Wetland Protection Strategy Based on “Source-Stream-Convergence” Theory-with Weishan Lake Ecological Tourism as An Example

Feng Shi¹, Xue Pan²

¹ Houde Chinese (Beijing) Cultural development Limited company, Beijing, China
² Beijing Century TAL Education Technology Co., Ltd., Beijing, China

Abstract: Policies on the development of countryside, towns, ecological system, regional tourism and canals are frequently issued these days. Weishan Lake should seize this opportunity to develop itself by coordinating ecology, industry and tourism for the integrated development of its urban and rural areas. From 1984 to 2018, the east of Dushan Lake Basin was suffering from the shrinkage of water area, lake filling for fields and ponds, rapid expansion of urbanization, and pollution caused by the direct pouring of sewage and agricultural waste water into the lake. A number of factors lead to the mounting pressure over the environment of Dushan Lake, which requires scientific planning and land use layout based on elements such as natural limits, economic efficiency and ecological protection to carry out land adaptability analysis and provide a reference for scientific and reasonable project layout while building up an ecological protective barrier to ensure the safety of the water quality.

1. General Information of the Project

1.1 Strategic background
The current trend of tourism has transformed from sightseeing to leisure vacation. The development of lake tourism and its surroundings has become the main trend of the big lakes. Weishan Lake should follow the trend and develop a lake-centered tourism integrating ecological sightseeing, wetland vacation, sports entertainment and cultural experience.

1.1.1 Transformation and upgrading of tourism-from trial to full involvement
The leisure industry is thriving. The tourism industry accounts for more than 4.33% of GDP, the cultural industry reaches 4.14%, the sports industry is close to 2 trillion yuan, and the catering industry accounts for 11.1% of the consumer market, enabling the leisure industry to hold a proportion of 10% or even 20% of the 80 trillion yuan of the national economy.

1.1.2 Binhu New District-an important way to develop the new city
The industrial functions of the new district have undergone transformations from single industrial function to multi functions, and then to the above standard and diversified functional system. The combined development of urban Binhu New District and tourism functions has become an important model for the integration of industry and city and the integrated development of town.
1.1.3 Lake tour-mountains sceneries and lake vacation
Since 2000, the development of domestic lake tourism has been leisure vacation oriented that has grown in numbers. Among the waterfront tourist resorts in Jiangsu and Zhejiang, over 90% are lake tourist resorts. At present, there are 10 lake tourist resorts among the 26 national tourist resorts in China.

Tengzhou, a capital city and harbor of civilization since the ancient times, has been the hometown of numerous celebrities, including Mo-tse, Lu Ban, Lord Teng Wen, Mao Sui, Lord Mengchang and Xi Zhong. Binhu is also home to a number of heritage sites, including Yulang, Phoenix Mountain, Jade Void Palace, Longevity Monument, Lotus Ancient Tombs and other historical sites. Cultures originating from TengWang Pavilion, canals, wetland, Communism and fishing are flourishing here.

1.2 Location
Project location: Binhu Town is located in the northwest of Tengzhou city in Dushan Bay on the east bank of Weishan Lake, with a total area of 149 square kilometers and a population of 120,000. The western shoreline of the lake is 55 kilometers long, with a lake wetland area of 90 square kilometers.

Binhu Town: A pilot of administrative reform in Shandong Province. In 2013, the document entitled Model Projects to Accelerate the Development of Small Towns in Shandong Province proposed to cultivate Binhu into a model town in Shandong Province based on resource integration in a balanced way, making it a sub-center of Tengzhou, an eco-city featuring cultural tourism, Honghe Wetland, Inland River Shipping Center and Lingang Coastal Industrial Zone.

2. Market analysis of Weishan Lake Eco-tourism Resort
2.1 The era of national diversified holiday tourism
According to the study by the World Tourism Organization, "when GDP per capita reaches US$5,000, a mature holiday tourism economy is achieved, with increasing demands, consumption capacity and diversified trends for leisure". According to the 2016 Government Work Report, China is now "embracing the emerging era of mass tourism", presenting a situation in which sightseeing tourism, leisure tourism and vacation tourism drive in parallel. According to the 2017 National Tourism Work Report by Li Jinzao, Director of the National Tourism Administration, China is still an extensive tourism power highly dependent on resources. From 2015 to 2020, China will gradually develop from extensive tourism to more intensive tourism[1].

2.2 The tourism market is becoming increasingly segmented, with bright prospects for sports tourism, research tourism and other special market
In recent years, tourism experienced a transformation from a trial to full-scale development, with the tourism market being increasingly segmented into fields including ecotourism, vacation tourism, sports tourism, research tourism and health tourism.

2.3 Shandong Tourism enjoys a promising future, and Weishan Lake should seize the opportunity to encourage the development of regional tourism
Shandong is a leading city in tourism in east China. Data shows that of the eight provinces and cities in eastern China, Shandong saw the biggest increase in tourism, up 210% year on year, according to the data, followed by Jiangsu, Fujian, Zhejiang and Jiangxi. In 2017, Shandong's tourism consumption totaled 920 billion yuan, up 14.5% year on year. It received 780 million domestic and foreign tourists, up 10% year on year. Under the favorable background of regional tourism development, Weishan Lake should pay more attention to quality and brand to lead the future of regional tourism.

2.4 With a solid regional market foundation, it is Weishan Lake's top priority to cultivate its brand, attract customers and gather popularity
In 2017, Zaozhuang received 22.5924 million tourists while the ancient city of Tai'erzhuang received
5.8186 million people. At present, the Lotus Land of Weishan Lake is visited by 300-500 thousand people a year, indicating the gap with the Tai’erzhuang tourism market. Therefore, it needs to integrate itself with Tai’erzhuang to attract more people while striving to improve the quality of tourism products, brand awareness and holiday experience as its core strengths. (see Table 1 for details)

| Year | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Tourist growth rate (%) | 12% | 14% | 16% | 18% | 20% | 20% | 24% | 26% | 24% | 20% | 18% | 14% |      |
| Number of visitors (10,000/person) | 50 | 56 | 63.84 | 74.05 | 87.38 | 104.86 | 125.83 | 156.03 | 196.6 | 243.79 | 292.54 | 345.2 | 393.53 |
| The per capita cost (10,000 yuan) | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 |
| Tourism income (10,000 yuan) | 3500 | 4480 | 5745.6 | 7405.44 | 9612.26 | 12583.3 | 16358.3 | 21844.6 | 29490.3 | 39005.8 | 49732.4 | 62136.3 | 74770.6 |

3. Analysis of Weishan Lake Eco-tourism Resort

3.1 Land utilization
The land use purposes of the project area include: the cultivated land, garden, forest, grassland, agriculture, rural roads, agricultural water conservancy, pits, waters and tidal flats, scenic spot, special use area, salt pan, farmland protection planning, rural residential land, railway, highway, civil airport, ports, pipeline transport, reservoir water and hydraulic construction, etc[3].

3.2 Natural conditions
Climate: The temperate continental monsoon climate of the planning area endows the land with four distinct seasons. In spring, there is mostly southwest wind, with a lack of rain, dry air, and frequent spring drought. The summer is hot and humid, often accompanied by large-scale shower, occasional strong wind, rainstorm or hail. Autumn is crisp, but sometimes there will be days of rain and local waterlogging. Winter is often accompanied by north wind, with dry and cold air and a lack of snow and rain.

Hydrology: there are three main river systems in the planning area, including a lake wetland, fish ponds, pits, ditches and reed wetlands in coal subsidence areas.

Vegetation: The mountainous vegetation is sparse, and the plain is scattered with farmland. There are large areas of poplar forests in the bottom land along the lakeside surrounded by lotus and reed.

Animals: There are 325 kinds of vertebrates in the lakeside wetland, including 85 species of fish, 8 species of amphibians, 9 species of reptiles, 207 species of birds and 16 species of beasts and vertebrate.

3.3 Landscape conditions
Red Lotus Land of Weishan Lake Wetland: there are red lotus cultural park, wetland recreation park, leisure park, wetland adventure park, water amusement park and other new landscape in the area. There are also sceneries such as the Morning Port, Sunset Glow, Fishing-boat Singing, Reed Snow, featuring the integration of nature and culture, adding glories to each other.

Lu Canal: The Lu Canal is a section of the Beijing-hangzhou Grand Canal that passes through Shandong province. Lu Canal (Linqing-Tai’erzhuang) takes advantage of water from Wenshui and the Sishui River, extends about 480 km long along Nanyang, Dushan, Zhaoyang, Weishan Lake and other waters.

Luban Cottage: Located in the Red Lotus Land, Luban Cottage is within walking distance to
Weishan Lake Wetland Park, with beautiful surrounding natural landscape. It is the first star-rated hotel in the scenic spot designed by first-class experts of ancient architecture in China and endowed with features of the Ming and Qing dynasty.

Lake Night Moon: The Lake Night Moon refers to the scenery of Weishan Lake under the moonlight. In the moonlight and breeze of summer and autumn night, tourists, with two or three bosom friends, row a small boat on the lake, picking lotus, drinking a few cups of wine, and singing a few fishing songs, experiencing infinite fun. It is one of the eight scenes of ancient Teng Pavilion.

3.4 Analysis of ecological situations
From 1984 to 2018, the east of Dushan Lake basin suffered a shrinkage of the water area coupled with lake filling for lands and ponds, rapid expansion of urban areas, and pollutions caused by direct pouring of the sewage and agricultural waste water into the lake. A number of factors lead to mounting pressure for the environment of Dushan Lake, which requires scientific planning and land use layout while building up ecological protective barrier to ensure the safety of the water quality.

4. Wetland Protection Strategies

4.1 Supportive strategies to protect water quality: water system protection under the theory of "source-stream-convergence" ensures the safety of water quality by source controlling, process simplifying and lake water purifying[3]. (see Figure 1 for details)

4.2 Ecological resilience strategy: build 6 habitats to form a complex and resilient regional ecosystem, resist external interference, meet the needs of various organisms for habitat, foraging and breeding to create an animal paradise.

4.3 The strategy of elastic protection and utilization, and zone division: Protect and utilize wetlands at different levels to give a full play to the ecological functions and economic benefit of wetland ecosystem.

Wetland conservation reservoir/river wetland restoration areas: Protect the integrity of wetland ecological processes, rich biodiversity, habitat or migration routes of wetland organisms. Restore damaged wetlands with potential ecological value;

Wetland ecological function exhibition: Display wetland ecological features, biodiversity, water purification and other functions;

Wetland experience area: Wetlands with natural or cultural landscape, where people can experience wetland farming, fishing and other activities that demonstrate the rational use of wetlands. Tourists are allowed to conduct restricted ecological tourism, scientific observation and exploration in this area.

Ecological buffer zone: It is a green barrier as the buffer space of the production and development zone and the wetland protection area.

5. Ecological Protection of Weishan Lake Ecological Tourism Resort

5.1 Habitat protection
Habitats for beasts like yellow weasel and red fox, habitats of birds including the red duck and mandarin duck, and introduction of wild birds such as white storks, swans, long-eared owls and cranes.

Six kinds of habitats are constructed to form a complex and resilient regional ecosystem to resist external interference and meet the needs of different creatures for habitat, foraging and reproduction so as to create an animal paradise.

5.2 The control and development of stratified subdivision
Classification: Protect and utilize wetlands at different levels to give a full play to the ecological
functions and economic benefits of wetland ecosystem. Build wetland conservation area, river wetland restoration area, wetland ecological function exhibition area, wetland experience area and ecological buffer area. Coordinate wetland conservation and production development.

5.3 Adopt environmental-friendly materials, facilities and equipment
Eco-friendly facilities and equipment are adopted to strictly prohibit pollutions from facilities and equipment (including cruise ships and speedboats that produce too much noises or harmful gas).
Environmentally-friendly materials are adopted while materials that are toxic, harmful or non-degradable are prohibited, like disposable tableware.

6. Innovation of Weishan Lake Eco-tourism Resort
The structural development model with the lake as the core is constructed based on the framework of "lake-shore-field-village" and the circular structure of "static-dynamic-active- nourishing"[4].

6.1 Ecological "innovation" is made by breakthroughs out of the primary sightseeing experience in the Red Lotus Wetland, making full use of "Red Lotus" cultural IP, and enrich the experiences of Red Lotus through implantation of film and television programs, research and education, artistic creation and wedding photography.

6.2 Cultural "innovation" is achieved by drawing experiences from the Huaqing Pool and the EXPO in terms of resource integration as well as the restoration of Tengwang Pavilion and the canals to create the core attraction that gathers tourists.

6.3 Activity "innovation" refers to the cultivation of entertainment and featured commercial space by learning from the Yilan International Children's Folklore and Folkgame Festival in Taiwan, Thailand's water market and other cases to bring fun and joy to the lake. The sports industry chain is implanted, and the water sports base and sports exhibition base are constructed to add a sense of fashion and movement to this place.

7. Weishan Lake Eco-tourism Resort Stimulus

7.1 Eco stimulus
Make use of ecological gene, namely flowers in four seasons, to build a ecological community involving mountain, water, forest and field, which is in line with the national strategy of "clear water and green mountains". Taking lotus as the ecological carrier and construct an overall pattern of "lotus leaf plus lotus pod" based on the spatial texture. Lotus leaf is the corridor for flower-stream sightseeing, connecting various projects (lotus pod). Seasonal limitations are removed by enriching the planting varieties, such as rape flower in spring, lotus in summer and chrysanthemum in autumn. In addition, the three-dimensional sea of flowers is designed based on the idea to create a diverse landscape involving wetland red lotus, rape flowers, waterways and streams. Thirdly, the flower-sea corridor combines the layout of the flower-sea with the tour routes to create innovative means of transportation, thus opening the flower-sea tour channel on the water and adding romance to the scene.

7.2 Cultural stimulus
Culture is the soul of Weishan Lake with assistance from technologies. The project focuses on revitalizing historical culture originating from the Tengwang Pavilion and the grand canal. With Tengwang Pavilion as the core, cultures of Tengzhou, Mo-tze, Luban, railway guerrilla and lotus were integrated, activated, expressed and presented by modern science and technology with strong visual impacts. These highly interactive cultural projects mark a breakthrough of the bottleneck confronting Weishan Lake tourism.
7.3 Activity stimulus
Entertainment activities and event marketing. The introduction of extensive outdoor sports enterprises, planning of water, land (flat ground, beach), air and a variety of three-dimensional sports activities as well as undertaking of sports events to achieve the purpose of event marketing, rapid gathering of popularity and spreading the city image. "Different theme activities in four seasons" is a proposal that distinguishes the scenic spot. Annual activities are maintained to maximize the brand.

8. The general idea of Weishan Lake eco-tourism resort
Ecology as the foundation, tourism as a breakthrough, culture as the soul, and health as an extension

8.1 Thinking on the development of ecological civilization
A layout for sound ecological environment is created with lotus as the career under the ecological strategy of “maximizing the use of landscape”.

8.2 Plans to develop toward 5A rated scenic spot (motivating the surrounding three areas)
Promote the construction by innovation. Based on standards of 5A tourist areas, improve the infrastructure of transportation, safety, environment, shopping, reception. In addition, innovate the business form of products, complete the transformation and upgrading of the scenic spot, and promote the development of the three surrounding areas.

8.3 Plans to develop featured towns
In order to create conditions for residents to participate in industrial development and product management, it is necessary to explore distinct local culture, industries, forms, ecological environment and service system of the project.

8.4 Plans to develop holiday destination
Oriented toward the 5A rated scenic spot, a long-term sustainable plan is formulated to guide and design the construction of a national tourism resort.

8.5 Breakthroughs for major projects
Through the combination of resource-oriented and market-oriented project, investment attraction, vigorous efforts are put into developing leading projects with strong market driving force and high industrial concentration.

Regional drive: A rapid formation of Honghe wetland eco-tourism resort is made within the Binhu Town to attract as many people as possible and turn the flow into cash and drive second startups in the Weishan Lake towns, drive economic development of east rural areas, develop cultural tourism construction in the north, realize the integration of resources, industries and the co-construction and sharing so as to promote the urbanization of Binhu Town.

Internal links: Take 5A scenic spot as the breakthrough to build core scenic spot through internal promotion and external expansion, develop the brand, promote and gather popularity; In view of the three regions of external geographical proximity, we should share tourism resources, improve public infrastructure, extend the agricultural industry, health industry, vacation industry, pan-tourism industry and other industries to build a complicated tourism and vacation destination.

Pattern of industry circle: Relying on the surface landscape and the texture of the domain space, an ecological circle consisting of "lake-islands-wetland-countryside" is formed, corresponding to 5 (five supports)-7 (Seven-Star island chain)-1 (an industrial belt)-8 (eight bases). Led by the five supportive projects in the wetland, nine big bases are scattered in the whole domain along with development of inward water sports and generic tourism vacation belt extending outward.

8.6 The spatial structure
Construct the spatial pattern of "Lotus" to balance the development of landscape, industries, culture
and ecology[5].

Relying on landscape along the entrance to the Tengwang Pavilion, cultural activation and accumulation are achieved by modern technology.

Double wings: Red lotus sightseeing plus sports entertainment wing (sports). Focus on red lotus sightseeing, water sports, children’s entertainment, cultural interaction and other dynamic products, a dynamic wing is formed; Wetland science plus leisure activities (static). Focus on cultural leisure, ecological science, hot spring vacation and other quiet products to form a static wing.

One axis: The axis of Tengzhou cultural image. The core cultural elements of ancient Teng State, Lu Ban and Mo-tse, The Tengwang Pavilion, canals and Communism are extracted to develop creative landscape and architectural experience, forming a multi-cultural axis bearing the regional cultures.

One belt: Extension of the industrial belt. Relying on the 5A wetland scenic spot along with access to airport resources and the strategy of rejuvenating beautiful countryside, products including tourism resort, aviation, theme parks and camping trips should be developed based on local culture, coal industry, aviation and astronomy.

9. Conclusion

According to the operation experience of constructed wetland system at home and abroad, this project adopts the water protection system based on the theory of "source-stream-convergence" to ensure the safety of water quality through source control, process simplification and end-water purification. Its main functions can be summarized as the following four aspects: first, development of ecological agricultural farmland and reduce the use of pesticides and fertilizers; establishing ecological intercepting ditches to control the discharge of agricultural tailwater; Establishing vegetation buffer zones, filtering agricultural runoff rainwater. Second, two sets of independent pipe networks for the access and discharge of water from the reservoir to the purified wetland; In situ ecological transformation of fish ponds to increase their water filtration and purification functions. Thirdly, the village sewage should be directed into the sewage treatment plant before being charged into the wetland purification system; stormwater runoff is filtered and purified by ecological margin and vegetation zone. Fourthly, wastewater from mining should be directed into the sewage treatment plant before being discharged into the purified undercurrent and surface flow of wetland; rainwater runoff is filtered and purified through ecological berm, vegetation buffer belt, rainwater garden and in-situ infiltration.

Wetland systems play an important role in ecological regulation. In landscape design, it is necessary to fully respect the topography, ecosystem and cultural environment of the original wetland, and always prioritize ecology in the process of design. The concept of ecology should run through the whole process of landscape design to ensure that both aesthetics and ecology are taken into account so that a balance is maintained between human and nature in harmony.

References
[1] Zeng Suiping, Yun Yingxia, Tian Jian. "Coordination" and "connection" - Planning Strategy of wind environment system based on the concept of "source flow sink" [J]. Urban development research, 2016 (11): 31-37 + 76
[2] Yang Chuanfeng. Assessment and management of non-point source pollution in mountain basin based on "source sink" pattern [D]. 2017
[3] Mo Xiaqi. Study on wetland landscape pattern change and protection strategy in Tianmu Lake Basin [D]
[4] Wei Wei, Zhang Yinlong. The control way of water source ground source pollution based on the theory of "source sink" landscape control -- Taking the protection planning of Yuqiao reservoir water source area in Jixian County of Tianjin as an example [J]. Chinese garden, 2011, 27 (2): 71-77
[5] Zhang Yunlu, Li Xiong, ye ye. City scale ecological functional zoning based on the "source sink" theory of Landscape Ecology -- a case study of Tongliao City, Inner Mongolia [J]. Journal of
ecology, 38 (1)