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A Study on the Spatial Distribution Characteristics and Influencing Factors of Traditional Villages in Jiangxi Province

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Abstract: This study selects 413 national-level traditional villages in Jiangxi Province as research objects. Based on the ArcGIS 10.8 software and combined with mathematical statistics methods, it conducts an in-depth investigation into the spatial distribution pattern of traditional villages and their influencing factors. The research results show that the overall spatial characteristics of traditional villages in Jiangxi Province present a "scattered but clustered" feature, distributed in strip or point patterns along plain areas. Notably, traditional villages in Ji'an City and Fuzhou City exhibit obvious agglomeration phenomena. According to the analysis data, approximately 82.8% of village locations have significant riparian characteristics, reflecting the ancestors' survival wisdom of "choosing water to settle." Further analysis reveals that topography and hydrological environment serve as the physical basis constraining village location selection, while diverse cultures such as Huizhou culture, Linchuan culture, Luling culture, and Hakka culture deeply shape the spatial layout of villages. Furthermore, cultural factors and hydrological factors interactively act together to constitute the key composite driving mechanism influencing the spatial layout of traditional villages in Jiangxi Province.

Keywords: Jiangxi Province; Traditional villages; Spatial distribution; Distribution characteristics

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1. Introduction

Traditional villages refer to settlements that have a long history, rich traditional resources, and possess significant historical, cultural, scientific, artistic, social, and economic values, which warrant protection [1]. With the acceleration of urbanization, blind tourism development and new rural construction often lead to varying degrees of damage to these traditional villages. In the process of solving the "three rural issues", the three elements—architecture, ecology, and culture—carried by traditional villages hold irreplaceable and important positions. In 2023, the sixth batch of the National List of Traditional Villages added 1,336 villages nationwide, including

70 new ones in Jiangxi Province. To date, a cumulative total of 8,155 traditional villages have been officially announced across six batches. This paper selects 413 national-level traditional villages from Jiangxi's six batches as research subjects. It employs ArcGIS 10.8 combined with quantitative statistical methods to analyze their spatial distribution characteristics and explore their influencing factors.

2. Study area and data sources

2.1. Study area

Jiangxi Province is located in the southeast of China. Geographically, it is characterized by a terrain dominated by mountains and hills, with a distinct topography that slopes from high in the south to low in the north (**Figure 1**). The total area of the province amounts to approximately 166,900 square kilometers, and its permanent population stands at roughly 45.02 million people. Administratively, it consists of 11 prefecture-level cities and 100 counties (cities and districts).

The province features a well-developed water system with dense river networks, centered around Poyang Lake. This extensive hydrological network is primarily formed by the convergence of five major river systems: Ganjiang, Fuhe, Xiushui, Raohe, and Xinjiang [2]. Climatically, Jiangxi belongs to the typical subtropical monsoon climate, characterized by humidity, abundant rainfall, distinct seasons, and complex weather changes.

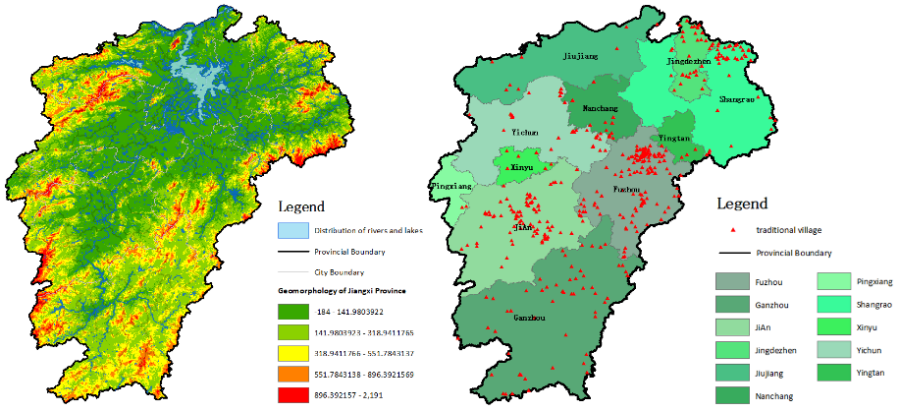

Figure 1. Topography, landforms, and distribution of traditional villages in Jiangxi Province

2.2. Data sources

The data foundation of this study primarily stems from the following platforms: the list of national traditional villages in Jiangxi Province was sourced from the Traditional Villages Network; geographic coordinates were obtained via Baidu Maps and converted into WGS1984 format before being imported into ArcGIS 10.8; terrain elevation data utilized a 30 m precision DEM image provided by the Geospatial Data Cloud; administrative boundary and landform type data were acquired from the Resource and Environment Science Data Center of the Chinese Academy of Sciences.

3. Spatial distribution characteristics of traditional villages in Jiangxi Province

3.1. Spatial distribution type

To determine the spatial distribution type of traditional villages, it is first necessary to identify their belonging

spatial elements. Spatial elements include point elements, line elements, and surface elements. Among these, point elements can be categorized into three types: uniform distribution type, random distribution type, and aggregated distribution type [3].

By using software and combining relevant data to calculate $R = 0.7426$, it can be roughly judged that the spatial distribution type of traditional villages in Jiangxi Province is a cohesive distribution type, with small clusters present.

3.2. Spatial distribution balance and aggregation area

From the traditional village distribution map, it can be observed that their distribution has a certain degree of imbalance, which can be supported by the imbalance index as an indicator. The imbalance index can reflect the degree of balance in the distribution of research objects within the research area [4].

By organizing and calculating relevant data, S=0.689 was obtained, indicating a significant imbalance in the distribution of traditional villages in Jiangxi Province. From the Lorenz curve, it can be seen that the number of traditional villages in Fuzhou City ranks first with a proportion of 32.69%, followed closely by Ji'an City with a proportion of 20.34% (**Figure 2**). Ganzhou City ranks third with a proportion of 13.32%, while Shangrao City is only 2.91% lower than it. The proportion of traditional villages in Pingxiang City is the lowest, only 0.48%, which is less than one-tenth of that of Fuzhou City, which ranks first.

According to the nuclear density analysis map of traditional villages, the layout of villages in the province presents a significant feature of "large dispersion and small aggregation" (**Figure 3**). Specifically, the central part of Ji'an City, the northern part of Fuzhou City, as well as the northern parts of Jingdezhen and Shangrao City, constitute a high-density core gathering area, while the remaining vast areas exhibit a low-density discrete distribution state.

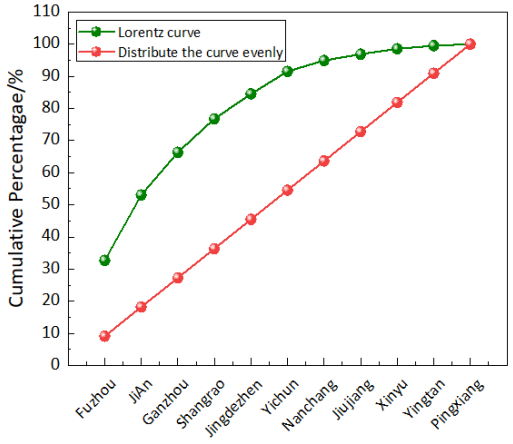

Figure 2. Lorenz Curve of traditional villages in Jiangxi Province

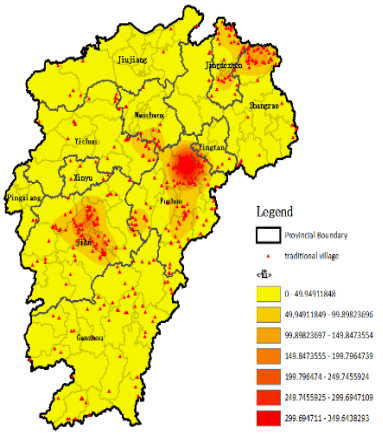

Figure 3. Nuclear density analysis of traditional villages in Jiangxi Province

4. Exploration of factors influencing distribution

4.1. Terrain factors

The geomorphic types of Jiangxi Province are mainly hills (42%) and mountains (36%) (**Figure 4**). The main

mountains are distributed along the border of Jiangxi Province, bordering Huaiyu Mountain in the northeast, Mount Wuyi in the east, Dayu Mountain and Jiulian Mountain in the south, Luoxiao Mountain in the west, Mufu Mountain and Jiuling Mountain in the northwest [5].

According to the topographic map of Jiangxi Province, most traditional villages in Jiangxi Province are distributed in plain areas (**Figure 5**). The flat terrain, fertile soil, and abundant water resources in plain areas greatly facilitate the development of agricultural life, laying the foundation for the steady development of traditional villages over a long history.

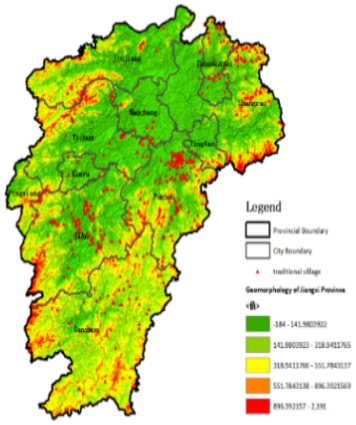

Figure 4. Distribution and geomorphic map of traditional villages

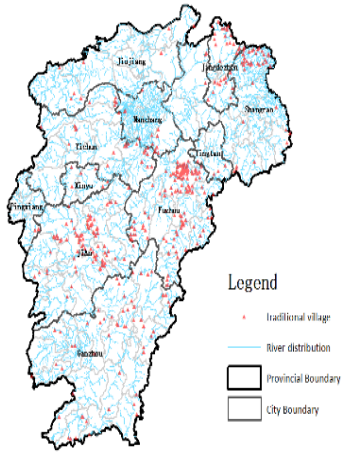

Figure 5. Water system relationship map of traditional villages

4.2. Hydrologic factors

Jiangxi Province has a huge water network system centered around Poyang Lake, consisting of five major water systems: Gan River, Fu River, Xiu River, Rao River, and Xin River [6]. Among them, the Gan River is known as the "Golden Waterway." These five major water systems run through the entire province, not only connecting various parts of Jiangxi, but also radiating to surrounding areas, forming an economically developed and culturally interconnected watershed pattern.

From the above figure, it can be seen that the spatial distribution of traditional villages in Jiangxi Province exhibits a significant characteristic of living by water. Using a distance of 1km as a water system buffer zone, the total number of traditional villages located within the buffer zone is 342, accounting for 82.8% of the total. This indicates that the distribution of traditional villages is closely related to rivers. Among them, the majority of traditional villages are located within the buffer zones of the Ganjiang River Basin and Fuhe River Basin.

4.3. Cultural factors

Based on geographical divisions, Jiangxi Province is typically categorized into four distinct regions: Northeastern, Central, Western, and Southern Jiangxi [7]. This study utilizes these four major divisions as a framework to investigate regional cultural characteristics and further examines the correlation between geographical features and cultural factors.

According to relevant studies, traditional villages in Jiangxi Province are primarily concentrated in the central region, exhibiting significant differences in cultural zoning. As an essential chapter of "Gan Culture", Linchuan

Culture centers on the central part of Fuzhou City, forming a high-density cluster of traditional villages [8]. These settlements not only carry the profound heritage of the "Hometown of Scholars" but also preserve the large-scale historical architecture of the Gan School.

Influenced by the profound heritage of the Luling culture, the region of Ji'an has not only nurtured historical figures such as Ouyang Xiu and Wen Tianxiang, but also preserved numerous precious traditional villages in its urban-rural fabric. These villages are not only the quintessence of Jiangxi architecture, but also three-dimensional carriers of the "Unity of Heaven and Humanity" philosophy held by ancient Jiangxi people, perfectly integrating clan systems, gongdu culture, and fengshui theory within the landscape. The distribution of traditional villages in Ji'an exhibits distinct geographical and cultural characteristics. Relying on the water transport advantages of the Ganjiang River basin and the natural environment of the mountains surrounding the water, a unique cluster of villages has formed. Meibei Ancient Village, located in Wenshi Town, Qingyuan District of Ji'an City, sits by the Fu River. As a representative historical and cultural village, it holds the reputation of "The First Village of Luling Culture." [9]. As a typical example of the Jiangyou ethnic group's ancient village, Meibei relies on mountains and water, with architectural styles primarily based on the Ming and Qing dynasties, skillfully blending the styles of academies, ancestral halls, and religious buildings. Yanfang Ancient Village is situated in Jintan Town, Jishui County, neighboring the Ganjiang River and backed by Long Mountain.

The northern part of Shangrao City and Jingdezhen City, located at the northeastern corner of Jiangxi Province and the border between Anhui and Jiangxi, represent a transitional geographical zone. Culturally, this area is known as a "Hui Culture Enclave." Historically centered on Wuyuan, the region has been deeply influenced by the New An Confucianism and Huizhou merchant culture. Spatial analysis using ArcGIS reveals a significant clustering pattern. Traditional villages in this area typically follow the Feng Shui philosophy of "resting against mountains, encircling water, and facing screens", forming a "core-dense, periphery-sparse" structure distributed in a belt-like pattern along basins and river valleys. These villages are not merely residential spaces but living museums of intangible culture. Yan Village, often referred to as the "Great View Garden" of Huizhou architecture, preserves a large number of complete ancestral halls, residences, and ancient bridges from the Ming and Qing dynasties. It serves as an important physical carrier for studying the Huizhou merchants' philosophy of "accumulating wealth and seeking blessings."

Situated at the intersection of Jiangxi, Guangdong, and Fujian provinces, the Gannan region features a landscape dominated by hills and mountains, characterized by sparse and scattered water systems. Due to late economic development and inconvenient transportation, traditional villages in Ganzhou have long remained in a state of low human disturbance, preserving the authentic appearance of Ming and Qing dynasty architecture. To cope with complex terrain and historical interpersonal conflicts, the Hakka people developed distinctive walled enclosures. Isolated by mountainous barriers, these areas became "islands" where Central Plain Han culture retained its unique form. Bai Lu Village in Gangxian is hailed as a "National Historic and Cultural Village", serving as one of the best-preserved ancient Hakka settlements in southern Jiangxi, centered around its ancestral hall complex and showcasing the typical style of Hakka manor-style dwellings [10].

5. Conclusion

Based on the aforementioned analysis, a quantitative assessment was conducted regarding the geographical distribution of 413 nationally recognized traditional villages across six batches in Jiangxi Province. By examining

three dimensions, this study analyzed the spatial configuration of these villages and systematically explored the influencing factors, leading to the following conclusions:

Spatial Pattern: Calculations of the nearest neighbor index confirmed that the spatial distribution type is characterized as cohesive clustering. High-density zones are primarily concentrated in Ji'an City, Fuzhou City, the northern region of Shangrao City, and Jingdezhen City. However, an overall uneven distribution persists, exhibiting the distinct feature of "large-scale dispersion with localized aggregation."

Influencing Factors: The distribution is significantly influenced by natural environmental factors, predominantly situated in flat plains or gentle hilly areas. A positive correlation exists between village distribution and elevation. Furthermore, the vast majority of villages are closely associated with water systems. The combined influence of hydrological and cultural factors exerts a cumulative effect, ultimately promoting optimal site selection.

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Author contributions

Yunyang Zheng conceived the idea of the study. Xingyu Liu and Jiayao Zhu performed the experiments. Junqing Deng analyzed the data and wrote the paper.

Disclosure statement

The authors declare no conflict of interest.

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