

Analysis and Research on the Characteristics of Mountain and Water System in Fengyang Ancient City

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Abstract:

Based on the existing achievements in the study of the characteristics of the ancient city, this study analyzes the traditional characteristics of Fengyang Ancient City and attempts to integrate the landscape design concept of the construction of the city into the restoration and construction in the new era. By proposing ideas and strategies such as protecting historical relics, strengthening the landscape pattern, constructing a height control system, and improving the restoration of historical sites, a distinctive ancient city construction is formed. The research results provide a reference for urban construction of ancient cities. It can also provide methods for building Fengyang Ancient City into a livable and tourist city.

Keywords: Fengyang Ancient City; Hydrogeology; Characteristic construction; Repair and construction

Date of Submission: 05-03-2024

Date of acceptance: 18-03-2024

I. INTRODUCTION

From a theoretical perspective, many scholars generally believe that the "characteristics of an ancient city" are a combination of historical accumulation, natural conditions, spatial form, cultural activities, and community life in its development process, which distinguishes it from other ancient cities in terms of human perception[1-5]. The recognition and exploration of the characteristics of ancient cities are of great significance for enhancing their competitiveness and sustainable development[6].

The research on the characteristics of ancient cities in Western countries has an early origin. Camillo Sitte[7] emphasized on the pedestrian scale and unique texture of ancient city space, Lewis Mumford's research[8] on ancient city space based on humanistic characteristics, and Kevin Lynch's theory[9] of ancient city imagery had pioneered the study of ancient city characteristics.

In recent years, a large number of Chinese studies have further refined the cognitive methods of ancient city characteristics. They pointed out that the elements of ancient city characteristics should be summarized from the aspects of regional environment, ancient city pattern, intangible culture, and physical relics (including historical buildings, historical streets and alleys, historical blocks, historical landscape symbols, etc.)[10-11]. They particularly pointed out the importance of the influence of traditional Chinese "mountain and water ancient city" and other urban management ideas on the characteristics of ancient cities[12-17].

The strategy for shaping the characteristics of ancient cities involves multiple aspects, including spatial layout, landscape zoning, public and open space systems, landscape systems, important nodes, skylines, tourist routes, development intensity, sculpture systems, color systems, etc.[18-25]. For example, Yang[26] proposed a suitable spatial growth model for the overall protection of the layout of Nanjing's ancient city. Huo[27] proposed a design method for the ancient city center under the guidance of cultural heritage protection, and so on.

Fengyang is a highly renowned historical ancient city, surrounded by mountains, rivers and historical relics, making it one of the exemplary cases of creating ancient "mountain and water ancient cities". However, due to hundreds of years of historical development and the advancement of modernization, the distinctive pattern of Fengyang Ancient City has been severely lost, so it is urgent to reshape it. This study takes the characteristics of hydrogeological conditions as the research object, draws on the experience and methods of previous research, excavates the characteristics of Fengyang ancient city, attempts to glimpse the reasons for the construction and abandonment of the founding capital of the Ming Dynasty, and proposes the idea of reconstructing its historical characteristic.

II. ANALYSIS OF THE CHARACTERISTICS AND CURRENT CONDITION

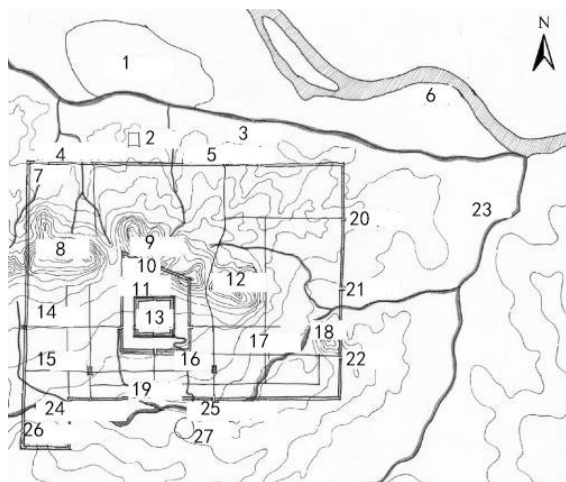
Fengyang is located in the northeast of Anhui Province, on the south bank of the Huai River. As the hometown of the founding emperor of the Ming Dynasty, Zhu Yuanzhang, at the beginning of the founding of the Ming Dynasty, a large-scale construction project was planned and built in 1369 AD, serving as the blueprint for the later construction of the two capitals of Nanjing and Beijing. Although the construction of the capital city

of Ming Dynasty ceased after 1375 AD, the overall layout of its ancient city has initially emerged, and the city site and some of the city wall relics have been preserved to this day. In the Qing Dynasty, Fengyang City was built on the southeast side, further increasing the number of various historical relics.

The spatial characteristics of Fengyang Ancient City can be regarded as a full reflection of the joint influence of the concept of "Shanshui Ancient City" . Due to centuries of rise and fall, decline in political status, and the influence of modern industrial and agricultural development, although the pattern of Fengyang Ancient City still exists today, its characteristics have gradually been forgotten. The surrounding landscape environment and scattered historical and cultural resources are also not related to the construction of the ancient city. It is urgent to take the huge investment in recent years as an opportunity to reshape the characteristics of the ancient city.

2.1 SITE SELECTION FOR INTEGRATION INTO MOUNTAINS AND RIVERS

The geographical location of Fengyang Ancient City is extremely unique. It is located in the extremely rare position between the five mountains and two rivers in the plain area of the Huai River Basin. To the north of the imperial city, it is adjacent to Ma'an Mountain, Fenghuang Mountain, and Jiuhua Mountain. To the southwest, there is Fengzui Mountain, and to the east, there is Dushan Mountain. These five mountains together form the "Fengshui Mountain". The three mountains on the north side and the three north-south axis lines form the opposite scenery. Utilizing the collection of water from the south of the mountain, a square imperial city river was constructed to surround the imperial city, allowing the imperial city to be built along the mountain and water. Although the imperial city was abandoned, with the construction of the Qing Dynasty capital, The river water on the southern side of the mountain was further led into the circular moat, and ultimately flowed into the "Suilong River" that crosses the southern part of the city to form the central capital pattern (Figure 1).



- | | |
|----------------------------|-----------------------------|
| 1. Fangqiu Lake | 2. Fangqiu Hill |
| 3. Yudai River | 4. Rear right Jia Di Gate |
| 5. North Left Jia Di Gate | 6. Huaihe River |
| 7. Outer City | 8. Ma'an Mountain |
| 9. Fenghuang Mountain | 10. Forbidden Wall |
| 11. Huangcheng River | 12. Jiuhua Mountain |
| 13. Imperial City | 14. Tushan Gate |
| 15. Bell Tower | 16. Drum Tower |
| 17. Dushan Creek | 18. Dushan Mountain |
| 19. Hongwu Gate | 20. Changchun Gate |
| 21. Dushan Gate | 22. Chaoyang Gate |
| 23. Hao River | 24. Front right Jia Di Gate |
| 25. South left Jia Di Gate | 26. Fengzui Mountain |
| 27. Yuanqiu Hill | |

Figure 1: The pattern of the ancient Fengyang city

2.2 STRICTLY ADHERE TO THE CAPITAL PATTERN

The planning of Fengyang Ancient City strictly follows the typical form of the capital city. It forms a square city wall with three nested layers from the outside to the inside: the outer city, the forbidden wall, and the imperial city. Outside the city, there is circular and square hills dedicated to the worship of heaven and earth in the north and south. The perimeter of the outer city is 30 km, with 9 gates; The perimeter of the forbidden wall is 8 km, with 4 gates; The circumference of the imperial city is 3.7 km, with an area of 84 km² and 4 gates[28]. The urban roads follow a strict symmetry relationship, with the main and secondary longitudinal and transverse axes forming a cross orthogonal shape. The north-south main axis is 7 km long, reflecting the "longitude" of imperial power, and the buildings on both sides are symmetrical from east to west. The east-west sub axis is 3 km long, symbolizing the "latitude" in worship, and the buildings along the line are all related to worship. The central axis "Jing", which embodies imperial power, intersects with the secondary axis "Wei", which symbolizes ritual, explaining the architectural form of "unity of politics and ritual" (Figure 2).

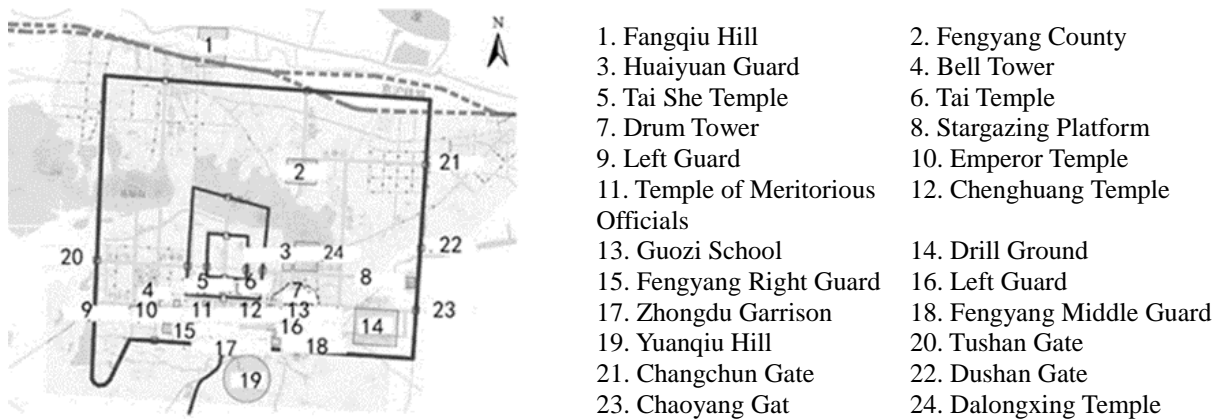


Figure 2: The morphology of capital city in early Ming Dynasty

2.3 PERFECT PATTERN OF CITY CONSTRUCTION

The Qing Dynasty built a capital in the southeast direction of the imperial city in 1755 AD. The overall shape of the city is elliptical, surrounded by a moat, with a circumference of 4 km and an area of 115 km². The Drum Tower becomes the intersection of the east-west and north-south axes in the center of the capital city, and is the highest point within the city; The official office is located in the northeast direction of the crossroads, and important public buildings such as the Imperial Censorate, Government Warehouse, Garrison Office, and Supervision Office are also located along the main streets of the city. The overall layout presents a typical case of the Qing Dynasty's capital system[29]. Between the capital and the imperial city, there is also the Longxing Temple at the foot of Jiuhua Mountain, which is said to be the place where Zhu Yuanzhang once became a monk. Although the existing buildings have been rebuilt by later generations, they still retain the traditional layout.

2.4 CURRENT SITUATION EVALUATION OF CHARACTERISTICS

Overall, since the establishment of the Ming Dynasty as the capital city, the respect and utilization of natural landscapes, as well as the embodiment of traditional ritual culture, have been relatively intact and passed down to this day in the construction of Fengyang Ancient City.

Due to the exceptionally planning pattern of the ancient city, although influenced by later construction, its macro pattern still exists. Most of the mountains around the ancient city are still covered with green plants. Although rivers and mountains are no longer able to form a complete runoff system, most of their basic forms still exist, and some of them formed strip-shaped ponds and wetlands. The current situation within the base site is mainly farmland and villages, and there is still a 1100 meter long "L" shaped city wall and Xihua Gate pedestal in the southwest. The Drum Tower is the most complete building that has been preserved to this day; The Tushan Gate is the most well preserved city gate site among the nine gates of Zhongdu; Other relics such as the Bell Tower, Fengyang Prefecture, Fangqiu, Yuanqiu, and Guanxing Terrace, although there are no traces to be found, their foundations can still be clearly verified. In addition, among the famous "Eight Scenic Spots of Fengyang" in the Qing Dynasty, there are five within the scope of the capital city of Ming Dynasty. Among them, the landscapes of Longxing Evening Bell, Jiuhua Barrier, and QiaolouGuishi are basically well preserved; The base of the Haoliang Guanyu and Diaotai Spring Rise landscapes still exist, and there is a high possibility of restoration (Figure 3).



Figure 3: The distribution of existing relics

However, in recent years, with the increase in scale and speed of ancient city construction, the traditional spatial characteristics of this ancient city have gradually faded away. On the one hand, the interaction between the construction of ancient cities and the landscape environment is gradually weakening. A considerable number of new buildings have rudely invaded the natural landscape areas around the ancient city. Some high-rise buildings also block the view of the mountains and water. The axis relationship of the new block is unclear, the scale is too large, and it is incompatible with the original texture of the old city. On the other hand, although there are still 6 national cultural relics and 2 provincial cultural relics, most of the historical relics are severely damaged, and there is a lack of connection between important cultural heritage sites such as the Drum Tower and the Imperial City. A few relics such as the Drum Tower are well preserved due to their central location, but their surrounding auxiliary facilities is poorly managed. There also lack recreational facilities, and lack integration with the comprehensive functions of leisure, culture, exhibition.

III. Reshaping the Characteristics of Shanshui Ancient City

With the strong drive of urbanization in recent years, the scale of Fengyang Ancient City has rapidly expanded. In the new version of the overall plan for the ancient city, the construction land area of the central urban area reaches a scale of 50km² by the end of 2030, which roughly overlapping with the planning scope of the Ming Dynasty capital city. This provides a significant opportunity for the ancient city to reshape its historical landscape. Therefore, by conducting research on overall ancient city design, it is hoped that efforts will be made to enhance the impact of the historical environment of mountains and waters on the characteristics of Fengyang Ancient City in the future, and to build Fengyang into a livable and tourism friendly ancient city. Based on specific current issues, corresponding strategies include four aspects: strengthening the landscape pattern, protecting historical relics, constructing a height control system, and improving heritage corridors.

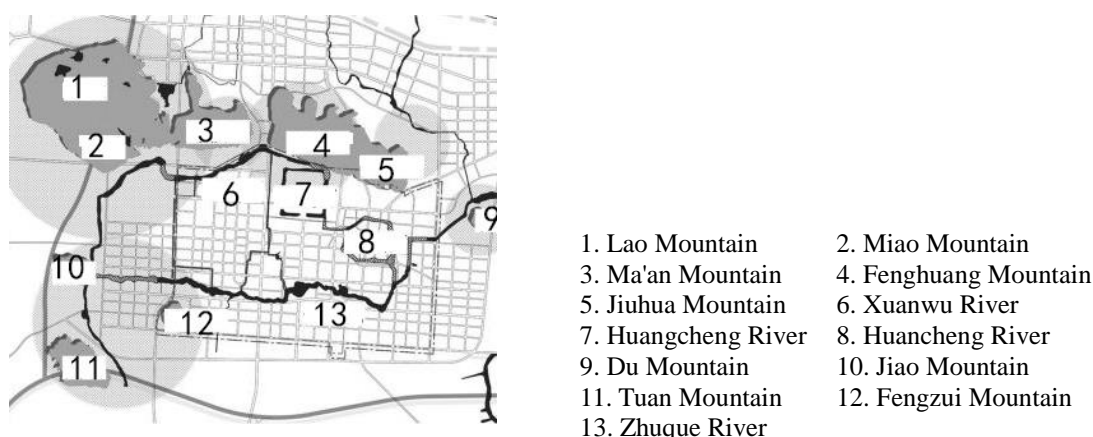


Figure 4: The reshaping of “ Shanshui” pattern

3.1 STRENGTHENING THE LANDSCAPE PATTERN

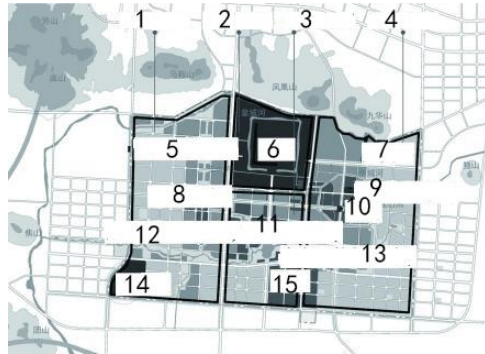
Based on the historical urban layout of the Ming Dynasty capital, combined with the current landscape conditions, a landscape pattern of "three mountains facing north, two gaps facing each other, north-south water veins, and a double ring road protecting the city" is constructed (Figure 4). The specific strategy includes: strengthen three north-south main roads, form an axis with Fenghuang Mountain, Ma'an Mountain, and Jiuhoa Mountain in the north, improve the environment at the foot of Fengzui Mountain and Du Mountain, rectify, dredge, and connect the water systems of Shannan creek in the north of the city and Dushan Creek in the south of the city, provide sufficient water sources for the two water systems of Huangcheng River and moat, etc.

3.2 PROTECTING HISTORICAL RELICS

In accordance with the principle of "strict protection, active repair, moderate reconstruction, enhanced utilization, restoration of pattern, and creation of nodes", the protection of historical relics needs to be carried out from the following three aspects.

Firstly, zoning control and layered protection should be implemented. Taking important historical buildings as the core, designate regional level such as key historical protection areas, general historical protection areas, first-class construction control areas, second-class construction control areas, and modern style areas. The height, architectural style, and color of buildings around the protection areas should be controlled. According to the distribution of historical and cultural elements, different landscape zones are formed, namely

the Central Hongwu Area, the North Imperial City Area, the East West Old City Area, and the New City Area. The Huangcheng and Hongwu districts showcase the historical and cultural heritage of the ancient city; The old city area showcases the historical and cultural heritage of the ancient city, as well as the lifestyle and culture of the old city; The new city area showcases modern ancient city landscape culture and modern ancient city lifestyle culture(Figure 5).



- | | |
|--------------------------------------|---------------------------------------|
| 1. New City Area | 2. Huangcheng Area |
| 3. Hongwu Area | 4. Old City Area |
| 5. Tushan Gate (Restored) | 6. Imperial City |
| 7. Longxing Temple | 8. Bell Tower (Restored) |
| 9. Fengyang Prefecture (Restored) | 10. Drum Tower |
| 11. Hongwu Gate (Restored) | 12. Front right Jia Di Men (Restored) |
| 13. South Left Jia Di Men (Restored) | 14. Fengzui Mountain |
| 15. Yuanqiu Hill | |

Figure 5: The hierarchical and zoning control of urban spatial characters

Secondly, 17 historical streets and alleys should be identified. For existing areas with good quality and appearance, such as Huapu Corridor Street, the current layout should be maintained; For historical streets and alleys that are still in the pattern but have undergone significant changes in appearance, with high historical value and located on important ancient city axes, such as Hongwu Avenue and Yunji Street, they will be repaired and renovated one by one; For historical streets and alleys with high historical value that have disappeared, those located on important axis positions can be chosen for restoration, such as Youbi Street on the axis of the Bell Tower.

Thirdly, in terms of individual buildings, key areas that need to be protected and repaired include Drum Tower, Longxing Temple, Imperial City, and Yuanqiu Hill; For historical buildings with high historical value that have disappeared, it is necessary to choose those located at important nodes in the planning for restoration and construction, such as the Bell Tower, Hongwu Gate, Tushan Gate, and other four gates in the central capital city.

3.3 BUILDING A HEIGHT CONTROL SYSTEM

By combining mountain height control, old city height control, visual corridor control, and line of sight control, a height control system is constructed.

Firstly, by gradually decreasing the height limit near the mountain, height control is implemented around important mountain areas to ensure that the volume of the mountain is not affected. According to Table 1, the building height around the mountain is controlled.

Table 1: The height control of the surrounding buildings of the mountain

Distance from the mountain boundary (m)	Height control (m)
100m	9
200m	18
250m	24
350m	36
500m	54
700m	80
Over 700	100

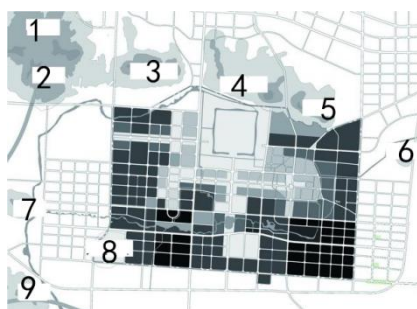
Secondly, by adopting a gradually decreasing height limit near the old city, the surrounding space of the old city is ensured to be comfortable. The height of buildings within a 100 meter radius around the city may be controlled to 15 meters. According to Table 2, the building height around the imperial city is listed.

Table 2: The height control of the surrounding buildings of the imperial city

Distance from the Imperial City (m)	Height control (m)
Interior	9
300	15
600	21
900	27
1 200	33
1 500	39

In addition, select two important mountain viewing corridors, strictly control the height of buildings on both sides of the corridor, and ensure that the mountain is observed from the viewpoint, with a clear view from a 15 ° or above angle.

Furthermore, select three mountain viewing points and strictly control the building height between the viewing areas of the nodes to ensure a mountain viewing experience on important nodes. It is required that the mountain can be seen at a height of 2/3 from the nodes. Overlay the above four height control strategies (Figure 6) to obtain the height control system of Fengyang urban area (Figure 7).



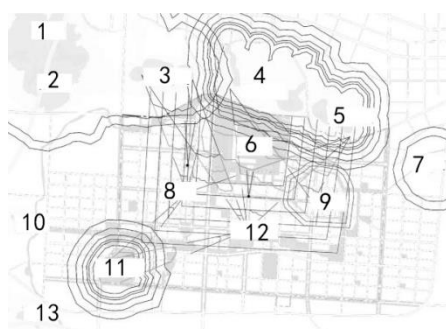
- 1. Lao Mountain
- 2. Miao Mountain
- 3. Ma'an Mountain
- 4. Fenghuang Mountain
- 5. Jiuhua Mountain
- 6. Du Mountain
- 7. Jiao Mountain
- 8. Fengzui Mountain
- 9. Tuan Mountain

Figure 6: The superposition of height control strategies

3.4 IMPROVE THE HERITAGE CORRIDOR

Firstly, identify 16 resource points. The following is the methods: build the Imperial City Ruins Park with the city walls and the Imperial City River as the core, add functions such as cultural display, leisure and entertainment, and high-end reception; Increase tourism facilities around the Drum Tower, develop characteristic businesses, and serve as the core cultural and leisure area of the old city; Restore important pavilions, platforms, gates, towers, etc. as the backdrop of the ancient city axis; Restore the four major gates and create important nodes by combining the surrounding squares and supporting cultural facilities.

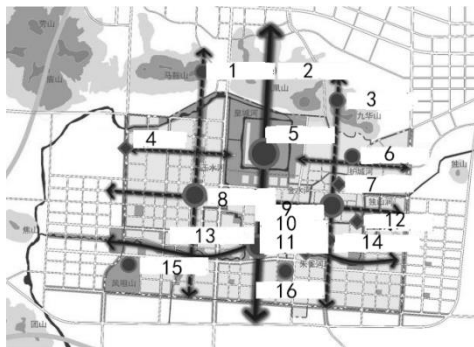
Secondly, after restoring and sorting out the streets and water systems, a five horizontal and six vertical heritage street and a three-bay-water system have been formed. Among them, Huapu Corridor Street, Louxi Street, Loudong Street, and Lounan Street are pedestrian streets that showcase the core historical style of the Ming Dynasty; Hongwu Avenue, Yunji Street, and Youbi Avenue, as historical image streets, focus on the creation of image style; Fubei Street, as a street with a coordinated style, emphasizes the priority of walking and creates a good environment.



- 1. Lao Mountain
- 2. Miao Mountain
- 3. Ma'an Mountain
- 4. Fenghuang Mountain
- 5. Jiuhua Mountain
- 6. Imperial City
- 7. Du Mountain
- 8. Bell Tower
- 9. Drum Tower
- 10. Jiao Mountain
- 11. Fengzui Mountain
- 12. Hongwu Gate
- 13. Tuan Mountain

Figure 7: The zoning control of height

Finally, various historical sites are connected through streets, alleys, and water systems to form a pattern of "jade veins and beads" (Figure 8). Add functionality and transform the landscape to enhance its attractiveness, forming an ecological green pedestrian system and a historical and cultural heritage corridor.



- | | |
|--------------------------------------|--------------------------------------|
| 1. "The Moon Blossoms from the West" | 2. "Phoenix in Flight" |
| 3. Jihua Barrier | 4. Tushan Gate |
| 5. "Imperial City Evening Crow" | 6. "Longxing Evening Bell" |
| 7. Fengyang Prefectural Government | 8. "Bell ringing and Auspiciousness" |
| 9. "Qiaolou Returned to the Market" | 10. "Hongwu Fengwan" |
| 11. "Observing Fish in Autumn Water" | 12. Yushui Ring City |
| 13. Front right Jia Di Gate | 14. South Left Jia Di Gate |
| 15. "Fengzui Wangdu" | 16. Yuanqiu Site |

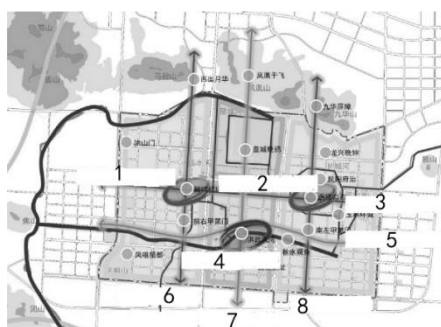
Figure 8: The configuration of heritage corridor

3.5 ANCIENT CITY CHARACTERISTIC SKELETON

Based on the above four strategies, the future layout of the ancient city has been thoroughly reshaped, presenting preliminary spatial characteristics. Specifically, it can be summarized as the characteristic framework of the ancient city, which includes "three outstanding centers, four major areas, five Feng-shui mountains, five major axes, seven rivers and bays, and sixteen nodes" (Figure 9).

The "Five Mountains" refer to Phoenix Mountain, Ma'an Mountain, Jihua Mountain, Fengzui Mountain, and Du Mountain. The "Seven Rivers" refer to Dushan creek, moat, Huangcheng River, Yushui River, Jinshui River, Zhuque River, and Xuanwu River. Combining with the ancient city axis planned by the Central Capital City, infiltrating new cultural connotations, five landscape axes are formed, namely the water cultural landscape axis, the eastern historical and cultural customs axis, the western modern service and leisure axis of the western area, the tourism service axis between the bell and drum towers, and the water system landscape and leisure axis. The three ancient city centers, namely the commercial and cultural center, the famous city tourism center, and the historical leisure center.

The four major scenic areas include the Huangcheng area, Hongwu area, Old City area, and New City area. The Hongwu area serves as a showcase for the image of the ancient city, a tourism reception and leisure center, with a focus on creating cultural tourism, leisure vacation, and other functions; The Huangcheng area, as the core protected area of historical and cultural heritage sites[30], keeps an eye on creating functions such as cultural display and senior reception; The old city area, as the core historical and cultural area, with a view to create distinctive commercial and life service functions; As the administrative center, cultural center, commercial and business center, the New City area emphasizes on creating new functions at the ancient city level such as administrative office, high-quality commercial and business, and cultural leisure.



- | | |
|-------------------------------------|-------------------------------|
| 1. Commercial and Cultural Center | 2. Famous City Tourism Center |
| 3. Bell and Drum Tower Leisure Axis | 4. Historical Leisure Center |
| 5. Dushan Creek Landscape Axis | 6. West City Service Axis |
| 7. Imperial City Feng Shui Axis | 8. Chengdong Cultural Axis |

Figure 9: The reshaping of urban spatial configuration in Fengyang



Figure 10: Current situation of the abandoned well and moat

In the design of the characteristic architecture of the ancient city, key points must be placed on the inheritance and protection of historical and cultural heritage. Referring to the distribution map of ancient city relics, primary monitoring measures will be implemented for cultural relics, such as the urgent need for rescue and protection of the Four-Eyed-Well in the suburbs, the urgent need for dredge of the moat urgently, etc (Figure 10). It is necessary to integrate the central capital city, take the core of natural landscapes, respect nature, respect history, and keep ancient city into the use of modern functions.

IV. CONCLUSION

The construction and development of Fengyang Ancient City hold a special position in history. Based on relevant theoretical research on the shaping of ancient city characteristics, this study analyzes the interactive characteristics of the pattern, landscape, history, and other environments that have been inherited from the Ming Dynasty's central capital and the Qing Dynasty's Fengyang Prefecture to the present day. Based on the current investigation, the utilization of landscape and historical resources is proposed to reshape the landscape characteristic. By strengthening the landscape pattern, protecting historical relics, constructing a height control system, and improving heritage corridors, Fengyang Ancient City will be transformed into a distinctive three-dimensional framework. At the overall level of ancient city design, the shaping of the macro landscape historical characteristic pattern is also an important content. The above research results provide guidance for the restoration of Fengyang and other similar ancient city sites, and offer ideas for the sustainable improvement of the living environment.

ACKNOWLEDGMENTS

This work was financially supported by Chinese Ministry of Education Project "Fengyang Mingzhongdu Water System Research" [Grant No. 19YJCZH237].

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