

Analysis of Ecological Management Strategy of River Channel in "Sponge City"—Lanzhou City

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Abstract: The environmental problems in Lanzhou city are increasingly clear. The problems of ecological environment, such as the serious pollution of the river, are manifested in different degrees, which seriously affects the sustainable development of Lanzhou's landscape construction. This paper, therefore, explores the ecological management strategy of river channel in "sponge city"—Lanzhou city.

1. The Significance of Building the Sponge City in Lanzhou

Building a sponge city can reduce the pressure of flood control and drainage in Lanzhou. The author summarizes that the main reasons for the frequent occurrence of water-logging are the increase of watertight area and the reduction of urban green area. Meanwhile, the development of drainage infrastructure far lag behind urbanization in Lanzhou. Because of vertical design pays more attention on landscape, which neglects the maintenance of drainage facilities. Besides, the sponge city can not only alleviate water shortages but also reduce costs in infrastructure construction and maintenance. In recent years, the frequency of extreme weather increases because of the destroyed ecosystem. Through the sponge city, we can save rainwater by permeable pavement. On both sides of the Yellow River, ecological revetment plays an important role in supplementing below ground water resources. As discussed above, those can make full use of rainwater. Thus, the pressure of water shortage can be alleviated.

2. Ecological Management Problems Exist in River Channel — Lanzhou City

Based upon the site investigation and feedback of visitors, the problems exist in river channel can be summarized as follows.

2.1 Hard revetment, inadequate ecological benefits

The green corridor and windbreaks of river channel along Bin He Road and areas of the Yellow River are inadequate. The distributary system of rainwater and sewage is not complete.

2.2 Deficient ecological greenbelt and a lack of water efficient design

The ecological environment quality of the river channel affects the cities' harmony. Thus, the windbreak system of the river channel is urgently necessary. At present, the coverage rate of gardening is very low. It indicates in a rare spalsh of green space and inadequate windbreak system.

3. Specific Measure

Based upon those problems, a great amount of measures must be taken to improve this situation. First, explore and construct tourism resources of approaching-port cultural. Second, manage the urban water system and river channel to enhance water self-purification. Last but not the least, construct ecological river channel and vegetation protection system.

3.1 Construct River Ecosystem

The river channel and corridor system is a significant component in the urban ecosystem. It was divided into two parts: the Yellow River waterfront landscape and green landscaped roadways on the river channel. The significant of the sponge city is to adjust and improve the green corridor and forest in an ecological way. Since there is limited space available for green land in urban city, we have to select seeds of climbing plants [1]. According to the connectivity and integrality of the urban landscape system, the stable river ecosystem will be finally established. In the natural environment, the elements of ecological protection include plants, soil, land, water, wetland, atmosphere, etc. Those can improve the environment in many aspects, such as, condition carbon-oxygen equilibrium, reduce noise, enhance the urban forest coverage rate, improve the urban climate, relieve Heat Island Effect and beautify the environment. In order to keep the integrity and coherence of the landscape, measures must be taken according to its own problems.

Adopt Ecology Bulkhead, Construct Plant Isolating Areas, Make Full Use of Water Resources.

Firstly, adopt engineering water-saving. The engineering investment in pre-governance stage should be cut down. The ongoing investment in furrow irrigation should be changed into drip irrigation. Secondly, adopt biological water-saving technology. In order to save irrigation water, desert plants and high tolerance plants are preferred in those areas.

Construct the Zoology Nature Protect Area in the Yellow River. The wetland of Yellow River is to protect, recover and manage the environment. The main water sources of the river channel has been damaged dramatically. It can be defined as poisoned waters and soil erosion.

3.2 The System of Protected and Recovered Plants in River Channels

The vegetation types in Lanzhou are natural secondary forests, barren hills, artificial forests, grasslands, etc. In general, vegetation construction should be focused on its conservation. First, make full use of the nature's recovery ability. Then, take effective measures to rehabilitate and develop key forest areas. At last, construct vegetated areas by artificial construction. To keep the normal storage, water storage walls should be built in the beach. Those plants in constructing the green corridor can be defined as follows: White elm, aspen, mountain willow, dense leaf Yang, Hu Yang, willow, jujube, rose, honeysuckle, golden pheasant, tamarisk, poplar, weeping willow, forsythia, purple cob, reed, cattail, etc.

Windbreaks: Windbreaks around the River Channel. Because of the location in the river channel, it has a big problem of the wind disaster. In order to reduce the wind disaster, the windbreaks around the river channel is necessary. Water-saving, drought-resistant and perennial deep-rooted plants are good choices. From the outer to the inner, it can be planted as sand jujube, *Fraxinus sogdiana* Bunge and river locust. Windbreaks in the River Channel. The intervals of forest and the inter-space size is to enlarge the vegetation coverage. Ecological protection forest is required to be higher than the ecological area. The standard of ecological protective forest is high than conservation areas.

The high standard can be summarized as follows: the intervals of the main forest belt is 150m, the bandwidth is 8m, the intervals of side forest is 300m, the bandwidth is 6m, and the mesh area is 4.5 ~ 6.0hm². The construction of windbreaks should be perpendicular to the main wind direction. Thus, NE-SW. The plants are *Fraxinus sogdiana* Bunge, *Ulmus pumila* and *Populus*. The secondary windbreaks are parallel to the main wind direction. Thus, NW-SE. The plants are *Fraxinus sogdiana* Bunge, sand jujube, *Ulmus pumila* and *Populus*.

Water Conservation Forests: The whole configuration is hybrid, including regular configuration and natural configuration. The structure of plant community landscape is as follows.

First: Banded plant community: bush + bush

Component: Chinese tamarisk + caragana + sand jujube + medlar; Chinese tamarisk + river locust + sand jujube; river locust + medlar + sand jujube + caragana

Major functions: Ecological protection, increasing the diversity of tourist, storm resistance

Second: Patched plant community: arbor + bush; bush + bush

Component: Chinese tamarisk + ephedra + licorice + river locust + hawthorn + sand sagebrush;

river locust + splendid + ephedra + sand jujube + licorice; hawthorn + mountain peach + river locust + caragana + caragana + clove + flowering plum + woodbine

Major functions: Ecological protection, increasing the diversity of tourist, storm resistance, showing the characteristics of desert plant communities

Third: Single plant community: arbor, bush

Component: medlar, narrow-leaved oleaster, ginkgo, etc.

Major functions: Ecological protection, increasing the diversity of tourist, decreasing wind speed, conserve water and soil.

Ecological Landscape Forest: The ecological landscape forest uses a variety of layers to create natural landscape [2]. Main vegetation: poplar, willow, compound leaf, mountain peach, flowering plum, woodbine, hawthorn, narrow-leaved oleaster, torch tree, river locust.

3.3 The combination of river channel management and tourism economy development

The ecological construction of river channel turns into the Forest Park, which full of natural, fun and humane atmosphere. Meanwhile, some activities were set to attract citizens, such as recreation, fishing, fitness, etc. What's more, try to improve the current conditions of the river channel and urban recreation system. Thus, it can enrich people's life.

4. Stage Goals and Targets

4.1 The ecological construction of the river channel in the central area

The main administration centers are in city's contraction areas and centers. It should be focused on ecological greening and soil and water conservation. The major problems of the environment are that urban heat island effect and serious air pollution. This type can be defined as coal burning pollution in winter and particle pollution in summer. Some measures are summarized as follows. First, make full use of the earth in city area. Second, increase the green areas. What's more, construct and improve sewage facility. Finally, construct the landfill facility.

The key point in constructing the protective system is building the ecological corridor, which can expand green areas and reduce the air pollution stress.

4.2 The conservation areas of waterfront and water

Waterfront of the Yellow river is an ecological corridor, which is rich in biodiversity but high in differences. In this area, it should pay more attention on water resources protection, including the quality and quantity. Besides, the windbreaks construction can reduce the damage of wind. Providing vegetation and soil conservation on the bank is to avoid stationary regions changing into a dead zone [3].

The key points in constructing the river channel protective system are protection of the headwaters and recovery of the ecological corridor. Thus it can restore the natural ecological environment and improve the self-purification ability of water.

5. Conclusions

This article intends to achieve the comprehensive balance in Lanzhou among economic benefit, ecological benefit and social benefit by ecological management of the river channel and the landscape construction of sponge city. Thus, it can improve urban ecological environment and the air quality. The landscape ecology construction of the river channel can optimize the industry structure and upgrade energy structure. It can also change the city's feature in industrial structure. According to those steps, it can improve the economic benefit as a whole.

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