

Review and prospect of research on regional resource and environmental carrying capacity

Wentao Wang

*School of Economics and Management, Guangxi Normal University, Guilin, Guangxi, 541000, China
w18075298337@163.com*

Abstract: *With the acceleration of globalization and the increasing prominence of resource and environmental issues, how to effectively enhance the carrying capacity of regional economic resources has become one of the current research hotspots. This article will analyze the factors that affect the carrying capacity of regional economic resources in depth, and propose corresponding improvement strategies and measures to explore how to promote the enhancement of regional economic resource carrying capacity in practice and promote sustainable development of regional economy. Aiming to provide new ideas and insights for the theoretical research and policy practice of regional economic resource carrying capacity, it has important theoretical and practical significance.*

Keywords: *resource environment, carrying capacity, sustainable development*

1. Introduction

Since the country has promoted the construction of ecological civilization, resource and environmental protection have become increasingly important. The Twentieth National Congress of the Communist Party of China proposed that Chinese path to modernization is a modernization in which people and nature coexist in harmony, and thereby promote carbon and pollution reduction and achieve synergy. Building an ecological civilization is a millennium long plan for the sustainable development of the Chinese nation. We must establish and practice the concept that green mountains and clear waters are invaluable assets, form a green development and lifestyle, and build a beautiful China. In order to fully implement the construction of national ecological civilization, strengthen top-level design, implement the central government's unified exercise of the responsibilities of owners of all natural resource assets, and incorporate the overall protection and systematic restoration of natural resources and environment into spatial planning, scientific guidance is provided for the protection and rational development and utilization of natural resources. The latest "Technical Guidelines for Evaluating the Carrying Capacity of Resources and Environment and the Suitability of Land and Space Development (Trial)" issued by the Ministry of Natural Resources in 2020 defines the carrying capacity of resources and environment as the maximum reasonable scale of human activities such as agricultural production and urban construction within a certain geographical range, based on specific development stages, economic and technological levels, production and lifestyle, and ecological protection goals. In the past, the carrying capacity of resources and environment mostly appeared in the field of geography, and related research focused on concepts, evaluation indicators, calculation methods, and other levels. The evaluation indicators generally include natural conditions, geological environment safety, resource conditions, environmental quality, ecological quality, etc. The weights of the evaluation indicators are determined through subjective weighting method, mean square error decision-making method, etc., and then linear weighting and other methods are used to obtain the comprehensive evaluation value of resource and environmental carrying capacity. The application field generally involves analyzing the ranking of regional resource and environmental carrying capacity, analyzing the impact of regional economic development, population aggregation, and land use conditions on resource and environmental carrying capacity. However, its application in spatial development structure prediction, development level optimization, population capacity control, and other fields is insufficient, and there is not much connection with urban and rural spatial planning. After the establishment of the national territorial spatial planning system, positioning regional development direction based on resource carrying capacity has become an important issue. It is necessary to incorporate resource and environmental carrying capacity into the preliminary analysis of spatial development, as a constraint and potential force for spatial development. The development of various regions should be constrained and guided by the carrying capacity of resources. On the one hand, it is necessary to actively coordinate and implement the protection of natural resources at the higher level;

On the other hand, it is necessary to tailor measures to local conditions and evaluate the comprehensive development potential and capacity of various regions within the jurisdiction based on local resource and environmental carrying capacity, in order to lead the development pattern.

1.1 Research background

With the continuous growth of global population and economic development, the pressure and demand for resources and environment are also increasing. Meanwhile, the frequent occurrence of extreme weather events brought about by climate change further exacerbates the challenge of resource and environmental carrying capacity. In this context, people's awareness of ecological environment protection is gradually increasing, and they are beginning to attach importance to the concept of sustainable development, actively seeking effective resource and environmental management and protection measures. The government plays an important guiding role in this field by introducing relevant policies and regulations to promote research and improvement of resource and environmental carrying capacity. Therefore, the study of resource and environmental carrying capacity has become an important issue that cannot be ignored in today's society, which is related to the sustainable development of the entire society and the health protection of the ecological environment. In addition, with the acceleration of globalization, population growth, industrialization, and urbanization, the pressure on resources and environment in various regions continues to increase, and the issue of regional resource and environmental carrying capacity has become one of the bottlenecks restricting sustainable development^[1].

1.2 Research significance

By studying the carrying capacity of regional resources and environment, we can better understand and grasp the relationship between regional economic and social development and ecological environment, and provide scientific basis for ecological civilization construction and sustainable development. At the same time, in-depth research on the influencing factors and evaluation methods of regional resource and environmental carrying capacity can help propose corresponding policy recommendations and development strategies, and promote sustainable development of regional economy and society. Therefore, conducting research on this topic has important theoretical and practical significance for deepening theoretical understanding, expanding research fields, and promoting regional sustainable development. In addition, by evaluating the carrying capacity of resources and environment, it is possible to timely identify and prevent ecological and environmental risks, scientifically understand and objectively evaluate the impact of regional economic and social development on the ecological environment, and provide scientific basis for government decision-making and planning. It also helps to promote sustainable economic and social development. Reasonably utilizing resources, protecting the environment, and improving resource utilization efficiency are all important goals in the study of regional resource and environmental carrying capacity. Only under the premise of sustainable carrying of resources and environment, can economic and social development develop in a long-term and healthy manner. Helps to promote regional coordinated development. There are differences in the carrying capacity of resources and environment in different regions. By studying the carrying capacity status and influencing factors of each region, targeted regional development plans and policies can be formulated to promote coordinated regional development. This can lay a solid theoretical foundation for the construction of subsequent evaluation index systems, the current development status of regional resource and environmental carrying capacity, and the discussion of solution strategies.

Regional resource and environmental carrying capacity, as an important research field, involves the intersection of multiple disciplines such as ecology, geography, economics, sociology, etc. Internationally, with the increasing prominence of global climate change and resource and environmental issues, academic research on regional resource and environmental carrying capacity has also attracted increasing attention. A series of research results on the evaluation, monitoring, and management of resource and environmental carrying capacity have been formed internationally, which play an important role in guiding and promoting sustainable development in various countries. In China, with the proposal of the concept of "ecological civilization" and the implementation of sustainable development strategies, the carrying capacity of regional resources and environment has become a hot topic of concern for the academic community and government departments. The imbalance and vulnerability of resource and environmental carrying capacity in various regions, as well as how to better protect and utilize resources and environment, have become important research directions at present.

2. Construction of rating system

In the study of regional resource and environmental carrying capacity, the construction of an evaluation system is one of the core and foundation. Establishing a scientific and reasonable evaluation system can help us comprehensively and accurately evaluate the carrying capacity of regional resources and environment, providing scientific basis and guidance for decision-makers. A multi-dimensional and multi-level evaluation system can be constructed for different research purposes and needs to comprehensively reflect the status of regional resource and environmental carrying capacity^[2].

2.1 The selection of multidimensional evaluation indicators

When constructing an evaluation system, it is necessary to select appropriate evaluation indicators. The evaluation indicators should not only reflect the overall level of resource and environmental carrying capacity, but also highlight its key characteristics and issues. The commonly used evaluation indicators include resource supply capacity, environmental capacity, ecosystem health status, population carrying capacity, economic development level, and other aspects. By comprehensively considering the weights and interrelationships of various indicators, a relatively complete and scientific evaluation system can be established. In the process of constructing the evaluation system, a multi-level evaluation model can also be used to better grasp the internal structure and evolutionary laws of regional resource and environmental carrying capacity. By setting different evaluation levels and indicator systems, it is possible to deeply analyze various aspects of resource and environmental carrying capacity, from macro to micro, from overall to local, and comprehensively understand the status and development trends of regional resources and environment. After establishing the evaluation system, it is necessary to verify and optimize the model to ensure the scientific and reliable evaluation results. Through on-site investigation, data analysis, and case studies, the effectiveness and applicability of the evaluation model are verified, and existing problems and shortcomings are identified and resolved in a timely manner. At the same time, based on feedback and actual situation, further optimize and improve the evaluation system to make it more in line with practical needs and research requirements. Through the above steps, we can establish a comprehensive and scientific evaluation system, providing strong support for the assessment and management of regional resource and environmental carrying capacity, and promoting the realization of regional sustainable development. In the process of constructing the evaluation system, the opinions and needs of all stakeholders should be fully considered to ensure the breadth and participation of the participating parties. Government departments, academic institutions, and corporate social organizations should jointly participate in the construction of the evaluation system, forming a diversified decision-making reference and supervision mechanism. Only with the joint efforts of all parties can the evaluation system better reflect the actual situation and provide decision-makers with more convincing and actionable suggestions. The establishment of an evaluation system is not a one-time process, but a process that requires long-term tracking and dynamic adjustment. With the development of socio-economic and environmental changes, evaluation indicators and models also need to be constantly updated and improved to adapt to new situations and demands. Therefore, we need to establish a sound monitoring system, regularly evaluate and revise the evaluation system, keep it up-to-date, and ensure its effectiveness and applicability at different stages. Through the comprehensive application of the above measures and methods, we can establish a scientific and comprehensive evaluation system for regional resource and environmental carrying capacity, providing strong support and guidance for promoting regional sustainable development and ecological civilization construction. At the same time, the establishment of an evaluation system will also provide valuable experience and inspiration for related research and practical fields, promoting further development and innovation in the field of regional resources and environment. In the process of constructing an evaluation system, interdisciplinary cooperation and comprehensive evaluation are particularly important. The evaluation of resource and environmental carrying capacity involves multiple disciplines, such as geography, ecology, economics, sociology, etc. It requires the joint participation of experts from different disciplines, leveraging their respective strengths, and forming a comprehensive evaluation result. Interdisciplinary cooperation can not only promote knowledge exchange and innovation, but also enhance the scientificity and authority of the evaluation system, providing decision-makers with more comprehensive and accurate information. The results of the evaluation system should be presented in a visual and intuitive manner, facilitating understanding and application by relevant stakeholders and decision-makers. Through visual displays such as maps, charts, and models, the spatial distribution and trend of resource and environmental carrying capacity can be clearly displayed, providing intuitive reference and support for decision-making. Meanwhile, by utilizing information technology and decision support systems, real-time monitoring and analysis of evaluation data can be achieved, providing decision-makers with real-

time decision support, improving decision-making efficiency and scientificity. In the process of constructing the evaluation system, international experience can also be borrowed and compared, and successful practices and experiences from other countries and regions can be absorbed. Different countries and regions have rich experience and methods in evaluating resource and environmental carrying capacity, which can provide useful insights for the construction of China's evaluation system. By aligning with international standards, we can continuously improve the evaluation system, enhance its international competitiveness and applicability, and promote the continuous development and improvement of China's resource and environmental carrying capacity evaluation work.

In summary, building a scientific and reasonable evaluation system is a key step towards achieving regional sustainable development^[3]. Through the comprehensive application of interdisciplinary cooperation, intelligent technology application, and broad participation, we can establish a comprehensive and dynamic evaluation system, providing strong support for achieving sustainable utilization and protection of resources and environment, and promoting a virtuous cycle of economic and social development and ecological environment protection.

2.2 Theoretical basis for constructing an evaluation index system

The construction of evaluation index system is the core content of resource and environmental carrying capacity evaluation, and its reasonable design directly affects the scientificity and credibility of the evaluation results. When constructing an evaluation index system, it is necessary to fully consider the following theoretical foundations:

2.2.1 Sustainable development theory

The theory of sustainable development is one of the important theoretical foundations for constructing an evaluation index system. Sustainable development emphasizes the coordinated development between economic growth, social equity, and environmental protection, which requires meeting current needs without compromising the ability of future generations to meet their needs. Therefore, when constructing an evaluation index system, it is necessary to consider the long-term sustainable utilization of resources, long-term sustainable protection of the environment, and long-term sustainable development of society, to ensure that the evaluation system conforms to the principles of sustainable development.

2.2.2 System thinking theory

The system thinking theory holds that the resource environment is a complex dynamic system, with interactions and feedback relationships between various elements. The evaluation index system should start from the overall perspective, considering the interrelationships and influences between various elements, and avoiding one-sided pursuit of indicators in one aspect that may lead to imbalances in other aspects. Through systematic thinking, a comprehensive and comprehensive evaluation index system can be constructed to better reflect the true situation of resource and environmental carrying capacity.

2.2.3 Principles for designing indicator systems

In the process of constructing the evaluation index system, it is also necessary to follow some design principles, such as scientificity, objectivity, comparability, authority, etc^[4]. Scientificity requires evaluation indicators to have scientific basis and theoretical support; Objectivity requires evaluation indicators to be objective and neutral, unaffected by subjective factors. Comparability requires evaluation indicators to have certain standards and measurement methods, which facilitate comparison between different regions and times; Authority requires reliable and authoritative sources of evaluation indicators, which can be widely recognized.

By applying and integrating the above theoretical foundations, we can construct a scientific evaluation index system that conforms to the principles of sustainable development, systematic thinking, and design, providing strong support for the evaluation of resource and environmental carrying capacity, and promoting the achievement of regional sustainable development goals.

3. Current status of regional ecological development

3.1 Resource depletion and ecological damage

In some regions, long-term excessive resource development and utilization have led to increasingly prominent problems of resource depletion and ecological damage. Large scale mining, excessive

deforestation, and excessive water resource exploitation not only consume precious natural resources, but also disrupt ecological balance, causing the local ecosystem to lose its original stability and health. Frequent phenomena such as land desertification, soil erosion, and wetland degradation seriously affect the fertility and sustainable utilization capacity of the land, posing a threat to the sustainable development of the local ecological environment. At the same time, the development model of some traditional industries is too single, with excessive emissions of industrial wastewater, exhaust gas and other pollutants, leading to deterioration of air quality and exacerbation of water pollution, posing potential risks to the health of surrounding residents. The destruction of ecosystems also directly affects the diversity of local species and the integrity of the food chain, which may lead to ecological disasters and pose a threat to regional ecological security. In the face of these problems, we need to strengthen resource protection and ecological restoration work, promote industrial transformation and upgrading, implement green development strategies, reduce resource consumption and environmental pollution, promote sustainable use of resources and healthy development of the ecological environment.

3.2 Unbalanced regional development

The imbalance of regional development in our country is a long-standing problem. In some regions, the carrying capacity of resources and environment is too large or too small, leading to unreasonable resource allocation and uneven economic development^[5]. The development of resource intensive industries in developed areas is relatively fast, with heavy resource consumption and environmental burden. However, in underdeveloped areas, resources are abundant but not effectively developed and utilized, leading to waste of resources and uneven regional development. Developed regions, due to their abundant resources and advanced technology, have attracted a large number of people and capital to gather, forming densely populated, convenient transportation, and industrialized urban clusters. However, this has also brought about problems such as traffic congestion and environmental pollution. However, underdeveloped areas face challenges such as population outflow and economic difficulties due to insufficient resource development and lagging infrastructure. The widening development gap between regions has led to low efficiency in resource allocation and a decline in social stability. To solve the problem of regional development imbalance, it is necessary to strengthen government planning and guidance, optimize resource allocation structure, promote regional coordinated development, increase support for underdeveloped areas, improve their resource utilization efficiency and competitiveness, and achieve the balance and coordination of national economic and social sustainable development^[6].

3.3 Weak awareness of ecological protection

Residents and enterprises in some areas have weak awareness of ecological environment protection, and there are long-term environmental problems caused by short-term behavior. Some local residents have insufficient awareness of the importance of environmental protection, and engage in bad behaviors such as indiscriminate dumping of garbage, planting and mining, leading to increasingly serious problems such as land resource depletion and water pollution. At the same time, some enterprises, in order to seek short-term economic benefits, ignore environmental regulations and standards, and discharge industrial wastewater, exhaust gas, and solid waste at will, exacerbating local environmental pollution problems.

The lack of awareness and behavior in ecological protection has exacerbated the pace of resource and environmental degradation, posing a serious threat to the stability and sustainability of local ecosystems. The destruction of the ecological environment not only affects the physical health and quality of life of local residents, but also leaves a huge environmental burden and heritage for future generations. Therefore, it is necessary to strengthen the construction of ecological civilization and environmental education, increase public awareness and importance of ecological environment protection, guide residents and enterprises to form good environmental habits and behaviors, and jointly maintain the ecological environment of their homes.

3.4 Lack of scientific management methods

In some regions, the lack of scientific resource and environmental management methods and evaluation systems leads to low resource utilization efficiency and ineffective environmental protection measures. Due to the lack of a comprehensive and dynamic resource and environmental evaluation index system, it is difficult to comprehensively and objectively evaluate the status and trend of resource and environmental carrying capacity, and formulate targeted management policies and measures. The lack of

information technology support and the backwardness of monitoring means have made it difficult to monitor the state of resources and the environment in a timely manner, restricting the scientific and precise nature of resource and environmental management.

The local government and relevant departments should strengthen resource and environmental management planning, formulate scientific and reasonable resource development and utilization plans and ecological environment restoration plans, pay attention to the integrity and stability of the ecosystem, and achieve sustainable use of resources and healthy development of the ecological environment. At the same time, it is necessary to strengthen the enforcement of laws and regulations, increase the crackdown on illegal activities, establish a strict law enforcement and supervision mechanism, and ensure the effective implementation of resource and environmental management work.

In the process of promoting industrial transformation and upgrading, we should encourage and support the development of green industries and clean production technologies, reduce resource consumption and environmental pollution, and promote a virtuous cycle of economic development and environmental protection^[7]. Through technological innovation and technology introduction, enterprises can improve their production efficiency and environmental protection level, promote industrial structure optimization and upgrading, and achieve a win-win situation of economic growth and environmental protection.

Strengthen support for underdeveloped areas, optimize resource allocation structure, build infrastructure, cultivate emerging industries, enhance talent quality, and achieve rational utilization of resources and sustainable development of regional economy. At the same time, it is necessary to strengthen regional coordinated development planning, promote the flow and complementarity of resource elements between different regions, and form a benign pattern of regional economic cooperation and coordinated development^[8].

Finally, it is necessary to strengthen the scientific and information construction of resource and environmental management, establish a sound resource and environmental monitoring network and information system, and improve the accuracy and timeliness of resource and environmental management. The government and enterprises can realize efficient and intelligent resource and environmental management through the use of big data, artificial intelligence to provide strong support for achieving the goal of sustainable development of resources and environment..

4. Countermeasures and suggestions

4.1 Develop scientific and reasonable resource and environmental protection plans and policies

In order to effectively address resource and environmental challenges, we need to develop scientific and reasonable resource and environmental protection plans and policies to ensure sustainable use of resources and continuous improvement of the environment. At present, the relevant departments should carry out in-depth evaluation and monitoring of resources and the environment, and scientifically analyze the current situation and trend of resource and environmental problems, so as to formulate resource and environmental protection planning that meets today's development needs. At the same time, we should pay attention to the scientific, forward-looking, and targeted nature of policies, promote resource conservation and the construction of an environmentally friendly society, and achieve coordinated and sustainable development of resources and the environment.

4.2 Promote green and low-carbon development, accelerate industrial transformation and upgrading

In order to achieve sustainable development of resources and environment, we need to promote green and low-carbon development, accelerate industrial structure adjustment and transformation and upgrading. We can increase support for the research and application of energy-saving and environmental protection technologies, guide enterprises to strengthen green production and recycling, and promote the formation of a green and low-carbon production and lifestyle. At the same time, it is necessary to strengthen the elimination and integration of high energy consuming and highly polluting industries, promote the development of industries towards green and low-carbon directions, improve resource utilization efficiency and reduce environmental pollution emissions, and achieve a virtuous cycle of economic development and resource and environmental protection.

4.3 Strengthen ecological protection and restoration, promote the construction of ecological civilization

In order to protect and restore ecosystem functions, we need to strengthen ecological protection and restoration work, promote ecological civilization construction and sustainable development. We can strengthen the monitoring and evaluation of the ecological environment, timely identify and solve ecological problems, protect and restore the stability and health functions of the ecosystem. At the same time, we should pay attention to the coordinated development of ecological protection and economic development, promote the development and growth of the ecological industry, promote the positive interaction between ecological protection and economic growth, and achieve common prosperity of the economy, society, and ecological environment.

4.4 Strengthen resource conservation and utilization, promote the development of circular economy

In order to effectively utilize resources, we need to strengthen resource conservation and utilization, promote the development of circular economy, and achieve the maximum value and recycling of resources. By strengthening the comprehensive utilization of resources and promoting the application of circular economy models, we can improve resource utilization efficiency and reduce resource waste. At the same time, we need to increase support and guidance for the circular economy industry chain, promote the healthy development of the circular economy industry, promote industrial upgrading and innovative development, and achieve a win-win situation of resource recycling and economic growth.

4.5 Strengthen the scientific and information construction of resource and environmental management

In strengthening the scientific and information construction of resource and environmental management, we need to continuously promote the in-depth development of technological innovation and information application. The application scope of big data technology in resource and environmental monitoring and evaluation can be further expanded, utilizing advanced technologies such as the Internet of Things and cloud computing to achieve real-time monitoring and analysis of resource utilization and environmental conditions in a wider range of fields. At the same time, it is possible to strengthen the application of artificial intelligence technology in resource and environmental management, develop intelligent decision support systems, achieve intelligent identification, prediction, and optimization control of resource and environmental problems, and improve management efficiency and scientificity.

4.6 Strengthen international cooperation and promote global resource and environmental governance

In strengthening international cooperation, we need to actively participate in international resource and environmental governance mechanisms, promote coordination and cooperation in global resource and environmental governance. We can strengthen cooperation and exchanges with developed and developing countries, jointly explore the direction and path of global resource and environmental governance, and promote the establishment of norms and standards for global resource and environmental governance. At the same time, cooperation with international organizations and multinational corporations can be strengthened to jointly carry out resource and environmental protection and sustainable utilization projects, promoting the improvement and implementation of the global resource and environmental governance system.

4.7 Strengthen supervision and law enforcement, and strictly punish illegal activities

In order to ensure the effective implementation of resource and environmental management policies, we need to strengthen supervision and law enforcement work, establish a sound supervision system and law enforcement mechanism. We can increase the crackdown on illegal activities related to resources and environment, strictly enforce relevant laws and regulations, and impose severe punishments on illegal activities, forming a strong deterrent against violators. At the same time, it is necessary to strengthen the training and supervision of law enforcement personnel, improve the level and efficiency of law enforcement, and ensure that law enforcement is fair, transparent, and operates in accordance with the law.

4.8 Strengthen the construction of talent team and cultivate professional management talents

In order to enhance the professional level of resource and environmental management, we need to strengthen the construction of talent teams and cultivate high-quality resource and environmental management talents. By establishing a multi-level and multi-form talent cultivation mechanism, we can strengthen education and training in the field of resource and environmental management, and cultivate professional talents with a global perspective and innovative abilities. At the same time, it is necessary to establish a sound talent evaluation and incentive mechanism, attract and retain outstanding talents, and provide talent guarantee and intellectual support for the long-term development of resource and environmental management.

5. Countermeasures and suggestions

In today's society, resources are becoming increasingly scarce and environmental issues are becoming increasingly prominent. How to optimize resource allocation has become an important issue that urgently needs to be solved. Optimizing resource allocation is not only to improve resource utilization efficiency, but also to achieve coordinated development of economy, society, and environment^[9]. We need to establish a sound resource management system, clarify resource property rights, and encourage the effective utilization and regeneration of resources. We should strengthen technological innovation, promote the development of resource-saving and circular economic models, and improve resource utilization efficiency. In addition, it is necessary to improve the market mechanism, guide the allocation of resources towards maximizing efficiency, and avoid excessive exploitation and waste of resources. At the same time, the government should increase regulatory efforts, regulate market order, and prevent resource outflow and environmental damage. In short, only through multi-party cooperation and joint efforts can we achieve optimal resource allocation and safeguard sustainable development.

Against the backdrop of increasingly severe ecological and environmental challenges facing the world, strengthening ecological and environmental protection is particularly urgent and important. As an important component of sustainable development in contemporary society, ecological environment protection is not only related to human survival and development, but also to the stability and prosperity of the entire Earth's ecosystem. Therefore, we need to take a series of comprehensive and effective measures to strengthen ecological environment protection. We should strengthen ecological monitoring and evaluation, scientifically analyze the evolutionary trends and health status of ecosystems, and provide scientific basis for decision-making. We need to strengthen the improvement of environmental legislation and policy regulations, establish a sound ecological protection system and legal framework, and ensure the smooth implementation of ecological environment protection work. At the same time, it is also necessary to pay attention to the construction of ecological civilization, cultivate the concept of respecting nature and cherishing ecology, and promote the comprehensive transformation of society into a green and low-carbon development model^[10]. Finally, it is necessary to strengthen cooperation and coordination across departments, regions, and borders, to form a joint effort to address global ecological challenges and achieve sustainable development of ecological civilization. With the increasingly prominent issues of resource constraints and environmental pollution, promoting regional economic circular development has become an urgent and important issue that needs to be addressed. The circular development of regional economy aims to build a circular economy system, optimize industrial structure, improve resource utilization efficiency, promote industrial synergy, achieve resource recycling, and reduce waste emissions. We need to establish a sound policy and regulatory framework to incentivize enterprises to carry out circular economy related activities, promote the recycling of resources and the substitution of energy. We should strengthen technological innovation, promote the application of clean production and energy-saving and emission reduction technologies, improve product recycling efficiency, and reduce environmental burden. At the same time, it is necessary to strengthen the collaborative cooperation of the industrial chain, promote complementary development of industries, form circular economy industrial clusters, and achieve resource sharing and complementary advantages. Finally, it is necessary to pay attention to publicity and education, enhance public environmental awareness, promote the participation of the whole society in regional economic circular development, and jointly build green and low-carbon beautiful countryside and cities.

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