural products, industrial products or spiritual and cultural products, and realizes the value through market premium sales. For example, both the Wuyuanwan ecological restoration and comprehensive development project in Xiamen, Fujian Province and the Yangtze River Protection project in Jiangyin, Jiangsu Province take the government as the lead to carry out pollution control and ecological environment restoration, improve regional environmental quality, and promote land premium and industrial transformation and upgrading[57].

(4) Green finance model: Banks and other financial institutions transform ecological resources into ecological assets and integrate them into social funds through financial transactions[64]. Representative cases include the forest rights acquisition and storage guarantee project in Nanping City, Fujian Province[65], the Fulindai project in Sanming City, Fujian Province and the "Tow mountains" financial project in Lishui City, Zhejiang Province [22]. Forest households or rural collective economic organizations can pledge forest rights assets as financing guarantee in order to purchase ecological financial products to meet their capital needs in ecological protection and forestry management.

4. Review of Case Studies on Value Realization of Ecological Products

The core of realizing the value of ecological products lies in transforming their inherent ecological value into actual benefits in economic, social or cultural aspects. This process includes transforming the environmental protection, sustainability, social responsibility and other characteristics of ecological products into the actual use value of the products and making them reflected and exchanged in the economic system through market mechanism or other means. In this process, the realization of the value of ecological products can be divided into three modes: the realization of the value of pure public ecological products is mainly led by the government, the realization of the value of quasi-public ecological products adopts various modes of coordination between the government and the market, and the realization of the value of operational ecological products is dominated by the market while the relevant support policies of the government play a role in guaranteeing the value.

4.1. Review of Typical Case Studies on the Value Realization of Pure Public Ecological Products

Pure public ecological products (such as climate regulation, soil and water conservation, water conservation, etc.) have significant externalities[66]. The value realization path is mainly led by the government, which is the representative of the land ownership of the whole people, supplemented by market methods while diversified ecological compensation methods are adopted.

- (1) Comprehensive ecological protection products: Local governments and social institutions are encouraged to participate in the whole ecological protection action mainly through the government's establishment of financial transfer system and the establishment of natural protection areas. Take Brazil as an example. The Brazilian government raises special ecological compensation and pays funds in stages in collaboration with public welfare organizations to support the ecological construction of the Amazon nature reserve[67]. In regional ecological governance, the government allocates fiscal revenue funds according to governance needs through quantitative assessment of ecological environment levels in each region [68,69].
- (2) Soil and water conservation ecological products: The government guides individuals or non-profit social groups to participate in the protection and restoration of vegetation by paying ecological services or ecological compensation. For example, in the cultivated land rotation

protection plan of the United States and the National Forest Fund project of Costa Rica, the government or national institutions provide individual ecological compensation to landowners who participate in forest protection actions and farmland conversion actions respectively, aiming to encourage a wide range of participants to contribute to soil and water conservation through the paid incentive of ecological services[70–72].

- (3) Water conservation ecological products: local governments, enterprises and individuals are encouraged to actively participate in the maintenance of water resources mainly through the implementation of ecological tax, ecological compensation and political performance evaluation and incentives by the government. For example, in the Camboriu water supply project in Brazil, the government hired poor people to remove invasive species in order to improve water resources supply[67], taking into account the dual goals of poverty alleviation and ecological environment governance. In the Catskill water supply project in New York, the government collected ecological taxes from the downstream residents and earmarked the funds for the construction of upstream water purification and filtration facilities[73], which reflected the consideration of social equity and ecological balance in the implementation process.

4.2. Review of Typical Case Studies on the Value Realization of Quasi-Public Ecological Products

Quasi-public ecological products have the characteristics of "clear property rights, scarce market and accurate quantification". The realization of the core value of the product mainly depends on the market transaction mode of ecological resource ownership transaction and index transaction under the supervision of the government. Under the guidance of the market mechanism, quasi-public ecological products can realize the reasonable development of resources and the balance of the ecosystem by optimizing the allocation of ecological resources such as grasslands, wetlands and forests.(1) Water rights products: The government grants trust funds the right to develop water resources and charges water users for services such as water storage and purification. For example, with the support of the government, Ecuador has raised multiple funds to provide a long-term and stable special financial fund guarantee for the ecological construction of water resources[74].

- (1) Wetland rights products: Taking the United States as an example, it implements the Wetland Mitigation Bank project[67], which requires developers to purchase ecological services from banks to offset the loss of wetlands caused by development activities, and this measure aims to achieve "zero net loss" of wetland resources.
- (2) Pollutant discharge right products: The pollutant discharge activities of factories and other institutions are controlled through the supervision of the government and the market. For example, the United States promulgated the Clean Water Act[75] and set up the "rainwater interceptor credit" mechanism[76,77] respectively increase the cost of pollutant discharge and reduce the cost of green facilities construction.
- (3) Land rights products: Under the control of the government and the market, land rights holders can transfer rights such as land management rights, use rights or easements to other individuals or economic organizations[78]. For example, the land trust fund mechanism in the United States limits the development of land through the signing of conservation easement contracts between land owners and land trust organizations, so as to achieve the goal of safeguarding the conservation value of land[79].
- (4) Forest rights and carbon quota products: the government shall establish a market access system to allow enterprises to buy, hold or sell forest rights or carbon quotas through market trading modes such as index trading or quota trading.

For example, countries with high carbon emissions can purchase carbon emission quota indicators to offset carbon emissions through the international carbon sink trading platform[16]. The US state of California sets a cap on the total carbon emissions allowed in a specific period of time, and companies need to buy additional carbon emission permits when their carbon emissions exceed the specified limit.

4.3. Review of Typical Case Studies on Value Realization of Operational Ecological Products

Market-led operational ecological products have the characteristics of direct access to market transactions while their value realization is mainly reflected in the realization of the value of ecological private products[23]. These products are the ecological products with the highest participation of human labor, including ecological agricultural products, ecological industrial products and ecological service products.

- (1) Eco-agricultural products: farmers or agricultural production organizations use sustainable, environmentally friendly and organic agricultural production methods to produce high-quality agricultural products. For example, the Danish Eco-farming project uses innovative technologies and waste recycling measures to reduce environmental pollution from pig farming[80]. The Farm-Institution program in the United States cultivates green organic agricultural products by building an industrial chain of green agricultural production, processing, distribution and sales[81].
- (2) Ecological industrial products: factories, enterprises or social production organizations adopt clean production technologies and circular economy methods to reduce resource use, improve energy efficiency, reduce waste generation and reduce environmental pollution, so as to produce green industrial products with environmental protection characteristics. For example, the Swedish Forest Industrial Mechanism and the "Green hydropower" project in Switzerland[82,83] respectively followed the forest sustainable development management and "green hydropower" certification standards to achieve a win-win situation for ecological resource development and environmental protection.
- (3) Ecological service products: individuals, enterprises, developers, village collective organizations or other social institutions attach the value of ecological products to the service industry through ecological industrialization management, ecological carrier premium or green finance, including ecological cultural goods, ecological tourism and ecological finance products. For example, the French National Park brand value-added system[84] and the American Rainforest Certified coffee project[85] drive the premium of cultural goods through the certification of ecological certification bodies. The Hawaii Mountain Forest Tourism Project[86] drives the premium of tourism industry by relying on the characteristic mountain forest landscape of Hawaii.

Table 1. List of typical cases of realizing the value of ecological products in international countries.

Eco-product classification	Cases	Specific measures		
Pure public ecological products Government-led path	Comprehensive ecological protection	Fiscal transfer payment system in Brazil	The government transfers payments to local municipalities according to their ecological governance needs.	Transfer payment
		Amazonas regional reserve plan in Brazil	The government, in partnership with ngos, transfers funds to nature reserves in stages.	
	Soil and water conservation	National forest fund project in Costa Rica	The Government/State agency provides ecological compensation to landowners who protect forest resources/participate in reforestation operations.	Ecological compensation
		Cropland potato conservation program in U.S.	The government buys "soil and water conservation" and other ecological service products from the market.	
	Water conservation	Natural forest protection project in China	The government allocates the amount of ecological compensation between the upper and lower provinces.	
		Xin'an River interprovincial basin ecological compensation project in China	The government hired the local poor to rid themselves of invasive species to improve water supplies.	
		Water supply project in Camboriú, Brazil	The government collects ecological taxes and fees from downstream residents for the ecological construction of upstream water resources.	Ecological taxes
		Water supply project in Catskill, New York, U.S.	The government has established an audit system for outgoing leading officials' natural resource assets and environmental responsibilities.	Performance evaluation
	Implementation plan of ecological value project in Ezhou, Hubei, China	The government has established a watershed water environment assessment mechanism.		
	Species diversity	Changbai mountain national nature reserve in China	The government has listed ecologically sensitive areas and drinking water sources as the red line for ecological protection.	The establishment of nature reserves
Water resources	Water Fund Project in El Guado Quito	The government and water users pay into the trust fund for water maintenance services.	The trading mode of	

Operational public goods Market-led path	development right				ecological resources rights and interests
	Wetland development right	Wetlands Mitigation Bank mechanism in U.S.		Developers purchase wetlands from banks to offset and compensate for the occupation and destruction they cause.	
	Pollutant discharge right	Federal water pollution control mechanism in U.S.		The government enacted the "Clean Water Act" to increase the cost of wastewater treatment for businesses.	
	Land right	Community land trust fund in U.S.		The government or landowner donates or entrusts title to land to a trust to acquire property.	
		Property rights mortgage financing model in Fuzhou, Jiangxi, China		Farmers use the management rights of contracted rural land and housing property rights as collateral for bank loans.	
	Forest right/ Carbon emissions right	International carbon sink trading market		Developed countries invest in afforestation in developing countries to offset total carbon emissions.	
		Carbon emission quota mechanism in California, U.S.		Companies buy and sell carbon credits through auctions or carbon markets.	Ecological resource index trading model
		Public welfare forest carbon inclusive project in Huadu, Guangzhou, China		Enterprises offset carbon emissions by purchasing carbon emission right quotas or voluntary emission reduction certification.	
		Forest coverage index trading in Chongqing, China		Districts and counties that do not meet the forest coverage index can buy indicators in other districts and counties.	
	Ecological agriculture	Ecological farming mechanism in Denmark		Farmers solve pig pollution by means of technological innovation and ecological recycling.	
		Farm-institution program in U.S.		Farms and social institutions build green industrial chains to produce high-quality fresh products.	
		Rice-fishery integrated breeding system in China		Farmers use rice-fish symbiosis to build a circular ecological agriculture system.	
	Ecological industry	Mechanisms of forest industry in Sweden		The factory follows the sustainable management of forests and produces ecologically friendly forest products	Ecological industrialization management model
		"Green hydropower" certification mechanism in Swiss		Hydropower developers obtain "Green hydropower Certification" by optimizing hydropower production mode	
	Ecological services	Mountain forest tourism project in Hawaii, U.S.		Local residents rely on mountain landscape characteristics to drive tourism industry premium.	
		Rainforest certified coffee project in U.S.		The enterprise create brand effect by obtaining standardized certification and creative marketing techniques.	
		National parks brand value-added system in France			
		Rural revitalization project in Shibatong Village, Hunan, China		Local residents rely on the karst landscape to drive the tourism industry premium.	
		Farmhouse project in Anji County, Huzhou Zhejiang, China		Local residents drive a premium in the tourism industry through a standard system of farmhouse music.	
Ecological restoration and comprehensive development project of Wuyuan Bay, Xiamen, Fujian, China			The government, enterprises or social organizations drive the land premium of industrial transformation and upgrading through the comprehensive treatment of ecological environment and the improvement of environmental quality.		
Yangtze River Protection Project in Jiangyin, Jiangsu, China					
"Two Mountains Finance" Project in Lishui, Zhejiang, China			The bank evaluates the "ecological credit" of enterprises and launches "ecological loan" financial products.		
"Forest Ecological Bank" Project in Nanping, Fujian, China		Farmers use their forest rights as collateral to apply for loans at financial institutions or buy financial products.	Green finance model		
	Fulindai project in Sanming, Fujian, China				

5. Evaluation of Existing Representative Conclusions and Views

5.1. The Concept, Classification and Evaluation Methods of Ecological Products Show a Trend of Diversity and Continuous Evolution

The definition, connotation, indicator calculation and valuation methods of ecological products exhibit diverse characteristics in research outcomes. With the development of economic and social factors and the evolution of major internal and external contradictions, relevant studies continue to progress. The primary controversy lies in the broad and narrow interpretations. Specifically, whether the value of products in agriculture, industry and services with ecological premiums should be included in the category of ecological product value. Furthermore, there is insufficient exploration and discussion regarding the recognition and calculation of the opportunity costs arising from human activities related to the conservation, restoration and abandonment of ecological products. Existing assessment and accounting data sources, evaluation metric systems, spatial-temporal scale selection, assessment standards and other evaluation methods for ecological product value possess a notable degree of subjectivity. The accuracy of evaluation results is influenced by factors such as sample size, public knowledge levels and expert professional standards. Questions regarding how to acquire

source data and construct a scientific evaluation metric system, how to establish indicator thresholds for maintaining the stability of ecosystems based on the assessment results of ecosystem services and how to formulate rational, achievable and sustainable development plans that optimize benefits and adjust and maintain the stability of utilization plans in response to changes in natural and socio-economic environments remain unresolved. The criteria or indicators for assessing the excellence of ecosystem services are still lacking a satisfactory resolution.

5.2. Research into Market-Government Synergies and Mechanisms for Realising the Value of Eco-Friendly Products is Expected to be a Prominent Topic of Research in the Near Future

The realization pathways of ecological product value have been significantly informed by pioneering explorations and summarative research conducted in exemplary provinces and cities, providing a rich foundation for scholarly inquiry. Across various regions, there has been active exploration of diverse value realization models, encompassing governmental, market-oriented and collaborative government-market approaches, thereby accumulating substantial research materials. Nevertheless, the existing research outcomes exhibit a relatively loose distribution and, given the heterogeneity pertaining to the types of ecological products, geographical locations and developmental stages, a comprehensive and systematic framework is yet to be established. The coordination effects of market forces and government intervention in promoting the balance of product supply and demand, as well as price formation, lack rigorous theoretical derivation and practical summaries of long-term operational mechanisms. Given the inherent characteristics of ecological products, characterized by strong public goods attributes, low-profit margins, low turnover rates and often situated in economically and politically disadvantaged areas, the process of market-oriented operation raises questions about the clarification of property rights and the internalization of externalities. In the face of the highly opportunistic nature of the mobile capital market and the dominant competition of urbanized economies, questions arise regarding the effective resistance to market shocks, ensuring stable and abundant cash flows and safeguarding the perpetual existence of ecological capital. Furthermore, how to strategically attract high-level talent and cutting-edge technologies to lead in value creation, continuously enhance the "quality" and "efficiency" of products, necessitates systematic, creative and targeted policy design and practical exploration.

5.3. Cross-Regional, Multi-Scale Supply and Demand Balances for the Realization of Ecological Product Values Need to Be Systematically Explored

There is significant heterogeneity, clustering and non-uniformity in the spatial distribution, total quantity and diversity of different categories of natural ecological products. Geographic variations contribute to divergent spatiotemporal patterns of development, accompanied by the emergence of ecological resource scarcity based on dimensions of human spatial utilization. According to the utility value theory of ecological product value realization, the value of ecological products is reflected in effectiveness and scarcity. Effectiveness pertains to the utility of resources in satisfying human needs, while scarcity is a crucial measure of economic value. Drawing on the trade formation mechanisms of traditional economic products, scarcity is expected to induce motives for inter-regional market transactions. There is an urgent need for a multidimensional perspective grounded in "vertical and horizontal coordination" as well as "spatiotemporal correlation" to initiate theoretical discussions on establishing mechanisms that balance the supply and demand of material and service flows within ecosystems. This requires exploring theoretical frameworks for precise ecological compensation and long-term dynamic balance mechanisms, founded on various supply areas (supply sources) and beneficiary locations (consumption sources).

6. Conclusion

Through a comprehensive literature review, this paper systematically elucidates the fundamental concepts and interrelationships between ecosystem services and ecological products. It

synthesizes the current basic methods for realizing ecological product value and delineates the governmental, market and collaborative pathways for achieving ecological product value. Additionally, the paper summarizes known cases of realizing the values of public, quasi-public and commercial ecological products. It is evident that, currently, the academic community lacks a unified and normative framework for the assessment and accounting system of ecological product value. Addressing the need to construct a multi-level and systematic ecological product supply system, particularly exploring diverse value accounting methods for various ecological products in exemplary regions, remains a significant challenge. Incorporating human labor value and considering product attributes and value utilization scenarios in the pricing process of ecological product assessment are pivotal issues that need immediate attention.

Currently, the academic focus on the mechanisms for realizing the value of ecological products primarily revolves around the exchange and distribution processes within the production phase. This can be summarized as the property rights system, compensation mechanism, price mechanism, financial mechanism and accounting mechanism for realizing the value of ecological products. However, there is a noticeable lack of in-depth exploration from the perspective of contrasting ecological products with urban economic products, particularly in delving into the protective aspects of the ecological product value realization mechanism. For ecological products characterized by "public" attributes, determining ownership and enhancing the transparency and marketization of ecological product value realization are essential considerations. How to leverage the decisive role of the market in the allocation of ecological product resources? How to nurture a well-functioning trading market and stimulate the enthusiasm of diverse market participants? How to effectively counteract the influence of the capital market, ensure the permanent existence of ecological capital, continually enhance the "quality" and "efficiency" of product value-added and establish a more diversified and seamless ecological product value realization mechanism? These are the key research directions that require focused breakthroughs in the future.

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