LE Based Model Study on Resource Development and Management in Ecotourism Areas

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Abstract

This paper studies resource development and management in ecotourism areas with Landscape Ecology Theory (LE). Firstly, it will summarize the domestic research which points out the necessity of resource development and management in ecotourism area. Secondly, it will illustrate the definition of LE which lays a solid theory foundation for the study. On this basis, it mainly discusses the resource development and build a model for resource development and management to figure out efficient measures. Therefore, the ecological resource can be developed scientifically by following the natural rule, and the ecotourism area can be protected in an all-round way, thus maximizing the economic benefit, ecological benefit and social benefit.

Keywords: LE, Natural Resource, Tourism Development, Management Mechanism.

1. STUDY BACKGROUND

1.1 Literature review

Ecotourism is a form of tourism that people head for a natural area with the aim to learn the local culture and its natural history. This type of tourism avoids altering the integrity of ecosystem while creating economic opportunity, and makes the protection of natural resource benefit the local community (Chen, 2017). It is not only conducive to the sustainable development of the tourist destinations and satisfying the aesthetic demand of tourism, but also a process of cultivating ecological ethic. It has become a new economic growth point in the world tourism industry. At present, the open ecotourism area mainly includes forest parks, places of interest and natural reserves. Its form involves in sightseeing, scientific investigation, expedition. Hunting, fishing and village tourists, which appears to be diverse. Many scholars have studied the reason why the ecotourism comes into being and becomes popular, and it can be grouped into three. Firstly, it is the environmental problem. The global environmental problem facilitates people to relocate the traditional resource development method, besides, the environmental pollution caused by tourism promotes the organizer to change the traditional tourism mode (Feng, 2017). Secondly, it is the changes of tourist’s interest. Many tourists gradually get bored at mass tourism, which requires to come out new tourism products to stimulate tourism demand. Thirdly, it is the strategic trend. The concept of “sustainable development” proposed in 1980 has recognized by the world. According to the concept, WIO put forward sustainable tourism, of which ecotourism is one of the best choices.

1.2 The research purpose

Currently, the study on relationship between ecotourism and ecological environment mainly focuses on the ecological environment capacity, which still remains in its primary stage that is disperse, small-scale and experimental. There is no public definition and no complete theory explanation as well as systematic empirical research for tourism environment capacity. In addition, the ecotourism theory research only focuses on a specific problem, which appear to be disperse and not systematic. The research method remains to be the theory basis of tourism. A commonly accepted theory system hasn’t been established yet, and the theory research result falls behind the practical demand, thus being deficient in feasibility (Hu, 2017). Hence, this paper analyzes resource development and management in ecotourism areas in an all-round way taking LE theory as its theory basis and explain the definition of the theory, along with its connotation. Then, it proposes the specific development procedure and efficient management mechanism to utilize the rich resource in a reasonable way and create a more comfortable and natural ecotourism area, thus satisfying practical need of contemporary mass and creating more ecological value.
2. AN OVERVIEW OF LE THEORY

2.1 The definition of LE

In 1939, LE was coined by German botanist Troll whose biggest contribution in creating the LE was that he combined geography with ecology through the comprehensive research on landscape. Therefore, the concept of LE was generated. Its publicly-recognized definition is an emerging multidisciplinary subject that mainly couples geography and ecology (Ye, 2016). Throughout ecology, the entire landscape was taken as the search object. With the ecosystem theory and systematical method, it studied the landscape structure, function, dynamic and interaction mechanism, together with its pattern, optimal structure, reasonable utilization and protection through the transmission and exchanges of material flow, energy flow, information flow and value flow on the surface of earth and the conversion and interaction between living and non-living things. Figure 1 presented the main content and elements of specific landscape ecology system.

![Figure 1. Landscape Ecology (LE) theory](image)

2.2 The theory basis of resource development and management in scenic area

It is concluded that the ecotourism destination ranges from natural reserves, places of interest to forest parks from the sense of its space, mainly presenting as mountainous land, forest, grassland and waters (Wu, 2016). The ecotourism destination serving as the research object provides “the landscape” for the LE. From the perspective of ecological connotation, ecotourism gives priority to the protection and scientifically reasonable development of ecotourism destination under the guidance of ecological thought and principle. Therefore, LE, combining modern geography and ecology, emphases both ecological thought and principle. It is in line with the space concept and ecological connotation of ecotourism, thus becoming one of the theory basis for ecotourism development and management.

3. THE STATUS QUO OF RESOURCE DEVELOPMENT AND MANAGEMENT IN ECOTOURISM AREAS

3.1 The status quo of ecotourism areas

The ecotourism area in China has enjoyed a history of several decades. This paper chooses Mount Emei as research object and conducts a series of investigations. Mount Emei ecotourism area was authorized to open to the public since 1979, and its development had achieved a prominent success (Wang, 2016). Its tourists and the economic benefit increased steadily year by year. Figure 2 and figure 3 revealed its development from 2010 to 2016. The gross tourist increased from 19.02 million to 30.084 million of 2016, a year-on-year growth of 57.25%. The tourist revenue raised from 595.3 million yuan to 1321.35 million yuan which is over 2 times more than that of 2010. According to the data provided by the local Tourism Administration and Statistical Bureau, the gross output of Mount Emei is 9377.96 million yuan, in which the gross output of its tertiary industry is 5777.31 million yuan. The gross tourism revenue is 29.36% of the gross output and 48.45% of that of tertiary industry. It indicates that tourism has become local competitive industry, and pillar industry of the tertiary industry (Deng, 2016).
3.2 The key factors and status quo of resource development and management in ecotourism area

3.2.1 The dominance of traditional sightseeing and single tourist products

Due to factors like unreasonable management mechanism and traditional concept, little innovation has been made in ecotourism resource development. It still remained in the primary stage of sightseeing in many years and had single tourist products, which can’t satisfy tourism development and the new demand of tourists, thus leading to the slow growth of tourist.

3.2.2 Narrow channel of tourist market affected by the location factor

Mount Emei sits at the southwest of Sichuan Province, far from China’s eastern coastal area—the major tourist market. Besides, no direct flight and railway also lead to narrow channel of tourist market (Wang, 2016). From the statistics, its domestic tourist mainly came from Sichuan, Chongqing, occupying 57% of its total number and 80% from Chengdu and Leshan. The foreign tourist only made up of 2.6%. The narrow channel of tourist market constrained the number of its tourist, however, it also suggested its great development potential in the future.

3.2.3 Insufficient investment in ecotourism resource development and few scenic spots

Mount Emei possesses rich tourist resources, however, few are open to tourists due to insufficient investment, thus, it has remained almost unchanged in recent years. Tourists only concentrate on the Jinding, Wannian Temple, Tongyin Pavillion, Baoguo Temple, etc., which can’t satisfy the tourism development and new demand of tourists.
and lead to a slow growth or decrease of tourists. Therefore, it is recommended to carry out ecotourism development and management in order to solve the above problem (Liu, 2014).

4. LE-BASED MODEL ARCHITECTURE OF RESOURCE DEVELOPMENT AND MANAGEMENT MECHANISM IN ECOTOURISM AREAS

4.1 The relationship between eco tourists and mass tourists

The analysis on ecotourists can work as an important guidance for ecotourism development. The ecotourist concept system proposed in 1978 differentiated general ecotourists from strict ecotourists. The concept as a basic system was broadly supported in the ecotourism academia. Strict ecotourists have strong ecological awareness and profound sense of responsibility for protecting environment, which makes them different from mass tourists (Zhang, 2012). Meanwhile, the general eco tourist is similar to mass tourists due to their superficial ecological awareness and shallow sense of responsibility. Organizational eco tourists like strict eco tourists have motivation to learn and strong sense of environmental responsibility but a higher demand for service. The relationship is shown in Figure 4.

![Figure 4. The Relationship between Eco-tourists and Mass Tourists](image)

4.2 The market prospect of the ecotourism area

If the number of tourists in the X-th year is Y, A is taken from the year of 2010. That is to say, when \( X = 1 \), \( A = 2010 \); \( X = 2 \), \( A = 2011 \); \( X = 3 \), \( A = 2012 \)… \( X = 6 \), \( A = 2015 \); \( X = 7 \), \( A = 2016 \). MATLAB software was applied to conduct linear fitting of data from 2010 to 2016 in Figure 2 with X as variable and Y as function.

Given \( y = g(x) = mx + n \), m and n are coefficients after fitting.

The expression of the linear function is \( y = g(x) = 4.3775x + 117.2482 \), where the number of tourists in 2015 and 2016 can be calculated:

\[
g(12) = 165.4002 \\
g(13) = 169.7776
\]

MATLAB software was again used to conduct fitting of data from 2010 to 2016.

Given \( y = ax^2 + bx + c \), a, b and c are coefficients.

The expression of quadratic function is \( y = f(x) = 1.5761x^2 - 11.3832x + 140.889 \), where the number of tourists in 2015 and 2016 can be obtained:

\[
f(12) = 206.3788 \\
f(13) = 231.2440
\]
Comprehensive prediction: the average value of 2015 and 2016 in the above two formula:

\[ h(12) = \frac{[g(12)+f(12)]}{2} = \frac{(160,4002+206,3788)}{2} = 183,3895 \]  
\[ h(13) = \frac{[g(13)+f(13)]}{2} = \frac{(169,7776+231,2440)}{2} = 200,51008 \]  

Therefore, the relative error of 2015 and 2016 are respectively:

\[ r_{12} = 1.07\% \]  
\[ r_{13} = 0.14\% \]

4.3 The development of ecotourism areas

The ecological design of the ecotourism patch consists of the design of the ecotourism area and infrastructure. It integrates plant landscape, animal landscape, meteorological landscape, geological and humanistic landscape with the infrastructure, and designs spatial layout dominated by water vein (water landscape and meteorological landscape), geographical vein (geographical landscape), green vein (plant and animal landscape) and humanistic vein (humanistic landscape), thus forming a well-structured and harmonious ecotourism area with high efficiency that can make the best use of the resource (Wu, 2012). The Tourism resource development structure was presented in Figure 5.

4.3.1 The protection of patches in natural landscape

It is shown the heterogeneity and diversity of the landscape that plant and animal landscape patches, meteorological landscape patches, geographical landscape patches and water landscape patches are inset in patches of plant landscape. The qualified ecological environment proves the stability of landscape structure. As improper changes will damage the stability, importance should be attached to enhance its management and protection instead of changing the category, quantity, size, color, shape and location of natural landscape patches.

4.3.2 The renovation of humanistic landscape patches

The existing temples were built along the 60-km mountain corridors by wise architects in ancient time, and a distinctive temple will be seen within almost every two kilometers. These temples take natural landscape like landform into consideration, thus, it either sits at the top of the mountain, besides the river, hides in the forest, or is surrounded by the cloud, thus becoming an indispensable part in the landscape painting. Hundreds of inscriptions and cliff inscriptions left by literati from various dynasties scattered inside or outside temples and on the mountain path (Xiang 2012). The category, location, color and scale of humanistic landscape were integrated with the natural landscape patches. However, some humanistic tourist area wear down due to out of repair for many years, thus not in harmony with the surrounding. For instance, the node of product development and design for ecotourism like Baoshenshuige in Dishan district, Chidian in Zhongshan District and Zhanglaoping, should be restored into their original appearances to attract more eco tourists and alleviate tourist overloading.
4.4 The management and construction of ecotourism areas

The ecotourism environmental carrying capacity is not the sum but the minimum of the carrying capacity of social and economic environment, social psychological environment, resource space environment and environment management. It follows the law of the minimum that states the carrying capacity depends on the limiting factor with poor performance (Yuan, 2011). If environment carrying capacity is analyzed from the perspective of environmental purification capacity and pollution absorption capacity, its calculating formula is:

\[ EEBC = \min(\text{WEC, AEC, SEC}) \]  

where EEBC is the carrying capacity of micro ecological environment, the minimum of WEC/AEC/AEC; WEC is water environmental carrying capacity; AEC is atmosphere environmental carrying capacity; SEC is carrying capacity of solid waste. With this concept, a more direct formula to calculate the model is: \( F_0 = \sum_{i=1}^{n} S_i T_i / \sum_{i=1}^{n} P_i \), where \( F_0 \) is ecological environmental carrying capacity, expressed in the maximum allowable number of tourists; \( P_i \) is the number of i-th pollutant produced by every tourist every day; \( S_i \) is the number of pollutant absorbed and purified by ecological environment; \( T_i \) is the time for waste self-purification; \( n \) is the category of the pollutant generated by tourists (Ren, 2011). The pollutant in the ecotourism area is handled manually, thus, assimilative capacity was taken in, and the above formula was further revised as follows:

\[ F = \frac{\sum_{i=1}^{n} S_i T_i + \sum_{i=1}^{n} Q_i}{\sum_{i=1}^{n} P_i} \]  

(10)

Given its concept calculating model is:

\[ EEBC = \min(\text{WEC, AEC, SEC, EEC}) \]  

(11)

Where the added EEC is vegetation carrying capacity. When the environment is damaged, the corresponding vegetation should be compensated, and the compensation is expressed in \( d=r=1+n+c \). Its carrying capacity model is:

\[ C_e = S \cdot m/M = S \left( m_i = m_{i,1} \right)/(M \cdot m_{i,1}) \]  

(12)

Where \( C_e \) is soil and vegetation carrying capacity; \( S \) is the tourist number of the n-th year; \( m \) is the soil capacity in n-th year. The formula calculating ecological footprint and ecological productive area is \( EF = Nef = N \sum_{i=1}^{n} \left( r_i c_i / p_i \right) \), where \( I \) is the consuming product and input type; \( EF \) is the gross ecological footprint; \( N \) is the population size, \( ef \) is the per capita ecological footprint. The formula to calculate \( ef \) is: \( EF_2 = \sum_{i=1}^{n} \left( r_i m_i \right) + \sum_{j=1}^{n} \left( I_j - E_j \right) r_j / p_j \).

From the above formula and the macro perspective, the corresponding ecological footprint was calculated based on sorted data via comprehensive calculation method, and its formula is: \( EF_2 = N_2 e_f = \left[ \sum_{i=1}^{n} \left( p_i + I_i - E_i \right) r_i / p_i \right] - EF_1 \), where \( EF_2 \) is ecological footprint of tourism; \( e_f \) is per capita ecological footprint of tourism; \( N_2 \) the average number of tourists in scenic area every day; \( p_i \) is the annual production of i-th consuming project; \( I_i \) is the annual import of i-th consuming project; \( E_i \) is the annual export of i-th consuming project; \( r_i \) is production equilibrium factor. The corresponding per capita ecological footprint of tourism \( e_f \) is:

\[ e_f = \frac{\left[ \sum_{i=1}^{n} \left( p_i + I_i - E_i \right) r_i / p_i \right] - EF_2}{N_2} \]  

(13)

It is concluded that ecotourism resource development and management in the scenic area should enable the reasonable utilization of its resource and satisfy the demand of diverse eco tourists. Furthermore, it should group ecotourism resource into different functional divisions using LE theory, apply ecological design in ecotourism patches, corridors and infrastructure, and emphasize the naturality, participation, protection and comprehensive effectiveness of product (Ni, 2010). Meanwhile, the resource development and management should sustain the ecotourism environmental carrying capacity in a reasonable range and build ecotourism bi-directional...
responsibility mode to ensure the reasonable utilization of ecotourism resource. It had better motivate the enthusiasm of the ecotourism developer and operator, together with the local government and residents to exert fully their roles in developing ecotourism and protecting resource and environment, thus avoiding fake ecotourism and shortsighted development and operation.

5. CONCLUSION

To develop the resource in ecotourism areas, the feature and connotation of LE theory should be fully grasped. Following the LE theory, the resource development should combine the actual conditions like geographical location, local environment, social culture and local residents’ comments, thus, the ecotourism area can be developed reasonably and the resource can be fully utilized. As to the management of ecotourism area, it is recommended to improve the comprehensive quality of administrative staffs and the awareness of local residents to protect ecological environment, together with exerting the role of government in guidance, thus sustaining a good ecosystem in joint effort and create a pleasant home.

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