

The Shaping of Spatial Morphology by Water Systems in Traditional Villages in Southern Hunan, China and Its Mechanism of Action

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How to cite this paper: Xu, Y., Zhou, W.L. and Zhang, Z.H. (2023) The Shaping of Spatial Morphology by Water Systems in Traditional Villages in Southern Hunan, China and Its Mechanism of Action. *World Journal of Engineering and Technology*, 11, 389-407.

<https://doi.org/10.4236/wjet.2023.112028>

Received: April 12, 2023

Accepted: May 27, 2023

Published: May 30, 2023

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Abstract

The abundant water resources, rainy climate and dense water network had deeply influenced the formation and development of traditional villages in the southern Hunan region of China. This paper was adopted buffer zone analysis, categorical statistical analysis, vectorization analysis and data literature analysis, studied the shaping of traditional village site selection, plane form and internal spatial structure by water systems in southern Hunan, China, and the mechanism of their effects. The results showed that: 1) The shaping ability and mechanism of the traditional village water system in Xiangnan area on spatial morphology was mainly based on the function of the water system. 2) The layout and spatial morphology of traditional villages were deeply affected by the width, area and form of water systems in Xiangnan area. 3) Traditional villages gave more consideration to water systems with large watershed areas in site selection. 4) Water systems with small watershed areas generally had a greater impact on the internal structure of traditional villages.

Keywords

Ancient Villages of China, Site Selection, Two-Dimensional Planar Forms, Street Structure

1. Introduction

With the development of social economy, people are no longer only satisfied with the need of material life, but gradually started to pay attention to the filling of spiritual culture. In the background of this demand, traditional culture has entered the public eye, and traditional villages, as the carrier of ancient farming civilization, have become the object of key research and protection by scholars.

However, in the pursuit of improving material living standards, most of the traditional villages have been damaged to varying degrees, and the protection of traditional villages is imminent. Facing the current serious situation of traditional villages, the Party and the State have made a series of decisions and measures for their protection and restoration: the Ministry of Housing and Urban-Rural Development, the Ministry of Culture, the Ministry of Natural Resources, the Ministry of Finance and other departments organized the first national mapping survey of traditional villages in 2012, and villages with historical and cultural values were entered into the “List of Traditional Villages in China” in the list; in 2017, the No. 1 document of the Central Government proposed to encourage and support the protection of traditional villages and villages with ethnic minority characteristics, and to carry out continuous protection and moderate development for qualified areas; in 2018, the “Strategic Plan for Rural Revitalization (2018-2022)” released by China pointed out that [1]: “we should strengthen planning to lead, scientifically orderly promote the revitalization of rural industries, talents, culture, ecology and organizations, emphasizing that traditional villages are important carriers for manifesting and inheriting excellent Chinese traditional culture, and that the relationship between protection, utilization and development should be coordinated, and efforts should be made to maintain the integrity, authenticity and continuity of villages.” The continuous implementation of relevant policies has provided new opportunities for traditional villages to achieve rational conservation and sustainable development.

2. Literature Review

Although domestic research on traditional villages started later than that of foreign countries, the breadth and depth of research perspectives have been greatly enhanced. As of March 2023, according to the keyword frequency of traditional villages on the China Knowledge Network, most domestic studies on traditional villages focus on the study of cultural heritage and customary characteristics of traditional villages, proposals for the protection and development of traditional villages, spatial distribution of traditional villages, landscape culture of traditional villages, spatial form of traditional villages, and habitat environment of traditional villages. Among them, the research on the spatial form of traditional villages has been the focus of research in recent years, but there are not many relevant studies in Xiangnan area. Scholars focus more on traditional villages in areas with more characteristics or better tourism development, such as Guanzhong Loess Plateau area, Huizhou area, Sichuan Province [2], Xiangxi Province of Hunan Province, Guilin area, Guangfu area, etc., and the research content is also relatively single, it's basically a comprehensive study of all factors that affect traditional villages. Of course, there are also scholars who study the spatial form of villages according to a certain characteristic of traditional villages in a certain region, for example, a study on the spatial form of traditional villages in

the western Hunan region in response to commerciality [3], a study on the spatial form of traditional villages along Xiaohe ancient road based on defensive characteristics [4], correlational studies on the spatial form of traditional villages in the Luohe river based on defensive [5], the study of the spatial form of traditional villages in the Qingjian river basin for regional environment [6]. The research on the spatial form of traditional villages in Xiangnan area is also similar, such as the comprehensive research on the factors that can affect the spatial form of traditional villages in Xiangnan area [7], or the research on the spatial form of traditional villages in Xiangnan area based on the same characteristics, such as the summer wind and heat environment [8] the Han nationality [9], and the single family name [10], but most of the studies on the spatial form of traditional villages based on the single influencing factor of water system are only similar to the influence of water system on the architectural pattern of traditional villages in Xiangnan area [11].

In this paper, the water system, one of the important factors influencing the spatial form of traditional villages, is analyzed in depth, and the role and influence of the water system in the formation of the spatial form of traditional villages in the south of Hunan area is studied to provide a new idea for the study of the spatial form of traditional villages.

3. Data Sources and Research Methods

In this paper, 203 traditional villages in the first five batches in southern Hunan were selected as the research objects, among which there were 28 in Hengyang, 85 in Yongzhou and 90 in Chenzhou. The main research methods used in the article are buffer zone analysis, categorical statistical analysis, vectorization analysis and data literature analysis. The basic data used in this paper were obtained from 91 Weitu Image Downloader (Class 16-17), high resolution remote sensing images, national resource data sharing service platform, various academic websites, planning texts of the sample villages, and two-dimensional plane vector maps obtained by digitizing relevant information (e.g.: the boundary outline of villages, building outline, and streets and roads in villages) in ArcMap platform.

Firstly, we collected the basic information of the sample villages by reading a lot of literature, newspapers and local chronicles related to the sample villages with the help of online resources; then, based on the remote sensing images of the south Hunan area, 203 traditional villages were located, through the visual interpretation of the remote sensing images and the analysis of the distribution of traditional villages in the buffer zone of the south Hunan water system, the location relationship between the sample villages and the water system was summarized; finally, based on the historical information, relevant planning texts, high-resolution remote sensing images, the outline of village boundaries and streets and roads after digitization, the spatial form of traditional villages shaped by water systems was analyzed and traced back to its causes.

4. The Influence of Water System on the Site Selection of Traditional Villages in Xiangnan Area

4.1. Overview of the Study Area

Xiangnan, the southern region of Hunan Province, adjacent to Guangdong, Guangxi and Jiangxi provinces, is the famous “land of fish and rice” in China, and is also an area inhabited by ethnic minorities and Han Chinese, located at 111°06' - 114°14' East longitude and 24°39' - 27°40' North latitude. It is located at 111°06' - 114°14' East longitude and 24°39' - 27°40' North latitude. The area of Xiangnan generally includes three prefecture-level cities, Chenzhou, Yongzhou and Hengyang, north of Guiding Mountain and south of Hengshan Mountain, with a total area of 57,000 km² and a population of about 18.8 million.

Most of the area in Xiangnan is hilly and mountainous, and the overall topography is high in the southeast and low in the northwest, and from north to south it shows a progressive pattern of plains—hills—hills—low mountains—middle mountains. The climate is mild and humid, with abundant rainfall and little snow in winter, and the heat, light and water are basically synchronized, which is conducive to the development of diversified structure agriculture [12]. The water system in southern Hunan is relatively well developed, with a dense network of rivers. With the Luoxiao Mountains on the east side as the watershed, it can be divided into three major basins: the Xiangjiang River, which belongs to the Yangtze River system, a small number of Ganjiang tributaries and the Beiji River basin, which belongs to the Pearl River system.

The Ministry of Housing and Urban-Rural Development of the People's Republic of China and other ministries promulgated five batches of “Chinese Traditional Villages List” from 2012 to 2019, and 203 traditional villages were selected in the Xiangnan area, which are at the forefront of the country in terms of number and integrity of preservation. Among these 203 traditional villages, most of them are attached to rivers and streams, and a small number of them are surrounded by water ponds or by digging ponds in the village to survive and develop. Traditional villages in south Hunan were classified by the buffer zone treatment of water systems (excluding ponds, canals, small streams, etc.): villages no more than 100 meters from the nearest water system (indicated by red dots in **Figure 1**), villages 100 - 500 meters from the nearest water system (indicated by yellow dots in **Figure 1**), villages 500 - 1000 meters from the nearest water system (indicated by pink dots in **Figure 1**), villages more than 1000 meters from the nearest water system (indicated by green dots in **Figure 1**), then, we categorized the traditional villages in each distance range and found that the distance between traditional villages and the water system was higher than 1000 meters, reaching 68.97%, which means that people prefer to keep a distance not too far and not too close from the water system; the number of traditional villages within 100 meters from the water system was relatively small, only about 4.93%, which means that most traditional villages do not tend to stay too close to the water system. The number of traditional villages within 500 m - 1000 m distance

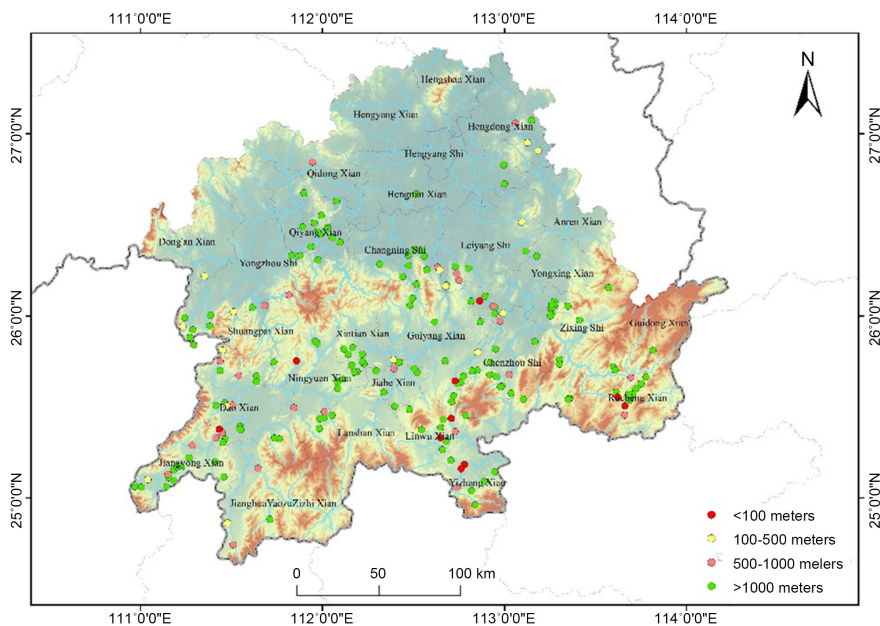


Figure 1. Distribution of water systems and traditional villages in Xiangnan area.

is not too many, but it also accounts for a certain proportion. This kind of area with a certain distance from the water system but the function of the water system can be radiated to is also the location that traditional villages are more willing to consider in the site selection (see [Table 1](#)).

4.2. The Function of Water Systems on Traditional Villages

In the Tao Te Ching, it is said that “Man follows the laws of the earth, the earth follows the laws of the sky, the sky follows the laws of the Tao, and the Tao follows the laws of nature.” Ancient Chinese philosophical thought shows that only when human beings follow the laws of nature will society be peaceful and tranquil. In the early days of village formation, there was no modern large-scale water diversion equipment, people’s production and life mainly depended on natural conditions, and the use of the water system basically took the “principle of proximity”, so in the location of the village, water is the first element. The survival of people is inseparable from water, and the prosperity and development of traditional villages is also inseparable from water, which makes water resources have a unique and irreplaceable role for the location of traditional villages. The water system of traditional villages has multiple functional characteristics, and in this paper, the following functions are considered: production and living functions, disaster prevention and defense functions, transportation and trade functions, climate regulation functions, and psychological adjustment functions (see [Table 2](#)).

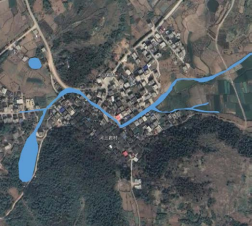

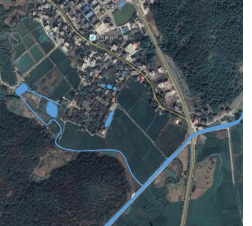
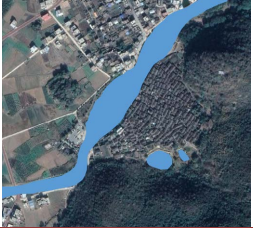

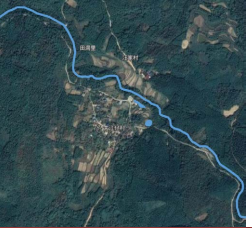
4.3. The Influence of the Productive and Living Functions of Water Systems on the Location of Traditional Villages

The Theory of Things says: “So the establishment of heaven and earth, water.


Table 1. Statistics of each range and percentage of traditional villages and water system locations in Xiangnan area.

Distance between traditional villages and the nearest water system	Number of traditional villages	Percentage of traditional villages
within 100 m	10	4.93%
100 - 500 m	21	10.34%
500 - 1000 m	32	15.76%
Over 1000 m	140	68.97%
total	203	100%

Table 2. Analysis of the influence of water system function on the site selection of traditional villages.

Water system function	Production and living function	Disaster prevention and defense function		
Impact Analysis	<p>The villagers of Hesanyan Village dig a canal to bring the water from the ancient rock cave mountain into the village and flow in series, and the water flows continuously throughout the year, nourishing thousands of acres of land nearby, facilitating farming and planting, and meeting people’s daily needs.</p>	<p>Xiapu Village is located on the eastern side of the Mishui river, and has sufficient water resources to facilitate irrigation and water storage for farming, as well as for shipping.</p>	<p>The Long family compound holds the crescent pond in the north, and the whole village is built with sewers for discharging sewage from top to bottom, in the form of open ditches or culverts combined with streets and alleys, which are powerful in preventing drought and flooding.</p>	<p>Tanwenxi Village is located on the flat land surrounded by mountains, and the two streams surrounding the ancient village can play a similar protective role as a moat, while also playing a role in fire prevention and theft prevention.</p>
Schematic				
Water system function	Transportation and Trade Function	Climate control function		
Impact Analysis	<p>The Xie Mu River is an important channel for the villagers of Shanggantang Village to communicate with the outside world. Through water transportation, food, oil, firewood, rice, salt and other necessities from the outside world are delivered to the village, and the village’s cash crops are also transported out.</p>	<p>Banliang Village: In ancient times, the ancestors developed a water trade industry along the Banxi River, and commerce flourished along the water, forming a market street with many stores and several money changers, and the overall scale of the village was large.</p>	<p>The village of Fujiangzai is built in a place surrounded by green mountains, with a natural stream winding through the north of the village and a lot of long bamboo by the stream, which is like a “natural oxygen bar”, and has been known as “Fujiangzai Fujiangzai, good mountain and good water” since ancient times, with a pleasant climate.</p>	<p>Ganyantou Village: Xianshui flows from the east side of the village to the north, while the Jinshui flows from the west side of the village, and the two waters converge to form a “golden belt” surrounded by three sides, which brings the village together and does not leak out.</p>
Schematic				

Continued

Water system function	Psychological adjustment function
Impact Analysis	<p>Dayangdong village as a whole revolves around a large pond, and the ancestors used each part of the Bagua diagram, such as Li, Tui, Qian, Xun and Kan, to correspond to the clan's eight gatehouses, which were laid out in a circular embrace bureau style with a unique appearance.</p> <p>The village is located on the flat land surrounded by mountains and water. The ancestors used the topography to follow the S-shaped gossip pattern and built along the slope, so that the village area in general "hides the wind and gathers the qi".</p>
Schematic	

The water, the essence of the earth. Exhale the vital energy, send the sun and moon, through the stars, all by water and rise.” It is believed that water is the essence of all things. Water is closely related to people’s lives and is the basic survival guarantee for human beings and other species. The groundwater is abundant in the southern Hunan area, and most of the village residents rely on wells for drinking water, while the water from the rivers and streams near the waterfront is mainly used for panning rice, washing vegetables and laundry (also for drinking), which can meet people’s daily water needs. At the same time, the waterfront is also a place where villagers like to go when they are chatting and taking a break, playing and relaxing. Without considering other influencing factors, the richer the water resources, the higher the priority of traditional village site selection; some traditional villages near the water system and with a large watershed area can develop important industries such as shipping and fishing, in addition to agriculture. For example, Hesanyan Village and Xiapu Village.

4.4. The Influence of the Disaster Prevention and Defense Function of Water Systems on the Location of Traditional Villages

In any living environment, safety is the first priority. In the stage of inadequate social development, traditional villages can only defend their homes to a large extent through the natural geographical environment, of which water systems and mountains are better natural barriers, therefore, traditional villages are usually built in areas surrounded by mountains and water.

Fire: Traditional villages in the southern Hunan region are built with wood as the main material and brick walls on the periphery, which are prone to fire during the dry and rainy season in summer and autumn. Whether it is natural fac-

tors or man-made accidents, fire is the biggest threat to traditional villages. The camping and management of water system can provide a strong guarantee for the survival and development of a village. For example, Tanwenxi village.

Droughts and floods: “Hunan droughts and floods appear every year, ten years, ten faces, spring and summer rains, autumn dryness, droughts into blocks and floods into lines” is the image summary of Hunan droughts and floods by the folk. The rivers in Xiangnan area are all rain-fed rivers and there are many hills in the territory, plus the uneven precipitation in Xiangnan area, and there are many rain showers, so the flood prevention becomes the top priority of village site selection [13]. Villages generally make full use of the foot of the mountains and valley slopes, choose relatively gentle terrain, using the local height difference as the main, ditching as a supplement to drainage, in order to avoid flooding; at the same time, in the village inside and outside the excavation of a number of ponds, which can be used to store water in case of emergency. For example, the Long family compound.

(Military) Defense: The village is surrounded by mountains, which can form an enclosed space open to the inside and closed to the outside, easy to defend and difficult to attack; the village is surrounded by water—just like the ancient moat, which is the barrier at the entrance of the village. In ancient times, Xiangnan was known as the land of southern barbarians, and because it was located in the southern part of Hunan Province, it was always a “place of contention for soldiers” during the war years, and there were constant banditry [11]. Therefore, whether it is a mountain or a water system, areas with natural barriers are more likely to be favored by people, and sufficient water is a more important factor compared to mountains. For example, the village of Tanwenxi.

4.5. The Influence of the Transportation and Trade Function of Water Systems on the Location of Traditional Villages

Transportation and trade are necessary factors to ensure the sustainable economic development of a region, but the transportation system was not developed in ancient times, and shipping was preferred in many ways compared to land transportation. Driven by this, the traditional villages in Xiangnan area tend to be located in areas with rich water systems, especially in the remote areas of mountainous regions with poor transportation, where the demand for the water system shipping function is much higher than agricultural production. Examples include Shanggantang Village and Banliang Village.

4.6. The Influence of the Climate Regulation Function of Water Systems on the Location of Traditional Villages

The water system has a certain regulating effect on the climate and ecological environment of the surrounding area, and the climate of the areas rich in water resources is more humid and the temperature difference is smaller, so the location of traditional villages naturally favors such areas. The area in south Hunan belongs to the transition climate zone from south subtropical to middle sub-

tropical, with high temperature and dryness in summer and cold and humid in winter. Surrounded by a certain scale of water bodies, the wind can make the air humidity inside and outside the village reach a relatively balanced state, which can effectively regulate the temperature and improve the local microclimate of the village. At the same time, water is also a necessary resource for plant growth, so the water's edge is often accompanied by a variety of green plants, thus purifying the air [13]. For example, Fujiangzai village and Ganyantou village.

4.7. The Influence of the Psychological Adjustment Function of Water Systems on the Location of Traditional Villages

The traditional philosophical thought of the unity of heaven and man in ancient China has deeply influenced the construction of traditional villages. Guo Pu's "burial" in the Eastern Jin Dynasty was the first to put forward the term "feng shui": "air by the wind is scattered, the boundary water is stopped. The ancients gathered so that does not disperse, the line so that there is a stop, it is called feng shui." Water occupies an important position in the traditional concept of feng shui, and the traditional concept of feng shui has gradually evolved into a culture that gives people a certain degree of psychological comfort and plays a good role in psychological adjustment. At the same time, in the Chinese traditional feng shui concept, "water is the main source of wealth", "water is the source of wealth" and so on, so in the selection of the site of the village, people always like to choose the area of rich water resources, in order to be able to prosper and develop the village, family descendants The village will be prosperous and the family will continue to grow. For example, Dayangdong Village and Xinao Village.

4.8. The Disadvantages of Water Systems for Traditional Villages

Although water is an indispensable resource for traditional villages, it is not entirely harmless to traditional villages, as areas with too much water are prone to flooding and erosion of buildings and land. Therefore, traditional villages also follow the idea of "distance makes beauty" in the relationship with the water system, but some water systems have small flow and watershed areas, so the consideration of the hazards is directly ignored, and the consideration of hazards is generally for the larger water systems. For safety reasons, when building a village around a larger water system, the village will be built at an appropriate distance from the water system according to its flow and watershed area, and generally not "zero distance" from the water system.

5. The Location of Water Systems and Traditional Villages in Xiangnan Area

Water has been a very important natural resource since ancient times, which is closely related to people's life and is the basic survival guarantee for human beings and other species. In the early days of village formation, people's production and life mainly depended on natural conditions, and the use of the water

system basically took the “principle of proximity”, so water was the first element in the selection of village sites. The survival of people cannot be separated from water, and the prosperity of traditional villages is also inseparable from water, which makes water resources have a unique and irreplaceable role in the location of traditional villages [12]. According to the width and area of the water system, there are two types of traditional villages in the south of Hunan area, single-side type and double-side type, in terms of their relationship with water (see Figure 2).

5.1. Single-Sided Type

Single-side type is the main type of traditional village and water system relationship in Xiangnan area, the mountains surrounded by water is the ideal place for village site construction. The water body adjacent to this type is large in area, usually a river with a width of more than 25 meters or a large pond, and has either transportation or irrigation functions, or both. The unilateral type of traditional villages in the south of Hunan area are mainly shown as encircling, parallel and free in dealing with the relationship with water.

1) Surrounding type: Surrounding type of traditional villages in Xiangnan area is the water system to form a hug around the village, the village site is generally located in the “belt-like water” hug inside the sedimentation area, such as Qifengdu town of Gangjiao village: the West River from the village in front of a hug around the potential winding down the east side of the village, and the back of the mountain, the village to form an echo of the trend, the water system of The water system’s embrace of the momentum determines the layout of the village building form.

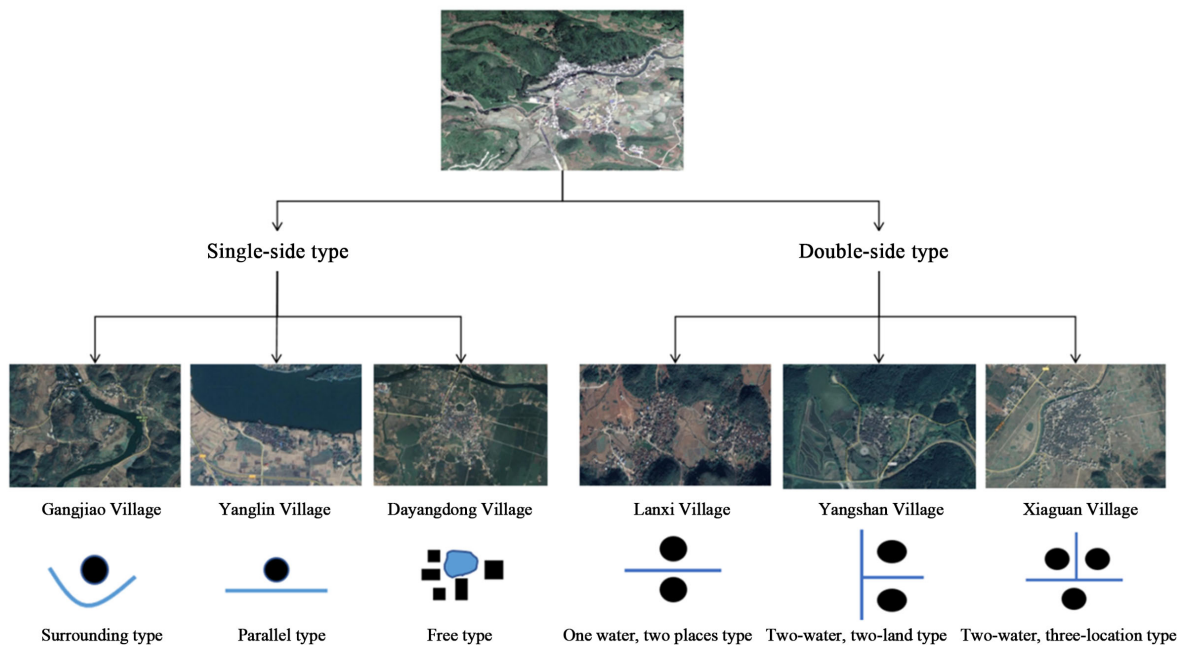


Figure 2. Location relationship between traditional villages and water systems in Xiangnan area.

2) Parallel type: The relationship and intimacy between villages and water in the parallel type is second only to the encircling type, and the main streets of traditional villages in this form are basically parallel to the water system. For example, Yanglin Village in Yanglin Town, Hengdong County: the village is laid out in a parallel water system at the section of the river where the water flows through the village, with the river section zigzagging slightly upstream and downstream of the village, with the main street following the same course as the water system and the secondary streets perpendicular to the main street.

3) Free type: Traditional villages are located “according to the water”, freely and flexibly according to the shape of the water system to locate the site and layout. For example, in Dayangdong Village in Tiantang Town, Ningyuan County: the Jiuyi River flows slowly 300 meters in front of the village, and there are few large mountains and hills around the village, the ancient village follows the trend of the water system, with a large water pond as the center of the appropriate layout, forming a cluster-like plane form.

5.2. Double-Side Type

The traditional villages of double-side type are generally located on both sides of the main stream or tributaries with slower water flow, less water volume and a width of about 15 meters, and the water bodies near the villages are mainly for domestic irrigation. In the relationship with water system, the traditional villages in Xiangnan area are mainly of one water and two places type, two water and two places type and two water and three places type.

1) One water, two places type: One water, two places type means that the village is penetrated by one water, and develops within the scope defined by both sides of the water body, forming the layout form along both sides of the water system. For example, the village of Lanxi in Jiangyong County is divided into two groups, the upper village and the lower village, and the Lanxi River runs through the village in an “S” shape and connects the two groups.

2) Two-water, two-land type: The two-water, two-land type refers to the traditional village located at the confluence of two waters, divided by the tributary water system, extending on both sides of the tributary water system, forming two groups laid out along both sides of the tributary water system. For example, in Yangshan Village in Zhenghe Town, Guiyang County, a small stream and its tributaries, formed by the convergence of mountain springs at the back of the village, divide the whole Yangshan Village into two groups, each of which draws water from the nearby stream for daily use and expands its housing construction along the respective streams.

3) Two-water, three-location type: Two-water, three-location type refers to the traditional village divided by dry and tributary, and then grows within the scope of the two water systems, forming three groups along both sides of the tributary water system and the opposite side of the dry water system. For example, the village of Xiaguan in Wanjing Town of Ningyuan County, with the de-

velopment of the village, is divided into three groups by the north-south flowing Lingshui and its tributary, the Washing Yan River, and the whole presents the characteristics of band-like layout along the river.

6. The Influence of Water System on the Plane Form of Traditional Villages in Xiangnan Area

The plane form is the material plane outline of the building group composed of each building monolith in the traditional village [14], the roads, water bodies, farmlands, woods and mountains around the village are not considered for the time being, and the characteristics of the boundary outline of the traditional village are defined and analyzed from the perspective of pure form: two-dimensional plane form. There are mainly rivers, rivulets, streams, lakes and reservoirs in Xiangnan area. With reference to the high-resolution remote sensing image map, according to the different types of waters or combinations of waters near the villages, the author found that the traditional villages in southern Hunan mainly present three planar forms, namely strip-like, cluster-like and scatter-like (see **Figure 3**).

Strip-like traditional villages are basically distributed on the single side of rivers or narrow, flat terrain on both sides, such as Yanglin Village and Puwei Village, which are distributed along rivers in a strip-like pattern on the single side of the water, and Yangshan Village and Xiaguan Village, which are distributed along rivers in a strip-like pattern on both sides of the water; there are a few villages that are not close to rivers, but are influenced by other water combinations and show the characteristics of strip-like distribution, such as Leling Village and Hesanyan Village, which are influenced by ponds, rock streams, canals and other water areas and have ribbon characteristics (see **Table 3**).

Cluster-shaped traditional villages are mainly located in the plains or relatively flat mountain basins, with rivers, streams, or canals and ponds nearby and surrounded the periphery of the village, such as Shanggantang Village and Chengxia Village, which are surrounded by natural rivers, streams, lakes or ponds; another example is Dayangdong Village and Jinhu Village, which have developed based on water ponds (see **Table 3**).

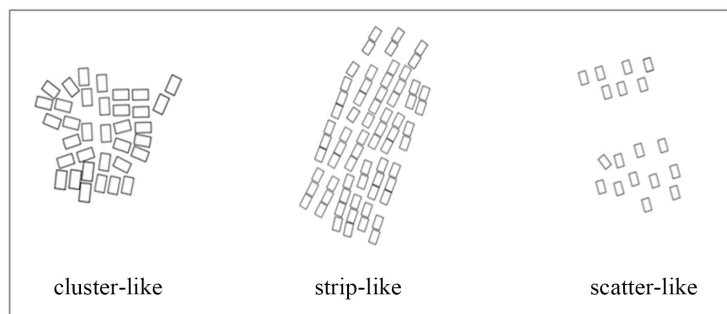



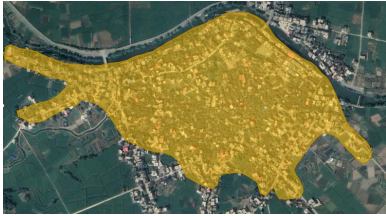

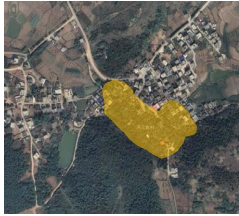


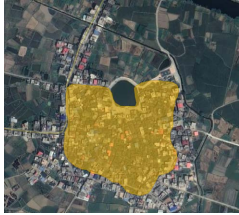
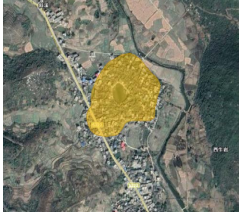




Figure 3. Planar morphological characteristics of traditional villages in Xiangnan area.

Table 3. Example of traditional village plane form in Xiangnan area.

Type of planar form	Example image			
Striped				
	Yanglin Village	Puwei Village	Yangshan Village	
				
	Xiaguan Village	Leling Village	Hesanyan Village	
	Cluster-shaped			
		Shanggantang Village	Chengxia Village	Dayangdong Village
				
Jinhu Village				
Scattered				
	Shuidong Village	Huangjialing Village		

Scattered traditional villages are mainly located in some areas where there are rivers and streams flowing through or many ponds scattered, but the terrain is more complicated. When the village was built, it was developed flexibly into a multi-group form by following nature and adapting to local conditions, the local water system either passes through the village or flows along the village, which is like a tie that connects all the groups of the village, making the village as a whole present the characteristics of a scattered plane form, such as Shuidong Village and Huangjialing Village (see **Table 3**).

7. The Influence of Water Systems on the Internal Spatial Structure of Traditional Villages in Xiangnan Area

Street and alley structure is the main expression of the internal spatial structure of traditional villages, which is the blood network of the whole village and the important channel through which each single building can reach each other. Street structure generally has three levels of “main street-sub-street-sub-sub-street”, the main street is the backbone of the village street space and is responsible for the communication between the village and the outside; then is the sub-street, which is the main activity space of the villagers and is an important corridor connecting the main street and the sub-sub-street of the village, and its width is slightly narrower than that of the main street; the last level is the sub-sub-street, which is responsible for connecting the residential buildings one by one, and has the characteristics of wide coverage, high distribution density and high privacy.

The study of village streets and alleys can help to understand the layout of the village, the main clan culture and the future development tendency. The traditional villages in Xiangnan region have formed a complex road network structure under the joint action of clan lineage, feng shui concept and water environment, but have a very significant and characteristic pattern of organization and form, showing the characteristics of interdependence between commonality and individuality. On the whole, the street texture of traditional villages in southern Hunan mainly includes three types of organization forms: fishbone network, tree-like network and radial network (see **Figure 4**).

Fishbone network is a road network system composed of main bones and secondary bones. The main bones are generally the main streets of traditional villages, which are the main axis of village development, and the secondary bones are generally connected with the main streets and sub-sub-street, with a clear road hierarchy. For example, Yanglin Village in Hengdong County, Hengyang City, north of the Mishui river, far from the mountains, surrounded by extensive farmland and pleasant scenery. The village was built along the Mishui river and the ancestral hall as the axis of development: the village showed the east-west direction of the belt distribution characteristics; Dong surname is the village’s main surname, Dong Hua Gong Ancestral Hall for the Dong family’s total ancestral hall, each residence, store, ancestral hall and other buildings to the east of the village Dong Hua Gong Ancestral Hall as the center, and constantly

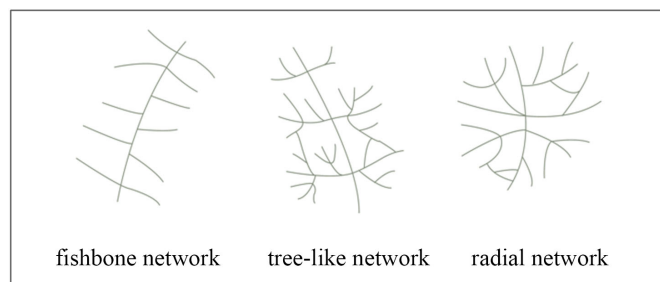
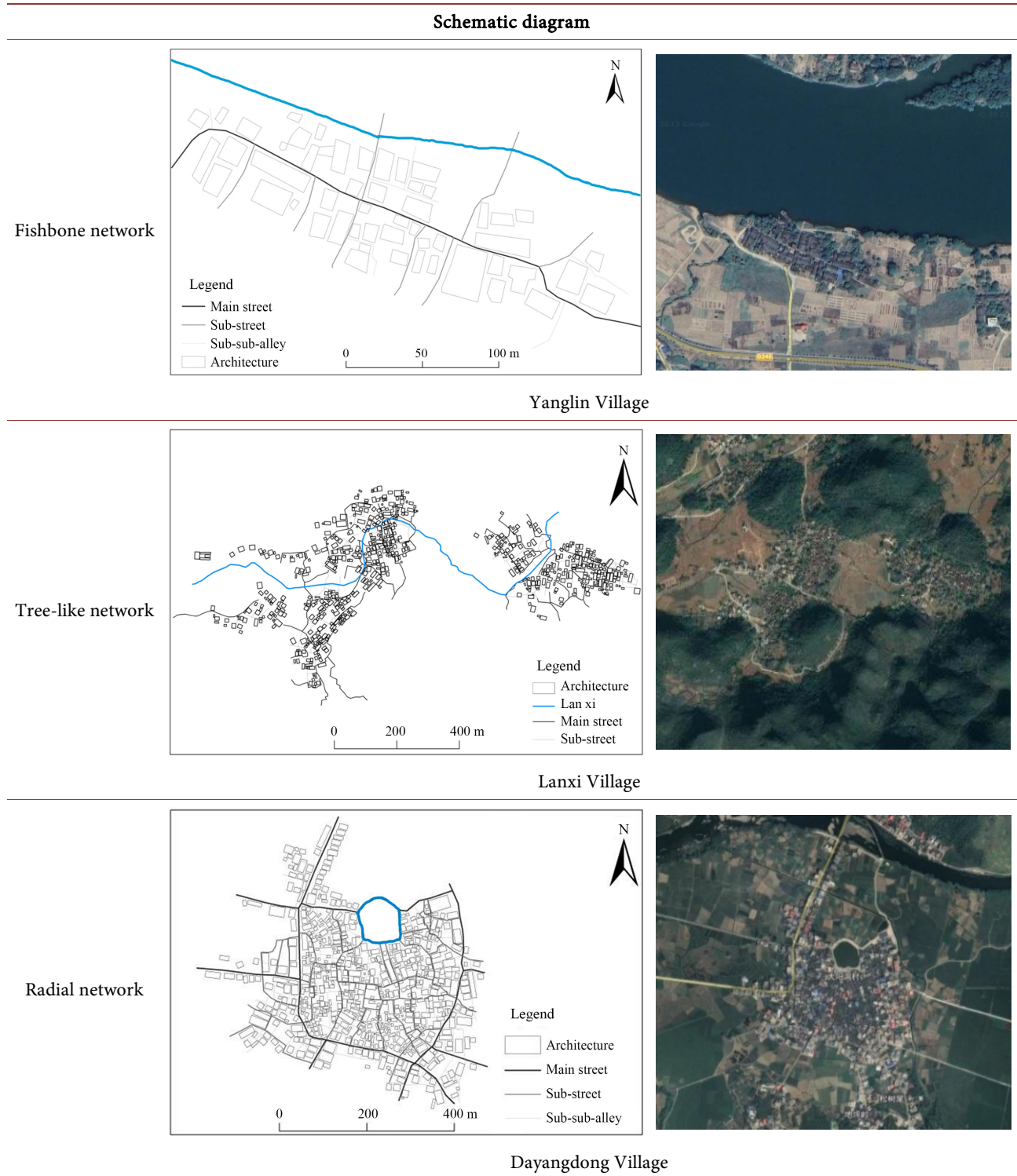


Figure 4. Street texture characteristics of traditional villages in Xiangnan area.

extended to the west, and distributed in the 2 - 3 meters wide main street (main bone) on the north and south sides, each family is through the width of about 1 meter branch lane (secondary bone) to contact each other, the overall street texture shows the characteristics of a fishbone network (see **Table 4**).

Table 4. Schematic diagram of the street texture of traditional villages in Xiangnan area.



Tree-like network is a form of village texture similar to tree branches, consisting of trunk, main branches and secondary branches, sub-streets along the main streets are extended in a dispersed manner in all directions, the direction is random, the main and secondary streets look like plant veins from the whole, the road space is recognizable. For example, the Lanxi village in Jiangyong County, Yongzhou City, is located in a flat basin surrounded by mountains, with the east-west Lanxi River winding through the village, and the Yao people's emphasis on cultivated land influences the layout of the whole village along the Lanxi River in the middle of the basin. Although there are as many as six clans in the ancient village, they all live together by the same surname. The clans are scattered in groups along the Lanxi River, and the clans are connected by 0.8 - 2 meter wide sub-streets and sub-sub-streets. The overall street structure of the village shows the characteristics of a tree-like network (see [Table 4](#)).

The radial road network is mainly composed of a radial center (core area), a radial main axis (main street), and a radial sub-axis (sub-street and sub-sub-street). The formation and development of this village texture reflects a high degree of clannishness with blood ties. A core area such as a family ancestral hall is usually built in front of the village, and elements such as moon ponds and ancient trees are arranged in front of the core area, and then houses are built in directions other than the front façade of the core area, and most of them grow in the direction of the two wings and the depth. For example, Dayangdong Village in Tiantang Town, Ningyuan County, Yongzhou City, is adjacent to Jiuyi River to the north and Gui River to the west, surrounded by few hills, near water and far away from mountains. The main family name in the village is Zhang, and the founder of the village is Zhou Ruxi, the ancestor of Zhou Dunyi. The ancient village has belonged to a clan colony with blood ties since its formation. The village is built with the main gatehouse and the Zhang Ancestral Hall (with a large feng shui pond in front of the building) as the central axis, and spreads outward along three horizontal axes (the main street) layer by layer, expanding into three horizontal and eight vertical lanes of 36 lanes according to tradition, and following the feng shui pattern of "ten wings and nine elephants" of the building in the "Zhengmeng" and "Yixue" of the distant ancestor Zhang Zai, with the eight trigrams "The houses are basically facing north, so that Dayangdong Village has a round layout with a concentrated settlement" [15]. From the overall point of view, the building layout is staggered, the streets and alleys are interwoven in order, and the street texture shows the characteristics of a radial network (see [Table 4](#)).

8. Conclusions

Water is the material resource that people depend on for survival, therefore, water system will have a great influence on people's consideration of village building and village spatial form, and water system in the process of shaping the spatial form of the settlement will also formation different types by different of wa-

ter system function, width, area, morphology, etc. The shaping of water system on the traditional village spatial form mainly through three aspects, one is the impact on the traditional village site selection, that is, the location of the village construction; two is the impact on the traditional village two-dimensional plane form; three is the shaping of the traditional village internal street texture, that is, the trend of building houses for residents in the village will be considered due to the location of the water system. The main findings are as follows:

1) The shaping ability and mechanism of the water system on the spatial morphology of traditional villages in Xiangnan area is mainly based on the function of the water system. As a place for people to live, traditional villages can determine the spatial form of traditional villages must be the villagers of the village, so traditional villages are based on the needs of villagers in terms of site selection and internal spatial layout, that is, the construction of villages from water system functional needs.

2) The width, area and form of the water system in Xiangnan area affects the layout and spatial form of the village. The water system can radiate a limited range, therefore, the housing architecture of traditional villages is usually laid out around the water system. The size and shape of the water system will affect the shape of the traditional villages around it. Generally speaking, the strip-like plane form of the traditional villages around it will be influenced by the strip-like plane form of the rivers and streams; the rivers, streams, canals or ponds surrounding the periphery of the traditional villages will influence the formation of the cluster-like plane form of the villages; in some areas where there are rivers and streams flowing through or many ponds scattered but the topography is more complicated, the local water system either passes through the village or flows near the village, which is like a tie that connects the various groups of the village and influences the village to form a scattered plane form.

3) Traditional villages in southern Hunan tend to be located around water systems with a certain flow or watershed area. Water systems with a certain watershed area and flow can respond to more needs of traditional villages, such as the defense and transportation functions of water systems, and the desire to develop a certain scale of agriculture, etc. A larger watershed area and flow can meet these needs well. There are advantages and disadvantages to everything. A water system with less than a certain flow and watershed area is very less hazardous and does not need to be considered, while when it reaches a watershed area and flow that cannot be ignored for its harmfulness, the surrounding traditional villages need to control the distance from the water system and take protective measures.

4) What plays a greater role in shaping the internal structure and layout of traditional villages in Xiangnan area is often the water system inside the village, which is not too large in terms of flow and watershed area, usually a tributary of a river, a small stream, a reservoir inside or outside the village, or wells inside the village. In other aspects, the guidance of traditional feng shui concepts and the constraints of clan culture also have a limiting effect on the internal street pat-

tern of traditional villages in southern Hunan.

9. Implications

The natural or artificial water system that traditional villages in Xiangnan area rely on, the feng shui culture that has been passed down to this day, and the clan rituals that each settlement believes in jointly determine the layout and internal street texture of the villages. The wisdom of water management contained in the spatial form of traditional villages is of great significance to the conservation and development of villages, and is worthy of our consideration in order to better respond to the rural revitalization strategy and to protect and inherit the culture of traditional villages in Xiangnan area.

Fund Project

National Local Joint Engineering Laboratory Open Fund Project of “Digital Protection and Creative Utilization Technology of Traditional Village and Town Culture” (No. 2021HSKFJJ018)

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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