

Compatibility Study Between Ecological Restoration and Regional Sustainable Development Goals

Aili Zhao¹, Xiaobin Zhang^{2*}

¹*Shanxi Fenhe River Basin Management Co., Ltd, Taiyuan, Shanxi, China*

²*Yuncheng University, Yuncheng, Shanxi, China*

**Corresponding Author*

Abstract: This study explores the compatibility between ecological restoration and regional sustainable development goals, analyzing the relationship between ecosystem restoration and the coordinated development of regional society, economy, and environment. Through a systematic literature review, the research examines theoretical studies on ecological restoration and related literature on regional sustainable development, aiming to verify the alignment and complementarity of their objectives, pathways, and outcomes. By comparing existing theories of ecological restoration and sustainable development, the core principles and key indicators of both are identified. Additionally, the study summarizes theoretical frameworks, restoration techniques, and management strategies from regional ecological restoration practices, exploring their specific mechanisms in promoting regional sustainable development. The findings reveal that ecological restoration directly improves regional environmental quality, and enhances ecosystem services, driving green economic transformation and social welfare enhancement, thus achieving comprehensive regional sustainable development goals. Furthermore, the study emphasizes that effective ecological restoration requires integrated plans based on ecological principles, tailored to regional contexts and socio-economic conditions, and ensured through multi-stakeholder collaboration and public participation. Finally, the study offers theoretical recommendations to guide the implementation of ecological restoration and provide theoretical support for regional sustainable development practices.

Keywords: Ecological Restoration; Regional

Sustainable Development; Ecosystem Services; Green Transformation; Public Participation

1. Preface

1.1 Research Background and Significance

In the 21st century, global environmental problems are becoming increasingly serious, mainly in the aspects of climate change, biodiversity reduction, water shortage and land degradation. Faced with these environmental challenges, ecological restoration and regional sustainable development have become the focus of the international community. Ecological restoration, as a means to restore degraded ecosystems, aims to enhance ecosystem service functions and restore biodiversity. Regional sustainable development focuses on the coordinated development of society, economy and environment, emphasizing the efficient use of resources and environmental protection. Exploring the compatibility between ecological restoration and regional sustainable development goals is not only conducive to scientific and reasonable ecological restoration practice, but also can promote the realization process of regional sustainable development.

1.2 Review of Research Status at Home and Abroad

Domestic and foreign scholars have studied ecological restoration and regional sustainable development from many angles. Internationally, the study of ecological restoration began in the 1980s, focusing on the development of ecological restoration technology and theory. Famous scholars such as Hobbs and Norton (1996) mentioned in their research that ecological restoration is not only an ecological technology, but also a way of social cooperation, which requires the participation

of multiple parties. In terms of regional sustainable development, the famous report "Our Common Future" (1987) put forward the basic framework of sustainable development, followed by the introduction of relevant policies in many countries, such as the 17 Sustainable Development Goals (SDGs) proposed by the United Nations. In China, the construction of "ecological civilization" and "beautiful China" have become national strategies, and scholars have conducted extensive research on ecological restoration technologies, policies and their relationship with regional development. However, the existing literature mainly focuses on empirical research, and lacks theoretical analysis of the compatibility between ecological restoration and regional sustainable development goals.

1.3 Research Objectives and Methods

This study aims to explore the compatibility between ecological restoration and regional sustainable development goals through theoretical analysis. The research methods mainly include literature review, theoretical comparison and mechanism discussion. By systematically reviewing the existing literature, summarizing the theoretical research on ecological restoration, combining the core concept of regional sustainable development, building a fit analysis framework, and putting forward corresponding theoretical suggestions.

2. Theoretical Basis

2.1 Basic Concepts and Theories of Ecological Restoration

ecological restoration refers to the restoration and improvement of the structure, function and dynamic balance of damaged ecosystems through human interventions. The theoretical basis of ecological restoration includes ecology, environmental science, biology and other multidisciplinary knowledge, and its core lies in restoring the health and function of the ecosystem. Specific methods include vegetation restoration, soil restoration, water body restoration and biodiversity conservation. For example, vegetation restoration is an important means of ecological restoration, through the cultivation of native plants, to improve biodiversity and ecosystem stability. Soil remediation aims to restore the function of contaminated or degraded soils and promote

ecosystem restoration by improving the physical, chemical and biological properties of soils. Water restoration includes the restoration of water ecosystems such as lakes, rivers and wetlands to improve water quality and ecosystem services by reducing pollution loads and restoring natural hydrological processes.

2.2 Basic Concepts and Theories of Regional Sustainable Development

Regional sustainable development refers to the efficient use of resources, environmental protection and coordinated economic development in a specific region to ensure the long-term prosperity and stability of the regional society. Its theoretical basis includes economics, sociology, environmental science and other disciplines. Regional sustainable development emphasizes that economic development should not be at the expense of environment, but should realize the coordinated development of economy, society and environment.

The core concepts of sustainable development include efficient use of resources, social equity and justice, environmental protection and restoration, and sustained economic growth. Specific indicator systems, such as the 17 Sustainable Development Goals (SDGs) proposed by the United Nations, cover the eradication of poverty, health and well-being, quality education, clean energy and other aspects.

2.3 Analysis of the Compatibility Between Ecological Restoration and Sustainable Development Goals

Ecological restoration and regional sustainable development have a high degree of compatibility in goals and paths. First of all, ecological restoration aims to restore and enhance the function of ecosystem services, which is consistent with the goal of environmental protection and efficient use of resources in the sustainable development of the region. Through ecological restoration, the quality of regional ecological environment can be improved, and the health of the ecosystem can be promoted, thus providing a good ecological basis for regional sustainable development.

The positive effect of ecological restoration on social economy also reflects its compatibility with sustainable development goals. For

example, vegetation restoration can not only improve ecosystems, but also provide jobs and boost local economies. Measures such as soil and water restoration can improve the efficiency of land and water use, increase agricultural output and water availability, and support regional economies.

The social benefits of ecological restoration also contribute to achieving the social goals of regional sustainable development. Through ecological restoration, public environmental awareness and participation can be enhanced, community cohesion can be enhanced, and social equity and justice can be promoted. This is in line with the Sustainable Development Goals' emphasis on social equity and justice.

To sum up, ecological restoration and regional sustainable development goals have a high degree of compatibility at the three levels of environment, economy and society. Exploring the compatibility of the two can not only provide theoretical guidance for ecological restoration practice, but also promote the realization process of regional sustainable development.

3. Relationship Between Ecological Restoration and Regional Sustainable Development Goals

3.1 The Effect of Ecological Restoration on Environmental Improvement

Ecological restoration significantly improves the quality of the regional ecological environment by restoring the structure and function of the damaged ecosystem. Vegetation restoration is an important means of ecological restoration. By planting local plants, the diversity and stability of the ecosystem can be restored, soil structure can be improved, water conservation can be increased, and soil erosion and water pollution can be reduced. At the same time, ecological restoration can also reduce environmental pollution by improving air quality and water quality, and improve the stability and resistance of the ecosystem.

Soil restoration is also an important part of ecological restoration. By applying organic fertilizers, planting cover crops, and repairing contaminated soil, soil structure and fertility can be improved, soil organic matter content can be increased, soil biodiversity can be promoted, and soil water retention and nutrient supply capacity can be improved. Such

remediation will not only restore the natural function of the soil, but also improve crop yield and quality, supporting sustainable agriculture in the region.

Water body restoration is also one of the important contents of ecological restoration. By reducing pollution sources, restoring natural hydrological processes, and restoring habitats of aquatic plants and animals, water quality and ecosystem services can be improved and water availability enhanced. Water body restoration can also reduce the frequency and intensity of flood disasters, protect biodiversity, and improve human living environment.

3.2 The Promotion of Ecological Restoration to Green Economic Development

Ecological restoration not only has significant environmental benefits, but also can promote the green development of regional economy. Green economic development means that while maintaining economic growth, reducing resource consumption and environmental pollution, and achieving sustainable economic development. Ecological restoration provides a good ecological basis and support for green economy.

Vegetation restoration can increase the output of resources such as timber, medicinal and ornamental plants, provide employment opportunities and boost local economies. For example, through afforestation and restoration of forest ecosystems, the output of wood and forest products can be increased, forest tourism can be developed and regional economic growth can be promoted. Similarly, soil and water restoration can also improve the efficiency of land and water use, increase agricultural output and water availability, and promote the sustainable development of regional agriculture.

In addition, ecological restoration can also promote the development of green technologies and industries. For example, ecological restoration requires the application of various advanced restoration technologies and equipment, such as biological restoration, physical restoration and chemical restoration technologies, which provides a broad market and opportunities for the development of environmental protection industry. Ecological restoration can also promote the development of green buildings, green transportation and

green energy, and promote the transformation of the regional economy to a green, low-carbon and sustainable direction.

3.3 Impact of Ecological Restoration on the Improvement of Social Welfare

Ecological restoration not only helps to improve environmental quality and promote green economic development, but also brings significant social benefits and improves the quality of life and social welfare of regional residents. Ecological restoration improves the ecological environment, reduces environmental pollution and ecological degradation, improves the living environment quality of residents, and enhances the cohesion of the community and the happiness of residents.

Through ecological restoration, the public's environmental awareness and participation can be improved, and the society's environmental awareness and responsibility can be enhanced. For example, in ecological restoration projects, community participation, public volunteer activities and environmental education can increase the public's understanding and concern about the ecological environment, enhance community cohesion and social awareness of environmental protection.

In addition, ecological restoration can also promote social equity and justice, and enhance social inclusiveness and fairness. Through the implementation of ecological restoration projects, it can provide employment opportunities and sources of livelihood for poor and vulnerable groups, and improve their living conditions and social status. For example, in projects such as afforestation and soil restoration, by engaging local residents in restoration work, they can increase their income and employment opportunities, improve their quality of life and social status.

In short, ecological restoration is of great significance to the realization of regional sustainable development goals by improving environmental quality, promoting green economic development, and enhancing social welfare. Exploring the compatibility between ecological restoration and regional sustainable development goals will help to systematically understand the relationship between the two, and provide theoretical support and practical guidance for theoretical research and practice of ecological restoration.

4. Core Principles and Key Indicators of Ecological Restoration

4.1 Core Ecological Principles of Ecological Restoration

The core ecological principles of ecological restoration include: restoring the original ecosystem structure and function, protecting and enhancing biodiversity, and restoring the natural dynamic balance of the ecosystem. These principles need to be comprehensively applied in practice to ensure the effectiveness and sustainability of ecological restoration.

Restoring the original ecosystem structure and function is the basic goal of ecological restoration. Through vegetation restoration, soil restoration and water body restoration, the diversity and stability of the damaged ecosystem can be restored, and the food web and ecological functions of the ecosystem can be rebuilt. In addition, the protection and enhancement of biodiversity is also an important part of ecological restoration, through the introduction and protection of native species, restore the diversity and complexity of the ecosystem, and enhance the resistance and resilience of the ecosystem.

4.2 Key Indicator System of Sustainable Development

The key indicator system of sustainable development covers three dimensions: economic, social and environmental, including resource utilization efficiency, environmental protection level, social equity and happiness. For example, the 17 Sustainable Development Goals (SDGs) proposed by the United Nations cover the eradication of poverty, health and welfare, quality education, clean energy, economic growth, environmental protection and other aspects, reflecting the comprehensive and comprehensive nature of sustainable development. These index systems can provide reference for evaluating and guiding regional sustainable development.

4.3 Comparative Analysis of Key Indicators of Ecological Restoration and Sustainable Development

The key indicators of ecological restoration and sustainable development are highly compatible in goals and paths. Through ecological restoration, it can improve the

efficiency of resource utilization, promote environmental protection, and achieve economic growth and social equity. For example, measures such as phytoremediation, soil remediation and water body remediation can improve ecosystem functions and services, improve resource utilization efficiency and environmental quality, and promote the realization of regional sustainable development. In addition, ecological restoration can also enhance social equity and justice, increase employment opportunities and sources of livelihood, and improve residents' quality of life and social welfare. These are consistent with key indicators of sustainable development.

5. Theoretical Framework and Strategy Analysis

5.1 Theoretical Framework and Elements of Ecological Restoration

The theoretical framework of ecological restoration includes: the structure and function analysis of ecosystem, the establishment of ecological restoration objectives, the selection of restoration techniques and methods, and the evaluation of restoration effects. For example, through the analysis of the structure and function of the ecosystem, the objectives and measures of ecological restoration can be determined; through the selection of restoration technologies and methods, ecological restoration can be effectively implemented; through the evaluation of restoration effects, the effects of ecological restoration can be evaluated and optimized.

5.2 Comprehensive Strategies for Regional Ecological Restoration

Regional ecological restoration needs to consider the natural environment, social and economic conditions and development needs of the region, and formulate scientific and reasonable restoration strategies. For example, in terms of vegetation restoration, native species can be preferentially selected to restore natural vegetation structures and improve the stability and resilience of ecosystems to disasters. In terms of soil and water restoration, appropriate restoration technologies and methods can be selected according to the specific conditions of the region, and the restoration effect and sustainability can be guaranteed through scientific management and

monitoring. In addition, regional ecological restoration also needs to strengthen multi-party cooperation and public participation, enhance social awareness and responsibility for environmental protection, and promote the effective implementation of regional ecological restoration.

5.3 Importance of Multi-Party Collaboration and Public Participation

The effective implementation of ecological restoration is inseparable from multi-party cooperation and public participation. Through the joint efforts of the government, scientific research institutions, enterprises and the public, a joint force can be formed to promote the smooth development of ecological restoration. For example, the government can formulate and implement relevant policies, provide financial and technical support; Scientific research institutions may provide scientific research and technical guidance; The enterprise can undertake the implementation and management of the restoration project; Through volunteer activities and community participation, the public can enhance environmental awareness and responsibility, and promote the implementation and effect of ecological restoration. Multi-party cooperation and public participation can not only improve the effect of ecological restoration, but also enhance the social awareness and responsibility of environmental protection, and promote the realization of regional sustainable development.

6. Discussion and Suggestions

6.1 Limitations and Improvement Directions of Existing Ecological Restoration Strategies

There are some limitations in the implementation of existing ecological restoration strategies, such as immature technical means, insufficient capital investment, inadequate management and monitoring. To this end, it is necessary to further improve and optimize ecological restoration strategies, introduce advanced restoration technologies and methods, strengthen financial input and policy support, strengthen management and monitoring, and improve restoration effectiveness and sustainability. For example, we can learn from

advanced ecological restoration experience and technology at home and abroad, strengthen international cooperation and technical exchanges, and improve the technical level and effect of ecological restoration in our country. In addition, it is also necessary to strengthen public education and participation, enhance social awareness and responsibility for environmental protection, and promote the effective implementation of ecological restoration.

6.2 Theoretical Suggestions for Improving the Compatibility Between Ecological Restoration and Sustainable Development

In order to improve the compatibility of ecological restoration and sustainable development goals, it is necessary to start from both theoretical and practical aspects. In terms of theory, through systematic literature review and theoretical analysis, we can build a framework for analyzing the compatibility of ecological restoration and sustainable development, and explore the relationship and interaction mechanism between the two. In practice, it is necessary to formulate a scientific and reasonable ecological restoration strategy based on the actual situation of the region, coordinate the relationship between environmental protection, economic development and social equity, and promote the sustainable development of the region. For example, in the implementation of ecological restoration projects, restoration measures that have a positive impact on the environment, economy and society can be prioritized, and the effectiveness and sustainability of restoration can be guaranteed through multi-party collaboration and public participation. In addition, it is also necessary to strengthen monitoring and evaluation, timely detection and correction of problems in the restoration process, to ensure the effectiveness and sustainability of the restoration.

6.3 Future Research Direction and Prospect

Future research can be carried out from the following directions: First, strengthen the theoretical research on ecological restoration and regional sustainable development, build a systematic theoretical framework and analysis model, and explore the relationship and interaction mechanism between the two; The second is to increase the research and

development of ecological restoration technologies and methods to improve the restoration effect and sustainability; The third is to strengthen the policy research of ecological restoration to provide theoretical support and practical guidance for the government to formulate and implement ecological restoration policies; The fourth is to strengthen international cooperation and technical exchanges in ecological restoration, learn from foreign advanced experience, and improve the technical level and effect of ecological restoration in China. Through these studies and efforts, ecological restoration can be promoted to meet the goals of regional sustainable development, and scientific basis and practical guidelines can be provided for realizing ecological environmental protection and regional sustainable development.

7. Conclusion

Through theoretical analysis, this study explores the compatibility between ecological restoration and regional sustainable development goals. The results show that ecological restoration can not only directly improve the regional ecological environment quality, but also promote the green transformation of regional economy and the improvement of social welfare by adjusting the ecosystem service function, so as to fully realize the regional sustainable development goals. Effective ecological restoration requires a comprehensive restoration plan based on the principles of ecology, combined with the actual situation of the region and social and economic conditions, and through multi-party cooperation and public participation to ensure the scientific and operational restoration process. Future research can be carried out from multiple aspects such as theory, technology, policy and cooperation to further improve the compatibility of ecological restoration and regional sustainable development goals, and provide scientific basis and practical guidelines for realizing ecological environmental protection and regional sustainable development.

Acknowledgements

Shanxi Water Science and Technology Project: Study on ecological restoration and pollutant control of Fenhe River into Huangkou (Project No. 2024GM40).

References

- [1] Han Xing, Zhang Ruiyin. On the Relationship Between Ecosystem Restoration and Regional Sustainable Development [J]. *Research of Soil and Water Conservation*, 2004, 11(1):3. DOI: 10.3969/j.issn.1005-3409.2004.01.058.
- [2] Sun Yi. Theoretical and Practical Research on Green Transformation in Resource-Based Regions [D]. Northeast Normal University, 2012.
- [3] Yang Rongjin, Sun Meiyang, Fu Bojie, et al. Sustainable Management Strategies for the Yangtze River Basin Ecosystem [J]. *Environmental Science Research*, 2020, 33(5):10. DOI: 10.13198/j.issn.1001-6929.2020.04.20.
- [4] Ai Jinhui, Fang Xiaoshan, Zhang Xuefei, et al. Construction and Application of Health Evaluation Index System for Wetland Parks—A Case Study of the Second Phase of Guangzhou Haizhu National Wetland Park [J]. *Acta Ecologica Sinica*, 2024(14).
- [5] Li Haidong, Hu Guozhang, Yan Shouguang. Research on the Goals and Models of Ecological Restoration in Mining Areas [J]. *Journal of Ecology and Rural Environment*, 2022, 38(8):9.
- [6] Zhang Sulan, Zhang Bi, Liu Xiang, et al. Research on the Protection and Sustainable Development of World Heritage Sites in Sichuan Under the Background of Green Development [J]. *Environmental Ecology*, 2022(006):004.
- [7] Chen Xinchuan, Li Xiaoqian, Lv Yihe, et al. Progress in Spatial Identification of Ecological Restoration at the Regional Scale [J]. *Acta Ecologica Sinica*, 2019, 39(23).
- [8] Cao Shixiong, Liu Wei, Zhao Maihuan, et al. Empirical Study on the Win-Win Model of Ecological Restoration in Yan'an City [J]. *Acta Ecologica Sinica*, 2018, 38(22). DOI: 10.5846/stxb201806091291.