

# **Emerald Necklace in the Lake Cluster**

*A Study on the Construction of the Fourth Ring Forest Belt and the Assessment and Renewal of Plant Communities in Wuhan City*

# **PROJECT STATEMENT**

The Wuhan Fourth Ring Ecological Belt has played a huge role in improving the quality of the urban environment, optimizing the urban landscape, and enhancing the city's ecological culture. Based on research and analysis of the current situation of the site's road planning, terrain, topography, and ecological resources, this plan follows the idea of "highlighting ecology, beautifying the landscape, planting trees according to the land, and highlighting characteristics". The theme is "Jiangcheng Landscape Gallery", and it has planned the overall layout of the "One Belt and Seven Scenes" for the Fourth Ring Ecological Belt: the One Belt refers to the Fourth Ring Ecological Belt, and the Seven Scenes refer to the seven segments of ecological belts with different seasonal changes formed by characteristic plants based on the principle of large greenery. After the ecological belt is built, this case will continue to follow up and evaluate, propose a series of targeted plant community optimization strategies, and formulate specific recreational development plans and management measures combined with recreational development needs and environmental carrying capacity, aiming to protect the natural environment, improve recreational quality, and experience.

# **PROJECT NARRATIVE**

- **Project Overview**

The Wuhan Fourth Ring Road is an important channel for external travel in the main urban area and another fast ring mainly for freight transportation in Wuhan. It connects six new city clusters and plays a role in integrating urban and rural areas. The construction of the Fourth Ring Road has effectively improved the urban transportation conditions of Wuhan, greatly enhanced Wuhan's comprehensive transportation capacity, and is of great significance for promoting the implementation of the development strategies of "Central Rise" and "Two Circles and One Belt". In order to further increase the city's ecological green volume and improve the urban ecological environment, the municipal government decided to build a landscape protection ecological belt on both sides of the Fourth Ring Road.

- **Overall Planning Layout**

According to the principle of "unified planning, divided implementation, synchronous construction, and staged construction" with the construction of the Fourth Ring Road, and based on the planning concept of "Jiangcheng Landscape Gallery", it encourages units along the road and various district governments to actively organize the construction of ecological belts, forming a layout that is reasonable, with trees, beautiful landscapes, and highlighting ecology, with the principle of biodiversity, forming a green landscape protection belt of the Fourth Ring Road, further constructing a "forest city with water, countryside, and mountains interdependent".

The construction scope of the Fourth Ring Road ecological belt refers to the land on both sides of the Fourth Ring Road red line, 50 meters wide, and the land outside the exchange road on the outer side (including the exchange). According to the "Wuhan Fourth Ring Road Planning Scheme", the total planned land area of the red line control is 26,257 acres, and the planned afforestation area is about 18,105 acres. The entire line involves 10 administrative regions (Wuhan Economic and Technological Development Zone, East Lake High-tech Development Zone, Wuhan Chemical Industry New Zone, Qingshan District, Huangpi District, Dongxihu District, Caidian District, Hankou District, Hongshan District, Jiangxia District), with a total length of 146 kilometers.

According to the idea of "highlighting ecology, beautifying the landscape, planting trees according to the land, and highlighting characteristics", the Fourth Ring Ecological Belt takes "One Belt and Seven Scenes" as the overall planning layout, with the One Belt referring to the Fourth Ring Ecological Belt and the Seven Scenes referring to the seven segments of ecological belts with different seasonal changes formed by characteristic plants based on the principle of large greenery. Multiple landscape nodes are created at interchanges and intersections with major roads.

# **PROJECT NARRATIVE**

- **Afforestation Technology Design**

Guided by the principle of ecological forest management and natural aesthetics theory, relying on the natural conditions of the Wuhan Fourth Ring Road, using ecological forest management principles and advanced technology, protecting natural, ecological, and artificial plant communities, restoring natural vegetation on bare land, promoting forest growth and succession, and forming natural composite, ecologically stable, self-maintenance, and good landscape benefits. The ecological landscape community achieves the goal of natural flow, beautiful landscape, functional integrity, and rich regional cultural characteristics of the scenic ecological belt.

The Fourth Ring Road's forest species are mostly protective forests, and some economic forests are designed appropriately. Protective forests should be established according to local conditions and set up in combination with road protection forests and bank protection forests on both sides of railways and highways, river channels, and lakes and reservoirs. They can also be combined with farmland and pasture protection forests, windbreak and sand fixation forests, soil and water conservation forests, and water source conservation forests. Economic forests can be built in areas where transportation and management are relatively convenient, and where soil and water conditions are good, producing dried fruits, fruits, edible oil crops, beverages, seasonings, spices, woody vegetables, medicinal materials, and industrial raw materials, etc. Plant species in each district are selected based on the characteristics of each district and the plant landscape characteristics of the seven belts. Key tree species: backbone tree species: background tree species = 2:6:2.

- Comprehensive Evaluation of the Fourth Ring Road Ecological Belt Plant Community

This study aims to conduct a comprehensive survey and post-evaluation of the plant community of the Fourth Ring Road ecological belt in Wuhan, deeply understand the current situation and problems of the plant community, and provide scientific basis and technical support for the sustainable development and transformation of the forest belt. Based on methods such as on-site investigation, laboratory analysis, data statistics, and model construction, a comprehensive evaluation and optimization study of the plant community of the Fourth Ring Road ecological belt in Wuhan was conducted. The specific contents are as follows:

1. Conduct a comprehensive survey and plot evaluation of the plant community of the Fourth Ring Road ecological belt in Wuhan, analyze its characteristics and problems in terms of species composition, community structure, ecological function, landscape benefits, and suitability for recreation.
2. Based on the survey and evaluation results, propose targeted plant community optimization strategies, including increasing species diversity and naturalness, adjusting planting density and proportion, improving community structure and layout, etc.
3. Combined with recreational development needs and environmental carrying capacity, formulate specific recreational development plans and management measures to protect the natural environment, improve recreational quality and experience.

# **PROJECT NARRATIVE**

The comprehensive evaluation results show that the plant community of the Fourth Ring Road ecological belt in Wuhan currently has a relatively single species composition, lacks species diversity, and has problems such as reduced ecosystem services and poor landscape benefits. At the same time, there are also shortcomings in recreational development and management, such as lack of recreational facilities and poor recreational experience.

Based on the comprehensive evaluation results, this study proposes a series of targeted plant community optimization strategies, including increasing species diversity and naturalness, adjusting planting density and proportion, improving community structure and layout, and formulating specific recreational development plans and management measures combined with recreational development needs and environmental carrying capacity, aiming to protect the natural environment, improve recreational quality and experience.

- **Sustainable Construction and Development**

Through the implementation of this study and the promotion of its results, it can provide reference and inspiration for similar problems in other cities and regions, and promote the construction of ecological civilization and sustainable development in Chinese cities.

# LOCATION



# BACKGROUND

The Wuhan Fourth Ring Road is an important channel for external travel in the main urban area and another fast ring mainly for freight transportation in Wuhan. **It connects six new city clusters and plays a role in integrating urban and rural areas.** The construction of the Fourth Ring Road has effectively improved the urban transportation conditions of Wuhan, greatly enhanced Wuhan's comprehensive transportation capacity, and is of great significance for promoting the implementation of the development strategies of "Central Rise" and "Two Circles and One Belt".

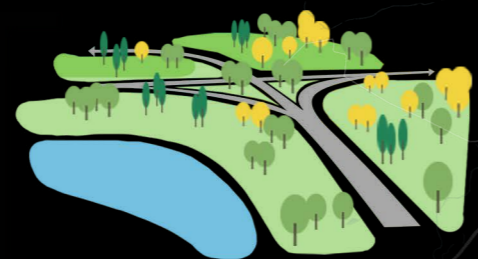


# PLANNING RANGE

The construction scope of the Fourth Ring Road ecological belt refers to the land on **both sides of the Fourth Ring Road red line, 50 meters wide**, and the land outside the exchange road on the outer side (including the exchange). According to the "Wuhan Fourth Ring Road Planning Scheme", **the total planned land area of the red line control is 26,257 acres, and the planned afforestation area is about 18,105 acres.** The entire line involves 10 administrative regions, with **a total length of 146 kilometers.**



Both sides of the Road red line, 50 meters wide



The land outside the exchange road on the outer side

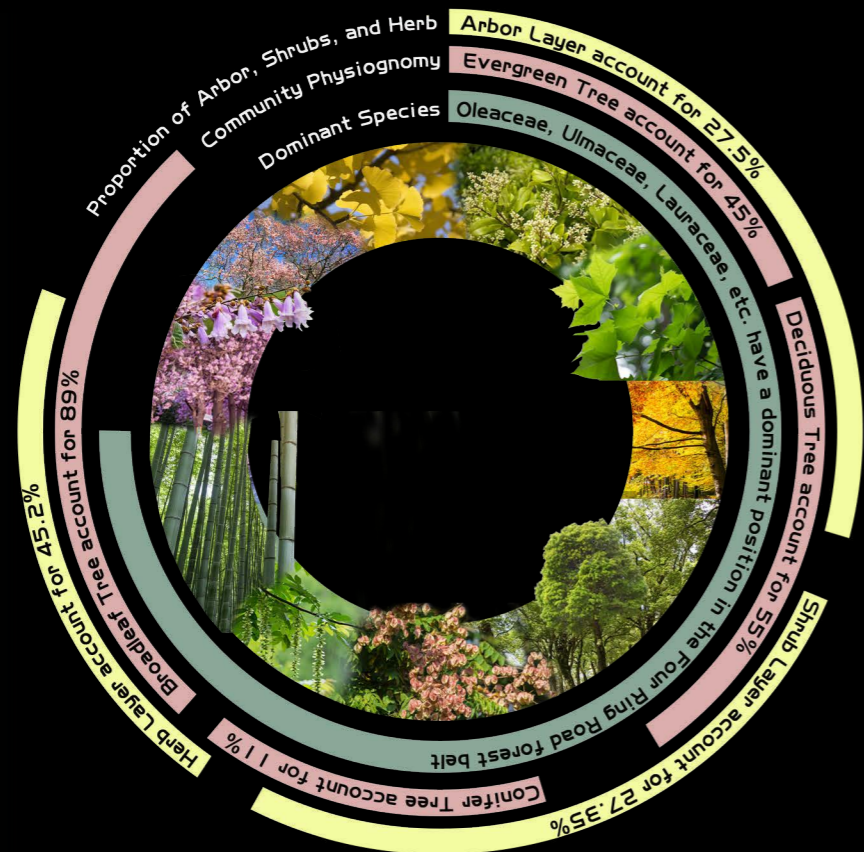


# MASTER PLAN

According to the idea of "highlighting ecology, beautifying the landscape, planting trees according to the land, and highlighting characteristics", the Fourth Ring Ecological Belt takes **"One Belt and Seven Scenes"** as the overall planning layout, with the One Belt referring to the Fourth Ring Ecological Belt and the Seven Scenes referring to the seven segments of ecological belts with different seasonal changes formed by characteristic plants based on the principle of large greenery. Multiple landscape nodes are created at interchanges and intersections with major roads.

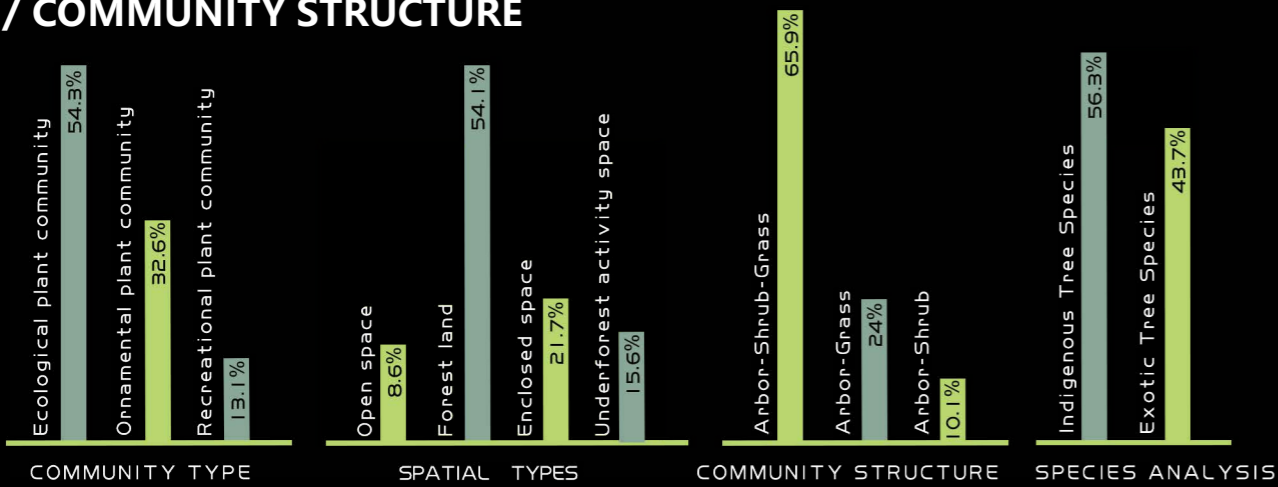
# COMPREHENSIVE EVALUATION OF PLANT COMMUNITY

## / SPECIES COMPOSITION

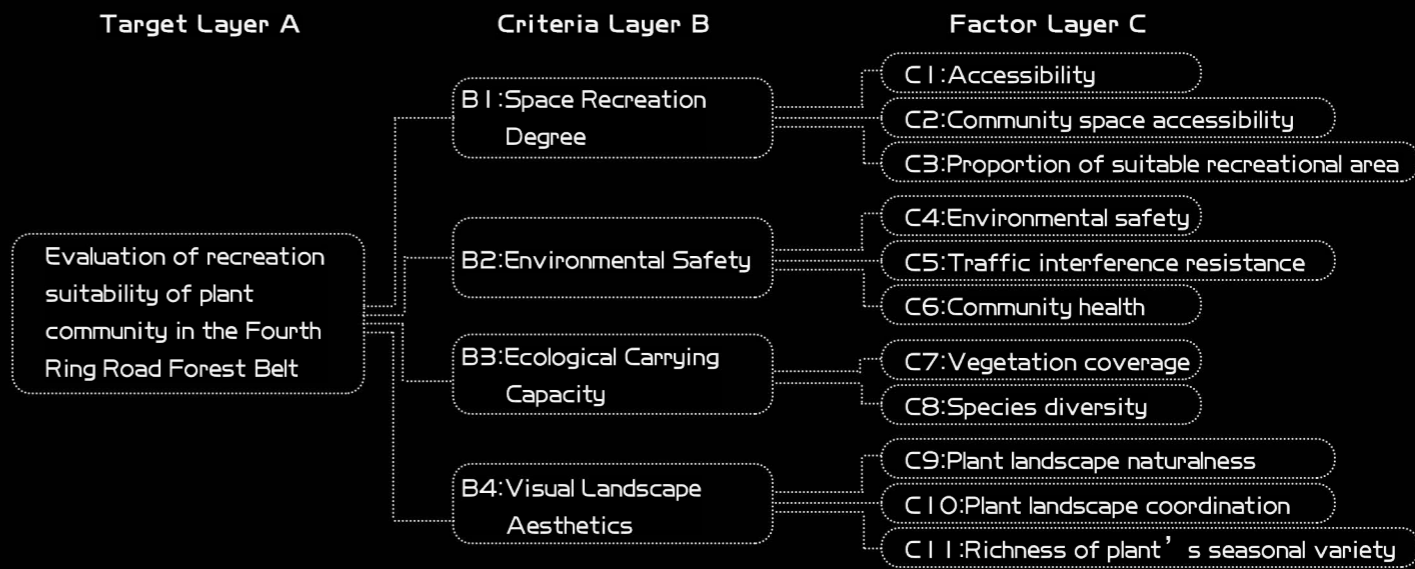


There are 183 species of seed plants, belonging to 63 families and 154 genera. Trees account for 27.5%, shrubs account for 27.3%, and ground cover and herbs account for 45.2%. From the overall appearance characteristics of the community, the proportion of evergreen deciduous tree species is 1:1.23, and the proportion of coniferous broad-leaved tree species is 1:8.12. The Oleaceae, Ulmaceae, and Lauraceae have a dominant position in the forest belt around the city.

## / COMMUNITY STRUCTURE



## / EVALUATION MODEL FOR RECREATIONAL SUITABILITY



## / ANALYSIS OF RECREATION SUITABILITY LEVEL

Evaluation and Classification of Recreational Suitability					
SEI	100-85	85-70	70-55	55-40	<40
Suitability Level	I	II	III	IV	V
Suitability	Suitable	Comparatively Suitable	Generally Suitable	Comparatively Not Suitable	Not Suitable

From the evaluation and grading results, 71.6% of the total samples are classified as Grade I and Grade II, and there are no Grade V samples. The results indicate that the Fourth Ring Road forest belt has a certain potential for recreational development. The order of factors that have a significant impact on recreational suitability among various indicators is Environmental Safety, Space Recreation Degree, Visual Landscape Aesthetics, and Ecological Carrying Capacity.

## / COMPREHENSIVE EVALUATION

The comprehensive evaluation results show that the plant community of the Fourth Ring Road forest belt in Wuhan currently has a relatively single species composition, lacks species diversity, and has problems such as reduced ecosystem services and poor landscape benefits. At the same time, there are also shortcomings in recreational development and management, such as lack of recreational facilities and poor recreational experience.

# OPTIMIZATION STRATEGY

## / OPTIMIZATION STRATEGY OF PLANT COMMUNITY

- Reasonably increase species diversity and richness, and improve the stability of urban forest species composition;
- Adjust the planting density and proportion to improve the naturalness of the horizontal structure;
- Improve community structure and layout, and provide recommended plant community configuration modes for different types of plant community.



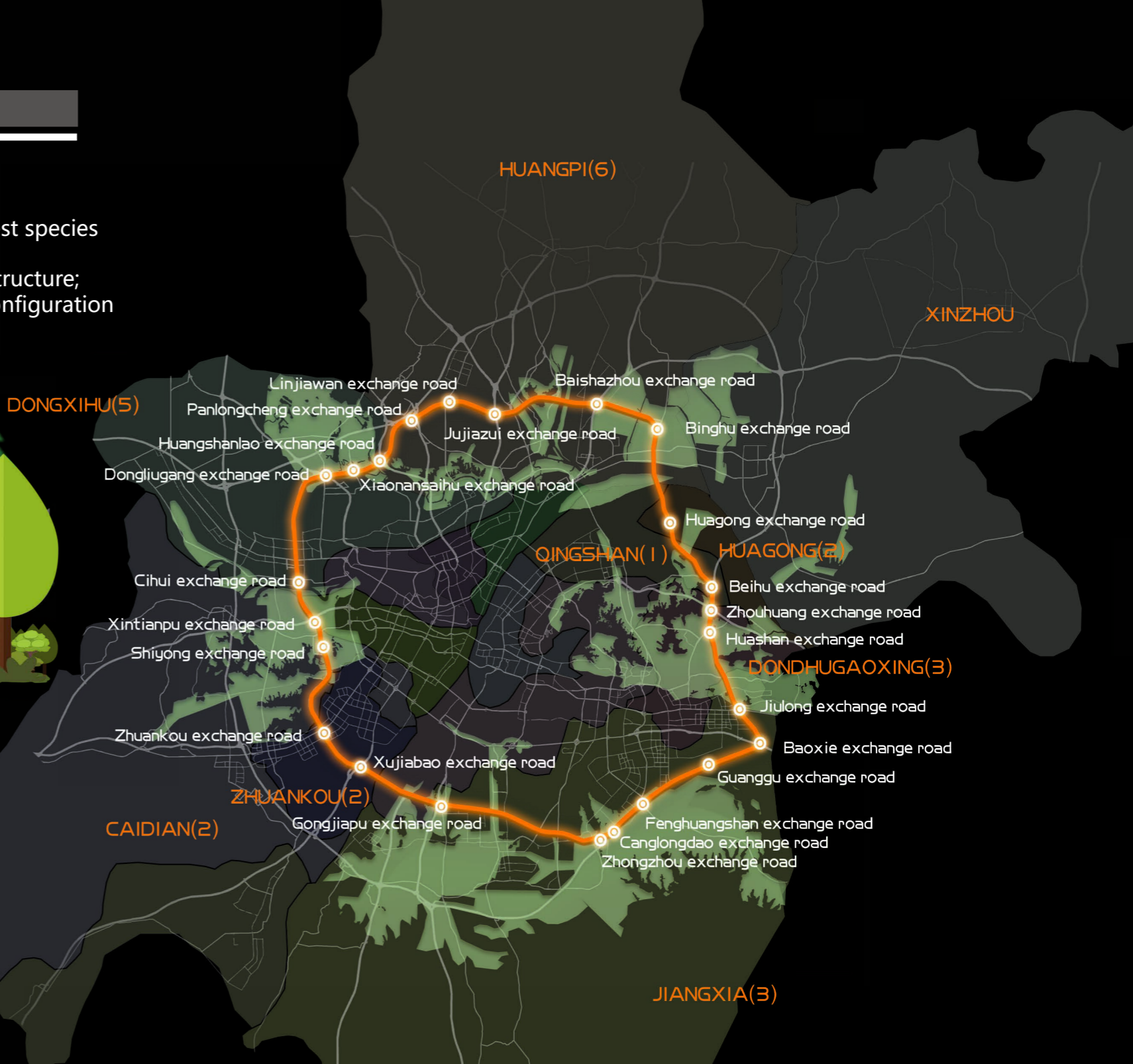
## / RECREATIONAL DEVELOPMENT STRATEGY OF PLANT COMMUNITY

- Select suitable land plots for recreational development based on the needs of recreational development and Environmental Carrying Capacity;
- Reasonably set up infrastructure to maintain natural and wild charm;
- With the goal of protecting the natural environment and improving the quality and experience of recreation, targeted optimization strategies and management measures are taken according to the plant community of different space types.



## / Sustainable Construction and Development

Through the implementation of this study and the promotion of its results, it can provide reference and inspiration for similar problems in other cities and regions, and promote the construction of ecological civilization and sustainable development in Chinese cities.



Administrative division	Exchange amount	Serial number	Exchange road
QINGSHAN	1	1	Beihu exchange road
HUAGONG	2	2	Huagong exchange road
		3	Zhouhuang exchange road
		4	Binhu exchange road
HUANGPI	6	5	Baishazhou exchange road
		6	Jujiazui exchange road
		7	Linjiawan exchange road
		8	Panlongcheng exchange road
		9	Huangshanlao exchange road
DONGXIHU	3	10	Xiaonansaihu exchange road
		11	Dongliugang exchange road
		12	Cihui exchange road
CAIDIAN	2	13	Xintianpu exchange road
		14	Shiyong exchange road
ZHUANKOU	2	15	Zhuankou exchange road
		16	Xujiabao exchange road
JIANGXIA	3	17	Gongjiapu exchange road
		18	Zhongzhou exchange road
		19	Canglongdao exchange road
DONGHUGAOXIN	5	20	Fenghuangshan exchange road
		21	Guanggu exchange road
		22	Baoxie exchange road
		23	Jiulong exchange road
		24	Huashan exchange road



Guided by the principle of ecological forest management and the theory of natural aesthetics, we protect the natural, ecological and artificial plant communities and restore the natural vegetation of the bare land by relying on the natural conditions of the base.



Guided by the principle of ecological forest management and the theory of natural aesthetics, road protection forests and shore protection forests are created on both sides of railroads and highways, on both sides of rivers and channels, and around lakes and reservoirs.



Apply ecological forest management principles and advanced technologies to protect natural, ecological and artificial plant communities and restore natural vegetation in bare land.



On both sides of the railroad highway, both sides of rivers and channels, around lakes and reservoirs, to create road protection forest and shore protection forest.



With the theme of "Jiangcheng Landscape Corridor", it protects the natural, ecological and artificial plant communities to achieve the goal of a scenic ecological zone with natural flow, beautiful landscape, sound function and rich in regional cultural characteristics.



With the theme of "River City Landscape Corridor", it protects the natural, ecological and artificial plant communities and restores the natural vegetation of the bare land.



It is planned and designed as an ecological zone with seven sections with different seasonal changes formed by characteristic plants to highlight the characteristics, manifest the ecology and beautify the landscape.



Wuhan's Fourth Ring Road ecological zone has played a great value in improving the quality of urban environment, optimizing the landscape pattern of the city and enhancing the ecological culture of the city.



Apply ecological forest management principles and advanced technologies to protect natural, ecological and artificial plant communities and restore natural vegetation in bare land.