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Spatial Distribution and Type Division of Traditional Villages in Zhejiang Province

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Abstract: Exploring the spatial distribution and type characteristics of traditional villages is crucial for promoting their protection and sustainable development. This article used the average nearest neighbor index, imbalance index, kernel density, standard deviation ellipse, and cluster analysis to analyze the overall distribution characteristics of traditional villages in Zhejiang Province and completed the classification of traditional village types and distribution areas in Zhejiang Province. The results indicate that traditional villages in Zhejiang Province exhibit a clustered and unbalanced distribution in space. They tend to be located below an altitude of 200 m, within 500 m of the river system, with terrain undulations of 20–200 m, 10–30 km away from county-level administrative centers, and 0–3 km away from main roads but with sparse road networks. Based on the comprehensive influence of geographical elements in the geographical environment of traditional villages, traditional villages in Zhejiang Province can be divided into five types. Based on the spatial distribution and type characteristics of traditional villages in Zhejiang Province, distribution areas of traditional villages in Zhejiang Province can be divided into six types. Finally, corresponding protection and development suggestions were proposed. These results can enrich the research content of traditional villages in Zhejiang Province and provide theoretical support for the protection and sustainable development of traditional villages.

Keywords: traditional villages; spatial distribution; geographical elements; type division; distribution area; Zhejiang Province

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1. Introduction

In China, traditional villages refer to villages that were formed early, have important historical, cultural, scientific, artistic, economic, and social values, possess rich traditional culture and natural resources, and should be protected [1]. Traditional villages have both material and intangible cultural heritage characteristics and are an important heritage of China's agricultural civilization [2]. However, with the development of multiple construction activities such as urbanization, new-rural construction, and rural tourism, many traditional villages are gradually disappearing. Therefore, giving sufficient attention to traditional villages and carrying out reasonable protection and utilization of traditional villages is of great significance for promoting sustainable and coordinated development between urban and rural areas.

The Chinese government's attention to traditional villages began in the 1990s, when traditional villages were known as ancient villages. In 1999, China held the first China Ancient Village Protection and Development Technology Forum. In 2003, China established a system for protecting historical and cultural villages. In 2012, China officially began to establish a traditional village directory protection system. As of 19 March 2023, six batches of Chinese traditional village lists have been announced, and a total of 8155 villages in China have been listed as national-level traditional villages [3]. To explore how to promote the protection and development of traditional villages, scholars in various fields have also begun to conduct extensive research. Scholars in the fields of architecture

and planning mainly focus on the research of traditional village site selection, village functions, living environment, architectural design, spatial form, landscape characteristics, and element layout [4–8]. Scholars in the fields of archaeology and cultural studies focus on the value recognition of traditional villages, the reconstruction of village style, the inheritance of traditional village culture, and the protection and utilization of village cultural heritage [9–12]. The field of agricultural economics focuses on researching the agricultural development model, land use model, and sustainable development of rural economy in traditional villages [13–16]. The field of tourism mainly focuses on rural tourism, with research directions including the development and utilization of tourism resources in traditional villages, factors affecting the development of tourism in traditional villages, and the impact of tourism on the protection and development of traditional villages [17–20]. The field of geography focuses on the spatial distribution, geographical differentiation, cultural landscape, type zoning, spatiotemporal evolution process, and corresponding influencing factors of traditional villages from a geographical spatial perspective [21–25].

As we all know, the level of economic development and urbanization in Zhejiang Province ranks among the top in China. At the same time, 701 traditional villages in Zhejiang Province have been selected for the National Traditional Village List in China, ranking fourth among all provinces in China. That is to say, while emphasizing economic development, Zhejiang Province also attaches great importance to the protection of traditional villages. It is evident that conducting research on traditional villages in Zhejiang Province is of great significance. Therefore, the purpose of this study is to explore the spatial distribution characteristics of traditional villages in Zhejiang Province, and to classify them into different types, laying the foundation for proposing corresponding protection and development strategies for each type of traditional village according to local conditions, thereby more effectively promoting the sustainable development of traditional villages.

2. Literature Review

Studying the spatial distribution and influencing factors of traditional villages is an important basis for rational planning and protection of traditional villages. Therefore, many scholars have conducted research on the spatial distribution and influencing factors of traditional villages. At present, in terms of the spatial scope of such research, some have been conducted nationwide, analyzing and exploring the distribution patterns of traditional villages throughout China [26–28]. There are also studies conducted on a specific province, city, or geographical region, such as selecting Guangxi Province [29], Shaanxi Province [30], Hebei Province [31], Fujian Province [32], Qinghai Tibet Plateau [33], Henan Yellow River Basin [34], and the Southwest area of China [35] as research areas. The studies above have found that traditional villages always exhibit dense distribution and unbalanced spatial distribution. In addition, such studies have summarized that natural factors that affect the spatial distribution of traditional villages mainly include terrain, climate, hydrology, soil, vegetation, animals, natural disasters, etc., as they are often the fundamental factors that determine the location and layout of traditional villages. The selected humanistic factors cover a wider range, including economic development level, political policies, local culture, historical background, population composition, transportation conditions, urbanization level, etc., as these factors not only affect the location and formation of traditional villages, but also affect the continuation and development of traditional villages [36–42].

In terms of research methods, since Liu, D. et al. introduced spatial analysis methods into the study of traditional village spatial distribution patterns in 2014 [21], more and more scholars have begun to use spatial analysis methods including Moran's I index, local correlation index Getis Ord Gi*, average nearest neighbor index, imbalance index, geographic connectivity rate, kernel density analysis, etc., to analyze the spatial distribution characteristics of traditional villages. In addition, standard deviational ellipse has been introduced to visualize the directional distribution and changes of traditional villages [43–45]. At the same time, relevant functions of software such as ArcGIS 10.2, SPSS 26, Stata 17 etc., are used to analyze the factors affecting the spatial distribution of traditional villages. Some scholars

also use geographic detectors or construct geographic weighted regression models to explore the comprehensive impact of various factors and determine the degree of influence of each factor [46–48]. However, it can be seen that there is relatively little research on the spatial distribution and influencing factors of traditional villages in Zhejiang Province. Therefore, this article takes Zhejiang Province as an example to explore the correlation between the spatial distribution of traditional villages in Zhejiang Province and various geographical factors.

Studying the type characteristics of traditional villages also has important practical significance. Its purpose is to determine the commonality and particularity between each type of village through the classification of village types, thereby revealing the formation and development process of various types of villages and formulating relevant strategies to promote the healthy and sustainable development of villages. British anthropologist Ahern divided traditional Chinese villages into single-surname villages and multi-clan villages according to their clan organization [49]. Hill applied GIS analysis methods to the study of village types and summarized six spatial distribution types of rural settlements: agglomeration, random, regular, low-density, high-density, and linear through analysis, which has certain pioneering significance [50]. Chen, J. et al. measured the potential for rural development and divided administrative villages in Shapingba District, Chongqing, into four types: core planning area, important planning area, overall planning area, and basic control area [51]. Dai, L. et al. classified traditional villages in Gaochun District into five types based on their development level and degree of reconstruction: characteristic protected villages, suburban integrated villages, agglomeration and upgrading villages, improvement and development villages, and relocation and merger villages [52]. Huang, L. et al. classified traditional villages into agricultural, commercial, transportation, defensive, religious, and secluded types based on their functions [53]. In addition, some scholars have conducted research on the zoning type of traditional villages from the perspectives of traditional village cultural landscape, architectural structure, spatial layout, etc., with the purpose of classifying the various elements contained in traditional villages, dividing the distribution areas of traditional villages based on their similarities and differences, and studying the protection and development of traditional villages within each area [54,55]. However, it can be seen that there is currently very little research on the classification of traditional villages throughout Zhejiang Province. Therefore, this study aims to classify traditional villages in Zhejiang Province into different types and different distribution areas to protect and develop traditional villages in a targeted manner.

Based on the background information above, this study focused on 701 national-level traditional villages in Zhejiang Province. Firstly, spatial analysis methods such as average nearest neighbor index, imbalance index, kernel density analysis, and standard deviational ellipse were used to explain the overall spatial distribution characteristics of traditional villages in Zhejiang Province. Then, based on the actual geographical situation of Zhejiang Province, five geographical elements were selected to explore the correlation between the spatial distribution of traditional villages in Zhejiang Province and these elements: altitude, terrain undulation, river system, county-level administrative center, and main roads. Finally, cluster analysis methods were used to classify traditional villages in Zhejiang Province into different types and distribution areas. It is hoped that through these analyses, valuable references could be provided for the protection and development of various traditional villages and their distribution areas, as well as for the sustainable development of traditional villages in other regions.

3. Materials and Methods

3.1. Study Area

Zhejiang Province is located between 118°01′–123°10′ E and 27°02′–31°11′ N in the southern part of the Yangtze River Delta region of China. It borders Jiangsu and Shanghai to the north, Jiangxi and Anhui to the west, Fujian to the south, and the East China Sea to the east (Figure 1). The land area of Zhejiang Province is approximately 105,500 km^2.

According to the latest administrative divisions, Zhejiang Province has 11 prefecture-level cities, including 37 municipal districts, 20 county-level cities, and 33 counties, with a total of 90 county-level administrative units. Although the land area of Zhejiang Province is small, the terrain is relatively complex, with mountains and hills accounting for 74.6%, bodies of water accounting for 5.1%, and plains accounting for 20.3%. The overall terrain slopes from southwest to northeast and can be roughly divided into six major terrain areas: northern Zhejiang Plain, central Zhejiang Jinqu Basin, western Zhejiang Medium Mountains and Hills, eastern Zhejiang Low Mountains and Hills, southern Zhejiang Mountains, and southeastern coastal plain and coastal islands. From the release of the first batch of national-level traditional village lists in China in 2012 to the release of the sixth batch of national-level traditional village lists in 2023, there are currently 701 national-level traditional villages in Zhejiang Province (Table 1).

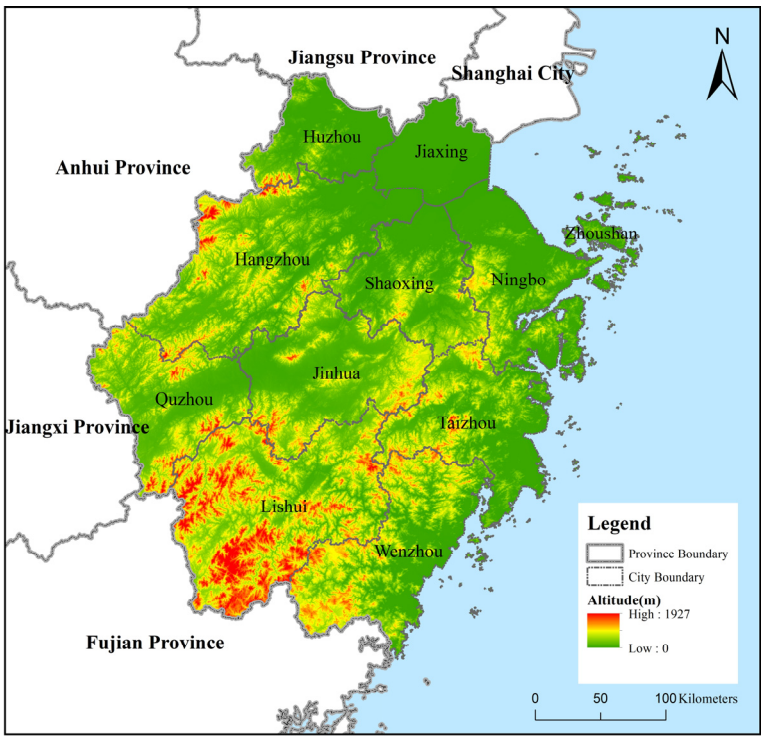

Figure 1. Location of Zhejiang Province.

Table 1. Statistics of different batches of traditional villages in Zhejiang Province.

Batches	Number of Traditional Villages/pcs
First Batch (2012)	43
Second Batch (2013)	47
Third Batch (2014)	86
Forth Batch (2016)	225
Fifth Batch (2019)	235
Sixth Batch (2023)	65
Total	701

3.2. Data Sources and Data Processing

The list of 701 traditional villages in Zhejiang Province was collected from the China Traditional Village Website (http://www.chuantongcunluo.com/, accessed on 1 March 2024). The geographical coordinates of traditional villages were picked up using the Map Location longitude and latitude conversion tool (https://maplocation.sjfkai.com/, accessed on 1 March 2024). The shapefile data of administrative division of Zhejiang Province were obtained from the National Geographic Information Public Service Platform

(http://lbs.tianditu.gov.cn/, accessed on 1 March 2024). The latitudinal and longitudinal coordinates of county-level administrative centers were also picked up using the Map Location latitude and longitude conversion tool. The 30 m digital elevation model (DEM) data were obtained from the Geospatial Data Cloud (https://www.gscloud.cn/, accessed on 1 March 2024). After merging and cropping in ArcGIS 10.2, it was put into subsequent use. The roads data of Zhejiang Province were obtained from the Open Street Map (https://www.openstreetmap.org/, accessed on 1 March 2024). After classifying and screening the main roads categories in ArcGIS 10.2, it was put into subsequent use. The river system data of Zhejiang Province were extracted from DEM data using the hydrological analysis tool in ArcGIS 10.2. The altitude and terrain undulation of traditional villages in Zhejiang Province were extracted by the extracting values to points tool in ArcGIS 10.2. The distances between traditional villages and county-level administrative centers, river systems, and main roads were extracted by the near analysis tool in ArcGIS 10.2. The classification of traditional village distribution areas was achieved through cluster analysis function in SPSS 26. Satellite images of various types of traditional villages were obtained through Gaode satellite maps (https://www.amap.com/, accessed on 13 April 2024).

3.3. Analysis Methods

3.3.1. Average Nearest Neighbor Index

Traditional villages can be abstracted as point-like elements on a macro scale, and the spatial distribution of point-like elements can be classified into three types: clustered, dispersed, and random. The average nearest neighbor index can compare actual research points with theoretically randomly distributed points to determine the spatial distribution type of traditional villages. The formula is expressed as follows:

$$R = \bar{r}_i / r_E \tag{1}$$

$$r_E = \frac{1}{2\sqrt{m/A}} = \frac{1}{2\sqrt{D}} \tag{2}$$

In the formula, R is the average nearest neighbor index, $\bar{r}_i$ is the average distance between each point and its nearest neighbor in actual research, and r_E is the theoretical nearest neighbor distance when point-like features are randomly distributed within the research range. m is the number of point-like elements. A represents the area of the research area. D represents the number of point elements per unit area. When $R > 1$, it indicates that traditional villages tend to be evenly distributed within the study area; when $R = 1$, it indicates that traditional villages are randomly distributed within the study area; and when $R < 1$, it indicates that traditional villages exhibit a clustered distribution within the study area.

3.3.2. Imbalance Index

The imbalance index can be used to reflect the degree of distribution balance of traditional villages in various prefecture-level cities, and its formula is as follows:

$$S = \frac{\sum_{i=1}^{n} Y_i - 50(n+1)}{100n - 50(n+1)} \tag{3}$$

In the formula, S represents the imbalance index, n represents the number of prefecture-level cities in Zhejiang Province, and Y_i represents the cumulative percentage of the proportion of traditional villages owned by each prefecture-level city in the province, ranked i-th in descending order. The S ranges from 0 to 1, and the larger the value, the more unbalanced the distribution of traditional villages in various cities. When $S = 0$, it indicates that traditional villages are evenly distributed within each prefecture-level city; when $S = 1$, it indicates that all traditional villages are concentrated within one prefecture-level city.

3.3.3. Kernel Density Analysis

Kernel density analysis can calculate the number of point-like elements around each output grid, obtain the kernel density value, and visualize the spatial distribution of point-like features. The formula is expressed as follows:

$$f_{\mathrm{n}}(x) = \frac{1}{nh} \sum_{i=1}^{n} k\left(\frac{x - x_i}{h}\right) \quad (4)$$

In the formula, $f_{\mathrm{n}}(x)$ represents the kernel density value of traditional villages, k is the kernel function, h is the search bandwidth, n is the number of traditional villages in the study area, and $(x - x_i)$ is the distance from the valuation point to the traditional villages. The higher the kernel density value, the denser the distribution and higher the degree of agglomeration of traditional villages at that point.

3.3.4. Standard Deviational Ellipse

Standard deviational ellipse is a method of studying the directional distribution and evolution trend of elements in a region, which can intuitively reveal the directionality, extensibility, and concentration or dispersion trend of element distribution. It describes the distribution characteristics of research elements through basic parameters such as the mean center, rotation angle, short half axis, long half axis, oblateness, and area of the ellipse [56].

When applying the standard deviational ellipse to the study of traditional villages, the mean center of the ellipse can be regarded as the center of gravity of the spatial distribution of traditional villages, and the rotation angle is the angle between clockwise rotation from the due north direction to the major axis of the ellipse, used to represent the overall distribution direction of traditional villages. The long half axis of the ellipse is used to represent the directionality and extensibility of traditional village distribution. The longer the long half axis, the more obvious the directionality of traditional village distribution in the long half axis direction. The short half axis is used to represent the centripetal and concentration of traditional village distribution. The shorter the short half axis, the more obvious the centripetal distribution of traditional villages in the short half axis direction, that is, the more concentrated the distribution in that direction. Oblateness is also used to indicate directionality; the larger the flatness, the more obvious the directionality, and vice versa. The elliptical area can, to some extent, represent the concentration level of traditional villages. The smaller the elliptical area, the more concentrated the distribution, and vice versa.

3.3.5. Cluster Analysis

Cluster analysis refers to the process of dividing a dataset without classification labels into several clusters based on certain attributes between the data in the dataset in order to analyze and compare the similarities and differences of data in each classification cluster [57]. To study the similarities and differences in the composition of traditional village types in various counties (cities, districts) of Zhejiang Province, this study uses the number of various traditional villages in each county (city, district) as the classification basis and uses SPSS 26 software to conduct cluster analysis on 90 counties (cities, districts) of Zhejiang Province, dividing these counties (cities, districts) into several categories. The Wald method in clustering analysis algorithms can minimize the sum of squared deviations within categories and maximize the sum of squared deviations between categories, distinguishing the differences between geographical units to the greatest extent possible. Therefore, this study uses the Wald method for clustering.

4. Results

4.1. Overall Spatial Distribution Characteristics of Traditional Villages in Zhejiang Province

4.1.1. Type of Spatial Distribution

In ArcGIS 10.2, using the average nearest neighbor function in spatial statistics tools, the average nearest neighbor index of traditional villages in Zhejiang Province was calculated by taking the land area of Zhejiang Province of 105,500 km^2 as the study area. The results show that the average nearest neighbor index R is 0.81, the z-value is −9.77, and the *p*-value is 0.00 (Figure 2). The probability of randomly generating this distribution pattern is less than 1%, with an extremely high level of confidence. Since R is less than 1, the type of spatial distribution of traditional villages in Zhejiang Province is clustered.

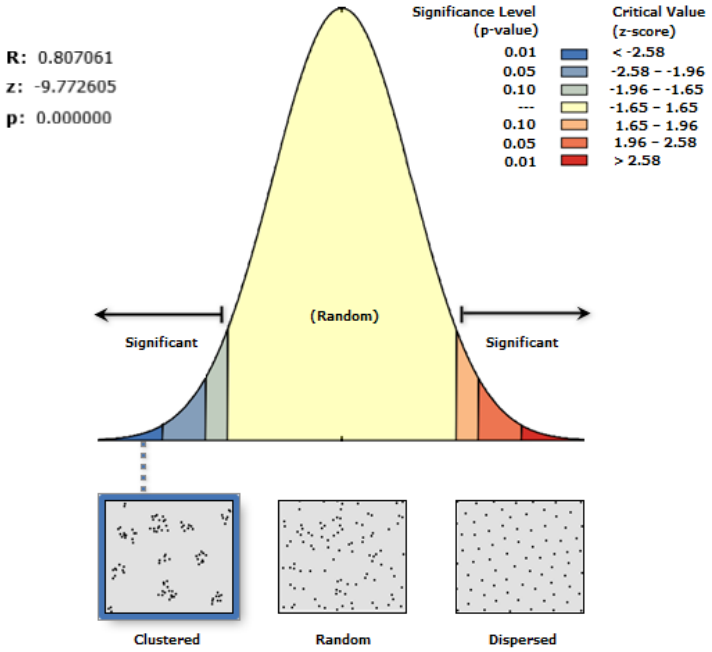

Figure 2. Graphical scheme of average nearest neighbor index analysis results.

4.1.2. Balance of Spatial Distribution

Statistics on the number of traditional villages in various cities in Zhejiang Province are shown in Table 2. According to the formula of the imbalance index, the imbalance index S of traditional villages in Zhejiang Province was calculated. The result shows that S is 0.60, which is less than 1, indicating that the spatial distribution of traditional villages in Zhejiang Province is not balanced at the city level. Then, ArcGIS 10.2 was used to visualize the distribution of traditional villages in various cities of Zhejiang Province (Figure 3). The results show that Lishui city, located in the southern part of Zhejiang, has the highest number of traditional villages with 268, followed by Jinhua city in the central part of Zhejiang. Next are Taizhou city located in the eastern part of Zhejiang and Hangzhou and Quzhou cities located in the western part of Zhejiang. Huzhou city, Jiaxing city, and Zhoushan city, located in the northern part of Zhejiang, have the least number of traditional villages, with 6, 5, and 3, respectively. It can be seen that traditional villages in Zhejiang Province generally exhibit a distribution pattern of more in the south and less in the north, with an unbalanced spatial distribution.

Table 2. Statistics of traditional villages in various cities of Zhejiang Province.

City Name	Number of Traditional Villages/pcs	Ranking	Percentage/%	Accumulated Percentage/%
Lishui	268	1	38.23	38.23
Jinhua	118	2	16.83	55.06
Taizhou	79	3	11.27	66.33
Hangzhou	65	4	9.27	75.60
Quzhou	57	5	8.13	83.73
Wenzhou	39	6	5.56	89.29
Ningbo	32	7	4.57	93.86
Shaoxing	29	8	4.14	98.00
Huzhou	6	9	0.86	98.86
Jiaxing	5	10	0.71	99.57
Zhoushan	3	11	0.43	100.00

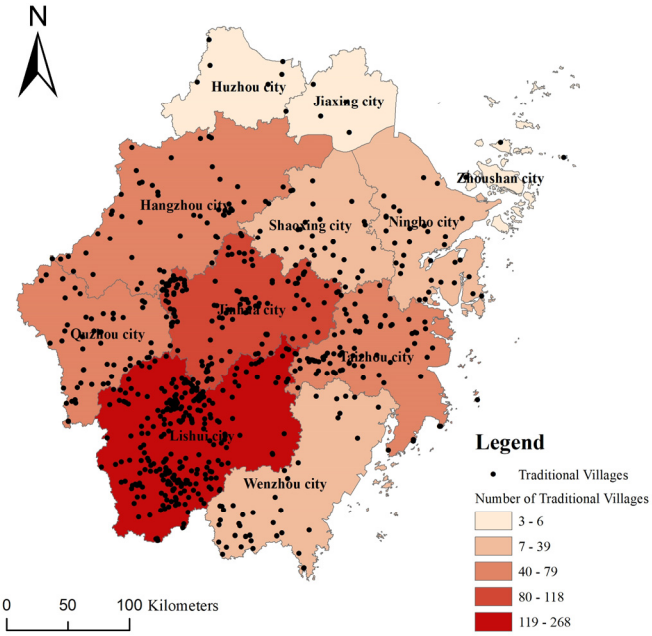

Figure 3. Distribution map of traditional villages in various cities of Zhejiang Province.

4.1.3. Agglomeration Centers of Traditional Villages

The analysis results of the average nearest neighbor index and imbalance index show that traditional villages in Zhejiang Province are clustered and unbalanced, but the specific agglomeration centers and agglomeration degree need to be further clarified. Using the kernel density function in ArcGIS 10.2, a kernel density map of the spatial distribution of traditional villages in Zhejiang Province was drawn (Figure 4). In order to more clearly represent the degree of agglomeration of traditional villages in various regions of Zhejiang Province, the area with the highest kernel density level is called the main agglomeration center, and the area with the second highest kernel density level is called the secondary agglomeration center. The unit of kernel density value is pieces/km^2.

Figure 4 shows that traditional villages in Zhejiang Province have three main agglomeration centers, respectively located in the northern part of Lishui city, southern part of Lishui city, and the junction of Jinhua city and Hangzhou city. Among them, the two agglomeration centers in the northern and southern parts of Lishui city have a larger range, and the traditional villages in these areas are densely distributed, with the highest kernel density value reaching 0.0872. These traditional villages are closely connected and have a high clustering effect. In addition, traditional villages in Zhejiang Province have four secondary agglomeration centers, respectively located in the western part of Taizhou city,

the central part of Jinhua city, the eastern part of Hangzhou city, and the southwestern part of Lishui city. These agglomeration centers have a relatively small range. Traditional villages in other regions of Zhejiang Province have lower density and a more scattered distribution, and the connections between these traditional villages are not as close.

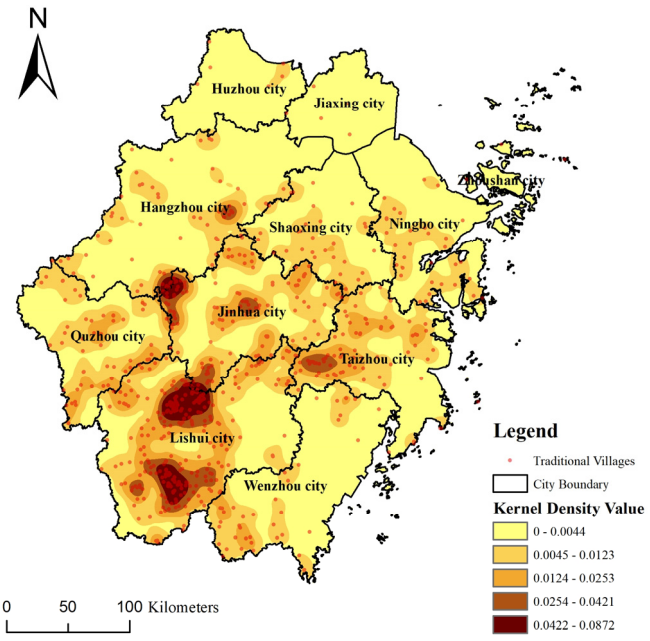

Figure 4. Kernel density map of spatial distribution of traditional villages in Zhejiang Province.

4.1.4. Directional Distribution of Traditional Villages

In ArcGIS 10.2, using the directional distribution function in the spatial statistical tools, the standard deviational ellipse of traditional villages in Zhejiang Province was obtained, and the relevant parameters of the standard deviation ellipse were statistically analyzed to display the directional distribution and the center of gravity of spatial distribution of traditional villages in Zhejiang Province.

As shown in Table 3 and Figure 5, the standard deviational ellipse of traditional villages in Zhejiang Province is located in the southern part of Zhejiang Province, with the center of gravity of spatial distribution located in Wuyi county, Jinhua city. The rotation angle of the standard deviational ellipse is 39.697°, indicating that the distribution direction of traditional villages in Zhejiang is a northeast–southwest direction. The oblateness of the standard deviational ellipse is 0.255, which is a relatively large value, while the area is 36,892.96 km^2, which is about one-third of the land area of Zhejiang Province, indicating that the centripetal and directional characteristics of traditional villages in Zhejiang are very obvious and their distribution is relatively concentrated. That is to say, the center of gravity of spatial distribution of traditional villages in Zhejiang Province is located at the southwest end of the geometric center of Zhejiang Province. The concentration degree of traditional villages is higher in the southwest region of Zhejiang Province, while it is lower in other areas. The directional distribution presents a northwest–southeast centripetal distribution pattern, extending and concentrating from northeast to southwest.

Table 3. Standard deviational ellipse parameters of traditional villages in Zhejiang Province.

Parameter	Value
Longitude of mean center	119.819° E
Latitude of mean center	28.755° N
Standard deviation along the *X*-axis/km	93.547
Standard deviation along the *Y*-axis/km	125.541
Area of standard deviational ellipse/km^2	36,892.96
Oblateness	0.255
Rotation angle	39.697°

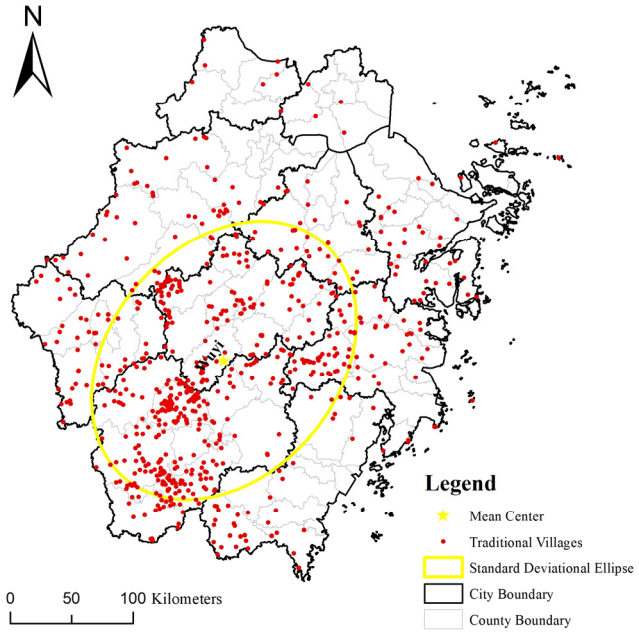

Figure 5. Standard deviational ellipse map of traditional villages in Zhejiang Province.

4.2. The Correlation between the Spatial Distribution of Traditional Villages and Geographical Elements

4.2.1. Altitude

Terrain is a fundamental factor affecting the site selection of traditional villages, and altitude is an important element among terrain factors. Different altitudes can bring different water and heat conditions, soil conditions, and transportation conditions, which in turn affect the site selection of traditional villages [58]. According to the classification standards of the world's five major terrains and combined with the actual terrain characteristics of Zhejiang Province, the altitude was divided into four levels: 0–200 m (plain), 200–500 m (hills), 500–1000 m (low mountains), and over 1000 m (medium mountains).

From Table 4 and Figure 6, it can be seen that there is a significant relationship between the distribution of traditional villages in Zhejiang Province and altitude. The higher the altitude, the fewer traditional villages are distributed, while the lower the altitude, the more traditional villages are distributed. Nearly half of traditional villages are located in plain areas with an altitude of 0–200 m, nearly one-third of traditional villages are located in hilly areas with an altitude of 200–500 m, about one-fifth of traditional villages are located in low mountain areas with an altitude of 500–1000 m, and only 12 traditional villages are located in mid-mountain areas with an altitude greater than 1000 m.

Table 4. The distribution number of traditional villages in Zhejiang Province at different altitudes.

Altitude/m	Number of Traditional Villages/pcs	Percentage/%
0–200	331	47.2
200–500	210	30.0
500–1000	148	21.1
>1000	12	1.7

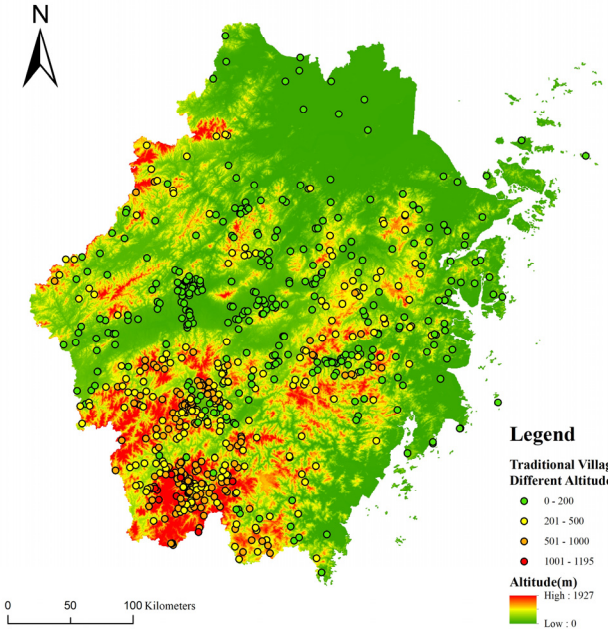

Figure 6. Altitude distribution map of traditional villages in Zhejiang Province.

4.2.2. Terrain Undulation

Altitude can only reflect the absolute height of the location of traditional villages, while terrain undulation can reflect the height difference of the location of traditional villages and thus can determine the specific landform type of the location of traditional villages. Referring to the classification standards for Chinese landform types [59], combined with the actual terrain characteristics of Zhejiang Province, the terrain undulation is divided into four levels: 0–20 m (plain), 20–100 m (low hills), 100–200 m (high hills), and 200–500 m (small undulating mountains).

From Table 5 and Figure 7, it can be seen that the distribution of traditional villages in Zhejiang Province is also affected by the terrain undulation. The traditional villages distributed in areas with terrain undulations of 20–100 m have the highest number, with a number of 352, accounting for 50.2% of the total. Secondly, there are 261 traditional villages distributed in areas with undulations of 100–200 m, accounting for 37.2% of the total. The results indicate that traditional villages in Zhejiang Province are mainly concentrated in hilly areas with moderate terrain undulations. Too low or too high terrain undulations are not conducive to the formation and preservation of traditional villages. The reason is that if the undulation is too low, the village is vulnerable to disasters such as rainstorms and floods; if the undulation is too high, it is difficult for buildings to gather and villagers to connect and form a certain scale of village.

Table 5. The distribution number of traditional villages in Zhejiang Province at different terrain undulations.

Terrain Undulation/m	Number of Traditional Villages/pcs	Percentage/%
0–20	66	9.4
20–100	352	50.2
100–200	261	37.2
200–500	22	3.2

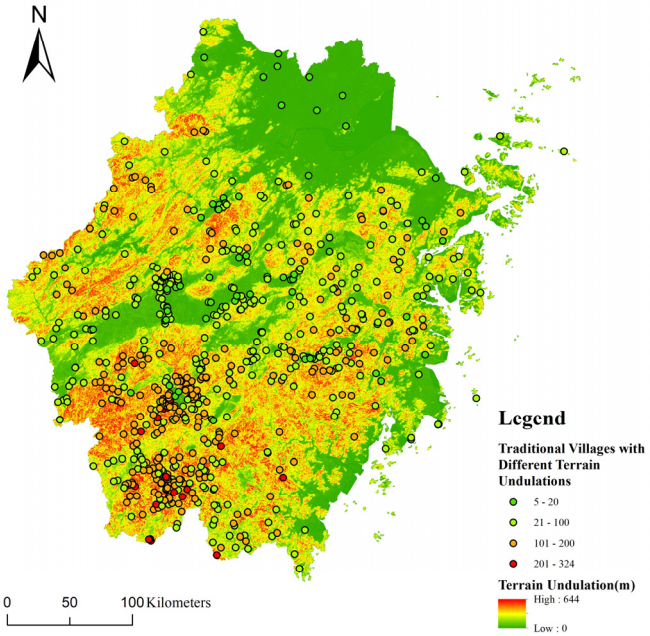

Figure 7. Terrain undulation distribution map of traditional villages in Zhejiang Province.

4.2.3. River System

Water is the material foundation for the birth and development of human civilization. Since ancient times, human settlements have been mostly distributed along river systems, which play an important role in the site selection and layout, landscape beautification, transportation, and other aspects of traditional villages [60]. According to the difficulty of human access to nearby water sources, the distance between traditional villages in Zhejiang Province and the river system is divided into five levels: 0–500, 500–1000, 1000–2000, 2000–4000, and 4000–6000 m. From Table 6, it can be seen that the distribution of traditional villages in Zhejiang Province reflects strong hydrophilicity. More than half of traditional villages are located within 0–500 m from the river system, while 15.0% of traditional villages are located within 500–1000 m from the river system. The further away from the river system, the fewer traditional villages are distributed, with only 3.7% of traditional villages located in areas over 4000 m from the river system.

Table 6. The distribution number of traditional villages in Zhejiang Province at different distances from the river system.

Distance from River System/m	Number of Traditional Villages/pcs	Percentage/%
0–500	369	52.6
500–1000	105	15.0
1000–2000	104	14.9
2000–4000	97	13.8
4000–6000	26	3.7

As shown in Figure 8, Zhejiang Province has a dense river network and developed river systems. However, in some areas with higher altitudes, the river density is relatively low. It can be found that traditional villages that are far from the river system (at a distance of over 1000 m) are mostly distributed in the high-altitude areas of western and eastern Zhejiang, as well as the mountainous areas of southern Zhejiang. Traditional villages that are close to the river system (at a distance of 0–1000 m) are widely distributed in both high-altitude and low-altitude areas. Through the observation of the environment of these traditional villages located far from the river system, it can be found that they are mostly distributed on flat land on mountain tops or slopes. The flat land on mountain tops is prone to collecting rainwater and forming small ponds due to its flat terrain, while the slopes on mountains are prone to forming small streams due to their large terrain differences, providing necessary water sources for people to settle and live in these areas.

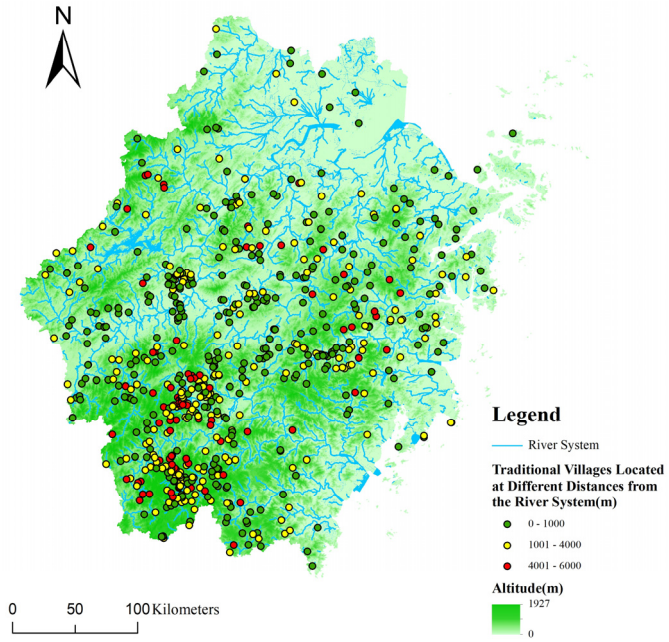

Figure 8. Distribution map of traditional villages and river systems in Zhejiang Province.

4.2.4. County-Level Administrative Centers

The relationship between villages and towns is inseparable. Towns have functions that villages do not possess, and the numerous demands of villages also depend on the supply of towns; however, towns are also prone to attracting rural populations, which can have an impact on villages. Generally speaking, county-level administrative centers, as economic, political, and cultural centers in a small area, will have a more direct impact on the villages within them [61]. Therefore, county-level administrative centers are selected as central towns in this paper to explore their impact on traditional villages

As shown in Table 7 and Figure 9, traditional villages in Zhejiang Province are mainly distributed 10–30 km away from the central county, with a number of 519 villages, accounting for 74% of the total. The number of traditional villages distributed within a range of 0–10 km from the central county is relatively small, with a total of 111; the number of traditional villages that are too far away from the central county (more than 30 km away) is even smaller—only 71. It can be seen from this that being too close or too far from the central county is not conducive to the distribution of traditional villages. This is because, only in areas a moderate distance away from the central county, traditional villages can avoid excessive external interference while maintaining necessary connections with the outside world, thus providing certain guarantees for the formation and development of traditional villages.

Table 7. The distribution number of traditional villages in Zhejiang Province at different distances from central counties.

Distance from Central Counties/km	Number of Traditional Villages/pcs	Percentage/%
0–10	111	15.8
10–20	310	44.2
20–30	209	29.8
30–40	51	7.3
>40	20	2.9

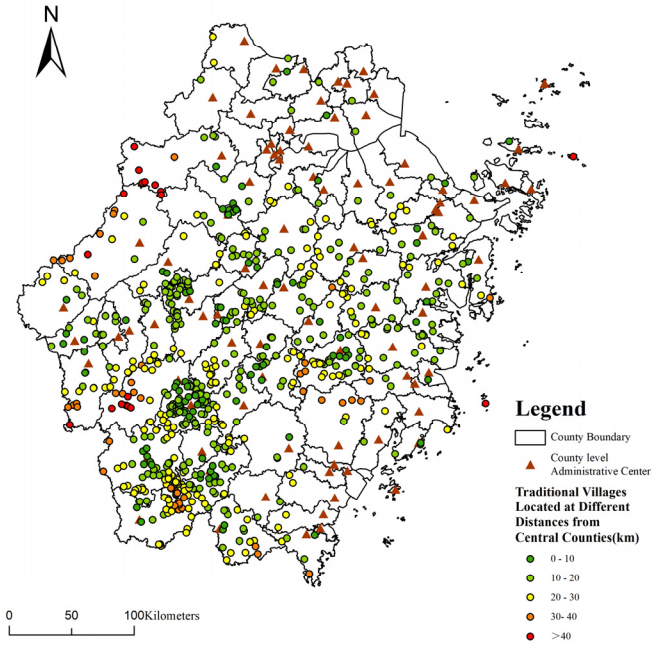

Figure 9. Distribution map of traditional villages and central counties in Zhejiang Province.

4.2.5. Main roads

Transportation conditions can affect both the formation and preservation of traditional villages [62]. The quality of transportation conditions in a region can be reflected by the transportation roads, so the main roads in the transportation roads were selected to explore their correlation with the distribution of traditional villages in Zhejiang Province. As shown in Table 8, traditional villages in Zhejiang Province are closely related to the main roads. A total of 52.2% of traditional villages are located within 0–1 km of the road, and 23.1% of traditional villages are located 1–3 km away from the road. The further away from the main road, the fewer traditional villages are distributed.

Table 8. The distribution number of traditional villages in Zhejiang Province at different distances from main roads.

Distance from Main Roads/km	Number of Traditional Villages/pcs	Percentage/%
0–1	366	52.2
1–3	162	23.1
3–5	93	13.3
>5	80	11.4

From Figure 10, it can be seen that the road network in Zhejiang Province is very developed and presents a dense distribution pattern in the northern plain of Zhejiang,

Wucheng district of Jinhua city, and Yiwu city of Jinhua city, as well as the coastal plain areas of Ningbo, Taizhou, and Wenzhou city, while the road network in other areas is relatively sparse. However, very few traditional villages are distributed in areas with dense road networks as mentioned above. Most traditional villages are distributed in areas near roads but with relatively sparse road networks. This phenomenon indicates that areas with too good transportation conditions are actually not conducive to the distribution of traditional villages. Even if traditional villages were once formed in these areas, they often cannot be preserved to this day. However, the distribution of traditional villages still has a certain correlation with roads. Appropriate roads can enable traditional villages to seek necessary resources and maintain necessary connections with the outside world, thereby playing a positive role in the preservation and development of traditional villages.

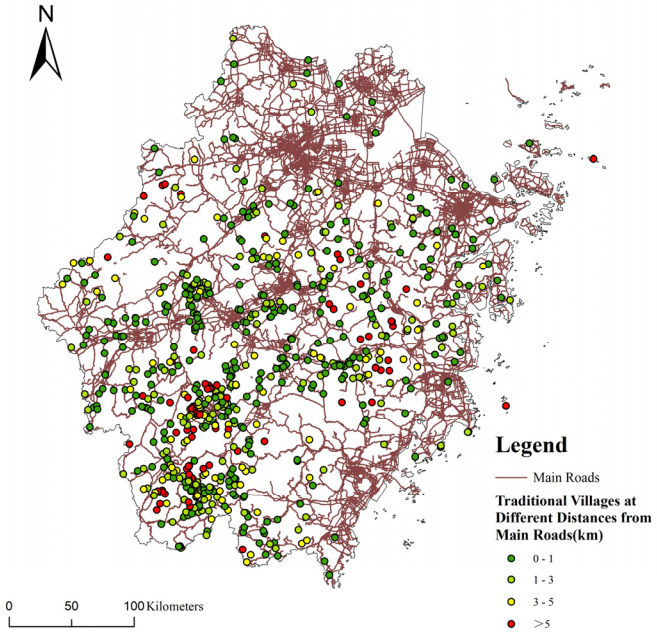

Figure 10. Distribution map of traditional villages and main roads in Zhejiang Province.

4.3. Type Division and Distribution Area Classification of Traditional Villages in Zhejiang Province

4.3.1. Results of Type Division

There are numerous and widely distributed traditional villages in Zhejiang Province, which have their own uniqueness and certain commonalities. Therefore, traditional villages could be classified and their distribution areas can be divided so as to provide more targeted protection and utilization of traditional villages of the same type and the same distribution area.

The geographical environment in which traditional villages are located is the sum of their geographical location and various natural and human elements associated with them, which will have an impact on the development scale, development value, protection, and many other aspects of traditional villages. Therefore, the type division of traditional villages in Zhejiang Province is based on the comprehensive influence of various geographical elements in the geographical environment in which traditional villages are located. In this study, the geographical environment of traditional villages was judged and confirmed based on Gaode satellite map and literature records of the traditional villages. Finally, traditional villages in Zhejiang Province were divided into flat-land type, mountainside type, valley type, mountaintop type, and coastal-type villages, as shown in Table 9.

Table 9. The results of type division of traditional villages in Zhejiang Province.

Types of Traditional Village	Number of Traditional Villages/pcs	Percentage/%
Flat-land type	296	42.2
Mountainside type	197	28.1
Valley type	163	23.3
Mountaintop type	33	4.7
Coastal type	12	1.7

4.3.2. Characteristics of Each Type of Traditional Village

1. Flat-land-type villages

The satellite image of a flat-land-type village is shown in Figure 11a. Flat-land-type villages are the main type of traditional villages in Zhejiang Province, accounting for 42.2% of the total. These villages are mainly distributed in plains or basins below an altitude of 200 m with small terrain undulations. Due to the wide and continuous space in these areas, the development scale of these villages is generally large. There are also a small number of villages located in the mountainous plains above an altitude of 200 m but with gentle terrain. Due to the limited space in these areas, the scale of these villages is generally small. The boundaries of some flat-land villages are clear and complete, often separated from the outside by rivers or roads. Some villages have blurred boundaries and are connected to other communities, making them vulnerable to urbanization. In terms of development value, many flat-land villages are located in areas with dense water networks and wide accessibility, thus carrying important transportation and commercial functions. These villages can serve as transportation hubs, distribution centers for goods, or important places for commercial trade and have natural advantages in attracting external populations or tourists.

2. Mountainside-type villages

The satellite image of a mountainside-type village is shown in Figure 11b. Mountainside-type villages are the second most common type of traditional villages in Zhejiang Province, accounting for 28.1% of the total. This kind of village is mainly distributed in mountainous slopes with a high altitude and certain terrain undulations, among which 140 traditional villages of this type are located in Lishui city, which is consistent with the terrain characteristics of Lishui city. Due to the limited construction space on the mountainside, the scale of such villages is generally small. Mountainside-type villages all have obvious commonalities. Firstly, they choose areas with gentle slopes to build terraces along contour lines to meet the needs of daily life and production. Village buildings are uniformly distributed on one side of the terraces or around the terraces as the center. Secondly, they are far away from rivers and usually require the collection of rainwater or streams to build ponds to conserve water sources. Thirdly, they are far from the main roads and often require passing through mountain roads to enter these villages, which are less affected by external factors. In terms of development value, most of these villages contain rich natural landscapes, such as century-old trees, strange peaks and rocks, celestial landscapes, etc. Some villages also preserve ancient mountain roads, cliff stone carvings, and other cultural landscapes. The overall environment is beautiful and far away from disturbance, so it is very suitable for people to come for vacation leisure, outdoor exploration, and seclusion.

3. Valley-type villages

The satellite image of a valley-type village is shown in Figure 11c. Valley-type villages are also an important type of traditional village in Zhejiang Province, accounting for 23.2% of the total. Some valleys develop rivers to form river valleys, with relatively flat and open terrain, so villages located in such valleys are generally larger in scale. Some valleys only develop streams to form stream valleys, with narrow and undulating terrain; villages located in such valleys are generally smaller in scale. In terms of development

value, valley-type villages are surrounded by mountains and rivers, with many waterfalls, deep pools, ancient trees and roads, and strange peaks and rocks. The air is fresh and the environment is quiet, and most of them have relatively convenient water and land transportation conditions, so they have both transportation and livable functions.

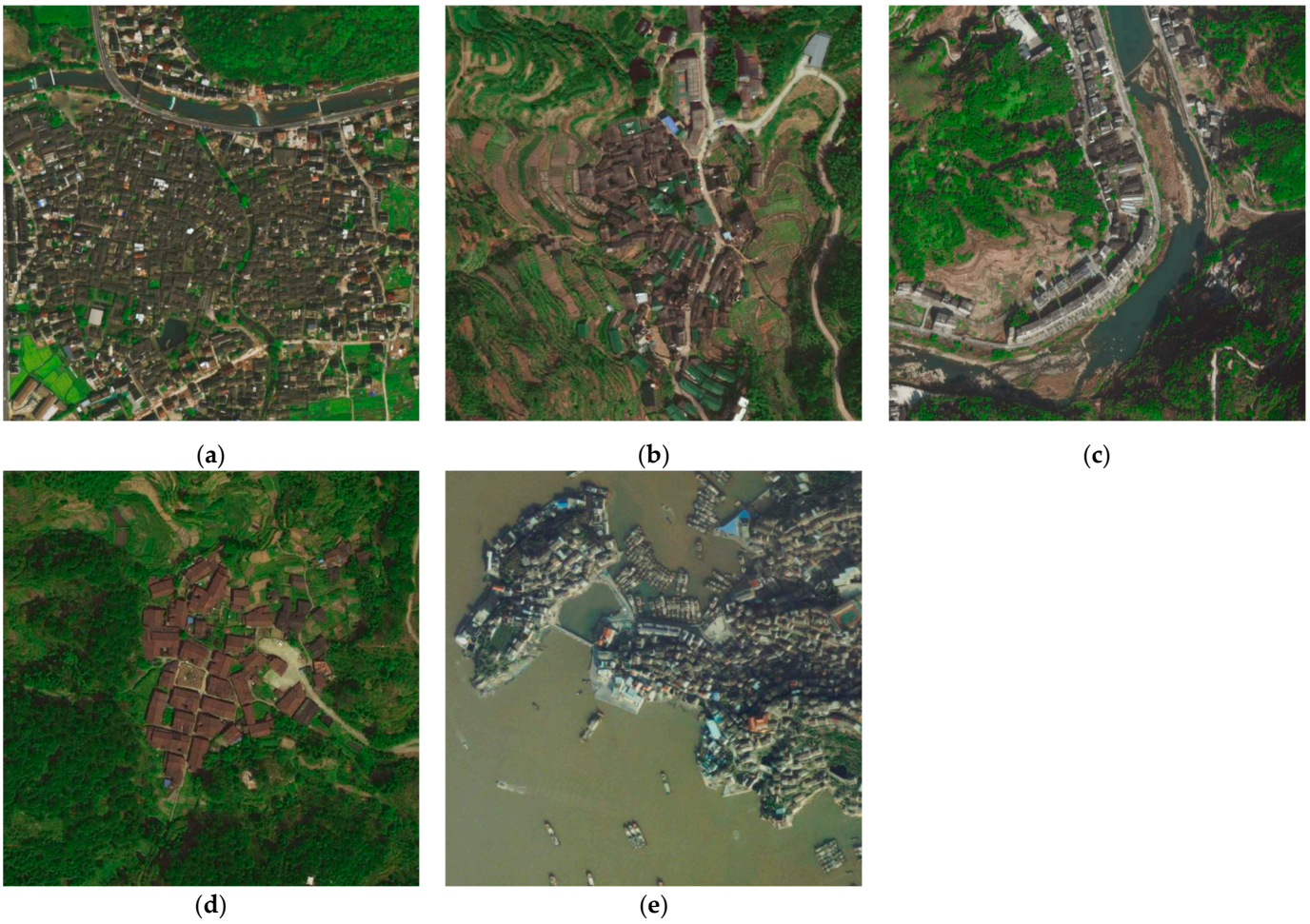

Figure 11. Satellite images of various types of traditional villages in Zhejiang Province: (**a**) Longmen village in Fuyang district, Hangzhou city, a village of flat-land type; (**b**) Lizhuang village in Sonyang county, Lishui city, a village of mountainside type; (**c**) Qiaoxi village in Taishun county, Wenzhou city, a village of valley type; (**d**) Chenping village in Jingning county, Lishui city, a village of mountaintop type; (**e**) Donghai village in Wenling city, Taizhou city, a village of coastal type. Map Source: https://www.amap.com/ (accessed on 13 April 2024).

4. Mountaintop-type villages

The satellite image of a mountaintop-type village is shown in Figure 11d. Mountaintop-type villages are mainly distributed at the flat top of the mountain rather than above the highest peak. There may be some peaks around them, but the terrain in the central area is relatively flat. Due to the difficulty of entry and exit, there are only 32 mountaintop-type villages in Zhejiang Province, and due to the limited space available on the mountaintops, the village size is generally very small. Similar to mountainside-type villages, mountaintop-type villages are far from rivers or main roads, and villagers will also build high-altitude terraces according to the terrain to meet production and living needs. In terms of development value, mountaintop villages have both defensive and livable functions because they are located in high mountains, have a beautiful environment, are far from the world, and are not easily affected by external interference.

5. Coastal-type villages

The satellite image of a coastal-type village is shown in Figure 11e. Coastal-type villages are mainly distributed in the eastern coastal plains or low-lying areas of islands in Zhejiang Province, with only 12 in number. In history, some coastal-type villages were formed early due to the development of fishing in the Tang Dynasty. Other coastal-type villages were formed due to the coastal defense needs of the Ming and Qing dynasties, and due to their location along the coast, they are more frequently affected by typhoons, so their layout generally has strong defensive capabilities. For example, Donghai village in Wenling city, Taizhou city, there are many stone ponds, stone roads, stone houses, and stone walls built to resist typhoon attacks and pirate attacks. The fishing and aquaculture industries in coastal-type villages are developed, and due to their unique location, they also carry functions such as sea transportation and coastal defense.

4.3.3. Classification and characteristics of Traditional Village Distribution Areas Based on Traditional Village Types

To further explore the similarities and differences in the distribution of traditional villages among different regions in Zhejiang Province, based on the classification of traditional village types, 90 counties (cities, districts) in Zhejiang Province were taken as basic units, and the number of five traditional village types in each county (city, district) was used as data. The SPSS 26 software was used for cluster analysis, and the distribution areas of traditional villages in Zhejiang Province were classified into six types. The cluster analysis results are shown in Table 10. Then, the results were imported into ArcGIS 10.2 for visual display, and a classification map of traditional village distribution areas in Zhejiang Province is shown in Figure 12. The results show that 70 counties (cities, districts) in Zhejiang Province have traditional villages, while the other 20 counties (cities, districts) do not have traditional villages. Therefore, blank patterns are used to display areas without traditional village distribution.

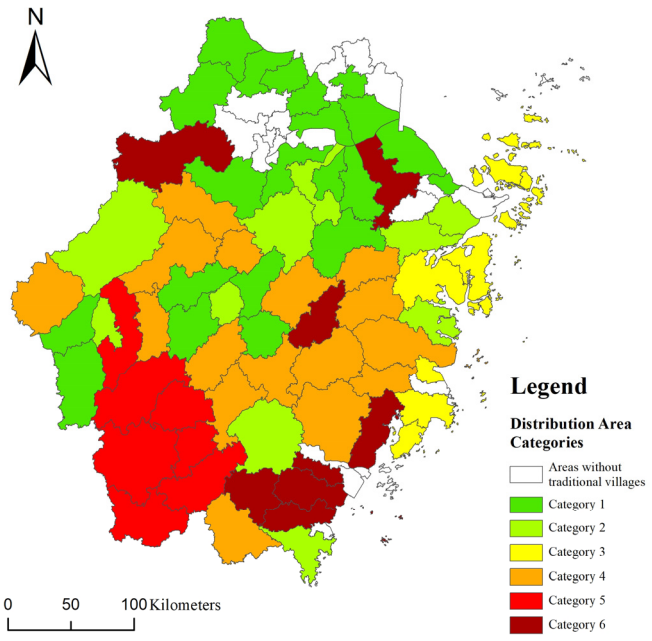

Figure 12. Classification map of traditional village distribution areas in Zhejiang Province.

Table 10. Cluster analysis results of traditional village distribution areas in Zhejiang Province.

Categories of Distribution Areas	County (City, District)	Composition Characteristics of the Type of Traditional Village
1. The distribution area of flat-land-type traditional villages	Anji county, Wuxing district, Changxing county, Nanxun district, Nanhu district, Haining city, Haiyan county, Tongxiang city, Xiaoshan district, Fuyang district, Cixi city, Zhenhai district, Yuecheng district, Shangyu district, Shengzhou city, Wucheng district, Yiwu city, Yongkang city, Lanxi city, Jiangshan city, Changshan county	The main type of village in this category is the flat-land type, and a few counties (cities, districts) also have some mountainside villages
2. The distribution area of flat-land-type and valley-type traditional villages	Cangnan county, Chun'an county, Fenghua district, Yinzhou district, Kecheng district, Keqiao district, Zhuji city, Jindong district, Qingtian county, Sanmen county	There are only two types of villages in this category: flat-land type and valley type
3. The distribution area of coastal-type traditional villages	Daishan county, Dinghai district, Putuo district, Jiaojiang district, Wenling city, Yuhuan city, Ninghai county, Xiangshan county	Counties (cities, districts) in this category all contain coastal villages, with a few also including flat-land-type or valley-type villages
4. The distribution area in which multiple types of traditional villages are densely distributed	Jiande city, Tonglu county, Longyou county, Kaihua county, Huangyan district, Linhai city, Tiantai county, Xianju county, Jinyun county, Liandu district, Dongyang city, Pujiang county, Wuyi county, Xinchang county, Taishun county, Yongjia county	There are rich types of villages in this category, all of which have three or more types of village
5. The distribution area of mountainside-type traditional villages	Jingning county, Longquan city, Qingyuan county, Songyang county, Suichang county, Yunhe county, Qujiang district	The main type of village in this category is the mountainside type
6. The distribution area in which valley-type, mountainside-type, and mountaintop-type traditional villages are sparsely distributed	Lin'an district, Yuyao city, Pan'an county, Yueqing city, Ouhai district, Pingyang county, Rui'an city, Wencheng county	The number of villages is relatively small, and the types only include two or three types among mountainside type, valley type, or mountaintop type

1. The distribution area of flat-land-type traditional villages

This distribution area contains 21 counties (cities, districts). As shown in Figure 12, in terms of geographical location, the counties (cities, districts) in this distribution area are mainly located in the Hangjiahu Plain and Ningshao Plain in northern Zhejiang. Some of them are located in the Jinqu Basin in central Zhejiang. The rest are located in Jiangshan city and Changshan county in Quzhou, western Zhejiang. Overall, these counties (cities, districts) have strong connectivity in geographical distribution, with at least two counties (cities, districts) connected to each other. From the perspective of traditional village type composition, the majority of counties (cities, districts) in this distribution area only contain flat-land-type villages. Among them, some counties (cities, districts) also contain a few mountainside-type villages. The terrain of these counties (cities, districts) is generally relatively flat, and a few counties (cities, districts) also have small undulating basins and hills within their borders, which can form a large number of flat-land-type villages and a certain number of mountainside-type villages.

2. The distribution area of flat-land-type and valley-type traditional villages

There are 10 counties (cities, districts) in this distribution area, which are geographically dispersed. Among them, as shown in Figure 12, Chun'an county in Hangzhou and

Kecheng district in Quzhou are located in western Zhejiang, Keqiao district and Zhuji city in Shaoxing are located in northern Zhejiang, Jindong district in Jinhua is located in central Zhejiang, Fenghua District and Yinzhou district in Ningbo, Sanmen county in Taizhou is located in eastern Zhejiang, Qingtian county in Lishui, and Cangnan county in Wenzhou are located in southern Zhejiang, with poor connectivity between them. From the perspective of the composition of traditional village types, each county (city, district) in this distribution area contains two types of villages: flat-land type and valley type. The reason is that these counties (city, district) have terrain with low mountains, shallow hills, valley plains, and valley plains alternating within their borders.

3. The distribution area of coastal-type traditional villages

As shown in the yellow patches in Figure 12, there are eight counties (cities, districts) in this category, which are all distributed in the coastal plain and hilly island areas of eastern Zhejiang. Due to their proximity to the ocean, these counties (cities, districts) all contain coastal villages, among which Jiaojiang district and Yuhuan city in Taizhou and Ninghai county and Xiangshan county in Ningbo also have flat-type villages due to their flat terrain. Due to the barriers of Linhai city and Sanmen county in Taizhou, the counties (cities, districts) in this distribution area are divided into two clusters: the Ningbo–Zhoushan cluster in the north and the Jiaojiang–Wenling–Yuhuan cluster in the south, but many connections can be formed between the two clusters through the ocean.

4. The distribution area in which multiple types of traditional villages are densely distributed

This distribution area contains 16 counties (cities, districts). As shown in Figure 12, in terms of geographical location, the counties (cities, districts) in this distribution area can be divided into four blocks in space. The largest block is located in the hilly area of eastern Zhejiang. Due to the influence of Tiantai Mountain, Kuaiji Mountain, north Yandang Mountain, Kuocang Mountain in eastern Zhejiang, Tianmu Mountain, Longmen Mountain, Qianligang Mountain in western Zhejiang, and south Yandang Mountain in southern Zhejiang, the terrain of these counties (cities, districts) is complex and varied. Therefore, traditional village types are also relatively rich, mostly including any three of the four types: flat-land type, mountainside type, valley type, and mountaintop type. Xianju county in Taizhou, Jinyun county in Lishui, Wuyi county in Jinhua, Kaihua county in Quzhou, and Taishun county in Wenzhou even have all four types of traditional villages.

5. The distribution area of mountainside-type traditional villages

As shown in the red patches in Figure 12, this distribution area contains seven counties (cities, districts), which are all distributed in the mountainous areas of southern Zhejiang. The mountainous areas in southern Zhejiang have a high altitude, complex terrain, and large undulations. People living in the southern mountainous areas of Lishui or Qujiang rely on the mountains to cultivate terraced fields and carry out production and life around terraced fields, thereby promoting the formation of villages. Therefore, from the perspective of the composition of traditional village types, the traditional villages in these counties (cities, districts) are mainly of the mountainside type and also include a certain number of the flat-land type, valley type, and mountaintop type. In addition, although there are only 7 counties (cities, districts) in this distribution area, there are 243 traditional villages, accounting for about one-third of the total number of traditional villages in Zhejiang Province. Among them, the number of traditional villages in Songyang county, Jingning county, and Longquan city in Lishui is 78, 56, and 50, respectively, ranking among the top three counties (cities, districts) in the province. Therefore, it is necessary to increase the attention toward traditional villages in this distribution area.

6. The distribution area in which valley-type, mountainside-type, and mountaintop-type traditional villages are sparsely distributed

As shown in the brown patches in Figure 12, this distribution area contains eight counties (cities, districts). The distribution of these counties (cities, districts) is relatively

dispersed. Among them, Lin'an district in Hangzhou is located in western Zhejiang, Pan'an county in Jinhua is located in central Zhejiang, Yuyao city in Ningbo is located in eastern Zhejiang, and Yueqing city is located in northern Wenzhou. The characteristics of this category of distribution area are that each county (city, district) has a relatively small number of traditional villages and does not include flat-land-type villages; they only include two or three types of the mountainside type, valley type or mountaintop type. The reason is that the terrain in these counties (city, district) is complex, and there are many hills and low mountains.

5. Discussion

This study first analyzed the overall spatial distribution characteristics of traditional villages in Zhejiang Province. Then, based on the actual geographical characteristics of Zhejiang Province, the relationship between the spatial distribution of traditional villages in Zhejiang Province and the five geographical elements of altitude, terrain undulations, water systems, county-level administrative centers, and main roads was explored. Then, taking into account the comprehensive influence of these geographical factors, traditional villages in Zhejiang Province were divided into five types. Finally, taking into account the spatial distribution characteristics of various types of traditional villages, the distribution areas of traditional villages in Zhejiang Province were classified into six categories. We will now discuss the main findings, contributions, and inspirations of this study.

Firstly, similar to many existing research results on the spatial distribution of traditional villages [27,42,45,47], the spatial distribution of traditional villages in Zhejiang Province also exhibits characteristics of clustered and unbalanced distribution. The concentration of traditional villages in Zhejiang Province is relatively high in the southwest region, while it is relatively low in other regions. There are three main agglomeration centers for traditional villages in Zhejiang Province, located in the northern and southern parts of Lishui city, as well as the border area between Jinhua and Hangzhou. These phenomena gives us the inspiration that different protection and development strategies should be implemented for different regions with varying levels of traditional village density.

Secondly, the correlation between different geographical elements and the spatial distribution of traditional villages in Zhejiang Province is not the same. The results show that traditional villages in Zhejiang Province have high hydrophilicity, with most of them distributed near river systems, and this result is similar to some studies [29,31,33]. However, the results show that traditional villages in Zhejiang Province are mainly distributed in areas with an altitude of 0–200 m, and the distribution quantity shows a decreasing trend with increasing altitude, which is inconsistent with some existing results. For example, traditional villages in Hebei and Fujian provinces are mainly distributed in hilly and low mountain areas with an altitude of 200–1000 m [31,32]. In addition, traditional villages in Zhejiang Province are mainly distributed in areas with moderate terrain undulation of 20–200 m, and similarly, they are mainly distributed in areas a moderate distance away from county-level administrative centers. If the terrain undulation is too low or too high, or the distance from the county-level administrative center is too close or too far, it is not conducive to the preservation of traditional villages. This is also different from the conclusions of some studies that traditional villages generally have lower terrain undulations and are generally far from administrative centers [26,38]. In addition, traditional villages in Zhejiang Province are more distributed in areas close to main roads but with sparse road networks, indicating that areas with a certain degree of transportation conditions but not particularly developed transportation conditions are more conducive to the preservation of traditional villages. This is also different from some studies that suggest that traditional villages are distributed far away from roads [30,48]. In summary, the above phenomena also give us the inspiration that, due to the different impacts of different geographical elements on traditional villages in different regions, when protecting traditional villages, it is necessary to consider the comprehensive impact of various geographical elements according to local conditions.

Thirdly, based on the comprehensive impact of various geographical elements in the geographical environment where traditional villages are located, we divide traditional villages in Zhejiang Province into five types as shown in Table 9. Each type of traditional village has different development scales, resource endowments, and development values. Therefore, corresponding protection and development strategies can be proposed based on these characteristics. Finally, taking into account the spatial distribution characteristics of various traditional villages in Zhejiang Province, we have divided the distribution of traditional villages in Zhejiang Province into six categories, as shown in Table 10, in order to implement specific protection and development strategies for these regions.

6. Conclusions

This study used the average nearest neighbor index, imbalance index, kernel density, and standard deviational ellipse to analyze the overall spatial distribution characteristics of traditional villages in Zhejiang Province. Then, based on the actual geographical characteristics of Zhejiang Province, the relationship between the spatial distribution of traditional villages in Zhejiang Province and the five geographical elements of altitude, terrain undulations, river systems, county-level administrative centers, and main roads was explored. Then, based on the comprehensive influence of various geographical elements in the geographical environment where traditional villages are located, traditional villages in Zhejiang Province are divided into five types: flat-land type, mountainside type, valley type, mountaintop type, and coastal type. Finally, based on the spatial distribution and type characteristics of traditional villages in Zhejiang Province, the distribution areas of traditional villages in Zhejiang Province are classified as follows: the distribution area of flat-land-type traditional villages; the distribution area of flat-land-type and valley-type traditional villages; the distribution area of coastal-type traditional villages; the distribution area in which multiple types of traditional villages are densely distributed; the distribution area of mountainside-type traditional villages; and the distribution area in which valley-type, mountainside-type and mountaintop-type traditional villages are sparsely distributed.

Based on the discussion and conclusion above, we propose the following suggestions for the protection and sustainable development of traditional villages: Due to the unbalanced distribution of traditional villages, different protection and development strategies should be implemented for different regions. For example, in the northern Zhejiang region, where the number of traditional villages is relatively small, traditional villages should be the core to create a comprehensive traditional village tourism scenic area. For the southern Zhejiang region with many traditional villages, it is necessary to enhance the connection between traditional villages and build a traditional village tourism industry chain based on the beautiful landscape environment. Due to the varying impacts of different geographical elements on traditional villages in different regions, it is necessary to pay attention to the comprehensive impact of various geographical elements when protecting and developing traditional villages. Due to the different types of traditional villages in different distribution areas, and the different characteristics of different traditional village types, it is necessary to protect and develop traditional villages according to their types and local conditions.

Although this study has achieved the above mentioned results, there are still some limitations. The research object of this study is national-level traditional villages in Zhejiang Province, and it is hoped that future research can also select some provincial-level traditional villages for research. Only five geographical elements were selected to analyze their correlation with the spatial distribution of traditional villages. It is hoped that more elements can be selected for analysis in future research. The distribution of traditional villages is dynamic, and this study only studied their spatial distribution. It is hoped that in the future further research can be conducted on their spatio–temporal evolution process.

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R.L.; visualization, Y.C. and R.L.; supervision, R.L.; project administration, Y.C. and R.L.; funding acquisition, R.L. All authors have read and agreed to the published version of the manuscript.

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