

Regional Ecotourism Sustainability Assessment: Research Value and Literature Review

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Abstract

The purpose of this paper is to study the value of ecotourism sustainability assessment, to sort out the literature review related to ecotourism sustainability assessment, and to review the current progress of international research on ecotourism sustainability assessment, etc. On this basis, it identifies the gaps in the content and methods of regional ecotourism sustainability assessment and provides a certain theoretical basis for future research in this field. It is hoped that this paper provides the needs of researchers and practitioners with some references for sustainable tourism and its definitions and applications, and also presents future research opportunities.

Keywords:

ecotourism sustainability assessment, regional ecotourism, literature review

1 Introduction

The Secretary-General of the United Nations, António Guterres, has said that tourism is one of the largest industries in the world today, contributing trillions of dollars to the global economy while supporting the livelihoods of about one-tenth of the world's population. In many countries, both developing and developed, tourism is rightly recognized as a major engine of economic growth and a way to increase the wealth of people and communities.

From the first package tour organized by Thomas Cook in 1841 to the present, the world tourism industry has developed rapidly and reached unprecedented prosperity. As the contradiction between tourism development and environmental protection becomes more and more prominent, almost every tourist destination is facing the serious situation of resource destruction and environmental quality degradation, and all kinds of negative effects arising from the excessive development of tourist destinations have begun to appear, and gradually show a huge potential threat (Peter Johnson et al., 1992). While the tourism industry is booming, the uncontrolled expansion of human tourism activities has caused a series of environmental and social problems, such as serious degradation of natural ecosystems and impacts on community economic development (Lu, L et al.,2023). At present, not only tourists are more and more concerned about all kinds of environmental problems in tourist destinations, but also the increasing economic losses of tourism caused by environmental pollution have brought great pressure on tourism operators, community residents, and other stakeholders (Buckley R,1994), in this context, for the negative impacts of mass tourism activities, tourism disordered planning and other issues on local resources, culture, and environment, how to prevent natural resources, cultural resources environmental resources, etc. from being destroyed while the tourism industry is booming to develop tourism, so that the tourism industry and natural, cultural, environmental, and other resources can be developed in a balanced manner and coexist harmoniously, ecotourism and sustainable development of tourism have been widely put forward as the main direction of the world's tourism industry development (Guo,L.X.,1997). The United Nations identified 2002 as the world's "year of ecotourism". Ecotourism is experiencing a period of booming development all over the world. According to Lindberg's 1991 analysis: world tourism is growing at 4% per year, while ecotourism is growing at 10-30% per year.

The value that ecotourism creates for local communities is significant. For example, in Costa Rica, Ecuador, the Philippines, and Thailand, tourism is one of the five most important industries within their countries and earns more foreign exchange earnings than exports of timber and wood products (Gradwohl, J., & Greenberg, R.,2013).In 1986, Costa Rica's tourism industry earned \$138 million dollars in revenues, which was largely based on nature-based tourism (Pearce. D.W et al,1996).

In order to ensure the coordinated and sustainable development of tourism and the tourism environment, it is particularly important to actively plan ecotourism and carry out ecotourism sustainability assessment under the premise of environmental protection. Ecotourism sustainability assessment research has become an important part of ecotourism planning and management research. Ecotourism sustainability assessment has become more and more prominent in regional ecotourism planning, development and management as an important tool for landscape planning and management(Lei. C. P.,2006). If there is a lack of scientific and unified tourism planning and management, it will impede the sustainable development of the overall ecological environment of tourist destinations and cause ecological degradation, which will in turn affect the sustainable development of the economy of the community as a whole.

Therefore, it is necessary to assess the sustainability of ecotourism in tourism destinations, to provide a scientific basis for ecotourism planning and management, to guide and adjust human activities related to ecotourism, so as to realize the harmony between human beings and nature, the unity of human beings and nature, and ultimately to achieve the sustainable development of the environment, society, economy and culture.

2 Value of Regional Ecotourism Sustainability Assessment Research

With the massification of tourism activities, tourism, once known as a "smoke-free industry", may gradually become a major source of negative impacts on the natural ecological security and human and social-ecological security of tourism areas due to irrational development methods (Hu, 2019; Jia, Kong, & Ren, 2019). Therefore, how to develop tourism under the premise of ensuring the ecological safety of tourism areas and orienting tourism development to promote ecological safety has received increasing attention from academia and industry. Ecological safety in tourist areas is an inevitable requirement for sustainable tourism, while sustainable tourism will further ensure the realization of the goal of ecological safety in tourist areas (Lu, L et al., 2023).

With the rapid development of global tourism, due to the development of tourist attractions, the natural landscape and tourist architectural landscape of tourist places have been damaged to different degrees, and this phenomenon not only makes the natural ecosystem unable to maintain a normal healthy structure and function but also the local cultural and ecological resources have suffered irreversible damage. For example, a large number of traditional dwellings in Xijiang Thousand Households Miao Village in Qian Dongnan have been disturbed by the uncontrolled expansion of newly built bus terminals, shopping malls, travel agencies, and hotels, which have disrupted the ecological pattern of the ethnic villages (Li, 2010).

In addition, part of the hot tourist areas are seriously polluted, mainly manifested by water pollution, air quality decline, local ecological environment, and tourism resources; tourism area environmental health conditions are poor, the area of garbage randomly thrown piles of sewage, dirt can be seen everywhere; some of the hot tourist areas to receive tourists on an oversized scale, the tourist areas overcrowded, the loss of tourism atmosphere, Tourism development, and construction projects are not in harmony with the overall environment of the tourist areas (Rong, R., 2008); tourism's impact on the ecological environment of scenic spots is subtle and throughout the whole process from planning, design, construction, operation, management, maintenance to the arrival of tourists, activities, and departure of the various aspects of the whole existence. Over-exploitation of resources has greatly damaged the ecological environment, and the development of tourism is constrained by the capacity of the ecological environment (Arif, M., Behzad, H. M., Tahir, M., & Li, C., 2022).

At present, while enjoying the various benefits brought by tourism, some countries and regions are also facing the negative impacts and pressures of social culture and ecological environment brought by tourism development, i.e., they are facing the

economic benefits of tourism while neglecting the social and ecological benefits of tourism. The development of tourism destinations is unsustainable if the economic benefits of tourism development are purely pursued while the social and ecological benefits of tourism are neglected (Zhang.,2006)

At present, governments and the tourism industry have realized that the development of tourism can no longer take pure economic benefits as the only goal, but should take economic and social benefits and ecological benefits as the goal of common development. Research on tourism has also evolved from focusing on the economic significance of tourism to a variety of aspects such as socioeconomic and ecological environmental issues. Under the guidance of the global sustainable development strategy proposed in the 1990s, how to develop tourism in a sustainable direction, how to judge whether the tourism development of a region is sustainable, and how to realize the sustainable development of tourism are the real problems that need to be solved urgently by the governments of various countries and the tourism industry, and the research focusing on the evaluation of sustainable development has important theoretical and practical value.

3 Literature Review

3.1 Ecotourism

When the economic development of the natural and human environment on which mankind depends for survival has brought great negative impacts, and even led to the environment mankind's desire for a healthy, beautiful ecological environment gradually increased. For those who are "city disease" entangled in the city, there is a return to the natural and quiet environment to relax the body and mind needs. Against this background tourism developers around the world have introduced a variety of new types of tourism aimed at emphasizing the importance of the natural environment and ecological resources for tourism activities dedicated to meeting this need of modern people. In this way, the practice of ecotourism has been developed (Wang F.Y., 1999).

There are two main types of ecotourism in terms of the specific situations in which it has arisen. Firstly is that ecotourism in less developed countries is derived without destroying the ecology, for example, in the late 1970s, the Kenyan government imposed a complete ban on wildlife hunting and declared that the hunting and trading of the animals were illegal, and this ban greatly benefited the tourism industry, one of the mainstays of the country. Due to the increasing number of wild animals after the ban, the country's 59 safari parks and nature reserves attract more and more domestic and foreign tourists every year (Perez Olindo, 1991). Secondly, ecotourism in developed countries is carried out on their own initiative. For example, in order to address the strong demand for natural environment in the process of urbanization, the United States designated the world's first national park, Yellowstone National Park. This pioneered the national park movement and gave rise to ecotourism in its original sense.

Since the mid-1980s, with the deepening of sustainable theory research and the widespread acceptance of the concept of sustainable development, ecotourism has attracted great attention as a form of tourism that embodies the philosophy of sustainable tourism development. In 1983 Ceballos-Lascurain of the International Union for Conservation of Nature (IUCN) defined ecotourism as a reflection and response to the ecological damage caused by traditional tourism. The development of ecotourism was specifically discussed at the International Conference on the Environment in Mexico in 1986.

In 1990, the World Wide Fund for Nature (WWF) published a study entitled *Ecotourism: Potentials and Pitfalls*, which specialized in ecotourism practices in five countries in Latin America and the Caribbean, and gave a great impetus to the development of ecotourism all over the world (Wang F.Y., 1999). In 1994, when formulating its National Tourism Strategy, the Department of Tourism of the Commonwealth of Australia, on the basis of summarizing various definitions, defined ecotourism as "nature-based tourism that involves the education, interpretation and management of the natural environment in a way that makes it ecologically sustainable" (Jones B, Tear T, 1996). After the signing of Agenda 21 in 1992 and the Charter for Sustainable Tourism and the Action Plan for Sustainable Tourism in 1995, the research and practice of ecotourism reached an unprecedented high point.

3.2 Ecological and Sustainable Tourism

Sustainable tourism is an important guideline for the development of tourism and applies to all forms of tourism that can be developed in harmony with the natural, social, and cultural environment over the long term. Sustainable tourism is by no means limited to eco-tourism, but other forms of tourism, such as strictly (participatory) folk tourism, adventure tourism, specific industrial tourism, and agritourism are all effective ways to realize sustainable tourism. Ecotourism is a specific form of tourism with a specific purpose, a way and a tool to realize sustainable tourism and a concrete application and practice of the principles of sustainable tourism in natural areas and in specific sociocultural regions. Ecotourism cannot be called ecotourism if it is not sustainable. The many so-called "popularized ecotourism" that are currently popular in practice (and even in theory) actually ignore the essence of ecotourism - the philosophy and principles of sustainable tourism - and are just fake products with the "ecotourism" label. We must pay great attention to this (Wang F.Y., 1999).

Examining ecotourism with the idea of sustainable tourism, three key elements must be considered: First, the quality of the experience (Globo 90 Conference, 1990). That is, the traveler can return to the basics, enjoy nature, and recuperate in a fresh, open, and clean environment; Second, the quality of the environment. That is, the quality of the environment, the diversity of ecological natural resources, and cultural heritage in a given area can be ensured and the virtuous cycle and orderly development of the ecosystem can be realized; Third, the quality of life (Butler R W, 2001). That is, through tourism development, funds are raised for the tourism area and employment opportunities are created for local residents. Effective economic development can

enable local residents to benefit economically and financially on the basis that the quality of the ecological environment is not reduced.

3.3 sustainable development

Before making this clear, the concept of sustainable development needs to be summarized. The idea of sustainable development began in Western societies with the publication of the book "Silent Spring" by the American Rachael Carson in 1962. Its development has gone through three stages: First, the emergence stage (1962-1971), second, the formation and development stage (1972-1991), and third, the practice stage (1992 to the present). Sustainable Development (Sustainable Development) originated from the concept of sustainability, which was first proposed by ecologists, namely, the so-called Ecological Sustainability (Ecological Sustainability), initially focusing on the definition of sustainable development from the natural attributes, that is, "to protect and strengthen the environmental system's production and renewal capacity". It was initially focused on defining sustainable development in terms of its natural attributes, Later on, the concept of sustainable development was defined in terms of social, economic and technological attributes (Tian., 1996).

The concept of socio-economic "sustainability" was first introduced in 1972 in Blueprint for Survival, which was funded and published by The Ecologist magazine, and was first formally used in a document by the International Commission on Environment and Development (WCED) in 1978. In the same year, sustainable development began to have an impact on world development policy and global thought with the publication of the Brundtland report Our Common Future, which defined sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their needs (Brundtland, 1987; Pearce.D.W et al, 1996), while emphasizing the concept of sustainable development: the root cause of sustainable development lies in the distribution of resources, both in terms of the distribution of time between generations and the distribution of resources between different countries, regions and groups of people in the present day, which includes the three concepts of need, limitation and equality (Pu,Y.J.,1997)..

The late 1980s and early 1990s were the second environmental revolution, during which the issue of sustainable development was redefined and broadened, describing a process that does not allow the natural resource base to deteriorate and focusing on the hitherto unappreciated role of environmental quality and environmental inputs in improving real incomes and livelihoods (Pearce, D.W. et al., 1996).

The introduction of the Earth Charter and Agenda 21, the two programmatic documents of the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in June 1992, marked the transition from theoretical discussion to practical development of sustainable development, especially in the Earth Charter, the concept of sustainable development emphasizes Four principles: First, the principle of equity. The equity referred to here includes intergenerational equity, intragenerational equity, and equity in resource utilization and development

opportunities. The core issue in realizing "intergenerational equity" is how to keep the possession of natural resources relatively stable at a certain level; "intragenerational equity" refers to the fact that the present generation enjoys equal opportunities for development and that all human beings are equal in terms of their right to enjoy the Earth's resources. Second, is the principle of coordination. People are required to adjust their lifestyles and demands for resources in accordance with the conditions and constraints of ecosystem sustainability, and economic and social development must not exceed the carrying capacity of resources and the environment. Third, the principle of quality. Sustainable development emphasizes the quality of economic development and aims to improve people's quality of life at the lowest possible cost in terms of resources, as well as to improve the efficiency of economic operations. Fourth, the principle of development. Development is the core of sustainable development, and it is necessary to improve the welfare of the current generation through development and to have a long-term development perspective (Luo ,H. et al., 2004).

In 1993, the U.S. government established the President's Council on Sustainable Development (PCSD) to specialize in sustainable development strategies. In 1995, Chinese President Jiang Zemin, in "Correctly Handling a Number of Major Relationships in the Construction of Socialist Modernization," discussed the relationship between economic construction, population, resources, and the environment as the third major relationship, stating that the realization of sustainable development must be taken as a major strategy (Pu,Y.J.,1997). It is important to note, however, that the concept of sustainable development is interpreted differently in different academic contexts or among people and countries at different levels of development. For example, in the natural sciences, the 1991 symposium held by the International Union of Ecology (INT ECOL), among others, defined sustainable development as the preservation and enhancement of the productive and renewable capacity of the environmental system, i.e., sustainable development as development that does not go beyond the regenerative capacity of the environmental system (Li ,1999); In economics, Pearce and Wofford, British environmental economists, have proposed that the definition of sustainable development expressed in the language of economics is: "When development ensures an increase in the welfare of the present generation, it should also not lead to a decrease in the welfare of future generations (Pearce. D.W et al, 1996)"; On the sociological side, the definition of sustainable development as set out in "Protecting the Earth - A Strategy for Sustainable Survival" published in 1991 is: "Improving the quality of human life while surviving within the capacity to maintain ecosystems." It emphasizes that the ultimate destination of sustainable development is human society, i.e., improving the quality of human life and creating a better living environment (Luo ,H. et al., 2004; Pu,Y.J.,1997).

Although there are different definitions of sustainable development, its essential idea is the same, that is, to realize the mutual coordination and common development between the economy and society and man and nature on the basis of ecological sustainability, economic sustainability and social sustainability. The concept of sustainable development is a challenge to the traditional development model, a new concept of development in order to prepare for the establishment of a new

development model, and is also the ideological and theoretical basis for the study of sustainable development of tourism and the promotion of sustainable development of tourism (Ding, C.C., 2021).

3.4 Research Status of Ecotourism

Butler, the author of the life cycle theory of tourism, pointed out that "if there is only one factor that has the potential to change the nature of tourism, it is the introduction of the concept of sustainable development" (Zhang, M.Y., 2006). Sustainable development is an indispensable theoretical guide for tourism development, and there is a natural coupling between tourism and sustainable development (Ding, C.C., 2021). In 1990, at the Global Tourism Congress in Canada, the Action Planning Committee of the WTO put forward a Draft Action Strategy for Sustainable Tourism Development, which for the first time defined sustainable tourism development as "sustainable tourism development". It was defined as "guiding the management of all resources to meet economic, social, and aesthetic needs while supporting cultural integrity, essential ecological processes, biodiversity, and life-support systems" (Zhao, C. S., 2019). This conference comprehensively elaborated the tourism sustainable development goal system, constructed the basic theory and fundamental framework of tourism sustainable development, and, at the same time, promoted a new trend of advocating tourism sustainable development globally.

In 1993, the academic journal *Journal of Sustainable Tourism* was launched in the UK, marking the initial formation of the theoretical system of sustainable tourism development. In the same year, the WTO defined sustainable tourism development as a model of economic development that is used to achieve the following: improve the quality of life of local communities; provide tourists with a high quality of experience; and maintain the quality of the environment on which local communities and tourists depend.

In 1995, in Lanzarote, Canary Islands, Spain, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Environment Programme (UNEP) and the World Tourism Organization (UNWTO) jointly convened the World Conference on Sustainable Tourism Development, attended by more than 600 delegates from 75 countries and regions, which adopted a Charter for Sustainable Tourism Development and a Plan of Action for Sustainable Tourism Development, which establishes the role and status of the ideology and methodology of sustainable development in the protection, development and planning of tourism resources, and clearly defines the actions to be taken in the planning of tourism.

The Program for the Further Implementation of Agenda 21, adopted at the 19th Special Session of the United Nations in 1997, included sustainable tourism as one of its sectoral themes, and for the first time, sustainable tourism was included in the United Nations sustainable development agenda (Zhang, G.R., 1998).

In October 1998, parliamentarians from 25 countries in Asia and the Pacific met in Guilin for the Sixth Annual Conference of the Asia-Pacific Parliamentarians on

Environment and Development (APEC). The main theme of the meeting was the challenges and strategic actions for the sustainable development of environment and resource conservation and tourism in the Asia-Pacific region. After the meeting, the Guilin Declaration was issued and a series of recommendations to promote sustainable tourism were put forward, calling on the international community and governments to take practical actions to implement strategies for the sustainable development of tourism, demonstrating the importance that the international community attaches to the issue of sustainable development of tourism.

The 1999 World Horticultural Exposition in Kunming, China, under the theme "People and Nature - Toward the 21st Century", demonstrated that mankind has committed itself to the practical exploration of sustainable tourism. At its seventh session, the International Commission on Sustainable Development adopted the "Programme for Sustainable Tourism Development" and established the Stakeholder Working Group on Tourism, which met in Costa Rica in 2000 under the auspices of the World Tourism Organization and identified 11 priority issues.

The 2001 United Nations definition of sustainable development is that sustainable tourism development is tourism that is developed and maintained in an area (community, environment) in such a way and on such a scale that it remains viable in the long term without degrading or altering the environment (human or physical) in a way that may organize the successful development of other activities and processes. The concept encompasses six principles: prudent use of the earth's resources; and poverty alleviation. Reducing gender inequality; improving the quality of life; preserving biodiversity and life support systems in all natural habitats; preserving indigenous cultures and lifestyles based on respect for different traditions; and encouraging top-down participatory responsibility and empowering local decision-making (Arif, M., Behzad, H. M., Tahir, M., & Li, C.,2022).

3.5 Research Status of Ecotourism

Research on ecotourism by scholars has focused on development planning and management, ecotourism evaluation, and community participation. For example, B. A. Masberg and N. Norales, using quantitative and comparative analysis and a large number of case studies, have proposed five success factors for ecotourism development (i.e., integrated approach, planning and slow start, education and training, maximizing local benefits, evaluation and feedback) and 24 corresponding strategies (B.A.Masberg et al,1999) Sheryl Ross put forward a theory of successful ecotourism development, he believes that the harmonization of the relationship between the community, the economy and the environment in ecotourism development depends on rational management, and put forward a series of ecotourism management strategies such as the implementation of monitoring and control, the development of community participation in planning, and the management of tourists (Sobhani, P.et al,2022). According to Canadian scholars Ross and Wall, methods for evaluating the impacts of the tourism environment include Environmental Impact Assessment (ELA), Environmental Capacity Assessment (ECA), Limits of Acceptable Change (LAC), Input-

Output Analysis (CBA) and Visitor Impact Management (VIM); Sudhiani Pratiwi argues that community participation with the familiarization of local people is an important factor in the successful development of ecotourism (Song, S .et al.,2019). Amanda Stronza believes that once local people are involved in ecotourism development, they will take the initiative to protect natural resources, the environment and local traditional culture in accordance with the expectations of tourists (Stratton, S. J.,2021). Sven Wunder took the Cuyabe Animal Reserve in Ecuador, Central America, as an example, and used comparative analysis to study the income structure, participation patterns and attitudes towards environmental protection of the residents in the five localities within the reserve, and the results showed that the different participation patterns did not have much effect on the income of the tourists but had a greater influence on the environmental protection, and that self-management was more conducive to the protection of the environment (Sven Wunder, 2000).

3.6 Progress in Sustainable Tourism Research

The 1992 book *Tourism and Sustainable Development: Monitoring, Planning, and Management*, edited by J. G. Neson & R. Butler, et al., brought together 13 papers by tourism scholars from around the world. (Mei,Y.Z.,2006), It is the first systematic discussion of key issues in sustainable tourism development, including the concept of sustainable tourism, the environmental capacity of tourism, ecotourism, sustainable tourism policies, the balanced relationship between resource utilization and conservation, and the role and importance of sustainable tourism monitoring, among others.

Numerous Western scholars' studies on sustainable tourism have focused on the theoretical connotation of sustainable development, development model (Rebelo, S., Patuleia, M&Dias, Á.,2022),assessment of sustainable development capacity , stakeholder groups (Lee, K. H., Noh, J., & Khim, J. S.,2020;Rasoolimanesh, S. M.,2023), ecotourism (Fennell, D. A.,2020), sustainable tourism education (Mínguez, C., Martínez-Hernández, C., & Yubero, C.,2021; Xayrullayeva, N., Kadirova, S., & Aripova, M.,2021) and other aspects. Among them, the connotation of sustainable tourism has evolved from focusing on the ethical dimension of guidance (Saarinen, J.,2021) to discerning the coordination of current and future tourism needs (WTO, 1998), and the research perspective has expanded from the environmental perspective to different perspectives, such as economic, social, and cultural perspectives (Butler R W,2011).

Chinese scholars' research on sustainable tourism development mainly focuses on connotation and development. For example, Xie Yanjun, Guo Laixi, and Liu Zhenqing firstly researched the connotation of sustainable tourism around the Charter for Sustainable Tourism Development, pointing out that sustainable tourism is the coordination of tourism development and protection with social economy; thereafter, Ding, C.C.,(2021), Luo, X.Y(2021), Li, Y.Q, & Xu, X., (2021)etc. have studied the concepts and meanings of sustainable tourism from different perspectives. Some scholars have also studied sustainable tourism development, for example, Professor Zou Tongzhuizi in his book *Tourism Development and Planning* (2001) believes that the core of sustainable

tourism development is " to protect the natural and chemical environment to provide tourists with high-quality experiences, to improve local welfare, and to harmonize the interests of the environment, the tourists and the local community ".

At present, although there is a large amount of information and data on economic, social, political, cultural, educational, demographic, resource, environmental and ecological aspects, people still find it difficult to find information reflecting the state of sustainable development, especially the lack of comprehensive information reflecting the interconnections and constraints of the various aspects of sustainable development. At the same time, despite the fact that the concept of sustainable development has been widely recognized throughout China and is gradually taking root in people's hearts, there is a lack of theoretical foundations and operationalization, as well as a set of indicators tailored to China's national conditions for measuring and evaluating the state of sustainable development and for monitoring its progress. The traditional methods and indicators for measuring the level of economic development do not indicate a country's or region's capacity for sustainable development (Zhao, C.S.,2109; Ding, C.C.,2021).Therefore, the development and implementation of a sustainable development indicator system is an important component of capacity building for sustainable development strategies. The study and exploration of indicator systems and evaluation methods for measuring sustainable development is a theoretical and practical issue of great practical significance.

4 Research methodology Review

4.1 Sustainable Development Evaluation Indicator screening methods and Indicator System Evaluation methods

(1)Theoretical analysis method (Hao et al., 2002; Xiong.,2008).

The connotation, characteristics, and basic elements of regional sustainable development are analyzed, compared, and synthesized to select those development conditions and targeted indicators. This method requires attention to the combination of qualitative and quantitative and the combination of synthesis and decomposition. There cannot be a simple correspondence between the required indicators and the existing data, so on the basis of quantitative analysis, qualitative analysis tends to make the understanding more profound. On the other hand, qualitative is the basis of quantitative, people always recognize the problem qualitatively before moving to quantitative. At the same time, an indicator can only reflect the problem at one level, and if a side of a certain level is to be reflected comprehensively, it involves the problem of synthesizing the indicators of each side at this level. Similarly, in order to establish indicators to reflect a certain problem, if there are no ready-made indicators to be synthesized, it is necessary to disaggregate the problem and then synthesize it.

(2)Principal component analysis (Wang.,2001).

The sustainable development indicator system covers a wide range of indicators, in order to pursue completeness often choose a large number of indicators, if you do not

use scientific and effective methods to screen the indicators, there is bound to be incomplete coverage of the indicator information or the phenomenon of overlapping information, the use of principal component analysis to reduce the dimensionality of the indicator system is currently one of the most commonly used methods. This method first standardizes the original data, then calculates the correlation coefficient of the indicators combines the duplicated indicators to construct the correlation coefficient matrix, and then determines the number of principal components and principal component indicators by calculating the variance contribution rate and cumulative variance contribution rate.

(3)Frequency statistics (Hao et al., 2002)

Frequency statistics of current reports and papers on the evaluation of sustainable development, and selection of those indicators that are used more frequently.

(4)Hierarchical analysis method (Li, F., Liu, X., Hu, D., Wang, R., Yang, W., Li, D., & Zhao, D.,2009).

Hierarchical analysis is a hierarchical weighted decision analysis method proposed by Satti, an American operations researcher and professor at the University of Pittsburgh, in the early 1970s of this century. It is mainly used for the determination of weights. The steps of the method are to establish the total objective of the system, then to establish a multi-level recursive structure, then to construct a two-by-two comparison judgment matrix, to rank the importance of the relevant elements in each level, and finally conduct a consistency test. Artificial neural network method (ANN).

(5)An artificial neural network

It is an abstract mathematical model that is well suited for regional sustainable development systems and has attracted widespread attention for its advantages of parallel division processing, self-organization, self-adaptation, self-study, and fault tolerance. Representative neural network models include perceptron, multilayer mapping networks, radial basis function (RBF) networks, self-weaving networks, and Hopfield networks. The steps of applying artificial neural networks to determine the differences in the level of regional sustainable development or make predictions of sustainable development indicators are to determine the structure of the network initialize the input neurons and output neurons, and then train the network by using the input and output sample sets, learn and adjust the weights and domain values, and finally repeat the training by inputting new samples, and the more the number of training times is, the better the effect of prediction and judging is.

(6)Fuzzy synthesized evaluation (PSE) (Li, F., Wang, W., Shi, Y., & Jin, C.,2013).

The theoretical basis of fuzzy mathematics is a fuzzy set, which was first proposed by Prof. L.A. Zadeh, an American expert in automatic control, in 1965. The process of applying fuzzy theory to judge sustainable development is to first establish the relevant fuzzy sets (factor set, weight set, and judgment set), then calculate the degree of attribution of each single factor to each review level, construct a fuzzy matrix, again

establish a fuzzy comprehensive judgment model and normalize the results, and finally assess the degree of regional sustainable development.

(7) Gray Modeling (GM) (Hailong, M., & Zhen, L., 2021).

The gray assessment of sustainable development is based on the fact that the sustainable development system is a gray system with incomplete or uncertain information. The key to the mathematical model is to establish the gray type of whitening weight function, i.e., the degree to which the assessment object belongs to a certain gray category. The steps of gray assessment are, firstly, to construct the sample matrix composed of the number of samples and the number of indicators, then to determine the polarity or measure of each indicator, and to carry out the hierarchical or isometric transformation, to determine the category boundaries of each indicator, to construct the weight function of each indicator according to the category boundaries and to calculate the vector of weight coefficients of the indicators' categories of each sample point, to determine the weight of each assessment indicator, to calculate the synthesis of the assessment sample points, and identify the type to which each sample point belongs and to delineate the gray category. Finally, identify the type to which each sample point belongs and delineate the triangular coordinate diagram, use the vector of normalized weight coefficients to calculate the composite score of each sample point, and rank the score value size.

4.2 Research methods Gap

In order to measure the ecological environment changes in tourist sites to guarantee sustainable development, related scholars have carried out many explorations in the quantitative research of sustainable development in tourist sites, utilizing the environmental carrying capacity (Wu, X., & Hu, F., 2020), the residents' perception evaluation of the environmental capacity (Mao, Q., Wang, L., Guo, Q., Li, Y., Liu, M., & Xu, G., 2020) with the acceptable change limit, ecological footprint model (Rees W E., 1992), sustainable development evaluation index system (Yumashev, A., Ślusarczyk, B., Kondrashev, S., & Mikhaylov, A., 2020) and other ecological, economic, geographic and sociological methods to evaluate the tourism and ecological sustainable development of tourist places. However, these methods cannot exhaustively disclose how tourism and the ecological environment interact within the region at different times in space and time when the concept and specific calculations are made, scholars turn to the experimental method to study the interference of scenic tourism activities on the ecological environment of soil, vegetation, microorganisms, air and other ecological environments, and a series of conclusions are drawn, but the range of application of this method is relatively small, and the experimental cost is high, which makes it difficult to be extended to the whole tourist place. In order to analyze the relationship between tourism activities and the ecological environment while observing the changes and interactions between the two over a long period of time, some scholars have turned to the use of coupled coordination theory based on statistical yearbook data (Wang et al. 2021), ecological carbon footprint theory (Yang, Y., & Meng, G., 2020) and other empirical studies on the relationship between regional tourism development

and the ecological environment, in which the coupled coordination model has been widely used in different types of tourism areas in China, but because of the inherent flaws of statistical yearbook data, resulting in the study of the first difficult to identify the relationship between tourism development and the ecological environment from the internal space of small and medium-sized tourism sites, while the inconsistency or lack of statistical indicators between the early and present lead to At the same time, the inconsistency or lack of statistical indicators between the early and the present leads to the fact that the whole process of regional tourism development and ecological environment is difficult to be expressed through quantitative analysis. In short, there is a lack of systematic research on the spatial and temporal changes of regional tourism development and ecological response, and the mechanism of ecological changes in tourist sites.

5 Conclusion

It is worth noting that there are various definitions, theories, and evidence of ecotourism, sustainable tourism, and sustainability assessment, and this study reviews all the relevant literature in the field. In general, this study consists of different parts, firstly, it reviews ecotourism development and the value of sustainability assessment in ecotourism, Secondly, explains the conceptual origin, Thirdly, it reviews the definition and research progress of ecotourism, the connection between ecology and sustainable tourism, the conceptual origin, definition, and research progress of tourism sustainability research, Finally, the screening method of sustainable evaluation indicators and the evaluation method of the indicator system are discussed.

There are still some limitations in this study, the main limitation is that the research value of ecotourism sustainability assessment is not elaborated deeply enough, lacks the support of data and examples, etc., and is only a conceptual description. In general, this paper refers to a large number of Chinese and English literature and explains the research progress of ecotourism sustainability assessment and related concepts in a more detailed way. Therefore, this paper offers to academic researchers and practitioners a framework for future research

6 About the author

Li Jiatong boasts a solid theoretical foundation, having authored four professional papers as the first author, one of which is published in an SCI journal. Additionally, they have edited one textbook. The host has also presided over several projects, including one by the Guizhou Provincial Education Department, a science and technology project of Qiandongnan Prefecture, a school-level education reform project, and a school-level master's degree construction project. Furthermore, they have contributed significantly to projects such as the Guizhou Theoretical Innovation Project and the Philosophy and Social Science Theoretical Innovation Project of Qiandnan Prefecture as a major participant.

Dr. Arni Abdul Gani, a senior lecturer holding a Ph.D. in Tourism Management from Universiti Putra Malaysia, is renowned for her researches in the realms of sustainable tourism, community-based management, and park management. With a prolific publication record, she has contributed significantly to the academic discourse, with numerous peer-reviewed articles appearing in esteemed local and international journals. These publications delve into diverse aspects of tourism sustainability, offering insights into effective management strategies and community engagement practices. She is actively engaged in innovation and invention, continually generating novel ideas to advance tourism practices. She is committed to driving positive change and innovation within the tourism industry, establishing them as a respected authority in the field.

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