

# Study on Plan of Rural Waterfront Greenway in Beijing Based On Valley Economy

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**Abstract.** Valley economy is a major strategy for the development of Beijing mountainous area. This paper tried to apply the theory of rural waterfront greenway in valley, propose the grade system of rural greenway, which has important meaning to the refining of ecological network, the integration of tourism resources, and the promotion of agricultural industry in rural area. By way of illustration, according to the detailed analysis of the hydrology, altitude, slope, aspect, soil and vegetation conditions by GIS, the waterfront greenway, named ‘four seasons flowers’, in Yanqing county area was planned, so as to provide scientific guidance for the rural waterfront greenway construction.

## 1. Introduction

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Greenway is a sustainable approach in landuse development, which is capable to synthesise and connect different resources pooling multiple functions. The concentration of resources enable it host various functions in limited space. Its require for the connectivity can mitigate the landscape fragmentation. Thus, rural greenway plays a crucial role in sustainable development of rural and urban areas. [1]

Rural waterfront greenway is a green linear network and located in the rural waterfront and the surrounding area, connecting urban and rural area. It is an important component in urban green network system. Valley Economy is the major development strategy of Beijing surrounding mountainous area since 2004. As present, the valley has been developed as a special mountainous economic development mode and spatial network base pattern. In our opinion, it is important that brings the water system, road system, forest system, and surrounding land into the Beijing rural waterfront greenway planning based on the developed valley network in mountainous area. This



method would have great influence on the more reasonable development of rural land and more active tourism activities, as well as the environment protection and the increase of rural income. The rural valley waterfront greenway network is also as important component in rural community green network system, and together with town greenway to form the rural greenway system of Beijing.

## **2. Valley Economy and Valley Waterfront Greenway**

As a special economy development with Beijing characteristics, the Valley Economy is based on the regional economics and watershed economy and combined with the characteristics of mountainous resource environment and agricultural development. [2] The main content of Valley Economy is regard valley as the link and axis, based on the natural and human resources, geographic condition, population and rural industry, by dividing three different function layers of the valleys (upstream, midstream, downstream) to realize the industrial integration and innovation. [3] Located in the capital ecological conservation development zone in Beijing area, Valley Economy become a popular mode which has positive influence on the mountainous area. It is not only provided a method for industrial structure adjustment and urban-rural development to increases the famers' income, but also a great opportunity of closing to the nature for residents in Beijing.

The main space characteristics of valley is the V shape as the cross section. The middle water landscape with both side of mountains is naturally formed complete and independent geographical unit. The transportation lines are generally along the valley with same direction of rivers. It forms the three-dimensional space road network by closing the river or departure from the river.

Analysis form the perspective of greenway, the natural water and surrounding environment in valleys could be regard as one of the waterfront landscape. From Ahern's theory, it also conform to the greenway content: the natural linear shape; the important corridor to connect the scenic spot, natural and cultural heritage, villages and economic forest; it has variety of functions including water conservation, wildlife protection, historical and cultural heritage protection, leisure and recreation for the public, and rural economic development; it meets the requirement of sustainable development; as a waterfront ecological corridor to connect other nonlinear scenic spot, nature reserves and woodlands to form the whole ecological network.

This research would define the waterfront in valleys as Valley Waterfront Greenway. Strengthen the construction of valley waterfront greenway combined with the economy development of valley area has significant influence on completing the urban-rural greenway system. It would also play on important role in promoting the ecological protection, recreation value, historical and cultural value and economic value.

## **3. Greenway Hierarchical System Based on the Valley Waterfront Greenway**

The experience in greenway hierarchical system in China is mainly from the 'General Planning Outline of Greenway Network in Pearl River Delta' in Guangdong Province which dates from Feb, 2010. It divided the greenway network as three layers: Regional Greenway, Urban Greenway and Community Greenway.

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**Table 1.** Greenway Hierarchical System

| Hierarchy          | Diffination  |
|--------------------|--|
| Regional Greenway  | Connection between cities and the important function zones in city area. It would influence the intra-regional ecological pattern intra-regional.  |
| Urban Greenway     | The open linear space in urban and rural planning district, including in the city level city-urban greenway, city level urban greenway, city level rural greenway, district level city greenway, district rural greenway.  |
| Community Greenway | Greenway near the community with the main purpose of recreation and fitness, connecting community garden, small garden and streetscape; the greenway mainly serve the rural ecological tourism along the natural corridor and connecting villages, natural scenic spot, historical heritage spot and historical lines. |

#### 4. The Main Function of Valley Waterfront Greenway in Valley Economy

##### 4.1. Protect the ecological environment in valley area

Compared with the plain, the mountainous area has a high ecological sensitivity and fragility which cannot afford to be disturbed by human development and construction. The waterways system in valley is the origin of Beijing urban river which is regard as the life line of the resident life. Besides, the natural landscape is habitat for wild fauna and flora.

Recently a lot of waterfront wetland in many mountainous area has become the construction land of resorts and villas under the guidance of the development of eco-tourism. Unreasonable development and construction on the environment caused a lot of environment problems. It would disturb the natural water process, the biological process and the humanity development process. Unreasonable development also destroys the natural shape and condition of rivers, cut off the water circulation and the cause the biological habitat fragmentation. The rural cultural landscape is also not well protected. [4] Building the multi-level and comprehensive rural waterfront greenway network system would limit the unreasonable land development and play important role in the protection of sensitive waterfront ecosystem and wildlife corridor.

##### 4.2. Link the Fragmentation of Rural Tourism Resources

Rural tourism is one of the core industry in valley economic development. Deep excavation tourism resources is a key process in developing rural tourism. The rural area of Beijing is rich in natural, historical and cultural tourism resources. On the micro level, some scenic spots are small but have certain natural, historical and humanistic values still show decentralization and fragmentation, lacking effective connectivity and integration. Connecting these tourism resources greenway system would be driving the development of local tourism by expanding tourism projects, integrate tourism resources and enrich tourism forms.

##### 4.3. Improve the Road Infrastructure in Valley Area

At present, most of the transportation lines in Beijing rural valley area are still single vehicle lane and lack of slow-traffics system. Incomplete slow-traffic system affected the experience of cycling, climbing, walking and other recreational activities in valley area. Besides, it also increases the risk of elderly and children when they visit the valley area. [5] By planning the greenway system, the transportation network would combine vehicle lanes with the slow-traffic system and design the integration traffic and recreation road system flexibly based on the local condition. The integration traffic system would provide more comfortable space for cyclist and pedestrian, at the same time provide leisure entertainment facilities for local residents.

##### 4.4. Improve the Economic Efficiency in Valley Area

The construction of rural greenway would promote the transformation of rural industries, the concentration of scientific and technological talents and the development of rural tourism. Relying on

the village greenway multi-function and promoting the connection between industries would renovate the air pollution, improve the infrastructure condition and aggregate the technological talents which can finally promote the industrial agglomeration. [5] Besides, it can promote the overall rural income by development of rural tourism and rural products. Take Zencheng Greenway in Guangdong province as example, the annual net income has increased by 17.18% after the greenway was built two years later. Another data shows the collective economy growth of the villages along the greenway is 54.6% faster than other villages. [6].

### **5. Plan of Valley Waterfront Greenway in Rural Area of Sihai Town**

Sihai Valley in Beijing Yanqing District is developed earlier than other valleys. From 2010, 'pearl landscape - four seasons flowers' valley area as Beijing one of the earliest development of 7 demonstration valley area is the key construction. As present, the 'four seasons flower sea' as an important scenic spot in Yanqing district famous line 'Hundreds Mile Landscape Gallery' has become a famous tourist and sightseeing place in the suburbs of Beijing.

The Four Seasons Flower Sea Valley is from Liujiabao, to Sihai Town till the Pearl Spring along with the gorgeous scenery of flowers in different seasons. However, the development of the rural tourism cannot be compared to the development of Pearl Spring Town, especially on the restaurant and the accommodation. At the same time, the Caishi River has also experienced declining surface and ground water levels and water pollution. According to the investigation, the author believes that the economic landscape is mainly distributed in the form of scattered spots, so the tourists only spend one to two hours here. The lack of integration of tourism resources is the main reason for the poor development of eco-tourism. Based on the rural waterfront greenway theory, we use the scientific planning method on the Sihai Valley. The natural resources are integrated through the linear space of the greenway which would promote the economy development in Sihai Valley and improve the waterfront landscape at the same time. Both economic development and greenway construction would be realized at the same time as well as the environmental historical heritage would be protected.

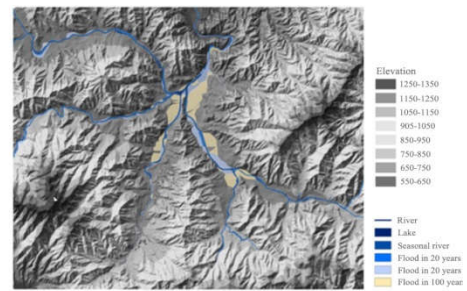
Sihai Town has a long history and abundant natural and cultural resources, especially historical heritage. As 'Yanqing Annals' records, the history of Sihai Town dates from the Yuan Dynasty and built on the 8th year of Tianshun Ming Dynasty (1464), which is already more than 500 years of history. Sihai Town locates on the extension line of the central line of Beijing, which is great location and geographic position for defense. There are plenty of historical heritages, such as Ancient Sihai Town Ruins, Jiuyan Building Great Wall, the ruins of the archery and 32 ancient temple sites. Besides, Sihai Town has rich resources of the river. Caishi River is origin from Sihai and collects 4 tributaries into a pool to form a special topography, which is the meaning of Sihai('Four Seas'). The forest coverage rate of Sihai is more than 90%, and the mountainous area in west valley area is even 100% where is the original secondary forest. Furthermore, majority of village in Sihai are ancient villages dates from Ming and Qing Dynasty which shows the cultural and heritage resources could be developed more in the near future.

With the valley economy in Sihai Valley and the concept of valley waterfront greenway, we propose a project, named 'Flowery Greenway', for the waterfront greenway in Sihai Valley.

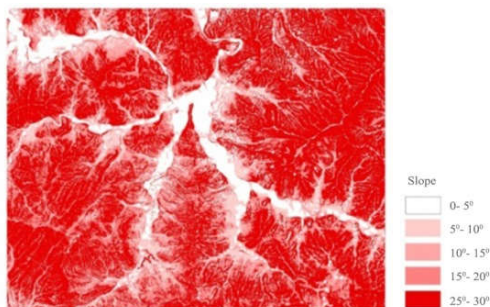
Based on ArcGIS, we analyze the hydrological, elevation, slope, aspect, vegetation, soil, and other conditions in detail, and the results are shown in Figure 1-7.



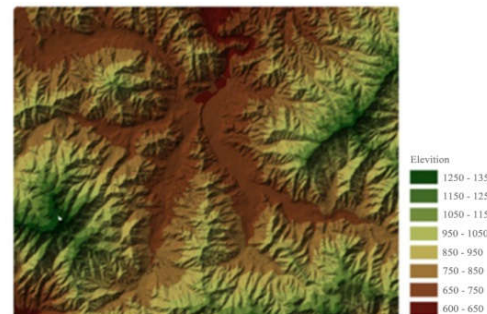
**Figure 1.** Drainage Map Of Sihai Town



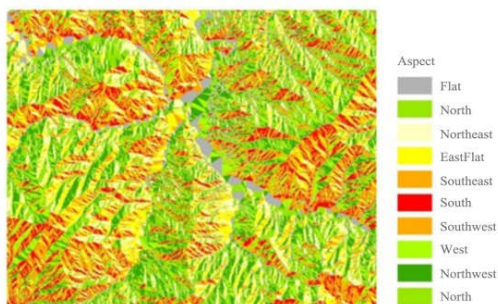
**Figure 2.** Flood Control Map Of Sihai Town



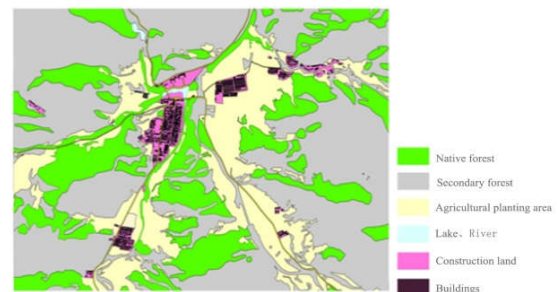
**Figure 3.** Height And Topography Drawing Map Of Sihai Town



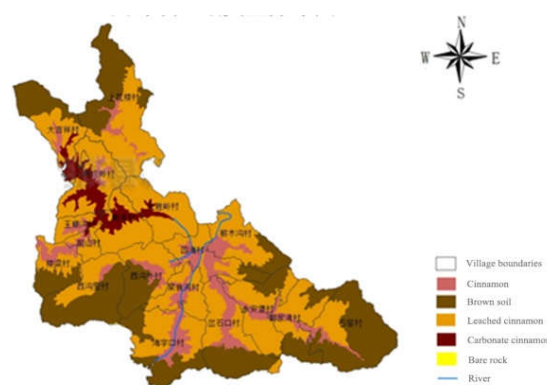
**Figure 4.** Slope Map of Sihai Town



**Figure 5.** Aspect Map Of Sihai Town

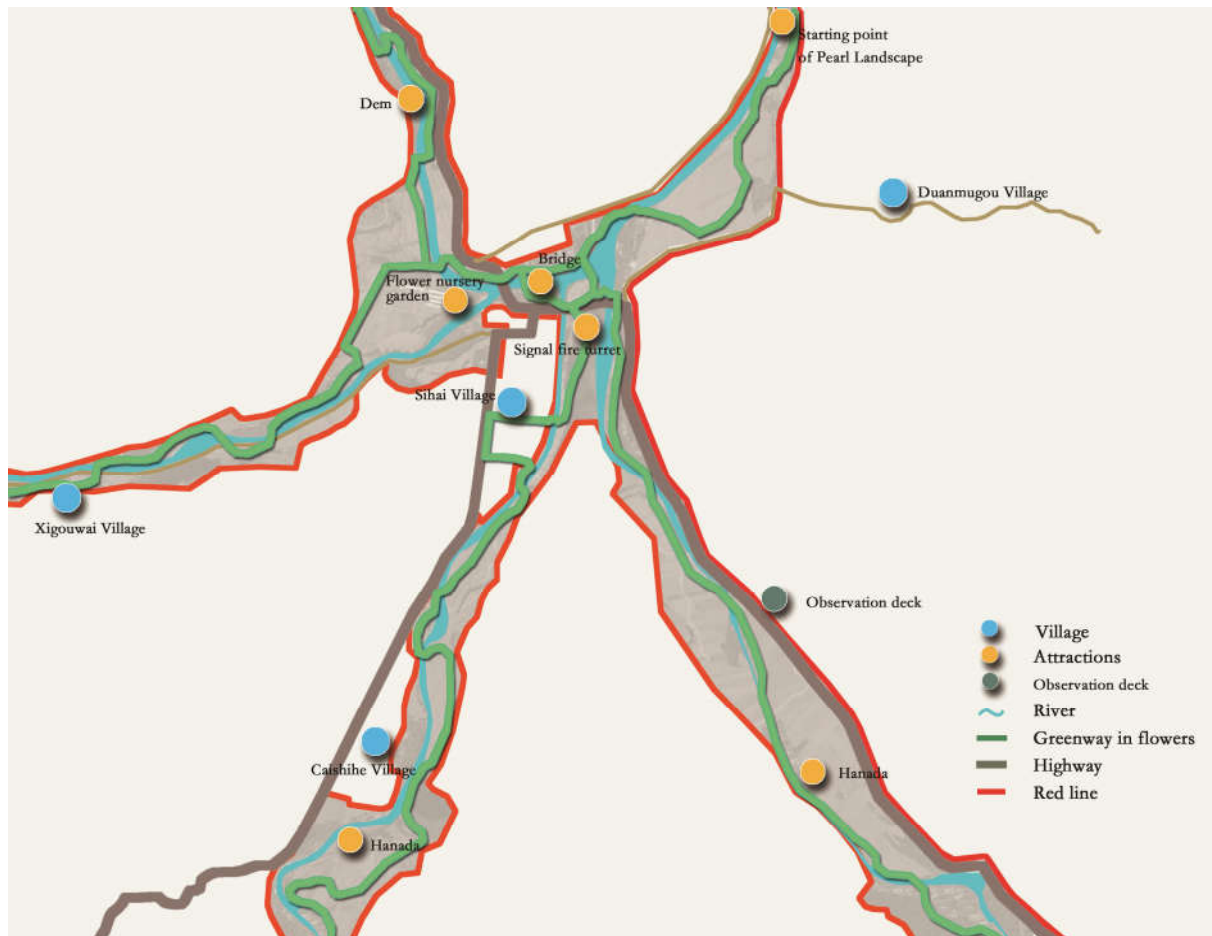


**Figure 6.** Vegetation Distribution Map Of Sihai



**Figure 7.** Soil Type and Location Drawing of Sihai Town.

According to the above analysis, the river in the valley is the basis of Sihai Valley's rural waterfront greenway planning. Besides, the Sihai Lake will locate at the center of this planning. Furthermore, the planning, about 11.98km, will wind its way to west, southwest, southeast, northeast, and northwest directions along the waterfront in the valley. We will leverage the existing municipal roads, mountains, and rivers to integrate the ecological and cultural resources, so that, the surrounding pastoral landscape, historical monuments, natural scenery, and the rural will be linked up like the roadmap in Figure 8.



**Figure 8.** The roadmap Plan of Sihai town's rural waterfront greenway.

## 6. Conclusion

With the rapid process of urban-rural integration, the development of new rural construction, and the transition from traditional agriculture to modern agriculture in China, the rural has become an important area for landscape planning and design. As an advanced concept of cultural heritage protection, natural resource protection, ecological and environmental protection, and greenbelt construction, greenway has a great value of application in many fields like land greening, environmental planning, urban ecology, urban planning, and conservation ecology. With the integration of greenway into the development and construction of valley economy, we will develop the resource-rich valley in the mountainous of Beijing into a comprehensive mountain greenway network. It will constitute an ecological barrier for the mountainous area of Beijing, and even work with urban greenways to build Beijing's ecological network. Therefore, the regional integrity, stability and sustainability of Beijing could be guaranteed.

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