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Analysis of Social Perception and Tourism Potential of Traditional Villages in Zhanjiang Based on Sustainability Eyes by Big Data, RS and GIS

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***Abstract*—** *The traditional village is not only the biggest heritage of agriculture but also the most ancient and precious resource of culture in China. But along with the rapid development of modern society and cities, the traditional village, which has a science of study, history, and cultural value, is disappearing rapidly. Therefore, this paper uses big data and ArcGIS as a means to obtain the research data of traditional villages in Zhanjiang and analyze their spatial distribution characteristics. Then, the driving factors affecting the tourism development of traditional villages are analyzed, and the social perception behind them is interpreted. Finally, the Tourism Development Potential Index (TDPI) model is used to evaluate the tourism development potential of traditional villages in Zhanjiang and make suggestions. The results showed that among the factors affecting the tourism development of traditional villages in Zhanjiang, the weight of human factors was greater than that of natural factors. Among the eight driving factors of tourism development, high-level scenic spots and socio-economic factors had the greatest impact on tourism development in traditional villages, with 10 traditional villages with strong potential, 47 with medium potential, and 39 with weak potential. Based on this, the corresponding development strategy is proposed, aiming at offering a scientific basis for developing Zhanjiang Traditional Village's tourist industry.*

Keywords*— *Traditional Villages; Big Data; Geography Information System (GIS); Tourism Development Potential Index (TDPI); Social Perception.

I. INTRODUCTION

As a country with a long history of farming and farming culture, China has accumulated a rich and diverse agricultural cultural heritage for thousands of years, and the rural settlements produced at the same time with farming civilization are where agricultural producers work together and multiply. However, in the

process of the rapid advancement of modern industrialization and urbanization, a large number of people in rural areas have left the country, resulting in a serious phenomenon of "rural culture" fault caused by the hollowing out of rural areas. In addition, villagers in some backward areas have weak awareness of protecting traditional buildings, and most of the newly constructed rural houses are incompatible with the buildings with local cultural characteristics. As a result, many traditional houses with cultural branding and great historical value were quickly flooded by the same reinforced concrete buildings (Lin et al., 2019). In this context, the preservation and sustainable development of traditional villages have become important issues that cannot be ignored.

With the proposal of the national "rural revitalization strategy" and the awakening of people's awareness of traditional culture protection, Chinese scholars have also carried out a lot of research on traditional villages. The research content focuses on spatial distribution (Huang and Li, 2021), restoration and protection, tourism development, value mining (Shen et al., 2006), and so on. The research methods mainly used GIS analysis technology (Fu and Huang, 2016), big data (Hu, 2018), social perception (Chen, 2021), and so on. The research scale is concentrated on the national (Ma and Wu, 2020), local (Zhang, 2018), urban (Zhang, 2019), and other large mesoscales. However, at present, scholars' research on traditional villages in Guangdong Province mainly focuses on areas where traditional villages are more densely distributed, such as East Guangdong and the Pearl River Delta, and there are few studies on western Guangdong. In addition, most of the research contents focus on restoration and protection of architectural structures, and the research scale is mainly microscale, lacking research on the tourism development potential of mesoscale traditional villages.

The study of villages abroad can be traced back to the 1930s. Due to the relatively backward science and technology at that time, foreign scholars mainly studied villages to elaborate and confirm. Based on the natural differences between different settlements, American scholar Hall (1931) selected three dimensions of village distribution type, spatial characteristics, and culture to analyze the form of rural settlements in Japan.

After the 21st century, the rapid development of information technology makes GIS, remote sensing (RS), and other research methods rise in the study of geospatial and are applied to the study of settlement form. Pamela et al. (2009) used RS technology to study the dynamic changes in the historical settlement landscape. Yang et al. (2009) used GIS and RS as research methods to discuss the updating of grid population distribution data in China. Janowicz et al. (2019) discussed how to understand the social perception of a certain regional environment by studying the spatial, temporal, and thematic characteristics of a certain region on the basis of providing massive data with big data. Chen et al. (2018), using RS and social perception as research methods, used big data to crawl traffic networks, commercial outlets, residential areas, and other points of interest to analyze Beijing's green space. Sarah (2014) took the Mayan village of Yucatan in eastern Mexico as an example and studied the tourism development of the local Mayan heritage village from the perspective of the villagers' social perception; Liu et al. (2015) discussed how geographers used the combination of social perception and RS to analyze the spatial interactivity of a certain region in the era of big data and put forward the main problems of applying the social perception analysis method; Lai et al. (2013) took historical towns in Taiping, Malaysia as an example to explore the role of cultural factors in the spatial characteristics of towns and villages.

At present, the research focus on traditional villages in China mainly focuses on the value, spatial distribution pattern, protection, and development of traditional villages. Li (2020) used ArcGIS and Excel software as tools to analyze the spatial pattern of villages in Hunan Province by using the nearest proximity index, Gini imbalance index, kernel density analysis, and Moran index. Then, 10 impact factors based on traditional villages selected by the state were

selected to analyze and study the tourism development potential of traditional villages in Hunan Province. Chen (2021) uses a combination of RS and social perception to analyze the landscape of urban villages in the Guangdong-Hong Kong-Macao Greater Bay Area. Song et al. (2002) took traditional villages in Beijing as an example, and on the basis of crawling the big data of tourism reviews on various online platforms, they used social perception methods to analyze the characteristics of cultural tourism on the evaluation of tourists' tourism behaviors such as eating, lodging, traveling, and shopping.

In the network, the definition of social perception is mainly based on human perception units, taking various types of geographic big data that can record residents' activity trajectories as data sources and analyzing the geospatial characteristics of human and socio-economic conditions in a specific area on the basis of GIS spatial models and analysis methods. The term social perception is extended from urban imagery, which is people's consciousness, which is the process of physical and mental perception such as awareness, feeling, and attention generated by people in the surrounding living environment. In the pre-network period, because the Internet was not yet popular, urban imagery mainly referred to citizens' collective memory of the built environment, such as roads, areas, boundaries, and other environmental elements. With the rapid development of the Internet, residents' perception of the living space environment is no longer limited only by the scene in the living environment; they can use self-media, various tourism platforms, and smart maps to express their perception of the landscape of features, that is, social perception.

Kevin Lynch, in his study of "urban scenes", proposed that there are many similarities between urban imagery (traditional social perception) as a result of the interaction between the urban environment and people, the evolution of cities from traditional settlements, and the product of the industrialization of human society. After Xiong Kai (1999) interpreted the theory of urban imagery, he extended the concept of rural scene, which has the same connotation as urban imagery, but the research object is rural rather than urban. This paper combines the connotations of urban imagery and rural imagery when discussing traditional villages, so the definition of social perception in this paper is relatively narrow, between traditional social perception and big data social perception, which refers to the analysis of the spatial distribution pattern, traffic road network, distance from advanced scenic spots, and other data of traditional villages, and expounds the geospatial characteristics of the natural and socio-economic conditions of traditional villages in Zhanjiang.

In the process of urbanization, many rural people have migrated to cities, traditional villages are facing problems such as aging and hollowing, and regional cultural characteristics are gradually declining with population loss. Traditional villages are the heritage of China's agricultural culture, with important scientific research, historical culture, and landscape value, and can provide rich historical and cultural landscape resources for the development of urban tourism. Thus, this paper aims to study the natural and human conditions of traditional villages in Zhanjiang, analyze their tourism development potential, and discuss the feasibility of tourism development in traditional villages. Specifically, the research objectives of this paper can be subdivided into the following aspects:

(1) Taking the traditional villages of Zhanjiang as the research area, the spatial distribution characteristics of their traditional villages were analyzed.

(2) This paper uses the tourism potential development index as the evaluation standard to explore the tourism development potential of traditional villages.

(3) Based on the actual situation of traditional villages in Zhanjiang, in addition to providing strategies for their preservation and development, we also hope to propose sustainable development strategies.

II. STUDY AREA AND DATA SOURCES

2.1 Study Area

Zhanjiang City is located in the southernmost part of the Chinese mainland, southwest and southeast of Guangzhou, and has a unique geographical advantage. The whole area is 13263km², under the jurisdiction of Chikan District, Xiashan District, Potou District and Mazhang District 4 municipal districts; two counties, Suixi County and Xuwen County; and three county-level cities in Lianjiang City, Leizhou City, and Wuchuan City (Figure 1), and the municipal government is located in Chikan District. According to the latest census data release, the permanent population of Zhanjiang is 6,981,236.

Zhanjiang is located in the middle and low latitudes, with a tropical monsoon climate, and rain and heat at the same time. Because it is surrounded by the sea on three sides, it is affected by the oceanic climate all year round, with no scorching heat in summer and no severe cold in winter. The average annual rainfall is 1395.5~1723.1 mm, and the frontal rain belt landed in southeast China in April ~ September.

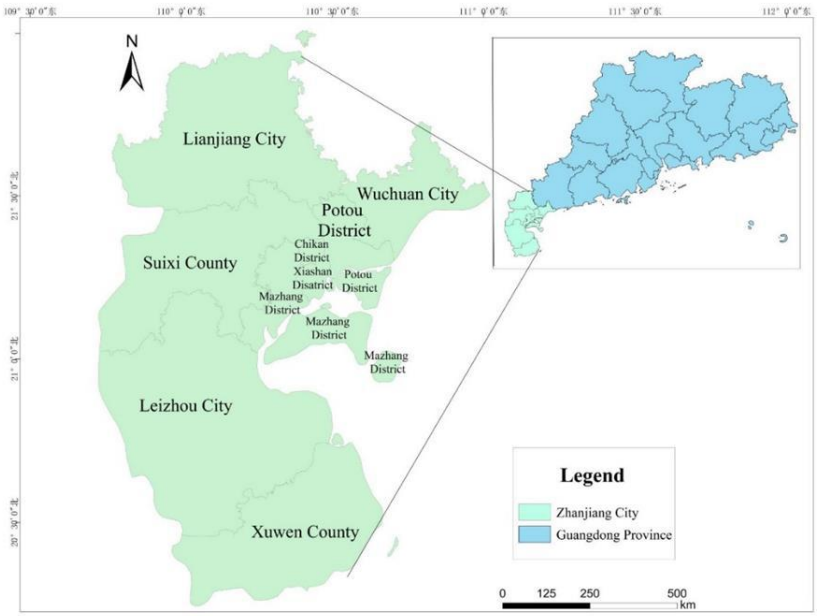

Fig.1 Location Map of Zhanjiang City

Zhanjiang has a tortuous coastline composed of the Leizhou Peninsula and its nearby islands, and the overall terrain is undulating and gentle. The overall topography of Zhanjiang is high in the south and low in the north, and the coastal areas are low, mainly plains and terraces. Coastal plains are mainly divided into two types: riparian plains with alluvial rivers and coastal terraces. Zhanjiang has a dense network of inland rivers, but most of them are small streams and rivers with short source flow, small water volume, and small catchment areas. The distribution of precipitation in time and space is not uniform because the Leizhou Peninsula is mostly flat, and it is difficult for water vapor to gather here to form precipitation, so the average precipitation of the Leizhou Peninsula for many years is significantly less than that of other areas of Zhanjiang.

Zhanjiang has a coastline stretching for 1,556 km, which makes seaside leisure tourism a long-standing tourist hotspot. It is known as the "city of lung washing", and its air quality index ranks in the top ten in China all year round. In addition, it also has a long history and culture; it was once the birthplace of the "Maritime Silk Road", with rich and diverse high-quality traditional villages, local folklore, pastoral scenery, coastal customs, and other tourism resources.

2.2 Data Sources and Processing

This paper's data can be divided into two categories, including DEM and satellite imagery and social perception data, including traditional village points of interest (POI), advanced scenic spot POI, and traffic road networks.

(1) DEM data: The DEM data in this paper is taken from the Geospatial Data Cloud (GDC), which is obtained by the radar topography mapping SRTM. In this paper, the natural discontinuity method is used to divide the elevation of Zhanjiang into three levels, and the elevation map is obtained as the basis for evaluating the topographic conditions of traditional villages. The river system was obtained by using DEM, which was overlapped with the location map of traditional villages, and then the buffer zone analysis of the river was used as the basis for assessing the distance from the river system.

(2) Image data: The image data is taken by Landsat, and the band operation in the ENVI software is used to extract the vegetation index (VI), and the vegetation cover map is obtained.

(3) Point data: this paper selected 96 traditional villages as research objects by referring to the method of selecting traditional villages. The point data of traditional villages and the advanced scenic spots are obtained through big data crawling in Baidu's picking coordinate system.

(4) Traffic road network data: we obtain the whole country and Zhanjiang from the WeChat public account and simplify the two to only display the three levels of trunk roads, highways, and main roads through hierarchical screening, editing, and processing, and then overlap with the location map of traditional villages.

(5) Population and GDP data: The data are derived from the "Zhanjiang 2020 Yearbook", and the inverse distance weight (IDW) method is used to interpolate and analyze the GDP and population data. The distribution map and the population density of traditional villages are obtained as the basis for evaluating the socio-economic conditions.

III. METHODOLOGY

In this paper, the imbalance index, nearest neighbor index method, coefficient of variation analysis, and kernel density analysis method were used to analyze the spatial distribution characteristics of traditional villages. Additionally, position analysis, extraction analysis, buffer analysis, interpolation analysis, and kernel density analysis in ArcGIS software were used. To analyze the driving factors affecting the tourism development of traditional villages and finally summarize the social perception and development potential under the influence of these factors (Figure 2).

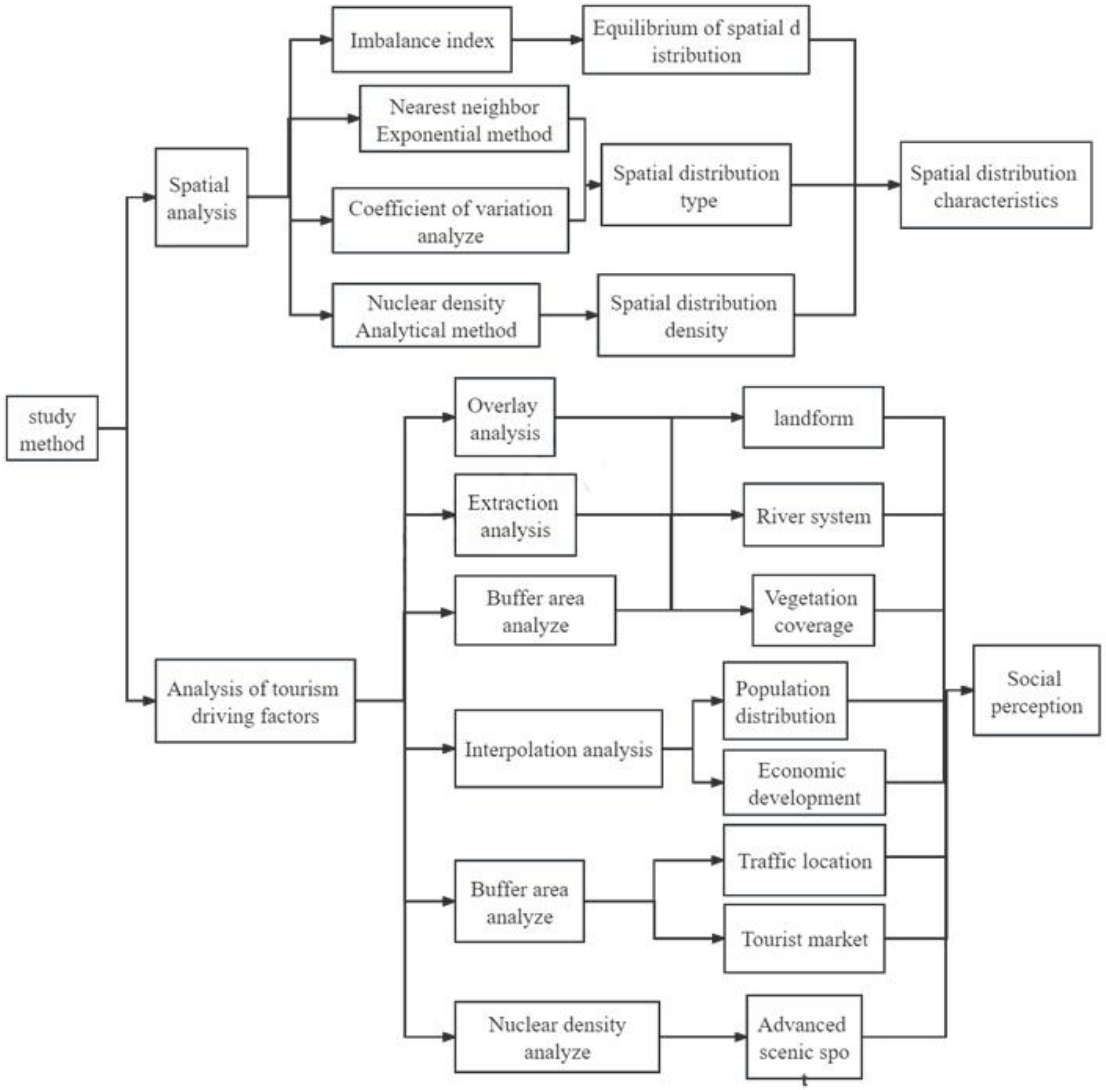

Fig.2 The Schema Flowchart of This Study

3.1 Spatial Analysis Methods

(1) Nearest neighbor index method: it is a kind of geographical indicator that can describe the proximity of point objects in the study area in geographic space, which can be achieved by measuring the distance between the last two points of each point feature in the research area, and can be used to reflect the spatial distribution characteristics of point features. In this paper, the nearest neighbor proximity index method is used to analyze the spatial distribution of traditional villages. The calculation method can be divided into the following two steps:

$$\overline{r_e} = \frac{1}{2\sqrt{n/A}} = \frac{1}{2\sqrt{D}} \quad (1)$$

$$R = \frac{\overline{r_1}}{r_e} = 2\sqrt{D} \bullet \overline{r_1} \quad (2)$$

In the above equation, it refers to the theoretical nearest distance, not the actual nearest distance. A refers to the area of the area, n refers to the number of research objects, D refers to the density of the spatial distribution of the area research objects, R refers to the nearest proximity index, and its geographical significance is: when R = 1, it indicates that the point features in the area are randomly distributed; when R > 1, it indicates that the point-like features in the area are evenly distributed. When R<1, it indicates that the point features in the area are concentrated; when R=0, it indicates that all point features in the area are fully concentrated.

(2) The coefficient of variation analysis, also known as the dispersion coefficient, specifically refers to the normalization measure of the degree of dispersion of the probability distribution of a thing. Its principle is that the area of the Tyson polygon changes with the distribution of point features, so the CV value can be used to evaluate the degree of change in the area of the convex polygon and to determine the distribution type of traditional villages. The specific calculation steps are as follows:

$$R = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(s_i - \bar{s})_2} \quad (3)$$

$$CV = R / \bar{s} \quad (4)$$

where CV represents the coefficient of variation; si refers to the area of the i-th Tyson polygon in the study area; s refers to the average of the polygon area; R means that the ground is the standard deviation of the polygon area; n refers to the number of polygons. Duyckaert and Godefroy (2000) proposed that when the CV value is in the range of 33%~64%, it means that the point set in the research area is randomly distributed; When the CV > 64%, it indicates the distribution of point clusters in the study area; CV< 33% indicates that the set of points in the study area is evenly distributed.

(3) Unbalance index: The imbalance index method is an approximate expression of the Gini coefficient of the Lorentz curve, which is mainly used to measure the spatial distribution differences of villages in different administrative district levels or geographical divisions. The specific calculation steps are as follows:

$$S = \frac{\sum_{i=1}^{n} Y_i - 50(n+)}{100n - 50(n+1)} \quad (5)$$

where S is the imbalance index; n is the number of study areas; Yi refers to the proportion of the number of traditional villages in the total number of villages in the city in the study area, from largest to smallest, calculated as a cumulative percentage of the ith place. In the case of 0<S<1, the higher the S value, the higher the imbalance of the distribution of point features in the study area, and the greater the degree of geographical concentration. In the case of S=0, it indicates that the point-like features are evenly distributed in the study area. In the case of S=1, it indicates that the point features are concentrated in a certain area.

(4) Kernel density analysis method: The distribution density of geographical phenomena is commonly described by the degree of aggregation of geographic data distribution. Kernel density analysis can be used to calculate the unit density of measured values of point and line elements within a specified neighborhood range. It can intuitively reflect the agglomeration of research objects into continuous areas. This article uses this method to study the spatial distribution and density of traditional villages in Zhanjiang City. The calculation formula is as follows:

$$f(x)=\frac{1}{nh}\sum_{i=1}^{n}k\left(\frac{x-x_i}{h}\right) \quad (6)$$

where f (x) is the kernel density value, n is the total number of counties in the study area, x-xi is the distance from the estimated point x to the data point xi, and h is the bandwidth. The larger the value of f(x), the higher the density of traditional villages near that point.

3.2 Potential Analysis Methods

(1) The entropy method is a method used to measure uncertainty in information theory. The more information, the greater the uncertainty and the smaller the entropy. Less information creates more uncertainty and, thus, more entropy. Starting from the characteristics of entropy, it can be used to determine whether an event is random, and the entropy value can also be used to determine whether an indicator has a discrete degree; the greater the degree of dispersion of the index, the greater the impact (weight) of the indicator on the comprehensive evaluation, and the smaller the entropy value. There are m samples and n evaluation indicators to form the original data matrix (7):

$$X=\begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (7)$$

The greater the gap in the value of an indicator, the greater the role of that indicator in the overall evaluation. If all indicator values are equal, the indicator will not be useful in the composite evaluation.

The entropy weight method calculation steps are as follows:

1) First, select n evaluation indicators and m samples. （i=1，2...，n; j=1，2，...，m）;

2) Next, the normalization of the finger is carried out: the homogeneity of heterogeneous indicators.

Because the measurement units of various indices are not uniform, before using these indices to calculate the composite index, they must be normalized. That is, the absolute value of the index is converted into a relative value to solve the homogenization problem of various heterogeneous index values. In addition, because the values of positive and negative indicators represent different meanings (the higher the positive indicator value, the better, and the lower the negative indicator value, the better), for high and low indicators, we use different algorithms to normalize them. The specific method is:

Positive indicators:

$$X_{ij}=\frac{x_{ij}-\min\{x_{ij},\cdots,x_{nj}\}}{\max\{x_{ij},\cdots,x_{nj}\}-\min\{x_{ij},\cdots,x_{nj}\}} \quad (8)$$

(

N

Negative indicators:

$$X_{ij}=\frac{\max\{x_{ij},\cdots,x_{nj}\}-x_{ij}}{\max\{x_{ij},\cdots,x_{nj}\}-\min\{x_{ij},\cdots,x_{nj}\}} \quad (9)$$

3) Calculate the proportion of the jth indicator under indicator i:

$$p_{ij} = \frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}} \quad (10)$$

where i=1, 2...,n; j=1， 2， ...， m.

4) Then calculate the entropy value of the jth indicator:

$$e_j = -k\sum_{i=1}^{n} p_{ij} \ln\left(p_{ij}\right) \quad (11)$$

Among them, $k = \frac{1}{\ln(n)} > 0$ satisfying $e_j > 0$

5) Recalculate the information entropy redundancy: ： $d_j = 1 - e_j$

6) Finally calculate the weights of each indicator: $\omega_j = \frac{d_j}{\sum_{j=1}^{m} d_j}$

(2) Tourism Development Potential Index (TDPI) model

Based on the above analysis results, the evaluation model of traditional village tourism development potential, namely the traditional village TDPI model, is established to explore potential traditional village tourism development areas. The TDPI model is as follows:

$$TDPI = \sum_{i=1}^{m}\sum_{j=1}^{n} c_{ij} w_i \quad (12)$$

Where: cij is the jth rating of the ith indicator, ωi is the weight corresponding to the i-th indicator, m is the number of indicators, and n is the number of ratings corresponding to the indicator.

(3) Determination of Factor Evaluation Indicators

The evaluation of tourism resource development potential is crucial to the scientific planning, sustainable development, and utilization of tourism resources. Combined with the previous analysis and referring to the tourism potential evaluation factors established by Shang (2021), this paper starts with the three systems of tourist destination, source of tourists, and tourism travel and selects eight evaluation indicators (Table 1). Such as topography and landform, river system, vegetation coverage, population distribution density, social economy, source market, transportation location, and advanced scenic spots according to the two major categories of natural geography and human geography to evaluate the tourism development potential of traditional villages in Zhanjiang.

Table 1 Evaluation Index and Grading of Village Tourism Development Potential

first-order index	Second level index	Assignment criteria	Grading				
			5points	4points	3points	2points	1point
Physical geography	Landform	DEM/m	Lowland plain（<100）	plain（00≤DEM＜200）	hill（200≤DEM＜255）		
	River system	Distance From major rivers	L＜2	2≤L＜4	4≤L＜5	L＞5	
	Vegetation coverage	NDVI	0.71≤NDVI<0.92	0.65≤NDVI<0.71	0.53≤NDVI<0.65	NDVI<0.0.53	
Human geography	Social Economy	Per capita GDP	19 234≤GDP<41 051	41 051≤GDP<61 533	61 533≤GDP<84686	84 686≤GDP<132774	
	Population density	Population density	73≤d<461	461≤d<848	848≤d<1 471	1 471≤d<4367	
	Tourist market	Distance from urban area	L_1<10	10≤L_1<20	20≤L_1<30	30≤L_1<40	L1≥40
	Traffic location	Distance from major highway networks	L_2<5	5≤L_2<10	10≤L_2<20		
	Advanced scenic spot	Distance from traditional villages	L_3＜10	10≤L_3＜20	20≤L_3＜30		

IV. ANALYSIS OF SPATIAL DISTRIBUTION CHARACTERISTICS

Xiong (1999) believes that the countryside, as the predecessor of the city, should also have its own image, so he proposed the "rural image", and divided the rural image into two types: landscape imagery and cultural imagery, of which the landscape image is composed of rural settlement form, architecture, and environment. Therefore, this paper analyzes the spatial distribution patterns of traditional villages in Zhanjiang and interprets the social perception behind them.

4.1 Degree of Spatial Distribution Equilibrium

The imbalance index S was calculated to be 0.37, indicating that the traditional villages in Zhanjiang were unevenly distributed among cities and counties. Figure 3 shows the Lorenz curve of the traditional village distribution in the city, and the Lorentz curve shows an upward convex trend, indicating that the spatial distribution is unbalanced. Additionally, the analysis shows that the cumulative percentages of Leizhou City, Lianjiang City, and Wuchuan City are low, indicating that traditional villages are generally concentrated in these three areas, and the statistics show that the number of traditional villages in Leizhou City, Lianjiang City, and Wuchuan City has reached 75% of the total number of the city.

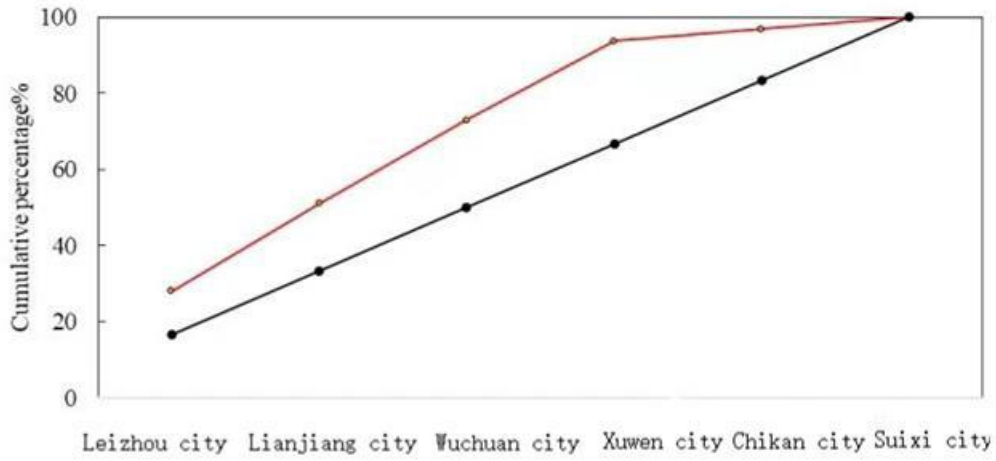

Fig.3 Lorentz Curve of the Distribution of Traditional Villages in Zhanjiang

4.2 Types of Spatial Distribution

This paper studies the spatial distribution law of traditional village complexes in Zhanjiang from the perspective of human geography. So the nearest proximity index, which is often used in geography to analyze the characteristics of spatial distribution, quantitatively analyzes the traditional villages, and the nearest proximity index method can reflect the spatial distribution type of point features in a certain area, which mainly has three types, namely uniform type, random type, and cohesive type.

This section, ArcGIS is used to analyze the nearest neighbor of traditional villages, and the calculation results are as follows: The actual value of the nearest neighbor distance of the distribution is r1 = 1.809 km, the theoretical nearest neighbor distance is re = 4.854 km, the ratio R = 2.68 > 1 (Table 2), and the Z value and P value of the two test parameters are 50.14 (greater than 2.58) and 0.00, respectively, which have strong significance. Based on the above results, it can be seen that the distribution types of traditional villages in Zhanjiang show a uniform distribution.

Table 2 Nearest Proximity Index of Traditional Villages in Zhanjiang

Nearest proximity（km）	Theoretical closest distance（km）	R	Distribution type	z-value	p-value
1.809	4.854	2.68	evenness	50.14	0.00

Using ArcGIS generate the Tyson polygon of the spatial distribution of traditional villages and calculate its coefficient of variation (CV) based on the coefficient of variation model. The results show that the CV value of the coefficient of variation is 12.81%, which is less than 33%. According to the research conclusion of Duyckaerts, the traditional villages are evenly distributed throughout the city, which further verifies the analysis results of the nearest neighbor index model above (Figure 4).

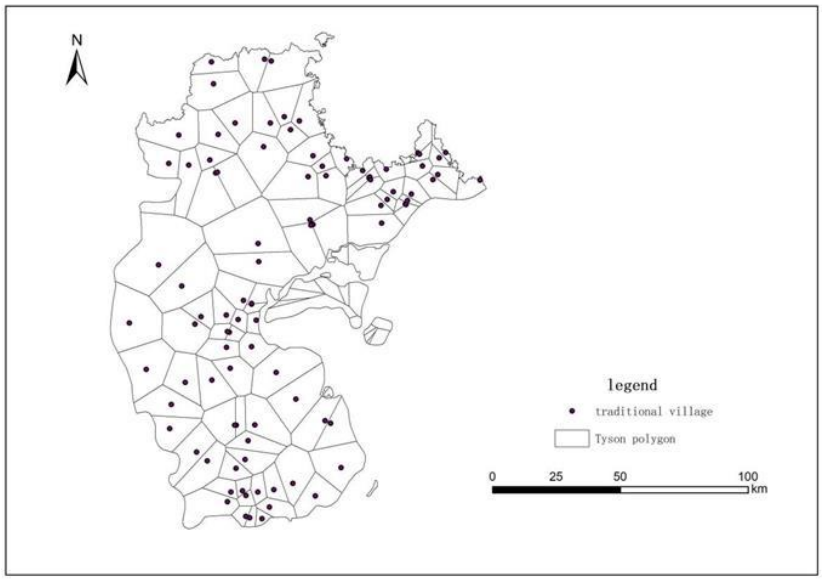

Fig.4 Distribution maps of Tyson Polygons in Traditional Villages in Zhanjiang

4.3 Spatial Distribution Density

The kernel density analysis was carried out to visualize and express the spatial distribution density. The design bandwidth value was 10km, the cell value was set to 1km, and the kernel density value was reclassified into 5 categories by using the natural break point method, and the distribution map of the kernel density of villages was obtained (Figure 5).

The results showed remarkable spatial agglomeration characteristics. The areas with extremely high nuclear density were distributed in the vicinity of Leizhou City, northeast (Wuchuan City), and southwest (Xuwen County) in the central part, while extremely low values were scattered in various areas. From the distribution, the overall distribution pattern from northeast to southwest is concentrated, while other areas show a scattered point-like spatial distribution pattern.

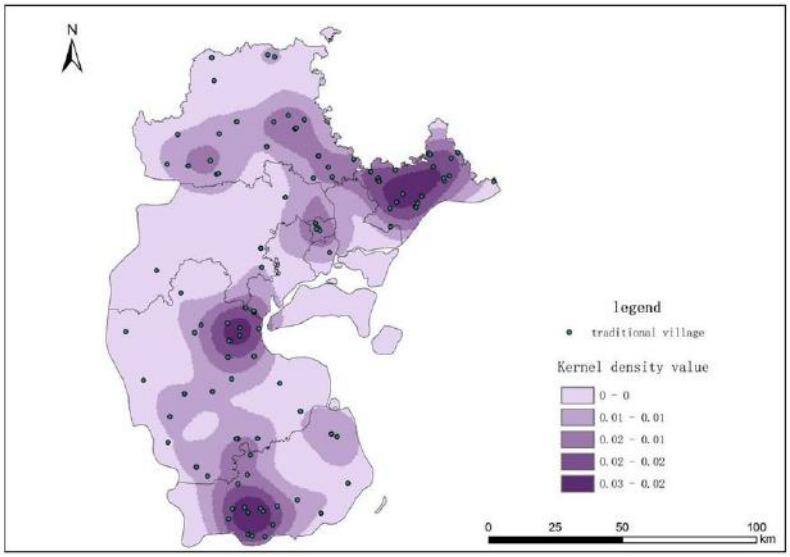

Fig.5 Kernel Density Map of Traditional Villages in Zhanjiang

From the above analysis, it can be seen that the traditional villages are evenly distributed as a whole, mostly distributed in Leizhou City, Lianjiang City, Wuchuan City and Xuwen County, and most of them are distributed in high-density clusters in the county area. In terms of natural environment, Zhanjiang has a low altitude, and the terrain is mostly low hills and plains. In terms of history and culture, it has developed from the "hundred Vietnamese borders" to the present, after thousands of years of historical changes, during this period of four large-scale population migration activities, after a long evolution, the distribution of villages from concentrated distribution in Leizhou City to spread to the whole area, after analysis. it can be seen that this spatial distribution state reflects the early rural residents living in the water and grass, pursuing a stable life of psychological activities (He and Wang, 2022).

V. TOURISM DRIVER ANLAYSIS

This study chooses to analyze the tourism development potential of traditional villages in Zhanjiang from the perspectives of natural factors and socio-economic factors, among which natural factors mainly include topography, river, and vegetation coverage. Social and economic factors mainly include population tourism density, the per capita GDP of each county, the transportation location of traditional villages, source markets, and high-level scenic spots.

5.1 Natural Environmental Factors

The assessment and analysis of the natural environment can not only speculate on the reasons for the location of traditional villages in Zhanjiang in the past but also provide references for the tourism development direction of traditional villages in the future.

5.1.1 Topography and Landforms

Altitude, elevation, and topographic undulations directly affect the size and distribution of settlement morphology. On the other hand, altitude affects the hydrothermal combination conditions in local areas, then affects the agricultural production methods in the area, and finally forms a specific history and culture under the influence of human activities. Therefore, as one of the important factors affecting the formation of cultural landscapes, the topographic factor of altitude should be paid attention to (Yin and Luo, 2010).

Based on the DEM data with a 90-meter resolution, the elevation information of Zhanjiang was extracted by the surface analysis method. Then, the elevation map of traditional villages was obtained by superimposing traditional villages (Figure 6). Based on the Chinese mountain classification standard, the elevation of traditional villages in Zhanjiang is reclassified into three categories, which can be divided into lowland plain (0–100 m), plain (100–200 m), and hilly (200–255 m) from low to high. It can be observed that the traditional villages decrease with the increase in elevation, and a total of 82 traditional villages are distributed in the lowland plain area with an elevation of less than 100m, accounting for 86% of the total number of traditional villages in the city.

In the plain area with an elevation of 100–200 m, there are 14 traditional villages, accounting for 14% of the city's traditional villages. In the hilly area of 200–255 m, no traditional villages appear. Reviewing the literature, it can be seen that the terrain of Zhanjiang is gentle; the terrain is high in the south and low in the north; the southern area is a basalt terrace; and the highest stone ridge in the area is distributed on the platform. The central and western regions and northern parts are mostly sea-formed terraces with slopes below 5°, with low-lying ravines between the slopes, which are suitable for planting. The central and eastern parts and north are alluvial and sea plains, which are large plains in the city, and most of the traditional villages are also located in Leizhou City, Lianjiang City, and Wuchuan City, which are relatively flat areas.

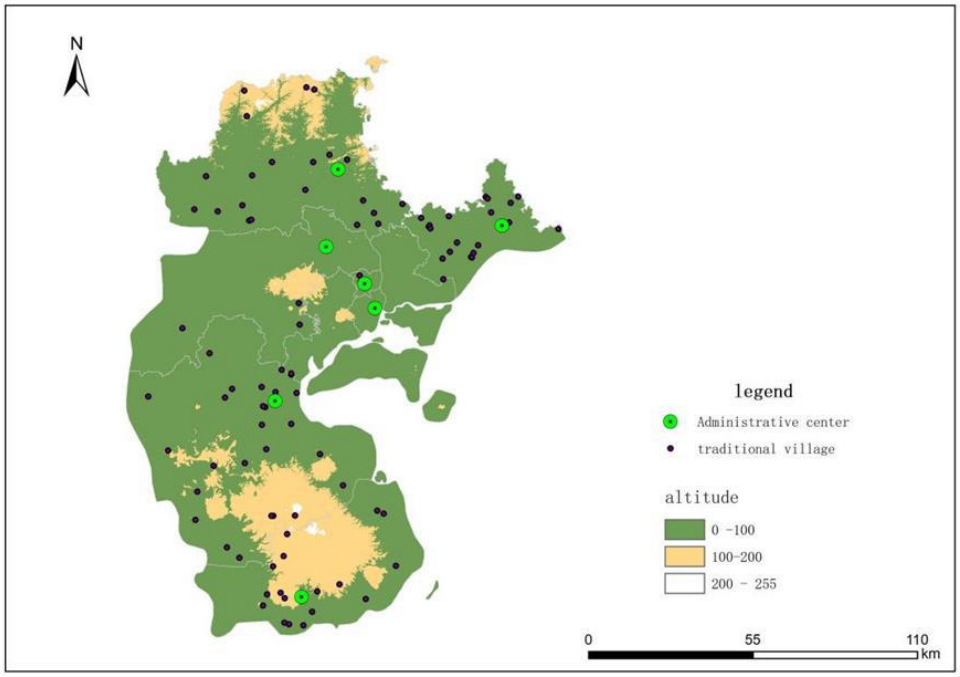

Fig.6 Elevation Map of Traditional Villages in Zhanjiang

5.1.2 River Systems

Water is the source of life, and rivers are the place where human civilization originated, which not only provides human beings with fresh water, food, and other materials necessary for survival but also provides natural conditions for water transportation since ancient times. Thus, this paper considers the river system as one of the factors affecting the tourism development of traditional villages.

ArcGIS was used to generate a water system map and then superimposed with traditional villages to obtain Figure 7. It can be seen that the inland river network is dense, but most of them are small streams and rivers with short rivers, small water volumes, and small catchment areas. The layout of traditional villages is closely related to the river and generally shows the distribution trend that the farther away from the river, the less the distribution of traditional villages.

The study found that there are 60 traditional villages within 2km of the river, accounting for 61% of the total; there are 20 traditional villages within 2-4km of the river, accounting for 21% of the total; and within 4-5km of the river, there are 6 traditional villages, accounting for 7% of the total. There are 10 traditional villages within 5km of the river, accounting for 11% of the total. The Nandu River is the main water supply river in Leizhou City, originating in Pozai, Hetou Town, and Suixi County, while the water supply system in Xuwen County is relatively weak. However, due to the relatively flat terrain, water vapor is difficult to gather here, and precipitation is less.

According to statistics, villages with distant mountains and waters are distributed in various areas of the Leizhou area, while villages with distant mountains and waters are concentrated on both sides of the Nandu River and its tributaries, and a small number are located on the inside of the western coastline, relying on the excavation of ditches to introduce seawater and form river resources. The villages near the mountains and rivers, like the villages near the mountains and rivers, are basically located in the area south of the central part of the Leizhou region. Living by water has been the concept of people's residential location since ancient times. Being close to the water source not only facilitates the production and life of residents, but in addition, it is easy to form a beautiful water landscape

and a good landscape pattern near the water source, which is a good place for people to choose rest under the fast-paced life, which is conducive to the development of tourism.

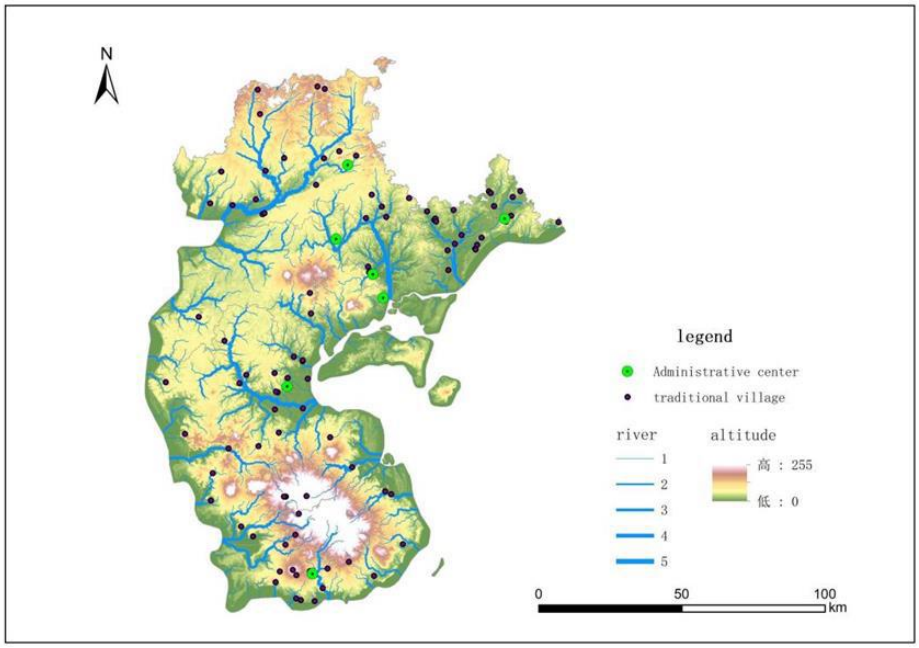

Fig.7 Water System Map of Zhanjiang

5.1.3 Vegetation Cover

The vegetation index (VI), also known as the normalized difference vegetation index (NDVI), is an indicator of vegetation coverage and vegetation growth status; the larger the VI, the denser the vegetation, and vice versa. The vegetation cover map of Zhanjiang (Figure 8) is obtained and adjusted for chromaticity through ArcGIS.

As can be seen, the NDVI value of Zhanjiang is in the range of 0.284~0.920, and the VI is divided into sparse from low to high according to the natural break grading method, sparser (0.53-0.65), denser (0.65-0.71), and dense (0.71-0.92). After analysis, the number of traditional villages in Zhanjiang increases with the increase in NDVI value, and there are 76 traditional villages distributed in the quintile range, accounting for 79% of the traditional villages in the city. There are 19 in the densely populated areas, accounting for 19% of the city's traditional villages; there is a total of 1 in the sparse area, accounting for 2% of the city's traditional villages.

It shows that most of the traditional villages in the area have good vegetation coverage, which can provide good resource conditions for the tourism development of traditional villages in Zhanjiang. In addition, most of the traditional villages pay attention to the feng-shui pattern, planting feng-shui forests around the villages, which have the function of conserving water sources and regulating local microclimate, and pay attention to the local customs of feng-shui layout, laying the foundation for the formation of good forest land resource reserves.

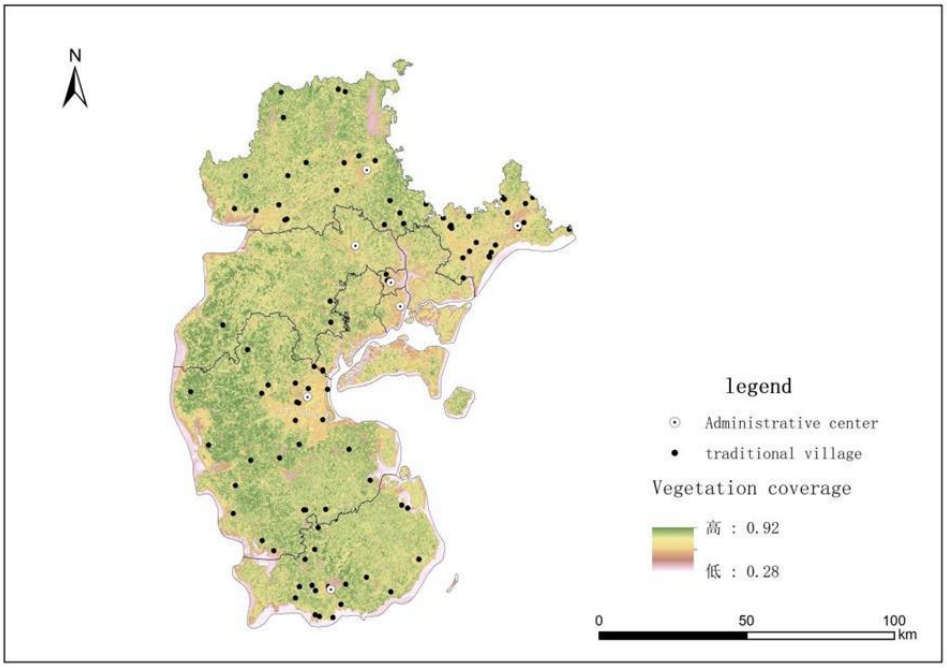

Fig.8 Vegetation Cover Map of Zhanjiang

5.2 Socio-economic Factors

5.2.1 Population Distribution

Based on the census data at the end of 2021, the population density distribution map of Zhanjiang was obtained (Figure 9). The IDW method was used to interpolate the population density of each county-level administrative center, and the result map was superimposed with the traditional village layer to obtain the population density distribution map of Zhanjiang.

The natural break grading method was used to divide the population density raster map into five categories, namely very rare area (73-461), rare area (461-848), medium area (848-1471), extremely dense area (1471-4367), and extremely dense area (4367-5432), of which there were 18 traditional villages in very rare areas, accounting for 19% of the city's traditional villages. There are 20 scattered in sparse areas, accounting for 21% of the city's traditional villages. There are 40 in the middle district, accounting for 42% of the city's traditional villages. There are 11 in dense areas, accounting for 12% of the city's traditional villages. The extent of the extremely dense area is smaller and is not visible in the figure.

It can be seen that the population density distribution of Zhanjiang shows a pattern of "more north and less south". The traditional villages show a trend of decreasing distribution with increasing population density. In sparsely populated areas, human activities cause less damage to traditional villages and natural resources, so the overall layout of traditional villages has been well preserved.

5.2.2 Economic Development

During the period of agricultural civilization, Zhanjiang's economic development level was low, and in order to effectively use the tight land resources and strengthen external communication, most people chose the mountain valley with low terrain and abundant water as a settlement (Feng et al., 2017). The change from agricultural production theory to modern production concept shows that the current society re-examines the function of rural areas, and the rapid development of urbanization and modernization has also changed the internal mechanisms of socio-economic development level and traditional village spatial distribution, and the relationship between the spatial layout of traditional villages and the direction

of social development has been broken (Liu et al., 2020). Therefore, it is necessary to pay attention to the relationship between modern social development and rural influence and re-establish the relationship between the two.

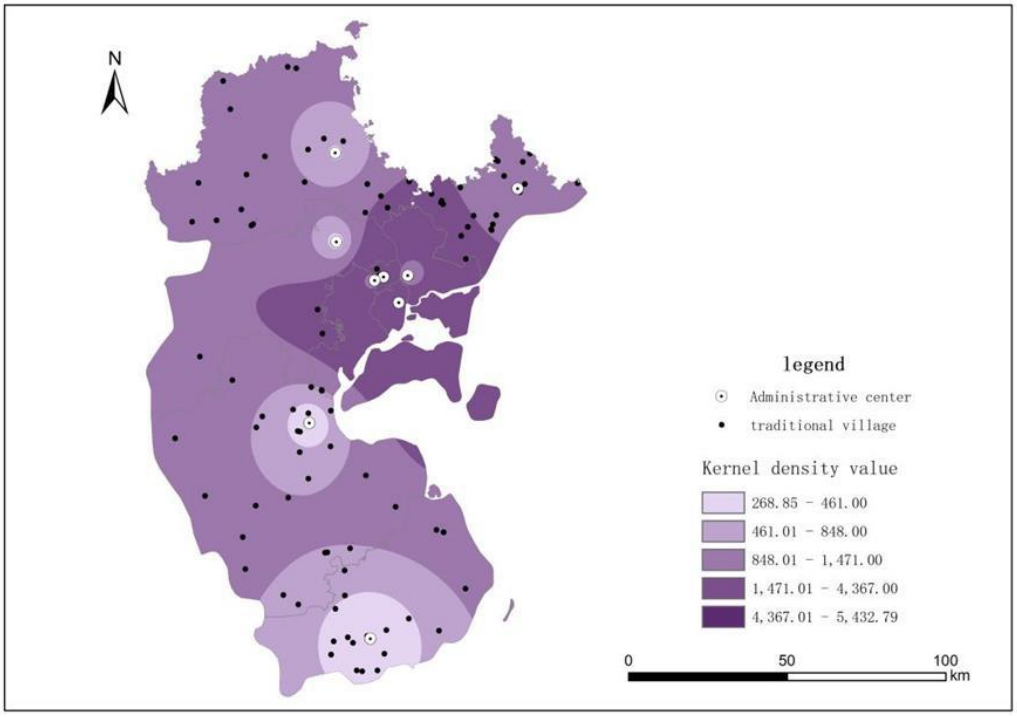

Fig.9 Population Distribution Density Map of Zhanjiang

The IDW method was still used to spatially interpolate the per capita GDP of the county-level administrative center of Zhanjiang, and the result map was superimposed with the traditional villages to obtain the distribution map of the per capita GDP and traditional tourism villages (Figure 10). We divide the GDP per capita raster into five categories: underdeveloped regions (0-25002), slightly developed regions (25002-41051), developed regions (41052-61533), extremely developed regions (61534-84686), and super developed regions (84687-98982). Among them, there are 45 traditional villages in underdeveloped areas, accounting for 47% of the city's traditional villages; A total of 20 are distributed in slightly developed areas, accounting for 21% of the city's traditional villages; there are 22 distributed in developed areas, accounting for 23% of the city's traditional villages; there are 9 distributed in extremely developed areas, accounting for 9% of the city's traditional villages; The extent of the extremely dense zone is small and is only found in the Potou area in the figure.

5.2.3 Accessibility to Transportation

Transportation connection refers to a social and economic activity formed by providing direct or indirect transportation services for tourists. Which is a transportation facility provided for tourists to travel from the source of tourists to the tourist destination and carry out various tourism activities in the tourist destination.

Transportation is a bridge connecting tourist sources and tourist destinations, a channel and medium for tourism, and an indispensable part of a complete tourism system. The construction of transportation lines and the quality of transportation services are related to the realization of the value of tourist places and the tourism experience of tourists and are of great significance to the tourism industry. Generally, tourist

traffic is divided into three levels: 1. external traffic; 2. intermediate traffic; 3. internal transportation.

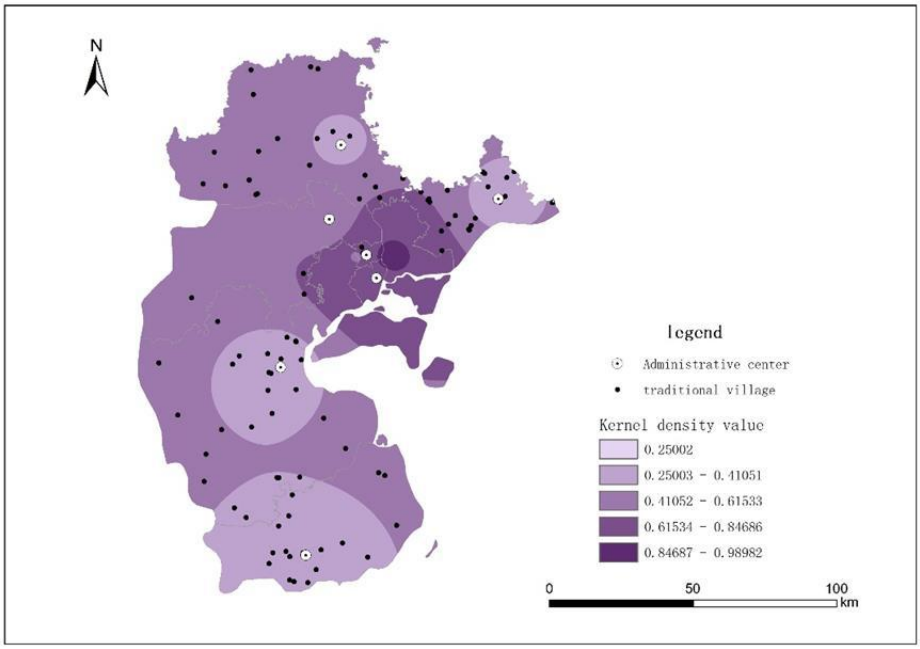

Fig.10 Distribution of GDP Per Capita in Zhanjiang

The buffer zone analysis of the main highway network in the province was used to obtain the transportation network distribution map (Figure 11) to count the number of traditional tourist villages in different buffer zones. The results showed that the spatial distribution of traditional tourist villages was closely related to the highway network, and there were 92 traditional tourism villages within the 5 km buffer zone, accounting for 95% of the total number of traditional tourist villages. There are 4 traditional tourist villages within 5–10 km of the county seat, accounting for 5% of the total. It can be seen that the spatial distribution of traditional villages has obvious characteristics of traffic directionality.

5.2.4 Relying Source Markets

With the acceleration of national urbanization, urban residents enjoy the high-quality living standards and convenient transportation modes brought by urbanization on the one hand and endure the fast-paced life brought by urbanization on the other. In order to balance work and life, more and more urban residents want to escape the noisy, crowded, and turbid urban communities through short holidays and go to the quiet, open, and fresh-air countryside to feel nature, return to themselves, and cultivate emotions. Thus, under normal circumstances, the higher the economic level, the larger the scale of the city, and the better the infrastructure of county-level towns, the stronger the promotion of the development of traditional villages.

This paper analyzes the buffer zone of Zhanjiang and county urban areas and obtains the urban and urban stations of Zhanjiang cities and counties (Figure 12). The results showed that there were 13 traditional tourist villages within the 10 km buffer zone of Zhanjiang, accounting for 13.5% of the total number of traditional tourist villages. There are 32 traditional tourist villages within 10–20 km of the county seat, accounting for 33.3% of the total. There are 51 traditional tourist villages within 20–30 km of the county seat, accounting for 53.1% of the total. As the distance of the source market becomes farther, the number of traditional villages shows a trend of decreasing, and the traditional villages that are far away from the source market are not conducive to attracting tourists, but it is

easier to meet the natural conditions required for the development of rural tourism, such as land and environment, than the villages that are closer.

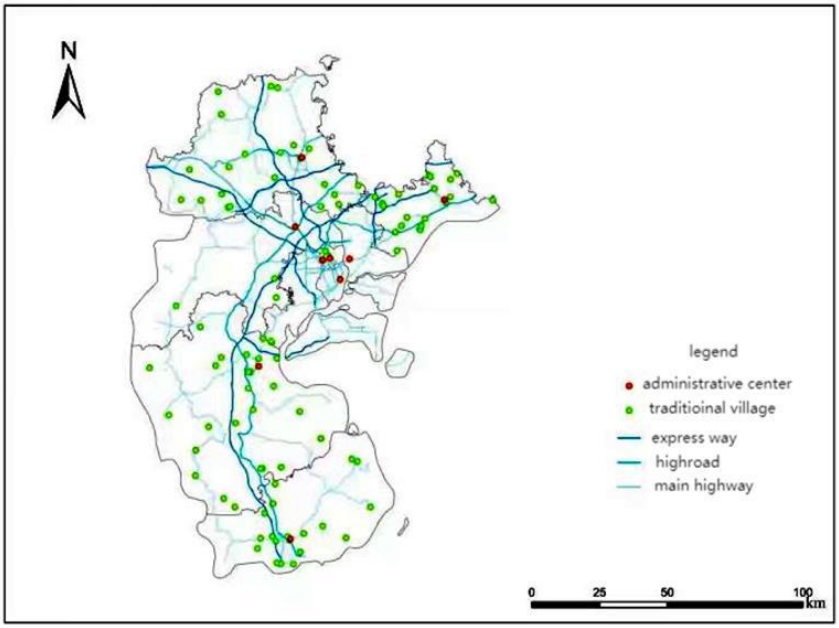

Fig.11 Distribution of Transportation Network in Zhanjiang

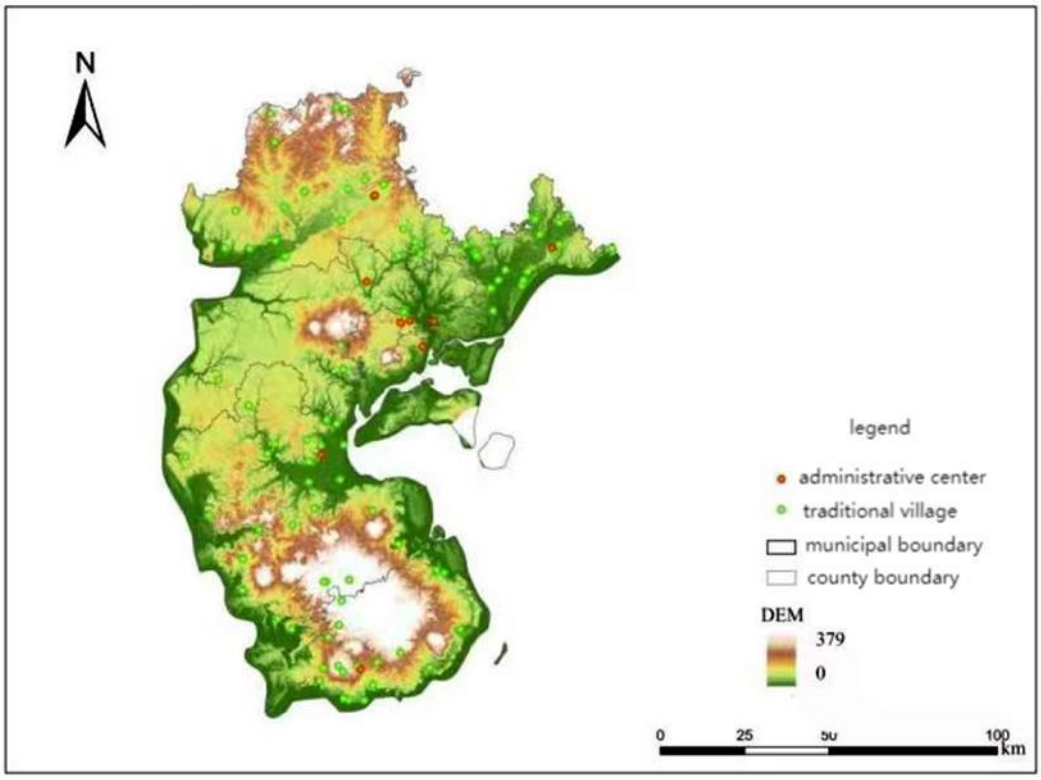

Fig.12 Map of Zhanjiang City and County

5.2.5 Dependent on Advanced Scenic Spots

The article "National New-Type Urbanization Plan (2014-2020)" proposes to achieve people-centered new-type urbanization by accelerating the development of small and medium-sized cities and focusing on the development of small towns. Based on the national conditions of a large Chinese population base and a large permanent population of middle-aged and elderly rural areas in urban areas, some scholars propose to solve the current urban-rural dual structure problem in China with "local urbanization". In addition, since the reform and opening up, many townships have successfully explored the development model of "tourism rejuvenation towns" and created a number of oriented villages and towns, which have provided rich reference experience for other townships in China to develop characteristic tourism.

At present, township tourism destinations are developing in the direction of miniaturization, specialization, and culture, but due to the late development time and the remote geographical location of some townships with characteristic tourism resources, their popularity is often lower than that of their neighboring tourist attractions. The development of tourist attractions can play a leading role in radiation and, to a certain extent, can promote the development of tourism in surrounding townships. This paper selects 3A, 4A, and 5A, three levels of tourist attractions, as research objects to explore the distribution of traditional villages attached to tourist attractions in Zhanjiang.

The analysis shows that the distribution density of high-level scenic spots in the northeast of Leizhou City, the northeast of Lianjiang City, the northeast of Wuchuan City, and Chikan District is high. Combined with the distribution map of traditional villages in Zhanjiang City (Figure 13), it can be seen that, compared with Wuchuan City and Lianjiang City, there are more traditional villages in the northeast of Leizhou City and Chikan District, distributed around the high-level scenic spots. With the help of the proximity analysis tool, the average distance between traditional tourist villages and high-level scenic spots is 35.14km, which is roughly within a 2-hour driving distance, and the proximity distribution characteristics of the two are obvious.

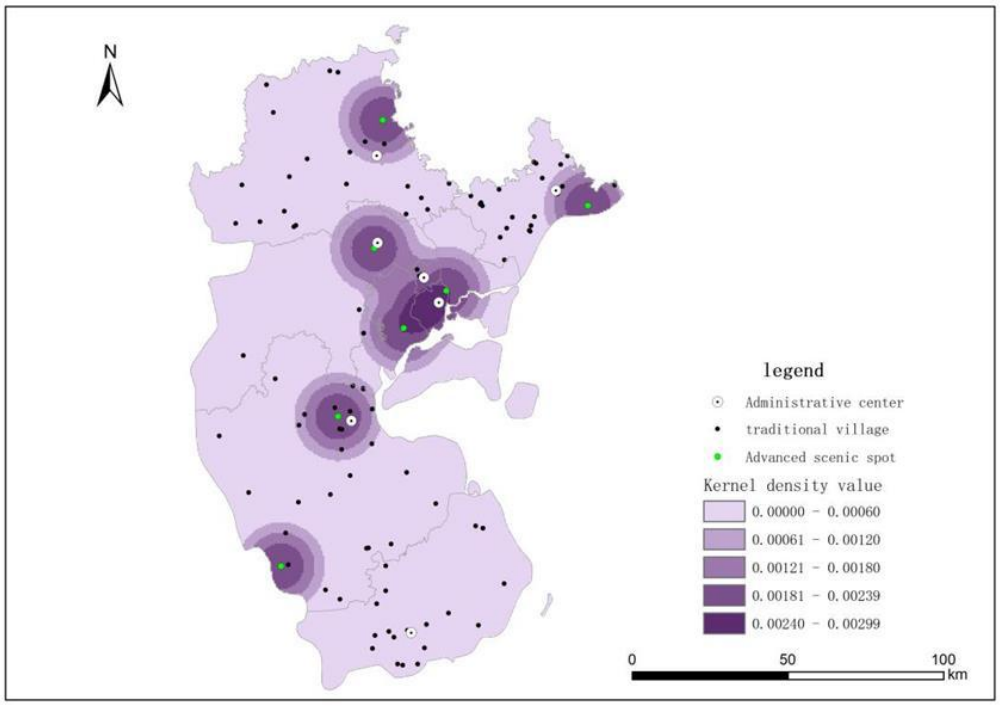

Fig.13 Distribution Maps of Scenic Spots and Traditional Villages in Zhanjiang

5.3 Comprehensive Analysis of Social Perception

Kevin Lynch believes that "roads" and "nodes" are the elements of urban image analysis, and on the basis of selecting these two elements, combined with the driving factors of tourism development in traditional villages in Zhanjiang, this paper adds "environment" elements to summarize and analyze the social perception of traditional villages in Zhanjiang.

(1) Environmental factors: This paper analyzes the topography, river, and vegetation coverage of Zhanjiang, and discusses the social perception of traditional villages in Zhanjiang under the natural environment. The results show that the overall topography of Zhanjiang is relatively low, the rivers are dense, the vegetation coverage is high, and most of the traditional villages are distributed in an area of 0-200 m of low hills, terraces, and plains within 2km of the river, and the vegetation coverage is dense (0.71-0.92). It can be seen that natural factors are one of the main factors affecting the spatial form of traditional villages in Zhanjiang. Under the influence of low terrain, dense rivers, and high vegetation coverage, traditional villages in Zhanjiang show the characteristics of balanced distribution in the whole city area, but the traditional villages in Leizhou City are mostly clustered near its "mother river", the Nandu River.

(2) Rural image elements: As linear elements among the five elements, roads connect various nodes (traditional villages, source markets, and high-level scenic spots) in the area of Zhanjiang. Figure 11 shows that most of the traditional villages are distributed along traffic roads. It can be seen from Figures 12 and 13 that most of the traditional villages are far from source markets and high-end scenic spots. Based on the above analysis, it can be concluded that roads are an important element that constitutes the social perception of traditional villages in Zhanjiang. Node elements such as source markets and high-level scenic spots are secondary elements. Therefore, the traditional villages in Zhanjiang are densely distributed along traffic roads, and the number of villages is smaller with the distance from source markets and high-level scenic spots.

In addition, this paper uses crawling software such as "descendants" and "octopus" to crawl the reviews of traditional villages on various tourism platforms and finds that there is very little evaluation data available and some even no reviews. It can be seen that traditional villages in Zhanjiang are searched less frequently on social media, indicating that people have low emotional awareness of them.

VI. DEVELOPMENT POTENTIAL EVALUATION MODEL ANALYSIS

6.1 Determined Evaluation Indicators

The superposition analysis, proximity analysis, and spatial interpolation were used to perform spatial analysis of traditional villages, and combined with the above research results, the initial matrix X (96 rows, 8 columns) was constructed. On the basis of obtaining the evaluation index data for 96 traditional villages, the weighted values of each evaluation index were obtained according to the entropy method (Table 3). In the evaluation indicators of the physical geography category, the weights from high to low are: river system, topography and landform, and vegetation coverage. In the evaluation index of the physical geography category, the weights from high to low are: advanced scenic spots, GDP, population density, transportation location, and source market. In general, human geography has a greater influence than physical geography.

Table 3 Tourism Development Potential Evaluation Indicators of Traditional Villages

Index class	Evaluation index	Entropy value(e_j)	Coefficient of difference(d_j)	weight(w)
Physical geography	landform	0.9402	0.0598	0.0977
	river	0.8965	0.1035	0.1690
	vegetation	0.9776	0.0224	0.0366
Human geography	GDP	0.8640	0.1360	0.2221
	Population density	0.9554	0.0446	0.0729
	Tourist market	0.9833	0.0137	0.0230
	Traffic location	0.9853	0.0147	0.0240
	Advanced scenic spot	0.7835	0.2165	0.3536

6.2 Model Building

Based on the above analysis results, the scoring grades and corresponding weights of various evaluation indicators of traditional village tourism development potential are combined to construct the TDPI model. And finally, the tourism development potential value and ranking of traditional villages in Zhanjiang (Table 4) are obtained. The results show that the tourism development potential value is between 3.13≤TDPI<4.90, and it is divided into three levels, namely: weak potential type (3.13≤TDPI<4.40), medium potential type (4.40≤TDPI<4.72), and strong potential type (4.72≤TDPI<4.90).

Table 4 Tourism Development Potential Value and Ranking of Traditional Villages

Ranking	Village name	TDPI value	Class of grades
1	Ancestral Hall of Lei	4.9031	5
2	Shuangcun Village	4.9013	5
3	Su Er Village	4.8922	5
4	Googan Village	4.8791	5
5	Chaoxi Village	4.8790	5
...	...	...	
94	Luoyi Cemetery	3.5642	3
95	Baiguanshan multi-angle well	3.1564	3
96	Changshan District Committee of CPC	3.1357	3

6.3 Evaluation of Tourism Development Potential of Traditional Villages

According to Table 4, there are 11 traditional villages with strong potential, accounting for 11.45% of the total, and this type of traditional village is closer to roads, rivers, source markets, and high-level scenic spots, so it can obtain more resources and future development space suitable for tourism development.

There are 44 traditional villages with medium potential, accounting for 45.83% of the total; there are 41 traditional villages with weak potential, accounting for 42.7% of the total.

Due to the fact that the traditional villages with medium potential and weak potential do not have good conditions for tourism development, such as insufficient infrastructure, long distance from the source market, low visibility, and other defects, the tourism development potential has not yet reached the conditions for development in the overall evaluation, and tourism development is not suitable. Therefore, this paper makes suggestions on the tourism development of traditional villages with strong potential and the distribution map of traditional villages with strong potential (Figure 14).

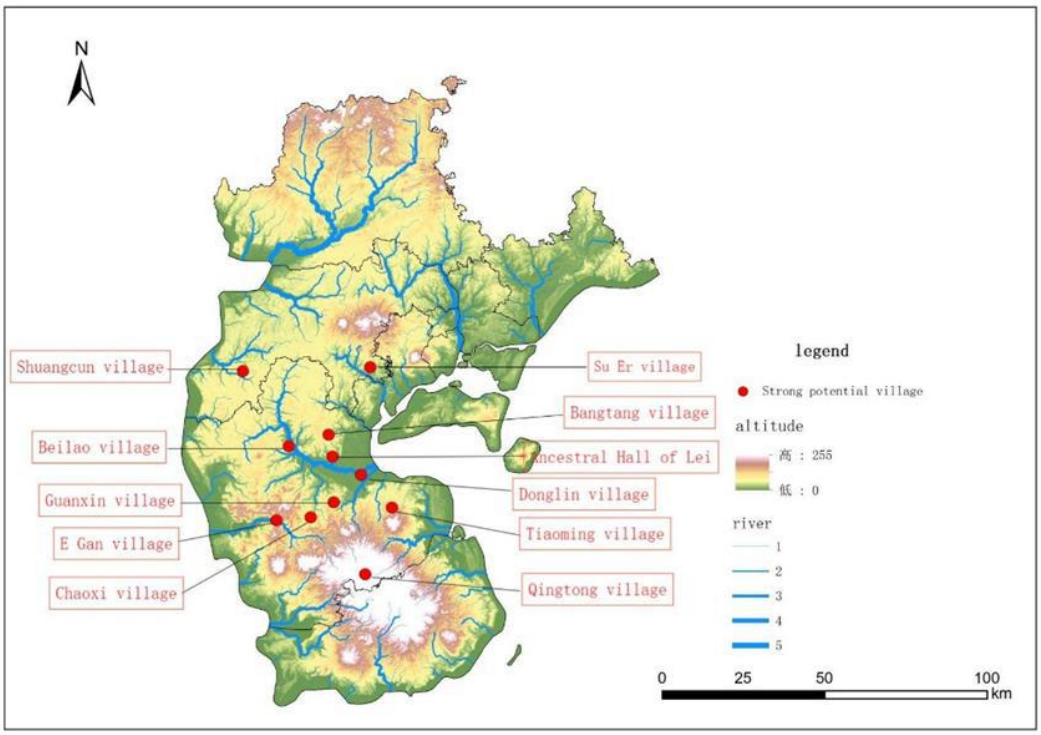

Fig.14 Distribution Maps of Traditional Villages with Strong Potential

Most of the villages with strong potential are distributed along the Nandu River, mainly in Leizhou City and Suixi County. The 11 traditional villages with development potential are all national traditional villages, which are more well-known than medium-potential and weak-potential traditional villages and have the characteristics of being established for a long time, preserving the appearance of the village, and having a unique architectural style. The brief introduction to high-potential villages is as follows:

(1) Leizu Ancestral Hall: Located in Leizhou City, Zhanjiang City, Leizu Ancestral Hall was built to enshrine Chen Wenyu (Leizu), the first governor of Leizhou in the Tang Dynasty, and was built in the sixteenth year of Tang Zhenguan. Leizu Ancestral Hall, known as "the first in Lingnan", is the fourth batch of national key cultural heritage in China.

(2) Shuangcun Village: Located in Hetou Town, Suixi County, Shuangcun was founded in the Song Hui Zongxuanhe period, has a history of more than 900 years, and is an ancient village with a long history. Now there is a well-preserved Chen ancestral hall in the village, as well as more than 600 acres of ancient forest and several century-old trees.

(3) Suer Village: Originally named Lychee Village, it was later changed to "Suer Village" to commemorate Su Dongpo's two visits here. In the western part of

Guangdong, the ancient houses of Suer Village are one of the best preserved ancient buildings. There are more than 40 ancient houses in the village, with different styles. Each alley is paved with bluestone, and most of the buildings are made of stone bricks.

(4) Bangtang Village: it is located in the western suburbs of Leizhou City, formerly known as Shiqi Village, with a history of more than 400 years. The whole village can be divided into two natural villages, north and south, with beautiful mountains and waters, green trees, antique colors, and a quiet and peaceful pastoral atmosphere everywhere.

(5) Chaoxi Village: it is surrounded by rivers on three sides, so it is called Chaoxi Village. Most of the ancient houses in the village are tile houses made of large bricks and tiles, with the characteristics of southern architecture of the Ming and Qing dynasties.

(6) Tiaoming Village: Tiaoming Village is located near Shililing in Diaofeng Town, Leizhou City, with fertile farmland in front and rolling hills behind, and the whole village topography is like carp-absorbing water, which is a good place for Zhong Lingyuxiu.

(7) Qingtong Village: Located in the east of Yingli Town, eight kilometers away from the town site, is a beautiful water town. It has a history spanning more than 400 years since the Ming and Qinglong dynasties, and the majestic ancestral hall complex of the Qing Dynasty still remains. Walking in the streets and alleys, people can feel a strong humanistic atmosphere.

(8) Guanxin Village: Located in Nanxing Town, Leizhou City, Guanxin Village is an ancient village with a history of more than 300 years, and many ancient residences and ancient cultural relics in the village have been well protected and repaired. In the Guan's ancestral hall, there is a stone tablet from the Qing Dynasty, which clearly records the flood that occurred during the Mid-Autumn Festival in the second year of the Qing Dynasty's Tongzhi and teaches future generations to do a good job in flood prevention. This stone stele is carved from hard bluestone, and the inscription is written by Xiaokai, which is very "Yan Jian and Willow Bone". Despite more than 150 years of wind and rain, the handwriting is still clearly visible.

(9) Beilao Village: It is located in Yangjia Town, Leizhou City, with a collection of cultures and many scenic spots. The ancient residential buildings in the village are very commendable, and the ancient houses in the village are not only numerous but also very exquisite in their architectural craftsmanship, and the interior and exterior decoration are gorgeous.

(10) Esense Village: Located in Beihe Town, Leizhou City, Egancun Village is a village with a history of more than 450 years that was established during the Jiajing period of the Ming Dynasty. On the Hutou Ridge in Egan's Village, there is a torii built more than 600 years ago and still intact, which is the oldest and most complete archway in Leizhou City.

(11) Donglin Village: It is located on the south bank of the Nandu River in Leizhou City. It was built during the Xiangxing period of the Southern Song Dynasty and has a long history. The scale and architectural style of the ancient houses in the village are the largest in Leizhou. There are four Ming Dynasty residences, all made of brick and wood, and each main house has five rooms. The ancient houses of the Qing Dynasty mainly include "Sima Di", "Dafudi", "Gui Lu", etc., each of which is unique and is a mansion of Huaju..

6.4 Suggestions for Tourism Development of Traditional Villages

Based on the above research results, combined with the specific conditions of traditional villages, this paper puts forward the following tourism development suggestions for traditional villages in Zhanjiang:

(1) Take intangible cultural heritage as the theme to create village cultural characteristics.

Zhanjiang has developed from the "Hundred Vietnamese Border" to the present and has undergone thousands of years of historical changes. The migration of people from successive dynasties has injected diverse cultures into the Leizhou region: from the pre-Qin to the Qin and Han dynasties, the slang culture brought by the Luo Yue people was derived here, and the basic

components of the "Lei culture" took shape; During the Tang and Song dynasties, the Central Plains culture and Minhai culture brought by the Central Plains people and the Min people were integrated with the Slang culture and evolved into the early Leizhou regional culture; During the Ming and Qing dynasties, immigrants from the Guangfu area brought Cantonese culture, and the collision and integration of diverse cultures eventually realized cultural integration to form a new culture, Lei culture, which was listed as the "four major cultures of Lingnan" along with Cantonese culture, Chaoshan culture and Hakka culture. It has been passed down to the present day, such as Zhanjiang Renlong Dance, Wu Dance, traditional drama Lei Opera, Wuchuan Cantonese Opera, and Southern School art. Traditional villages with strong potential have been formed for a long time and can combine intangible cultural heritage culture with unique local historical stories or historical figures to create a unique cultural museum or intangible cultural heritage learning base for the village.

(2) Use the traffic network as a bridge to introduce high-level scenic spot visitors.

As a bridge for people to communicate with the outside world, transportation has played a very important role since ancient times. The development of traditional villages in Zhanjiang is inseparable from the construction of the traffic road network. Referring to the above research results, it can be seen that the traditional villages of Zhanjiang are far away from source markets and high-end scenic spots, and the money, time, and energy spent on the journey will be prohibitive, weakening the willingness to visit. Therefore, cities (counties) and districts in Zhanjiang can build roads from administrative centers or high-level scenic spots to the centers of traditional villages and towns and provide shuttle bus lines to reduce tourists' concerns about inconvenient transportation and strengthen the connection between traditional villages and source markets.

(3) Guiding government policies to attract rural populations to return.

In March 2022, Zhanjiang held a conference on promoting the construction of the tourism industry. At the meeting, the leadership team of Zhanjiang said to build a global tourism demonstration zone and create a "culture + tourism" development model to drive the economic development of Zhanjiang. The article "Implementation Opinions on Creating a Global Tourism Demonstration Zone in Zhanjiang City to Promote the High-quality Development of the Cultural Tourism Industry (2022-2025)" released at the meeting mentioned that vertical and horizontal tourism corridors should be created, Wuchuan, Leizhou, and Xuwen tourism growth poles should be created, and a tourism pattern of "one core, one belt, two corridors, and three poles" should be built. Under the impetus of this policy, traditional villages in Zhanjiang can attract people to return through talent introduction.

(4) Take the direction of promoting the old and innovating to avoid the homogeneous development of villages.

Under the impetus of rural revitalization, a number of villages with tourism-driven industrial development have emerged in China's rural areas, and due to the lack of professional team guidance, practice, and construction, the tourism development of many villages has shown a homogeneous trend, resulting in the tourism of some villages being only short-lived. Thus, the traditional villages of Zhanjiang must attach importance to the construction of tourism professional teams, excavate village culture, create village cultural characteristics in a down-to-earth manner, and repeatedly grind the unique road of traditional village tourism development.

(5) Use the Internet+ as a platform to improve the popularity of villages.

Broaden publicity channels, use the Internet, social software, online self-media, and other modern publicity methods to strengthen the innovation and output of cultural works with local characteristics such as literature, stage plays, and songs, and establish new brands and new business cards for traditional village

tourism in Zhanjiang; Improve the publicity platform and create a new image for external publicity. Establish a public platform for the external promotion of rural tourism in Zhanjiang, based on the big data platform, combined with the development of new infrastructure such as 5G, to produce publicity websites with local characteristics, and establish a virtual tourism experience window for traditional villages to provide tourists with a better experience; Actively carry out various publicity activities, give full play to the spread effect of the network by holding various preferential activities, and promote and publicize each other among netizens.

VII. CONCLUSIONS

This paper uses big data to crawl the points of interest of traditional villages and advanced scenic spots in Zhanjiang and combines the survey of text data to screen out 96 villages with high tourism development levels in Zhanjiang for analysis. Meanwhile, using ArcGIS, ENVI, and other software, the spatial distribution characteristics of traditional villages in Zhanjiang were analyzed. We couple with some analysis methods such as the imbalance index method, the nearest proximity index method, the coefficient of variation method, kernel density estimation, and other methods trying to figure out the deep value of the study area.

Based on spatial analysis methods such as GIS superposition analysis, extraction analysis, proximity analysis, and interpolation analysis, topography, river, vegetation coverage, GDP, population, transportation, advanced scenic spots, and administrative centers were selected as the driving factors of tourism development from both geographical and human aspects, and the impact of eight driving factors on tourism development was analyzed in combination with social perception. On this basis, the scores and weights of each index are combined to establish an evaluation model for the tourism development potential of traditional villages based on TDPI, and the traditional villages with strong potential are analyzed and evaluated. Finally, on the basis of the analysis results, suggestions for the tourism development of traditional villages in Zhanjiang are put forward. This article concludes the following:

(1) Spatial characteristics analysis: In this paper, the nearest neighbor index, coefficient of variation, imbalance index, and kernel density analysis are used to analyze the spatial distribution characteristics of traditional villages in Zhanjiang. The nearest proximity index of traditional villages was calculated to be 2.68, greater than 1, and the CV value of the coefficient of variation was 12.81%, which was less than 33%, indicating that the number of traditional villages was relatively uniform and its spatial distribution type was uniform. The calculated results show that the imbalance index was 0.37 and the Lorentz curve showed an upward convex trend, indicating that the spatial distribution equilibrium degree was unbalanced. We analyzed the nuclear density of traditional villages in Zhanjiang. The results showed that the high-density areas were mostly distributed in Leizhou City, Lianjiang City, and Wuchuan City, and the distribution characteristics were point-like concentrated distribution.

(2) Analysis of tourism driving factors: The topography, river, and vegetation coverage conditions of traditional villages in Zhanjiang are good, which can enable different tourists to have different social perceptions of the natural environment of traditional villages, enhance the psychological impression of tourists, and thus improve the transmission rate of traditional village tourist attractions. However, the socio-economic conditions are weak, on the one hand, to avoid the disappearance of traditional villages in the process of urbanization so that traditional villages can be protected. On the other hand, the infrastructure of most traditional villages is not perfect. The weights of each driving factor are, from largest to smallest, as follows: per capita GDP> advanced scenic spots> rivers> topography> population> vegetation coverage> transportation location> source market.

(3) Development potential analysis: the tourism development potential value of traditional villages is

between 3.53≤TDPI<4.91, and the development potential is divided into three levels according to the natural break point grading method: weak potential (≤TDPI<4.37), medium potential (4.37≤TDPI<4.62), and strong potential (4.62≤TDPI<4.90). Among them, there are 11 traditional villages with strong potential, 44 with medium potential, and 41 with weak potential. Traditional villages with strong potential are most distributed in Leizhou City, followed by Suixi County and Wuchuan City..

(4) According to the analysis results, the following suggestions are put forward for the tourism development of traditional villages in Zhanjiang: 1) Take intangible cultural heritage as the theme to create village cultural characteristics; 2) Use the traffic network as a bridge to introduce high-level scenic spot visitors; 3) Guided by government policies to attract rural population to return; 4) Take the direction of innovation to avoid the homogeneous development of villages; 5) Use the Internet + as a platform to improve the popularity of the village.

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