

Full Length Research Paper

Research on sustainable tourism development of a Leisure City – The case of Changsha

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Under the global trend of low-carbon economy, the sustainable development of tourism is very important for the adjustment of economic structure, regional economic development promotion, and improvement of city taste, community environment and conditions of public service facilities. More and more leisure cities consider their own tourism products as the best, which is becoming the comprehensive industrial complex market to meet the leisure consumption of foreign tourists and local residents. The state council clearly takes Chang-Zhu-Tan area as a “two-type” demonstration area. All society circles advocate establishment of the concept of ecological civilization; to develop tourism rapidly and healthily which is the objective and direction of Changsha, and their goal is to create “the central leisure capital”. Changsha is a leisure city in middle China that has her own main background resources for tourism development, such as long-depth history and cultural tradition, and their characteristic mountains, water, continents, and city landscape. And also urban residents have good recreational traditions. The tourism industry developed together with the leisure industry, and has now formed the economic structure and industrial clusters of main tourism, entertainment, service and cultural industries. Consequently, it is a practical issue to make the comprehensive study on sustainable development of tourism by using the landscape ecology theory, which also is a breakthrough to predict the future development.

Key words: Leisure City, tourism, sustainable, landscape ecology, region force.

INTRODUCTION

Currently, the low-carbon city of international standing should be made up three qualities, namely: low-carbon economy development form and direction, conception and behavior of low-carbon life for community residents and short-term visitors, low-carbon society establishment for governmental management. All the afore-mentioned are practical and feasible conception of sustainable development.

According to the eco-city theory, developed in the

1980s, believes that ecological limit (Register, 1987) existed during the urban development, eco-city also known as the ecological community. Peng and Li (2001), stated that eco-city was a result from city ecological development; simply speaking, it is a living form of social harmony, economic efficiency and ecological virtuous circle, and also it is an organic system of nature, city and people incorporated, which forms mutually beneficial symbiotic structure (Peng and Li, 2001). Huang and Yang (2001) believe that eco-city is not an unreachable and perfect ideal state, but an expected and reachable sustainable development process, an ecological revolution to break down the old and establish the new (Wang and OuYang, 1994). Eco-city is a kind of

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sustainable subsystem that shares a fair carrying capacity; it is the complex system of natural harmony, social equity and economic efficiency, which was established, based on ecology principle; it is also ideal settlement environment with characteristics of coordination between nature and artwork, harmony between people (Huang and Yang, 2001). The author agrees more with this point.

Many of the city's economic growth models have transferred to reliance by the leisure industry and related industries from the single industry. Tourism leisure becomes the main choice for urban residents, and tourism becomes the major representative and leader of leisure industry (Lou, 2006). In addition to tourism, the leisure industry has a big effectiveness on city transformation and development, mainly large and medium cities in the eastern coastal area and part of inland areas (He and Dang, 2007). He and Dang (2007) believe that leisure economies developed based on tourism and entertainment in part of urban areas and tourism cities formed a new growth point for regional economy. Most cities' economic development mode has transferred their reliance from single industry into leisure and related industries. Tourism leisure becomes the main choice for urban residents, and tourism becomes the major representative and leader of the leisure industry.

RESEARCH THEORY AND METHOD

Environmental evaluation system

With the rapid development of tourism, the environment damage from tourist activities and lagged city auxiliary service become obvious day by day. If the tourism development of leisure city is still in the mode of carrying predatory development without any suitable management, there will be a big damage and threat to natural environment and culture, not only for the development of tourism industry itself, it will also affect the whole regional sustainable development. Correct evaluation of the status of leisure tourism city, is an important basis for this type of city to implement sustainable development strategy.

Landscape ecology

From the view of ecological planning, the so-called ecological position, is landscape elements, ecological units, economic factors, and the optimum ecological use configuration of life requirements; in accordance with the ecology rule and the unit requirements of human interests, ecology planning requires the implementation of the principle of local conditions, suitable application and production of land, and rational distribution; through the environment, resources, transport, industry, technology, population, management, capital, market, efficiency and other economic factors. With this we can analyze and summarize areas with ecologic economy, and can develop and utilize natural resources, distribute the productivity, remediate environment, and arrange life rationally. According to the analysis and design on system special structure of landscape ecology, to develop the theory and method of ecology position and local ecology, to aid planning, organize and manage the regional ecologic construction.

The basic condition of research area

Chang-Zhu-Tan City Group is located in northeast Hunan Province, with a GDP total of 456.5 billion Yuan accounted for 40.9% in the whole Hunan province, and it is the core growth point of economy development. Combined together, the three cities in the local city and whole province can form and play an important role in industrial center, trade center, transportation center, financial center, information center, technology center, and multi-functional integrated economic center. State Council announced in their first batch that Changsha is one city of 24 historical and cultural cities, is also one of the opening tourist cities. Changsha, the capital of Hunan Province, is the center of polity, economy, culture, science, business trade, transportation, finance, and information. Changsha is a typical landscape continent city.

Natural conditions

At present, forestry land of Changsha city is 620,000 hectares, accounting for 52.5% of total area, 53.6% of forest coverage, 42.41% of urban are green coverage, 37.8% of green land; and its public average green area is 9.42 m²; forestry greening target can reach and exceed the national city standard. Changsha is rich in wetland resources, has a large number of rivers, lakes and reservoirs. Wetland area of whole city is 28,015 ha based on preliminary statistics, which accounts for 2.36% of the whole city. Wetlands in blocks, zonal distribution, less concentrated, comparatively restrict the wetland conservation work.

Economic conditions

Changsha is the 14th administrative division city of the whole nation, municipalities including 5 zones of Furong, Tianxin, Yuelu, Kaifu, Yuhua, three countries of Changsha, Wangcheng, Ningxiang, and Liuyang city. The 'Hu' of Hu-Xiang culture means 'Dong Ting Hu', and 'Xiang' means 'Xiang River'; and Hu-Xiang culture mainly refers to modern regional culture with the main body of Hunan province. Hu-Xiang culture as an integral part of traditional Chinese culture, originated in the late Northern Song Dynasty, formed in the Southern Song Dynasty.

THE RESEARCH PROCESS

With the rapid development of tourism, damage to environment from tourist activities and lagged supporting services become obvious day by day. If the tourism development of leisure city is still in the mode of carrying predatory development without any suitable management, there will be a case of big damage and threat to natural environment and culture, not only for the development of tourism industry itself, but will also affect the whole regional sustainable development. Correct evaluation of status of leisure cities, is an important basis for this type of city to implement sustainable development strategy.

Parameters assignment

Changsha city area has five country districts, with large difference in rich land resources, thick density population

Table 1. Tourism economic indicator in Yuelu District from 2004 to 2006.

Year	Immigrated tourist (million people)	Tourism exchange earning (million dollar)	Domestic tourist (million people)	Domestic tourism income (billion yuan)	Total tourism income (±)%
2004	3.1	1800	221	15.4	16.9
2005	3.8	2800	277	21.2	23.5
2006	6.1	5125	318	27.5	31.6

Table 2. Tourism economic indicator in Kaifu District from 2004 to 2006.

Year	Immigrated tourist (million people)	Tourism exchange earning (million dollar)	Domestic tourist (million people)	Domestic tourism income (billion yuan)	Total tourism income (±)%
2004	/	/	/	/	/
2005	3.2	1900	362	31.7	33.3
2006	4.6	3610	405	39.9	42.8

Table 3. Tourism economic indicator in Yuhua District from 2004 to 2006.

Year	Immigrated tourist (million people)	Tourism exchange earning (million dollar)	Domestic tourist (million people)	Domestic tourism income (billion yuan)	Total tourism income (±)%
2004	2.2	1050	115	13	13.9
2005	3.5	2350	145	15	16.9
2006	4.3	3150	180	18	20.5

and economic development level; and also has major differences between tourism resources and its development level. Therefore, there is need to evaluate the carrying capacity of all regional tourism areas, analyze the limited factors of regional environment carrying capacity, so that we can make the suitable countermeasures according to their basic regional situation.

Resource space capacity

In accordance with each region's available tourism activities, land carrying capacity can be evaluated (0.25, 0.5, 0.75, 1) for five districts of Changsha successively. As per available developed tourism areas, it can be assigned in sequence. The following tables are the tourism economic indicator of each region (Tables 1 to 5). We can see from the tables above: in the index calculated of abundance tourism resource, tourism resource area is total, including museum, city parks and city-level scenic spots. As per the tourism carrying capacity, it can be evaluated as 0.25, 0.5, 0.75, and 1

successively.

The carrying capacity of ecological environment

Tourism land intensity index is expressed as rate of tourism land area and real city residential land area. In Changsha, each district land intensity is for Yuelu, Tianxin, Kaifu, Yuhua, and Furong district respectively.

In the carrying capacity calculation of ecological environment, the green index can be determined mainly by surface condition, green space distribution, geological disaster, etc. Steep topography, natural disasters such as landslide and debris flows, and difficulties of facility construction and activities, this kind green index is defined as the first level with score of 0.25. The second level with score of 0.5 is that more steep terrain, a certain geological hazards, restrict on facility construction and available activities. The third level with score of 0.75 shows that that the terrain is more flat, better facility construction and activities. The fourth level with score of 1, shows a more flat terrain, and without basic restriction on facility construction and activities.

Table 4. Tourism economic indicator in Tianxin District from 2004 to 2006.

Year	Immigrated tourist (million people)	Tourism exchange earning (million dollar)	Domestic tourist (million people)	Domestic tourism income (billion yuan)	Total tourism income (±)%
2004	/	/	/	/	/
2005	3.2	2568	153.2	15.6	17.7
2006	4.8	3822	172.7	19.7	22.8

Table 5. Tourism economic indicator in Furong District from 2004 to 2006.

Year	Immigrated tourist (million people)	Tourism exchange earning (million dollar)	Domestic tourist (million people)	Domestic tourism income (billion yuan)	Total tourism income (±)%
2004	/	/	/	/	/
2005	4.9	3574	287.8	43.4	46.4
2006	7.8	5953	347.9	55.2	59.9

Waste carrying capacity index is got from numbers of health institutions in unit land area. According to the number of health institutions and their distribution, numbers of health institution in unit area can be degreed and evaluated as below: if under 1 per square kilometers we mark it as 0; the first level, with number of 1 to 5 per km², will be recorded as 0.25; the second level, with number of 5 to 10 per km², recorded as 0.5; the third level, with number of 10 to 15, recorded as 0.75; and the fourth level, with number above 15, recorded as 1. Tourism land intensity index can be determined by the evaluation of regional tourism area and total country land area; here tourism land is the area above city degree like scenic spots, museums, and city parks.

Landscape diversity index, based on tourism resources survey in Changsha, is evaluated by the original diversity of resource abundance and type, and the resource degree situation, meanwhile referring to urban green space landscape indices.

Facility capacity

In the calculation of facility capacity, accommodation carrying capacity index is the rate of number star hotels accounted for the whole city. During the detail calculation, there will be large difference in size, facilities and service quality as per the different star level, therefore star hotel will be awarded the weight coefficient. The hotel number is the amount of hotels with different weight coefficient in Changsha city and other countries and districts. Weight indices are studied out: five-star 1.5, four-star 1.3, three-star 1.1, and one or two-star without weight indices. Financial service index can be grade evaluated by bank system numbers in unit area. As per detail difference, financial service index can be evaluated as follow

division: under 1 per 10 km² recorded 0.25, 1 to 5 per 10 km² recorded 0.5, 1 to 5 per one km² recorded 0.75, above 5 per km² recorded 1.

Carrying capacity intensity of water resources evaluated and recorded as per health institutes and leisure footbath distribution status in regional districts of Changsha city; and it is determined by the rate of the number accounted for total land area.

Social and cultural carrying capacity

Carrying capacity index of society and culture will be determined by several indicators of travel and living index, tourist satisfaction index, cultural industry supporting index, local resident leisure index, and tourist visiting again index.

Travel and living index is expressed by using the number of tourists and local residents; and tourist satisfaction index and residents' cognitive index obtained through field research. Cultural industry supporting index are scored by the number of cultural structure, animation base, film base, and culture cluster area. Tourist visiting again index is evaluated through the research results (Tables 6 to 9).

The landscape of Leisure City changes often and there is no absolute stability. The landscape stability is of a certain time and space relative stability. The space combination of landscape elements also affects the stability of landscape. Different special configuration affects the landscape function to play. We can get below conclusions through the analysis on all kinds of greenbelt index in Changsha (Figure 1).

(1) The patch fragmentation degree of Changsha greenbelt is more serious, and the small patch accounted

Table 6. The composing of greenbelt in Changsha.

Landscape type of greenbelt	Area size/hm ²	Percentage	Patch number/piece
Park greenbelt	1015.44	10.22	40
Production greenbelt	77.66	0.78	7
Protecting greenbelt	575.86	5.79	339
Subsidiary greenbelt	2545.85	25.61	8594
Other greenbelt	5725.85	57.60	271
Total	9940.66	100.00	9251

Table 7. The types of the urban greenbelt patch in Changsha city.

Grade type of greenbelt patch	Patch area (hm ²)	Proportion (%)	Patch number (piece)	Proportion (%)
Mini Patch ($\leq 1\text{hm}^2$)	1285.75	12.93	8499	91.87
Medium Patch (1-5hm ²)	1150.89	11.58	533	5.76
Large-medium Patch (5-10.0hm ²)	609.44	6.13	88	0.95
Large Patch ($>10\text{hm}^2$)	6894.59	69.36	131	1.42
Total	9940.67	100.00	9251	100.00

Table 8. Spatial pattern index of urban greenbelt of Changsha.

Greenbelt type	Area (hm ²)	Fragmentation degree (FN ₂)	Separation degree	Aggregation degree	Patch density (piece/hm ²)	Patch average area (hm ² /n)
Park greenbelt	1015.44	0.0036	0.9469	72.0703	1.7852	25.39
Production greenbelt	77.66	0.0006	0.9943	48.1491	0.3097	11.09
Protecting greenbelt	575.86	0.0315	0.9999	4.5318	11.2870	1.70
Subsidiary greenbelt	2545.85	0.7999	0.9938	14.3119	38.4768	0.30
Other greenbelt	5725.85	0.0251	1	25.2906	10.8528	21.13

Table 9. The analysis of landscape diversity index of urban greenbelt in Changsha.

Index	Diversity (H)	Large diversity (H _{max})	Evenness (E)
Value	1.0760	2.32	0.4897

for the whole of about 92%, therefore, it weighs' more on the carrying capacity of the whole city; so that the anti-interference ability of the whole ecology system is very weak to cope with large tourism disasters and cultural system contingencies.

(2) From the type of greenbelt, greenbelt of production and protection is so small, which will impact more in carrying capacity of tourism basic facilities. During the tourism planning, we need to increase the greenbelt to enhance its carrying capacity in future tourism land.

(3) In the analysis of greenbelt diversity, we can see from

large diversity, evenness, diversity, etc several indexes that: are at present in one scenic area and corridor, the serious situation fragmentation affects the landscape diversity and stability, and need to increase large landscape patch as developed basis in future project construction and design.

(4) Generally speaking, leisure atmosphere of Changsha landscape is full of leisure and pleasant style; landscape pattern of mountain, water, continent, and city, is very favorable for the development of tourism industry. The framework of whole city's greenbelt and landscape system has been preliminarily formed which is very favor-

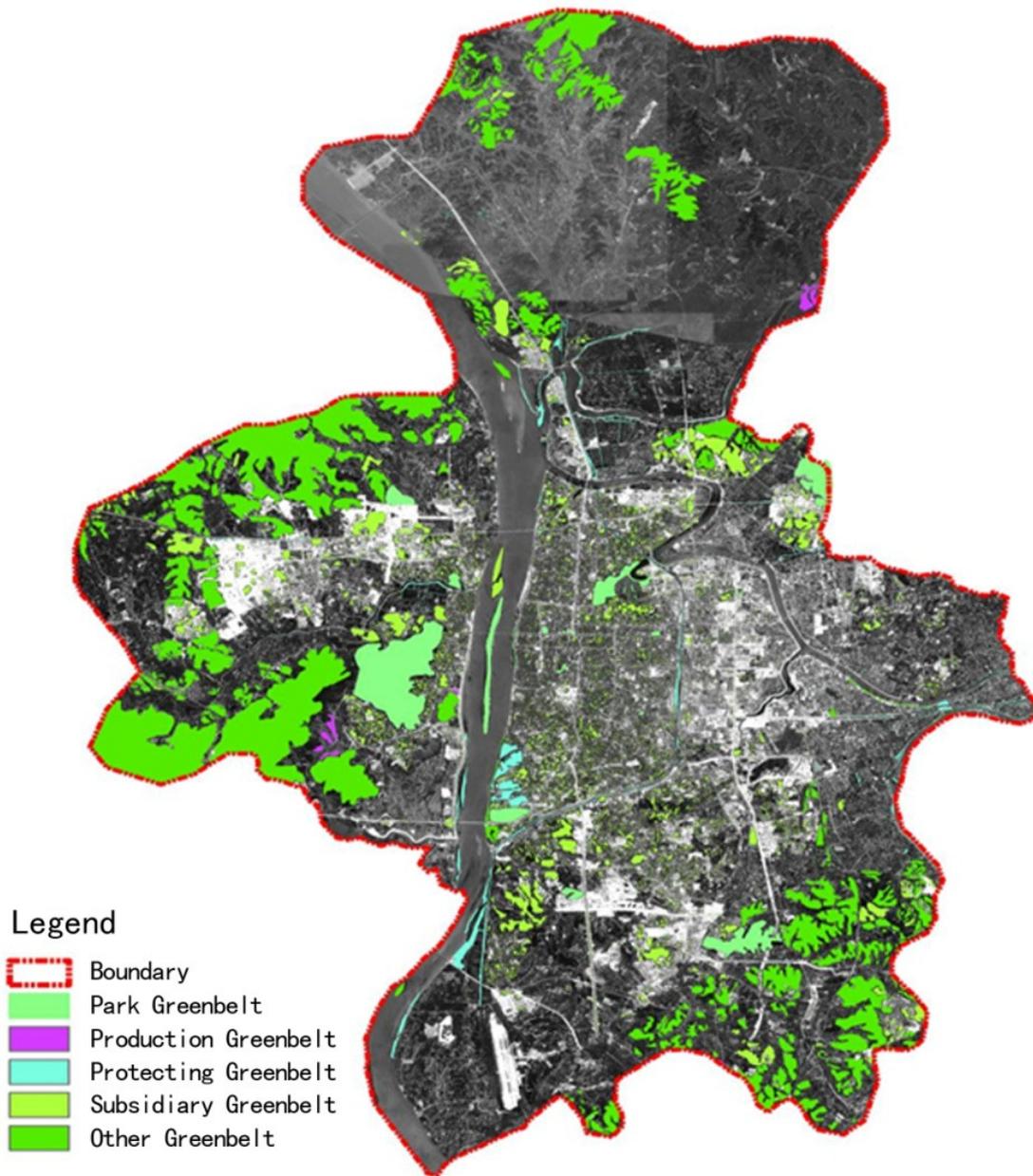


Figure 1. Greenbelt Landscape Map of Changsha.

able for leisure and tourism city.

CONCLUSIONS AND RECOMMENDATIONS

Carrying capacity analysis of Changsha city and each district is as follows:

(1) Regional difference of carrying capacity is very obvious. The maximum value of carrying capacity is above 0.85, and the small is under 0.34, there is a great disparity between before and after. This showed a large difference in tourism resource, economic facility,

ecological construction and environmental protection in Changsha city; tourism planning and tourism influence should be carried out according to different carrying capacities.

(2) The special variation is obvious. By the influence of geographical position, Changsha tourism carrying capacity is decreasing from north to south, from west to east; and economical facility carrying capacity is reduced from center city to the surrounding. The ecology-environment carrying capacity presents layer distribution; the largest is the best area of surrounding landscape, such as Tianxin district and so on, followed is the city

central area with perfect health facility, and last smallest is suburban area with less greenbelt resource and health facility.

(3) The limitation of regional tourism resource is very serious. In the biggest difference of tourism carrying capacity, the top three districts are Furong, Kaifu and Yuhua with values of 1.623, 1.373 and 1.218 respectively; Yueli and Tianxin district only have the value of 0.285 and 0.282, the carrying capacity of economic facility is very obvious. Yueli district mainly has the natural mountain landscape, combined with waters, shoal, etc resources; Furong district is the tourism leisure landscape city with city leisure, shopping and restaurants. However, others like Yuhua district also consider natural landscape important, but the lack of infrastructure capacity; Tianxin district is the main development area of Chang-Zhu-Tan city with a suitable environment, rich in ecology and biological resources. In Tianxin district, the infrastructure is also less developed; hopefully in the future, with rapid development the conditionally, increasing number of basic facilities can enhance the tourism carrying capacity.

(4) As indicated by some main conditions of tourist residence time and tourist behavior for analyzing the carrying capacity of each district. For Furong, Yuhua district, the impact on whole regional carrying capacity from their tourist residence time is not serious; but for Yueli, Tianxin, and Kaifu district, consideration of natural resources as foremost will exert large pressure on tourist behavior and residence time, and the increasing number of tourist in future might result in an overload situation locally.

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