

Research on Ecological Corridor Planning of Lanzhou Yuzhong Ecological Innovation City from the Perspective of Ecological Civilization

Jiaojiao Wang¹ Fenli Chen¹ Weihong Wang² Libao Dou^{1,2*}

1. College of Geography and Environmental Sciences, Northwest Normal University, and Key Laboratory of Resource Environment and Sustainable Development of Oasis, Lanzhou, Gansu, 730070, China
2. Gansu Ecological Environment Science Design and Research Institute, Lanzhou, Gansu, 730030, China

ARTICLE INFO

Article history

Received: 10 August 2021

Revised: 15 August 2021

Accepted: 9 October 2021

Published Online: 16 October 2021

Keywords:

Ecological civilization

Ecological corridor

Ecological planning

Yuzhong Ecological Innovation City

ABSTRACT

The practice and research of ecological civilization is a focus of current planning and design, as well as a scientific strategy under the current situation of resource constraint, environmental degradation and ecosystem degradation. Urban elements such as buildings, green land, farmland, water systems and mountains can be connected by ecological corridors into a green ecological system design. At present, many ecological and environmental problems, such as urban heat island effect, fog and haze, automobile exhaust have a negative effect on the construction of social ecological environment. In order to build a new modern city with prosperous economy, beautiful environment and social civilization, scientific and efficient ecological corridors should be designed to improve the environmental quality of the eco-city, and promote the construction and development of ecological civilization and green cities. Based on the relevant research and specific practices of ecological corridors at home and abroad, combine the needs of the planning and construction of the Yuzhong Ecological Innovation City, and discuss on the connotation and characteristics of ecological corridors, and discuss the key elements of ecological corridor planning. This article will take the ecological corridor planning of Yuzhong Eco-Innovation City as an example. We design ecological corridor based on field investigation, literature and geographic information system.

The planning and design of the ecological corridor in the planning area proposed in this paper can provide positive suggestion on the planning and design of the ecological corridor in other ecological innovation cities.

1. Introduction

With the continuous progress of our society, sustainable development has become the main theme of the current society^[1]. Since the 1980s, China has put forward the theory of sustainable development, which also confirmed the promotion of national natural ecological awareness. Under

the long-term economic development, industrial development conflicts with the ecological environment. How to realize the sustainable development of human society on the basis of ensuring the stable development of society has become the key to the development and progress of all walks of life^[2]. With the continuous strengthening of human development and transformation of nature, the

*Corresponding Author:

Libao Dou,

College of Geography and Environmental Sciences, Northwest Normal University, and Key Laboratory of Resource Environment and Sustainable Development of Oasis, Lanzhou, Gansu, 730070, China; Gansu Ecological Environment Science Design and Research Institute, Lanzhou, Gansu, 730030, China;

Email: 1913388311@qq.com

fragmentation of natural landscape is becoming increasingly serious^[3-5]. Ecological corridor construction should shift from Greenway Construction focusing on leisure and urban-rural connection to landscape connectivity maintenance and biodiversity protection, and should be based on large-scale issues such as natural regional fragmentation, ecosystem deterioration, loss of natural habitat and habitat structure, and species extinction^[6]. For example, the European ecological network planning based on the pan European biological and landscape diversity strategy at the continental level^[7]; Southwest Australia ecological corridor connecting biological habitat and national important ecological protection area^[8]; Ten large ecological corridors^[9] in the Caspian coastal assessment plan, which are dedicated to connecting the broken ecosystems in different regions of the Caspian Sea, are relatively successful cases. In recent years, the construction of ecological corridors in China emphasizes more on the green belt construction on both sides of linear space, and more on the early greenways based on aesthetic design in Europe and America, including the construction of greenways in Guangdong, the construction of ecological landscape forest belt or green passage based on main traffic trunk lines, etc.^[10]. In 2016, the development planning outline of the Yangtze River economic belt requires the construction of a green ecological corridor for the harmonious development of human and nature^[11]. In 2018, Shanghai will promote the construction of ecological corridors, promote the construction of 17 municipal level key ecological corridors, give full play to their functions of blocking NIMBY facilities, isolating urban clusters, connecting the ecosystem, and providing residents with leisure activities^[12].

Standing at the strategic height of history and overall situation, the 18th National Congress of the Communist Party of China formulated the strategic goal of promoting the overall layout of “five in one” in the new era from five aspects of economy, politics, culture, society and ecological civilization^[13]. The 19th National Congress of the Communist Party of China pointed out that speeding up the reform of the ecological civilization system, building a beautiful China, adhering to the harmonious coexistence of human and nature, and building an ecological civilization are the millennium plan for the sustainable development of the Chinese nation. We must establish and practice the concept that green water and green mountains are golden mountains and silver mountains, adhere to the basic national policy of saving resources and protecting the environment, and treat the ecological environment like life^[14]. Therefore, the construction of ecological civilization is an important part of the cause of socialism with Chinese characteristics. The practice and research

of ecological civilization is a focus of current planning and design, and also a scientific strategy under the current situation of resource constraints, environmental degradation and ecosystem degradation. When inspecting General Secretary Xi Jinping, General Secretary General of Gansu proposed to accelerate the construction of a happy new Gansu with economic development, beautiful mountains and rivers, national unity and social harmony. Among them, one is to strengthen the protection of ecological environment and improve the level of ecological civilization. From the perspective of ecological civilization, this paper takes Yuzhong ecological innovation city as an example to analyze the ecological corridor planning of the ecological innovation city, and puts forward that through the planning of ecological corridor, we should vigorously develop ecological economy, create green environment, cultivate ecological civilization, and comprehensively enhance the comprehensive strength of Yuzhong ecological innovation city.

In recent years, urban landscape ecological planning is an important way to reshape urban space and environment. The design of urban ecological corridor is an important part of urban landscape ecological planning. Reasonable planning of urban corridor is of great significance to improve the urban ecological environment and people’s quality of life, and promote the sustainable development of urban social economy^[15]. The planning and construction of Lanzhou Yuzhong ecological innovation city is another major measure of Gansu Province at the end of the 13th five year plan and the beginning of the 14th five year plan. It is also the top-level design of the general secretary’s “eight efforts” to lead Gansu’s future development. In Yuzhong ecological innovation city, through the scientific design of efficient ecological corridor, promote the construction and development of ecological civilization and green city.

2. Materials and Methods

2.1 Connotation of Ecological Corridor

William, an American scholar, first put forward the concept of Greenway in 1959, which was highly valued in North America and European countries. It mainly serves for aesthetic recreation and provides the way and guarantee for people to enter the green landscape from the working and living environment, and then it is expanded to entertainment, culture, ecological protection and other aspects^[16,17]. Forman^[18] put forward the patch corridor matrix theory in 1983, and used it to analyze the relationship between spatial pattern and ecosystem in 1995. So

far, the concept of corridor has been extended to the category of ecological structure of regional ecological security protection. Corridor is a long and narrow area different from the two sides of the substrate, which is an important element of ecosystem construction. The concept of ecological corridor is derived from the concept of Greenway and corridor, and more emphasis on the ecological benefits of corridor. The concept of ecological corridor originated from greenway. American greenways, written by Little CE, summarizes greenways, including urban riverside greenways, recreational greenways, natural corridors and historical routes. Among them, greenways with natural corridors are usually built along rivers, streams and ridges, with more emphasis on animal migration and species exchange^[19]. Ecological Corridor refers to the corridor type with ecological functions such as protecting biodiversity, filtering pollutants, preventing soil loss, preventing wind and sand fixation, and regulating flood, which is an important part of supporting ecosystem operation^[20,21]. Generally, urban ecological corridor refers to the type of linear or zonal ecosystem in urban landscape ecosystem. Urban ecological corridor is composed of natural ecological elements such as vegetation and water area. Through scientific and reasonable design, the basic building content in the city is connected, and the organization form of ecological corridor is constructed^[22]. Domestic scholars pointed out that ecological corridor is actually similar to green corridor and green channel^[23]. Ecological corridor is connected with a wide range of urban internal infrastructure structure, covering residential buildings, office buildings, streets, roads, railways, unpolluted rivers, suburban shelterbelts, etc., so as to show the ecological utility of ecological corridor to the greatest extent.

The difference between the ecological corridor and the general corridor is that the ecological corridor can organically connect all kinds of natural and human resources with typical characteristics and values in the region, and has ecological, social, economic, cultural and other functions. From an ecological point of view, ecological corridor can not only provide enough space for plant growth and animal reproduction, but also a temporary and permanent habitat diffusion channel for species, which can play the role of flood control and soil consolidation, water and air purification, and also provide ventilation corridor for urban areas to alleviate the heat island effect, which helps to better protect the natural ecological environment^[24]. From the social and cultural point of view, ecological corridor can provide people with more places close to nature and pull into the distance between human and nature; The function of popular science education is to help people understand and experience nature; With the charm of high-

lighting local characteristics, it can create an attractive and pleasant ecological landscape^[25]. From an economic point of view, ecological corridor can promote the development of tourism, business services and other related industries, stimulate consumption, expand domestic demand, and provide diversified employment opportunities for surrounding residents^[26]. At the same time, ecological corridor can enhance the land use value, improve the investment environment, promote economic growth, avoid the disorderly expansion of cities and towns, and promote the harmonious development of the region.

2.2 Characteristics of Ecological Corridor

The characteristics of ecological corridor are mainly reflected in spatial scale and time scale. In terms of spatial scale, ecological corridor is an important part of urban ecosystem. Compared with urban ecosystem, ecological corridor has more length, width and green coverage^[27]. From the perspective of ecological civilization, this paper describes the relevant contents of the concept of ecological corridor. As a subsystem of urban ecosystem, ecological corridor is not a lawn or a few trees on the roadside. Only when the degree of green coverage reaches a certain degree, it can be called ecological corridor^[28]. In terms of time scale, ecological corridor is not only a stable ecological landscape in the city, but also a fundamental material guarantee for improving the urban greening system. In the ecological corridor, there is appropriate lighting, and with the help of water, nutrients and many other contents, it can ensure the elasticity and stability of the whole ecological corridor structure, effectively resist interference within a threshold range, give full play to its ecological function to the greatest extent, and effectively improve the overall ecological benefits.

2.3 Overview of Planning Area

Yuzhong ecological innovation city is located in Yuzhong basin, starting from Qinglongling in the East, Baihu Mountain in the west, Xinglong Mountain in the South and North Mountain in the north^[29]. That is, Yuzhong ecological innovation city is located in “two towns and one township” in Yuzhong County. Two towns refer to Chengguan town and Xiaguanying Town, and “one township” refers to the urban and rural areas in the triangle. Two towns and one township “are located in the south central part of Yuzhong County, among which Chengguan town is the current urban location of Yuzhong County. The urban and rural areas of the triangle are in the north of Chengguan Town, Xiaguanying town is located in the north of the urban and rural areas of the triangle, and the

planning area is generally extended from south to north to East“ The total area of “two towns and one township” is about 260 km², and the planned construction area is 123 km² (Figure 1). Yuzhong ecological innovation city is located in the central accumulation plain area in geomorphological structure. The central part of the mountain is a sloping alluvial and proluvial plain in front of Xinglong Mountain, commonly known as “Sichuan land”, including the high-level loess buried in the county town to the delta plain, lianta to Dingyuan plain, Heping plain and Baihu mountain beam, zhuzuishan beam and shenjiahe mountain beam.

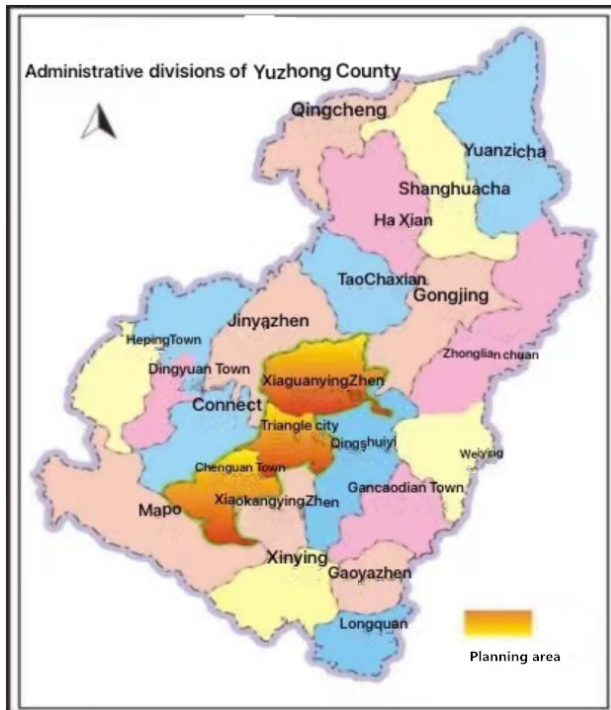


Figure 1. administrative division of the planning area

The inner topography of Yuzhong ecological innovation city is high in the south and low in the north. The geomorphic features are the crisscross distribution area of Piedmont proluvial, alluvial plain and loess ridge. In terms of geography and geological structure, Yuzhong ecological innovation city is a basin with an altitude of 1432~2000m. The planning area has a typical temperate semi-arid continental climate with an annual average temperature of 6.57 °C and four distinct seasons. It is windy in spring and drought occurs frequently; In summer, it is hot in the day and cool at night, dry in early summer and rainy in midsummer; In early autumn, it is cloudy and rainy, but in late autumn, it is cool and rainy; It's cold and snowy in winter. Although faced with some ecological problems, such as climate aridity, land desertification and uneven distribution of forest resources, the natural ecology of the

planning area is well maintained and the environmental quality is high. All the natural ecological indicators can reach a higher level according to the requirements of eco-city, so as to improve the overall natural ecological indicators of Lanzhou City and improve the human settlement environment of Lanzhou city to achieve the balance of Lanzhou urban ecosystem.

2.4 Research Methods

This paper focuses on the development and layout of the ecological corridor planning of Yuzhong ecological innovation city, using field investigation, copy investigation and GIS Application Technology (application software is arcgis10.2 and envi5.3).

The ecological corridor in the planning area should be designed scientifically and reasonably to build an ecological civilization city with harmonious and healthy ecological environment as the main symbol and highly unified material civilization and spiritual civilization.

2.5 Analysis of Key Elements of Ecological Corridor Panning

In the process of planning urban ecological corridor, some key elements are often involved, such as corridor number, corridor width, background and key areas ^[30].

2.5.1 Number of corridors

In general, the more the number of ecological corridors, the better. This can make a variety of ecological flows flow in them, and form a larger radiation area around the corridor, so that the ecological environment around the corridor has been greatly improved.

2.5.2 Background

The ecological corridor is closely related to the surrounding land. The planning area is the main crop planting area in Yuzhong County, which has good natural conditions and is easy to carry out agricultural activities. Cultivated land is an indispensable part of maintaining the integrity of regional ecosystem structure and regional ecological security pattern. The maintenance of farmland ecosystem around the planning area can effectively maintain the ecological service capacity, and the habitat maintenance service, soil conservation service and food supply service have been improved to varying degrees.

2.5.3 Corridor width

Corridor width plays an important role in its ecological function. Too narrow corridor has adverse effects on

the growth of organisms, but also reduces the function of corridor to filter pollutants. Therefore, when we plan the ecological corridor, we should design different widths for different types of ecological corridors according to their own characteristics, so as to achieve the ideal ecological regulation function.

2.5.4 Key areas

There are noise pollution, air pollution and water pollution in the areas near roads and rivers in Yuzhong ecological innovation city.

3. Results and Analysis

3.1 Identify Major Green Corridors

When carrying out the planning and design of ecological corridor, we should first consider the scientific, ecological and green nature of ecological corridor design^[31]. For the planning area of Yuzhong ecological innovation city, there are less natural ecological land in the planning area, more rural residential areas, scattered distribution, and insufficient reserve land for development and utilization. The economic development level is low, the industrialization and urbanization rate is not high, the contradiction between land use and ecological environment protection and construction is relatively prominent, the ecological environment situation between regions is obviously different, the infrastructure construction of transportation, water conservancy, energy and so on is relatively backward, and the situation of ecological environment protection and restoration is grim. Therefore, we determine the main green corridor through the reasonable planning of the ecological corridor in the planning area. We need to maintain the balance of urban carbon and oxygen through the planning space of the ecological corridor, so as to realize the exchange of fresh air, effectively solve the problems of urban pollution and poor air quality, and gradually achieve the goal of ecological corridor construction. Ecological corridor is a systematic project, which has different requirements for different infrastructure, so we must carry out differentiated planning efficiently to ensure the comprehensiveness of the planning and design of ecological corridor in the planning area.

According to the statistics of the frequency of each season and wind direction in the planning area for many years, it is concluded that the dominant wind direction in the planning area is southeast wind (SE) in summer and northwest wind (NW) in winter. Because of the influence of valley wind in the planning area, we need to increase the green land area in the planning area and its surround-

ing areas, adopt new urban planning and design concepts, and plan the wind power transmission channel. The construction of wind power transmission channel in urban planning is one of the important means to effectively reduce urban heat island effect and air pollution. Through the construction of urban ecological corridor, improve the urban air duct.

In the planning and design of urban air duct, 30 ~ 200 m traffic and green landscape passageways with different widths in the northwest and Southeast directions should be built; A 500m wide valley wind passage along Nanhe River and Jiagou River in southwest northeast direction and a 500m wide wind transmission passage along Wanchuan River in northwest southeast direction will be built. In this way, the planning area has cool valley wind in summer, and forms a wind corridor for ventilation and haze removal in winter, so as to reduce the intensity of regional urban heat island to the greatest extent.

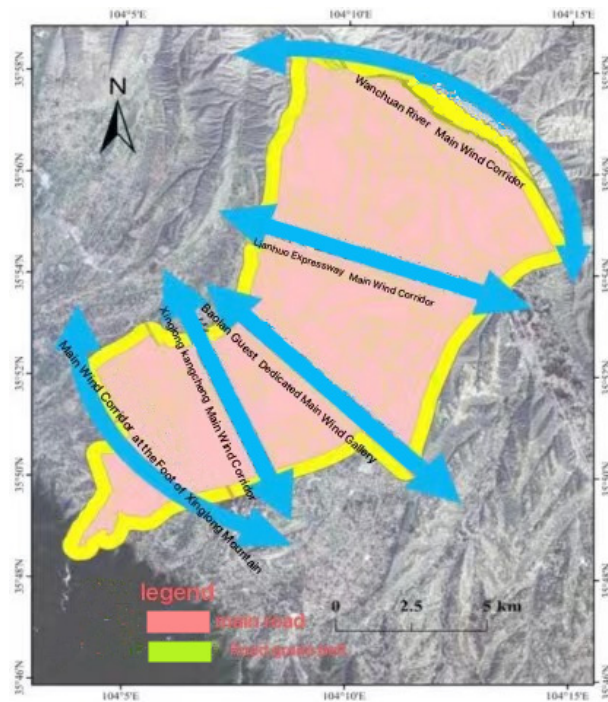


Figure 2. layout of wind corridor in planning area

3.2 Planning and Design of Ecological Corridor for Road Greening in Planning Area

The planning area plans the length, width and height of the Ecological Corridor around the highway to ensure the safe sight distance of drivers, and the plant crown near the lane should not be too large to ensure the smooth discharge of polluted air. Low shrubs and lawns can be planted near the green belt to strengthen the fresh air circulation.

On both sides of the green road in the planning area, local trees such as pine, cypress, *Sophora japonica*, *Euonymus japonicus*, *Salix matsudana* and *Robinia pseudo-acacia* are dominant; The shrubs are mainly *Hippophae rhamnoides*, *Rhododendron* and *Tamarix*; The main herbs are *Poa pratensis*, *Hemerocallis fulva* and *Yumei*. The specific plants that can be planted are shown in Table 1.

According to the road greening ecological corridor in the planning area, it mainly includes the green corridor of Lianhuo expressway, the green corridor of Baolan passenger dedicated line, the green corridor of Xiaguanying expressway, and the green corridor of Xinglongshan tourism ring line. The width of the corridor is 200 m, 100 m on both sides of the highway and railway, and the surrounding area is arranged with grass, shrub and tree. It also includes a landscape corridor, which is the green corridor of Yuzhong light rail special line. The width of the corridor is designed to be 100 m, 50 m on both sides, and the surrounding area is designed with lawn, trees and shrubs (Figure 3).

3.3 Planning and Design of Ecological Corridor Near Rivers in the Planning Area

The runoff from the mountains around Yuzhong ecological innovation city and the rainwater from the inner plain flow into the North-South stormwater corridor dominated by Jiagou River, xinglongxia River (South River), xujiaxia River and nichangu river; Through these four corridors, the rainwater flows into the Wanchuan River and then into the Yellow River. On the basis of compre-

hensive river regulation, the water ecological restoration project is carried out in the reach of Yuzhong ecological innovation city of Wanchuan River to restore the water ecosystem and improve the pollutant degradation and self purification capacity of the basin.

For the planning and design of the ecological corridor near the river in the planning area, we should not only consider it from the perspective of ecology, but also analyze it from the perspective of water resources and environment. At the same time, we should also consider the needs of local eco-tourism construction. On the basis of the existing corridor, landscape tourism resources should be added to the planning and design of its ecological corridor, and various kinds of landscape tourism resources such as rivers and forests should be rationally developed and utilized. According to the capacity of landscape tourism resources, the reception scale should be controlled, the ecological tourism network and routes should be reasonably arranged, and the ecological management should be strengthened.

The planning and design of river ecological corridor in the planning area (Figure 4) forms two main ecological corridors, namely Jiagou River and Nanhe river. The width of the corridor is designed to be 500 m, 250 m on both sides of the river, including 35 m artificial buffer zone, which is arranged by herbaceous vegetation combined with artificial wetland; The 215 m green belt is composed of grass, shrub and arbor. A green corridor along the Wanchuan River, 500 m wide, 250 m on both sides, including 35 m artificial buffer zone, is arranged with herbaceous vegetation and artificial wetland. The 215

Table 1. Specific plants planted in the Scheme Area and surrounding areas

Plant type	Plantable Plants
Evergreen trees and small trees	<i>Pinus tabulaeformis</i> , <i>Pinus armandii</i> , Whitebark pine, <i>Arborvitae</i> , Juniper, <i>Picea crassifolia</i> , Fir, Fir and Juniper
Deciduous and small trees	Poplar, <i>Xanthoceras sorbifolia</i> , Luelantra, Stinky Stakes, Locust, <i>Salix</i> , Crabapple, Torch Tree, Yang, Qingyang, Xin-Jiang, etc.
Evergreen shrub	Alpine Cypress, Sand Cyper, Square Branch, <i>Daphne sansa</i> , Chamomile, <i>Rhododendron Mull</i> Rixiang <i>Rhododendron</i> , Fair Azalea, Red-backed Azaleas, etc
Deciduous shrub	Elm, Weigela, Forsythia, Jinlumei, Honeysuckle, Lilac, Redwood, Thyme, Peony, Cherry, Tamarisk, <i>Rhus</i> , Plum, Hedgehog, <i>Acacia</i> , <i>Perilla</i> , <i>Rosa roxburghii</i> , Elderberry, pinnate lilac, etc.
Lawn & Ground Cover Plants	<i>Poa pratensis</i> , Creeping Shearwater, Iris, Tilapia, Faeces, <i>Zoysia</i> , Kentucky bluegrass, <i>Canac</i> Poa, Purple Fescue, <i>Carex heterophylla</i> , <i>Festuca</i> , Woodland Poas, etc.

m green belt is composed of grass, shrub and arbor. The corridor is 100 m wide and 50 m on both sides, including a 30 m River buffer zone, with herbaceous vegetation and artificial wetland; The 20 m green belt is arranged with grass, shrub and arbor. Planting trees and shrubs on both sides of the river can not only guarantee the ecological value of the ecological corridor, but also ensure the ornamental value of the ecological corridor, and integrate with the local eco-tourism industry to build an ecological corridor for people to watch and keep fit.

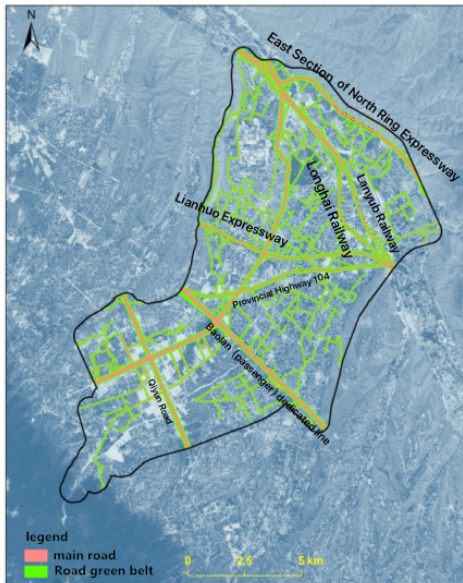


Figure 3. road greening corridor planning

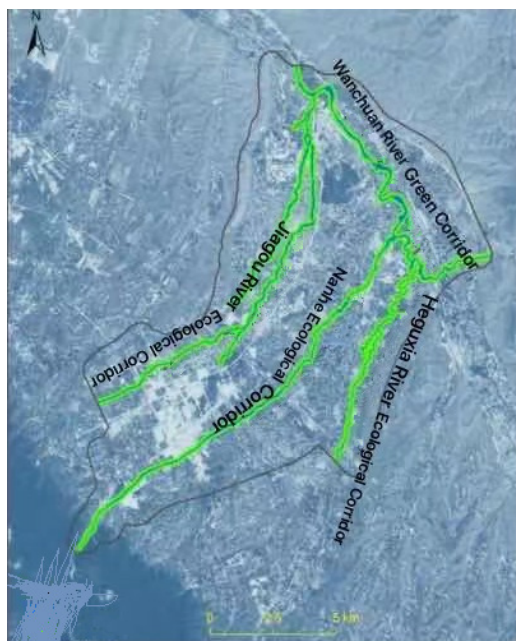


Figure 4. planning of river ecological corridor in planning area

4. Conclusions and Discussions

The natural ecological background of Yuzhong ecological innovation city is “four mountains encircled and five water resources cities” “Four mountains” improvisation of Longshan, Beishan, Qinglong mountain, Baihu mountain. Xinglong Mountain is the eastern extension of Qilian Mountain. The vegetation condition is good, and Xinglongshan National Nature Reserve is set up; The northern mountain is a mountainous Loess Plateau with sparse dry vegetation; Qinglongling is a mountainous Loess Plateau, which is dry and vegetation free. Baihu mountain is a loess hill, and the typical soil Liangshan in Loess Plateau; Baihu mountain, a summer official camp, is a good green mountain in Lanzhou University. Jiagou River, xinglongxia River (Nanhe), xujiaxia River, NICU River and Wanchuan River constitute the water ecological pattern of “five water run cities”. Therefore, we should strengthen Shenglong gold belt (Jiagou river ecological corridor), Xinglong cuigu (Nanhe ecological corridor), and form the green skeleton of Yuzhong ecological innovation city. The planning can refer to the concept of “Park City” construction [32], and build a whole park system including country park, waterfront park, comprehensive park, community park and Street Park, and shape a new city with green ecology as the base and slow green road as the context. Based on the planning and design of ecological corridors on both sides of the road and river, the planning of belt green space corridor should be added. The corridor width should be set at 20-40m. The belt green space along the street, adjacent channel and adjacent capillary sponge channel shall be arranged. At the same time, several secondary landscape lines shall be planned, and the main road and secondary main road shall be constructed along the city, and the main road green corridor and secondary main road green corridor shall be arranged, The corridor is 30m wide and the two sides of the corridor are reasonably matched with grass, shrubs and trees according to the landscape characteristics.

In order to make the ecological corridor planning of Yuzhong ecological innovation city more perfect, we propose the following suggestions:

1) Through the research of this paper, we should understand the connotation and characteristics of ecological corridor correctly, and reduce some problems in the construction of planned and built-up area as much as possible. The ecological corridor construction is not equal to the general Greenway Construction. Ecological corridor emphasizes the ecological restoration and comprehensive management of landscape forest, land, lake and grass system. Through the increase of green expansion in Xinglong

Mountain in the planning area, the ecological innovation city can be maintained with good ecological conservation. In addition, more attention is paid to the agricultural leisure tourism in qinglongling. At present, qinglongling has a high farmland coverage, which is the concentrated area of urban leisure agriculture and sightseeing agriculture. Meanwhile, the corridor is reserved for regional traffic facilities and major infrastructure, which can better construct the network ecological corridor.

2) In the process of planning and construction of ecological corridor, we should consider the barrier effect of artificial infrastructure such as roads and water conservancy on the wildlife in the planning area. On the basis of long-term observation, we need to reserve biological channels for the construction and reservation of biological channels to reduce the adverse effects on the wildlife in the area during the construction of road and river ecological corridor.

3) Establish and improve the long-term mechanism of Ecological Corridor Management and protection. Establish a long-term mechanism of Ecological Corridor Management and protection. We should improve the management and protection mechanism in accordance with the principle of “local management, hierarchical responsibility and responsibility to people”, build management and protection infrastructure, establish management and protection team, ensure the management and protection funds, and adhere to the principle of “no main forest”. Finally, good management and protection effect is achieved.

4) In the planning and construction of ecological corridor, the construction of ecological isolation green belt between roads, both sides of river and residential land and other land use such as industrial, traffic road and public construction shall be strengthened; Strengthen the construction of the surrounding ecological barrier, form a perfect ecological protection green space system, and protect the residential environment of residents. In the planning and design regulations, the important natural landscape interface principles are controlled along the shenglongjin belt of main ecological corridor and Xinglong cuigu, and the height of buildings on both sides of the landscape interface is strictly controlled. For buildings in the vertical ecological corridor direction, the design method of back-bench is recommended, and the height is gradually increased to ensure that the sight of the interface of the corridor is not blocked and a rich landscape level is created.

5) In order to make Yuzhong ecological innovation city develop better from the perspective of ecological civilization, more people pay attention to it. We should actively encourage the exploration of various modes of ecological corridor construction. Through improving the public

participation, the public can participate in the top-level planning and design of ecological corridor and the specific implementation process, improve the public participation in the discourse right, and make the ecological corridor construction achievements more effectively reflect the direct interests of the people and get the support of the people.

References

- [1] Sun Yu, Miao Shiqing, Liang Yichan. Sustainable development efficiency of ecological civilization and its regional dynamic differences based on panel data of 31 provinces [J]. *Ecological economy*, 2021,37 (01): 212-219.
- [2] Jiang Wenbin. Planning, design and practice of Ecological Corridor Based on the perspective of Ecological Civilization: a case study of Central Ecological Corridor Planning of Optical Valley [J]. *Urban construction*, 2020, (7): 335-336.
- [3] ASCENS A O F. CLEVINGER A, SANTOS-REIS M, et al. Wildlife Vehicle Collision Mitigation: Is Partial Fencing the Answer? An Agent-Based Model Approach[J]. *Ecological Modelling*, 2013,257:36-43.
- [4] Qiao Xin, Yang Wei. Urban ecological corridor planning from passive protection to protective development: a case study of Panyu District in Guangzhou [J]. *Journal of western human settlements*, 2013 (03): 62-68.
- [5] HADDAD N M, BRUDVIG L A, CLOBERT J, et al. Habitat Fragmentation and Its Lasting Impact on Earth's Ecosystems[J]. *Science Advances*, 2015,1(2):1-9.
- [6] Zheng Hao, Gao Jixi, Xie Gadi, et al. Ecological corridor [J]. *Journal of ecology and rural environment*, 2019,35 (2): 137-144
- [7] Hannah Wright. Understanding green infrastructure: the development of a contested concept in England[J]. *Local Environment*, 2011,16(10).
- [8] Bradby K, Keesing A, Wardell-Johnson G. Gondwana Link: connecting people, landscapes, and livelihoods across southwestern Australia [J]. *Restoration Ecology*, 2016, 24 (6): 827-835.
- [9] Andrey C B. The caspian coastal green way vision plan [M]. Amherst: University of Massachusetts-Amherst, 2010.
- [10] Qu Yuehui, Li Zhihua, Chen Guanghui, Feng Chao, Wang Li. Construction of ecological corridor system in Hunan Province [J]. *Hunan forestry science and technology*, 2020,47 (02): 129-134.
- [11] Liu Shiqing, Ju Dong. Research on the overall strategy and implementation path of the Yangtze River green ecological corridor construction [J]. *Engineer-*

- ing Research - Engineering in the interdisciplinary perspective, 2016,8 (5): 561-571.
- [12] Shanghai Municipal People's government. Shanghai ecological corridor planning system (2017-2035) [R]. 2017.
- [13] Ren Ling, Zhao Rong. From "two civilizations" to "five in one": theoretical sublimation and practical progress of the relationship between man and nature [J]. Environment and sustainable development, 2020,45 (02): 35-39.
- [14] Meng Wei, fan Juntao, Zhang Yuan. River basin water ecosystem health and ecological civilization construction [J]. Environmental science research, 2015,28 (10): 1495-1500.
- [15] Cui Wenwen, Wang Jihao, Luo Jing. Landscape planning and design of urban ecological corridor [J]. Urban architecture, 2019,16 (20): 128-129.
- [16] FABOS J G.Introduction and Overview: The Greenway Movement, Uses and Potentials of Greenways[J].Landscape and Urban Planning,1995,33(1/2/3): 1-13.
- [17] AHERN J.Greenways Planning Strategy[J].Landscape and Urban Planning, 1995,33(1/2/3):131-155.
- [18] FORMAN R T T.Land Mosaics: the Ecology of Landscape and Regions[M].L ondon:Cambridge University Press,1995:35-38.
- [19] Little C E.Greenways for America [M].Baltimore: The Johns Hopkins University Press,2013.
- [20] Zhu Qiang, Yu Kongjian, Li Dihua. Ecological corridor width in Landscape Planning [J]. Acta ecologica Sinica, 2005 (09): 2406-2412.
- [21] PREMIER A K, KIPARSKY M, GMUR S,et al.A Riparian Conservation Network for Ecological Resilience[J]. Biological Conservation,2015,191:29-37.
- [22] Liu Shanshan. Exploration on the planning method of Electric Power Industrial Park from the perspective of Ecological Civilization -- Taking Duolun as an example [J]. Central China architecture, 2019,37 (06): 95-98.
- [23] Guo Jiguang, Cai Yongli, Luo Kun, Zuo Junjie, Liu Zhiguo, Ni Jingxue. Ecological corridor construction based on target species protection: a case study of Chongming Island [J]. Journal of ecology, 2009,28 (08): 1668-1672.
- [24] Zhong Jun. study on landscape corridor planning of Nanting River Wetland in Lincang under the concept of Greenway movement [J]. Anhui agronomy bulletin, 2016,22 (19): 83-84.
- [25] Wang Xiahui. Scientific promotion of urban ecological environment quality comprehensive standard [n]. China environment daily, August 7, 2018 (003).
- [26] Dong Bin, Miao Lei, Li you. Discussion on the construction of ecological corridor system in the process of "Zheng Bian integration" [J]. Meteorology and environmental science, 2008 (01): 35-38.
- [27] Cai Chan Jing, Zhou Zhi Xiang, Chen Fang, Zheng Zhong Ming. Landscape pattern of green corridor in Wuhan [J]. Acta ecologica Sinica, 2006 (09): 2996-3004.
- [28] Zhang Yue, Xu Duanyang, Li Xia, Zhang Xiaoyu, Wang Xiaobo, Wang Shaoqiang. Ecological corridor construction and key node identification in the core area of China Laos transportation corridor [J]. Acta ecologica Sinica, 2020,40 (06): 1933-1943.
- [29] Jin Wangqiang, Wu Mingyan, Yan Caixia, Zhao Shasha, Zhao Xiaofu, Yang Bin. Discussion on coordinated promotion of Yuzhong ecological innovation city planning and construction based on ecological environment protection [J]. Environmental ecology, 2019,1 (04): 23-28.
- [30] Yang Bo, Wang Wen, Zeng Qingru, tie Baiqing. Discussion on Urban Landscape Ecological Construction -- Taking Furong District of Changsha City as an example [J]. Environmental science and management, 2013,38 (01): 147-149 + 176.
- [31] Tao Lihua, Zhu Xiaodong, GUI Feng. Ecological analysis and optimization design of agricultural landscape in coastal zone of radial sandbank in Northern Jiangsu [J]. Environmental science, 2001 (03): 118-122.
- [32] Qian Fuyan, Fang Changying, Ma rongjiao. Concept connotation and practice path of Park City [J]. Heilongjiang science, 2020,11 (20): 140-141.