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Designing of Scenic Spots Trail from the Angle of Ecological Protection- A Case Study of Xixi National Wetland Park

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Abstract

Human being attain huge economic income resulting from tourism, meanwhile they paid an enormous cost for that. Environmental pollution and resource destruction in scenic spots become an important issue that tourism development is confronted with. Trail is an significant basic service facility in scenic spots, and its design is close correlated with project development and resource protection. In the present paper, we attempted to start with trail design in scenic spots, through expounding trail function, in a case study of Xixi national wetland park, make an empirical study, and put forward principles trail design should follow. We hoped that we could enhance environmental carrying capacity and promote sustainable development in scenic spots by proper trail design.

Keywords: Scenic spots, Trail design, Ecological protection, Xixi national wetland park

1. Introduction

Trail, as an significant basic service facility in scenic spots, is a cohesive tie connecting with various scenic spots, and plays a cardinal role in the tourism planning and construction(Zi, 1999, PP.58-60). On the one hand, trail planning and design is a re-integration for resources in scenic spots, and determines environment layout and project development. Its construction inevitably causes damages in some degree to resources in scenic spots; On the other hand, trail is a significant facility to guide and load tourists. Their most activities in scenic spots carry through the trail. Trail design determines the impacts of tourism action of tourists on scenic spots environment to some extent. Consequently, trail design affects tourism development to some extent in scenic spots. In the present paper, based on trail functional analysis in scenic spots, we studied trail design in scenic spots from the angle of ecological protection, in a case study of Xixi national wetland park, and put forward principles trail design should follow in the light of ecological protection, with an attempt to offer reference for trail planning and design in scenic spots.

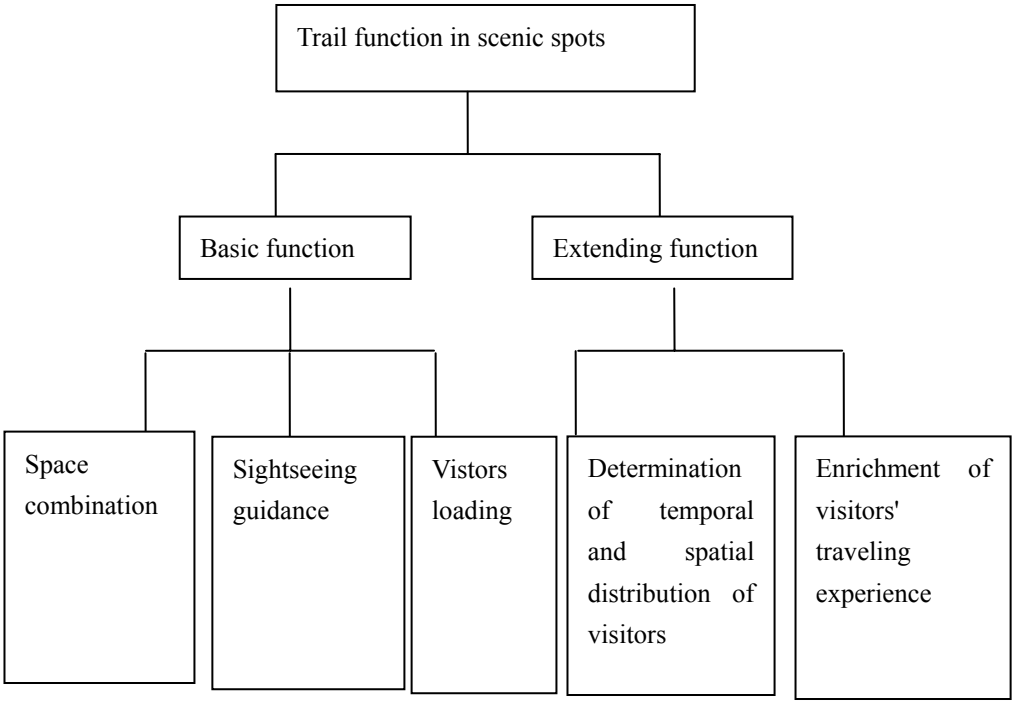
Research results about trail in China focused on pavement design in garden, forest park and mountain style scenic areas(Meng, 2008, P. 286; Wang, 2007, P. 146; Wang, 2007, PP. 492-564; Li, 2006, PP. 55-56; Yang, 2004, PP. 46-48; Wang, 2008, PP. 82-88.2-7), with an emphasis on the design of trail layout in scenic spots, as well as the construction standard studies of trail and its relevant facilities, etc. In the present paper, based on trail functional analysis in scenic spots, we studied trail design in scenic spots from the angle of ecological protection, in a case study of Xixi national wetland park, and put forward principles trail design should follow in the light of ecological protection, with an attempt to offer some references for trail planning and design in scenic spots.

2. Trail and its function in scenic spots

Through the observation of tourists action, considering from the angle of visitors characteristics and environmental protection in scenic spots, we classified trail function into two sorts, viz. basic function and extending function. Basic function includes the combination of scenic spots space, sightseeing guidance and visitors loading and so on; Extending function includes determination of temporal and spatial distribution of visitors, enrichment of visitors' travelling experience and so on. Therefore, trail is the combination and joint of resources in scenic spots, and a facility to guide and load tourists. Its design would affect the temporal and spatial distribution of visitors and the quality of traveling

experience.

Trail functional structure diagram in scenic spots:



2.1 Basic function

2.1.1 Determination of environment layout in scenic spots

One basic function of trail in scenic spots is to link the scattered spots, and its connection mode determines the whole environment layout of scenic spots. Meanwhile, trail is not only the tie of sight organization and relation, but also could give different visual and recreational experience due to its meandering and crankle or rising and falling(Li, 2003, PP. 10-11). Accordingly, trail itself is an important part of scenic spots environment. Make visitors feel the beauty of scenic spots environment through the conscious layout of trail and layered and rhythmical spread.

2.1.2 Traffic organization and sightseeing guidance of visitors

Trail in scenic spots not only accomplishes the transport task, such as environment, the maintaining, conserving and administering of building and so on through the traffic organization, but also guides the movement path for visitors. The most impact on the movement path of visitors is the trail design of direction and capacity, for visitors undertakes their journey in scenic spots according to trail direction and quantity, as well as marks of affiliated landmark. Herewith, trail in scenic spots is a necessary basic facility for visitors to complete a tour experience.

2.1.3 Visitors loading

Trail is an important carring facility in scenic spots, and complementary to its guidance function. Cui Fengjun(Cui, 1995, PP. 105-109) figured that resource space capacity was an important aspect to determine tourism carrying capacity, and trail carrying capacity should be an important part of practical carrying capacity in scenic spots. Consequently, trail in scenic spots also have a threshold of carrying capacity correspondingly, namely carrying visitors quantity under the premise of no damages to trail itself and no interference with travelling experience of visitors.

Cui Fengjun(Cui, 1995, PP. 105-109) indicated that resource space capacity was the compound concept of space limitation of tour resources to tourists and perception capacity of tourists themselves. Accordingly, how to comprehend trail carrying function should be considered from the two aspects of tourists and trail. On the one hand, carrying of tourists' space displacement should be under the premise of no influence on the quality of tourists' travelling experience. On the other hand, trail itself affects the exertion of trail carrying function.

2.2 Extending function

Extending function is a comprehensive consideration on the basis of basic function.

2.2.1 Determination of temporal and spatial distribution of visitors

Through the combination of scenic spots space, trail guides and carries the sightseeing activities of visitors, and

determines their temporal and spatial distribution, namely sightseeing route of visitors in scenic spots, as well as their residence time distribution in one spot or region. This is a dynamic index, and close associated with this static facility, trail, which indicates that quantity, width and direction design of trail determines the temporal and spatial distribution of visitors to a great extent. Direction herein means the scene spots trail leads to. Different trail direction means different resource features in scene spots, which will affect the temporal and spatial distribution of visitors in this road section.

2.2.2 Enrichment of visitors' travelling experience

Through the coordinated design with scenic spots, trail not only could guarantee the security of visitors during sightseeing, but also could enhance the ornamental value of scenic spots and enrich visitors' travelling experience. On the other hand, trail comfort design could also affect the travelling experience of visitors. Therefore, during the period of sightseeing, if it is greatly harmonious between trail design and surrounding environment and comfort is quite high, visitors' satisfaction of travelling experience will be certain to advance. Conversely, satisfaction will lower, which could affect the development of scenic spots. Consequently, trail design in scenic spots affects the quality of visitors' travelling experience to some extent.

3. Present situation and existing problems of trail in Xixi national wetland park

3.1 Trail present situation of Xixi national wetland park

Trail width in scenic spots mostly ranged from 1 to 2m, main distribution was listed in Table 1. Slate, detritus or slate, cobble or sandy soil and so on are all slate in the middle, detritus in both sides. Due to more trail in scenic spots and more spurroad to scene spots, visitors would scatter, and select sightseeing manner of battery ship, so not many visitors walk around the trail, but more visitors would appear intensively around the scene spots.

3.2 Existing problems of trail design in scenic spots

3.2.1 Large quantity, damage to original ecological system in scenic spots

There are much trail in Xixi national wetland scenic spots. For instance, three kinds of trail exist from checking position to Xixi water pavilion, and many spurroad exist in each trail. Trail in scenic spots is built by people based on the original ecological system. More trail in scenic spots will undoubtedly have a stronger impact on the ecology of scenic spots and exacerbate the damages to the original resources.

3.2.2 Great damages to vegetation around the trail

In the whole scenic spots, situation that plants around the trail were trampled by visitors is quite universal and serious. Due to soft clay around the board road, such situation is little. But damages to vegetation around the trail in main scene spots are quite serious. Situation of damages to trail itself is quite universal, especially in the trail mainly built by detritus. Seen from the trail construction in China, slate roads are majority, in which trampling situation exists to some extent.

3.2.3 Damages to trail itself

In the scenic spots of Xixi wetland, situation of damages to board and detritus roads is greatly serious. Damages to board roads is not necessarily caused by human being, for its particularity is susceptible to the interference of natural factors. But damages to detritus roads were induced by human being, and some little detritus was artificially peeled away from the ground, which facilitated other detritus break off and brought difficulty for visitors to walk, especially for children and the aged. Consequently, trail protection includes not only the protection of vegetation around the trail, but also the protection of trail itself.

3.2.4 Insufficient protection of trail sign system

Sign belongs to the additional service content of trail sign system, and plays an important guided role in the sightseeing of visitors in scenic spots. In the scenic spots of Xixi wetland, damages to trail sign system was rather serious. On the one hand, due to some wood materials universally used in scenic spots trail, trail sign system is susceptible to the interference of natural factors. On the other hand, insufficient protection of trail sign system by the administers of scenic spots is also an important causation resulting in such situation.

4. Principles of trail design in scenic spots

Trail design in scenic spots should persist in the premise of ecological protection, comprehensively consider various factors, based on scenic spots environment, and take the visitors as center with attempts to develop scenic spots. On the basis of ensuring the exertion of basic function, humanized design should be undertaken in favor of efficacious protection and reasonable development of scenic spots resources and attain the goal of promoting sustainable development of scenic spots. In combination with above trail function analysis, as well as the existing problems of trail design in Xixi national wetland park, under the premise of ecological protection, we brought forward some principles that scenic spots trail design should follow.

4.1 Macro-principles

4.1.1 Principles of protecting scenic spots environment

Due to actions of most visitors occurring intensively in or around the trail, studies on the relationship between trail design and environment in scenic spots seem more important. Ye Yongzhong of plant laboratory, Henan Agriculture University had investigated effects of trail on species features of community in Longchiman Nature Reserve, and results showed that the largest effect caused by trail was the plant coverage, and meanwhile plants with resistance to trampling started to grow which limited the growth of herb and shrub with higher individual(Zi, 1999, PP.58-60). Based on the existence of numerous environmental problems, especially in the scenic spots with relatively weaker resource characteristics, trail design should be carefully considered.

On the one hand, the embody of trail basic function should be under the premise of environmental protection without any damages, including trail design of width, quantity and so on. Sufficient survey on scenic spots resources is essential. Under the condition of properly forecasting the potential visitors in scenic spots, pertinence design and further amelioration should be undertaken; On the other hand, basic purpose of scenic spots operation should be to implement resource protection, and thus scenic spots development is promoted and resource protection is further implemented through trail design, which is the indirect effects of trail on resource protection. Taken together, resource protection is the basic premise and objective that trail design should follow in wetland scenic spots, and also the important embodiment of trail extending function.

4.1.2 Principles of enhancing visitors' experience

With the advent of economy era of travelling experience, planning and design of tourism scenic spots should sufficiently consider perception experience of visitors, and trail design, as an important traffic facility in scenic spots should embody humanity concept. Therefore, trail design of width, quantity and so on should be reasonable, and higher requirements should be raised for materials which should not only guarantee the security of visitors, but also enhance the comfort of visitors.

Due to the existence of quality problems in trail, trail itself has a carrying threshold. If visitor quantity exceeds the carring threshold of trail itself, damages to trail occurs, such as detritus breaking off the ground. Meanwhile, trail itself is an important part of resource environment in scenic spots, and damages to trail is identical to damages to scenic spots environment. Accordingly, materials used for trail in scenic spots should be carefully selected. Economic factor should not be only considered, and carring range is also an important factor, which could be depicted as "ratio of performance to price" of materials used for trail.

Anyway, travelling experiences of visitors determine the development of scenic spots, and trail design should not only consider scenic spots resources or fund regardless of visitors. Travelling experience should be promoted in scenic spots in order to enhance economic income, implement resource protection and promote benign cycle of scenic spots development. Consequently, trail design in scenic spots should be attempted to enhance visitors' travelling experience.

4.2 Micro-principles

According to the cognitive frame of social physics(Wang, 2007, PP. 34-37), generation of power certainly results from difference, difference results in gradient, gradient causes power, and power induces current. In scenic spots, difference is the difference among scenes, power is the leading-force resulted from visitors, current means temporal and spatial distribution of visitors in scenic spots. Taken together, it is evident that space displacement of visitors in scenic spots should resort to the leading-force effect resulted from the difference among scenes.

In light of this theory frame, as an important service facility in scenic spots, trail design should stick to the principles as follows:

4.2.1 Joint of line and dot

Trail in wetland should not only connect several scattered scene spots, but also be a pretty scenery. Its design should follow the principle of uniting with nature(Li, 2003, PP. 10-11), correspond to the scene spots nearby, and form an efficacious integration of lines and dots. In Xixi wetland scenic spots, trail design fails to show this principle, and match between scenery and scene spots around the trail is not very harmonious. Therefore, trail deign in scenic spots should exhibit different ecological beauty in the trail leading to different scene spots, and pose the landscape effect of "step walking, scenery changing" as possible. During the period of visitors shifting to next scenic spots, through scenery design around the trail, trail design should merge into its ecological atmosphere, and deep understand ecology connotation of the scene spot, which should be the basic connotation of trail design.

4.2.2 Serial-parallel association

Serial-parallel association mainly means that the principles trail should follow when it links various scene spots in scenic spots. Circuit design in physics link used electric apparatus in the manner of series, parallel and the combination

of those two. Applying this theory to trail design in weltand, trail is equivalent to electrical wire in circuit design, each scene spot is identical to the used electric apparatus. For trail has main road, branch road and alley, its design should embody discernible main and secondary, and have specific directivity(Wang, 2007, P. 146). Accordingly, when planning the whole scenic spots, trail could connect the main scene spots in series to form main road, and several supplementary scene spots in parallel to form branch road or alley.Trail design should highlight the main scene spots, contain subordinated sight, embody sight difference, exhibit the beauty of resources in scenic spots with level and rhythm, and induce visitors' sight-seeing actions. However, too much spurroad existed in Xixi wetland, which blocks the exertion of trail inducing function to some extent.

4.2.3 Force vector

According to the principles of social physics, larger difference, stronger gravitation. Magnitude and direction of gravitation determines the same properties of current. In scenic spots, such difference relies on the resource difference among scene spots. Therefore, connecting different sight in order should be considered in trail design, and feature of the scene spot should be highlighted around the trail, which is attempted to enhance the visitors' perception experience to the resource feature of scene spots.

In addition, force is a vector in physics, with not only magnitude but also direction, which gives a requirement for trail direction and its sign system. Sign design should consider various conditions, and offer perfect service for different visitors, especially for the aged and children. If necessary, sign system of different languages should be offered. Additionally, staff members in scenic spots should check and maintain the trail guides in time. For guides are all made by wood, and vulnerable to the erosion of wind and rain, the writing there should be renovated frequently to keep the integrity of guide and clear writing. Writings of tablet are unclear, arrows point in an indistinct way, and map marks are not clear, which all could affect the sight-seeing activities of visitors.

5. Conclusions

Taken together, from the angle of ecological protection, trail development is resources recombination in scenic spots, which could affect its original ecology system. Trail design in Xixi national wetland park affected ecological system greatly, and failed to exert its basic function very well. Consequently, trail design should integrate various factors, namely trail design of quantity, width, direction and so on which should consider not only visitors, but also resource features in different scene spots, and follow the principles of force vector. Trail should be undertaken pertinence design and planning in order to guarantee the sustainable development of tourism in scenic spots.

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Table 1. Trail overview of Xixi national wetland park

Materials	Width(m)	Main distribution	Flux(population/min)	Road trampled situation
Slate, detritus	1—1.5	Check position--Xixi water pavilion	6--8	25 centimetre vegetation on both sides of trail, trampled
		Yehu ferry--Bird-seeing booth	8--16	
		Yanshui fishing villa --Berth nunnery	13--21	
		Yanshui fishing villa--Pool entrance	16--32	
	4	Berth nunnery--exit	6--15	Vegetation around trail, not trampled
Slate, cobble	2.1	Xixi water pavilion--Bridge of Qiu family	8--14	25 centimetre vegetation on both sides of trail, trampled
Slate, sandy soil	1	Qiu family--Yehu ferry	6--8	25 centimetre vegetation on both sides of trail, trampled
Slate	1.5	Bird-seeing booth--Yanshui fishing villa	16--29	25 centimetre vegetation on both sides of trail, trampled
		Slate bridge near water area		
Board	1--1.5	Board road near Bird-seeing booth, board bridge near water area	6--16	Vegetation around trail, not trampled
Board, detritus	1.5	Bird-seeing booth--Yanshui fishing villa	10--24	25 centimetre vegetation on both sides of trail, trampled