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Study on the Spatial Distribution Characteristics and Influencing Factors of Famous Historical and Cultural Towns or Villages in Hubei Province, China

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Abstract: Famous Historical and Cultural Towns or Villages are among the important components of China's cultural heritage. Their spatial distribution patterns are directly related to regional geographical patterns, historical transportation geography and traditional communities. Meanwhile, their conservation is challenged by the change in regional population density, the level of urbanization, modern transportation and ecological environment conditions. Therefore, studying the provincial distribution patterns is of great practical significance to the conservation and sustainable development of Famous Historical and Cultural Towns or Villages in China. This study takes 44 of China's national and provincial Famous Historical and Cultural Towns or Villages in Hubei Province that were announced from 2003 to 2022 as the research subjects and uses the Geographic Information Technology (GIS) tools to determine their clusters and linear distribution zones, including nearest distance analysis, nuclear density analysis, buffer zone analysis and imbalance index analysis. We further analyze the causes of their spatial distribution in conjugation with historical geography and factors related to the preservation of the current situation of them via correlation analysis. Finally, we make suggestions for the conservation and development of Famous Historical and Cultural Towns or Villages in Hubei Province.

Keywords: spatial distribution characteristics; influencing factors; geographic information technology (GIS) spatial analysis; famous historical and cultural towns or villages; Hubei Province

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Citation: Wang, Q.; Bing, H.; Wang, S.; Xu, Q. Study on the Spatial Distribution Characteristics and Influencing Factors of Famous Historical and Cultural Towns or Villages in Hubei Province, China. *Sustainability* **2022**, *14*, 13735. https://doi.org/10.3390/su142113735

Academic Editor: Zihan Kan

Received: 13 September 2022
Accepted: 20 October 2022
Published: 23 October 2022

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1. Introduction

1.1. Research Background

Since the International Charter for the Conservation and Restoration of Monuments and Cities (The Venice Charter, 1964) proposed the concept of historic monuments, embracing urban and rural settings, rural settlements conservation became an issue of common concern for the international community and in all countries of the world. The International Committee on Historic Towns and Villages (CIVVIH) was established in 1982, and a number of towns and villages with outstanding universal values have been included in the World Heritage List since the 1980s (Figure 1). In the context of decades of globalization and urbanization, historical towns and villages are increasingly regarded as typically representative of human material and spiritual heritage, and countries around the world place a greater emphasis on the value and conservation of historic towns and villages. However, a large number of historic towns and villages have been damaged in the forces of ongoing globalization, urbanization and mass tourism development, and ways to address these pressures and challenges have been continually sought.

China began to protect rural settlements in the 1980s and established the system of Famous Historical and Cultural Towns or Villages (FHCTV) in 2003, which included national and provincial levels. The selected FHCTV are the essence of China's rural settlements heritage, and a total of 799 towns and villages in seven batches have been

incorporated into the system as of 2022. Relevant government departments have also issued a series of important documents for supporting the conservation and management of China's rural heritage (Figure 2). In February, 2021, the No. 1 Central Government Document of "Strengthen the Conservation of Cultural Heritage Sites in Rural Areas" was published, which shows the determination of the Party Central Committee to protect rural heritage. At present, the conservation and inheritance of FHCTV has become an important endogenous driving force for China's Rural Revitalization Strategy.

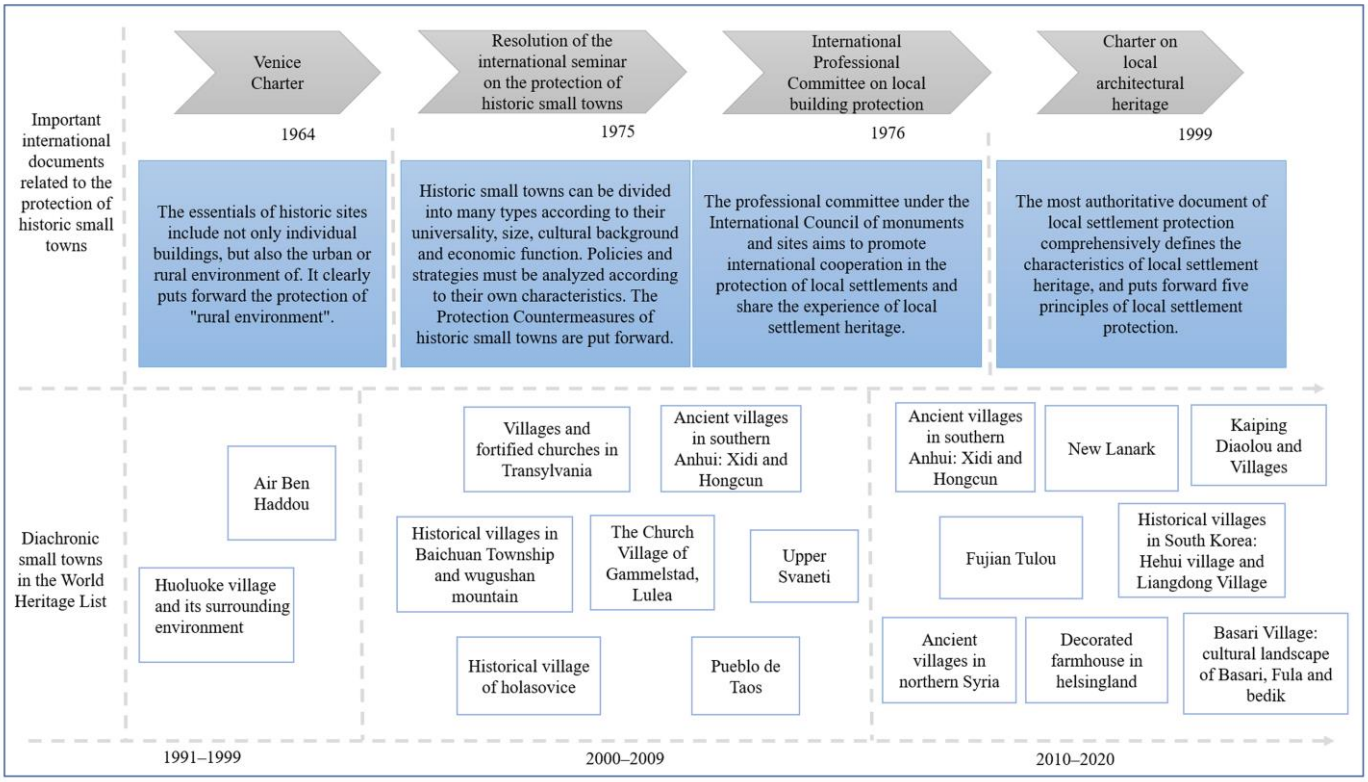


Figure 1. World Heritage List of Vernacular Buildings.

With the introduction of the concept of cultural routes and corridors heritage conservation in the World Heritage field, the idea of the collaboration and integration of cultural heritage at a regional level is also spreading in China. Meanwhile, China has reorganized the Ministry of Natural Resources since 2018 to build the "five levels and three categories" of territorial spatial planning in China. China's territorial spatial planning is a unified territorial spatial planning that integrates the former main functional area planning, land use planning, urban and rural planning and other spatial planning into a unified territorial spatial planning after the establishment of the Ministry of Natural Resources of China in 2018. According to the planning level, it is divided into "five levels": national, provincial, municipal, county and township levels; according to the planning content, it is divided into "three categories": general planning, detailed planning and special planning; according to the planning management and operation system, it is divided into "four subsystems": preparation and approval, implementation supervision, regulations and policies and technical standards. Thereafter, the provincial territorial spatial planning required the construction of a network of historical, cultural and natural landscapes, which is an opportunity for the regional integration of the fragmented historical and cultural heritage in the former Chinese provinces. Based on the study results of the distribution pattern of provincial FHCTV, the analysis of the distribution characteristics in terms of natural, historical and cultural factors, historical traffic and other factors, as well as the factors affecting the conservation of the current situation, is of great practical significance for the

construction of the historical and cultural conservation system in provincial territorial spatial planning.

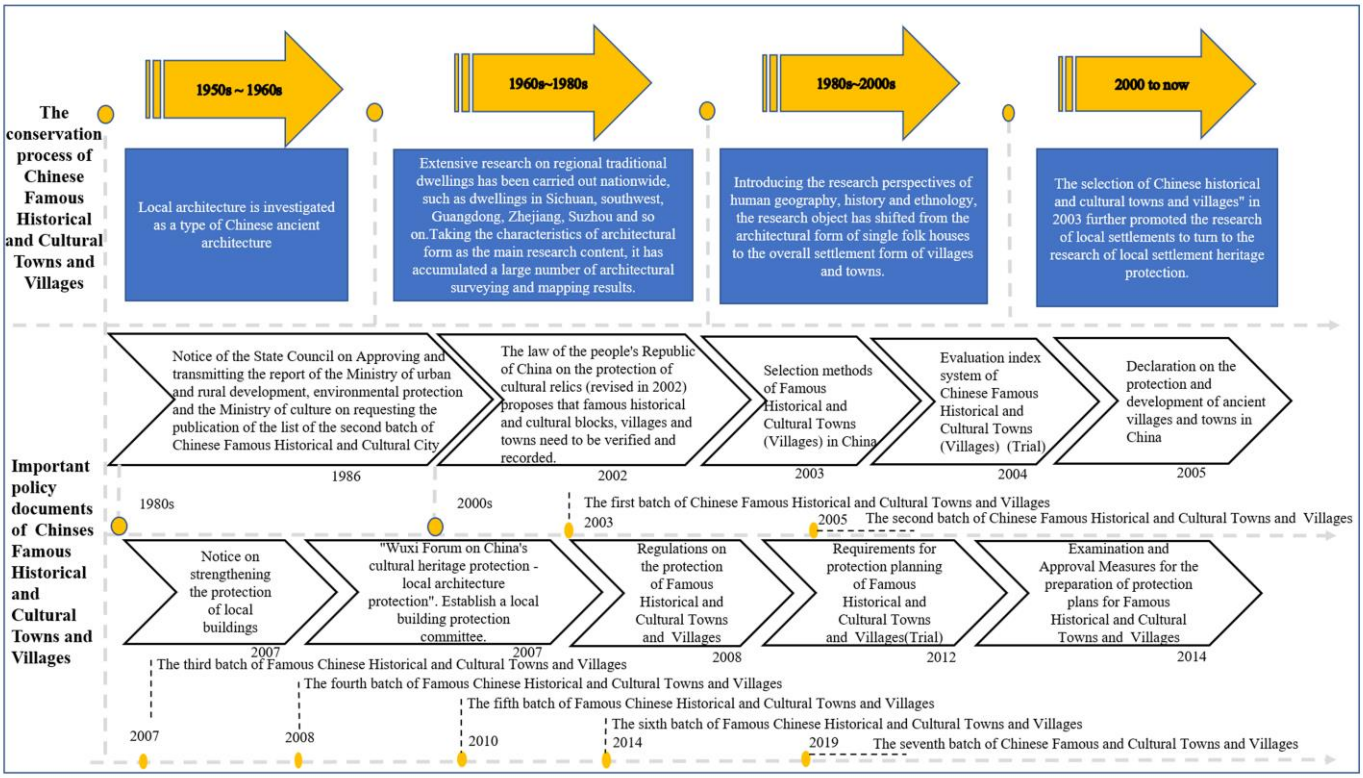


Figure 2. Summary of the stages of rural settlements research and related policies in China.

1.2. Literature Review

The study of rural settlements, which originated in Western geography, initially focused on the formation, development, types and functions of settlements under the influence of the natural environment, thereby forming the research idea of the material determinism of rural settlements. Subsequently, anthropology began to focus on social and cultural phenomena such as immaterial laws of marriage, family organization and myths and legends. On the other hand, architecture incorporated the material and immaterial ideas of geography and sociology and summarized the four main influencing factors on the characteristics and causes of housing forms in rural settlements around the world: the materials, availability and usability of buildings, environment, socio-culture and economy and politics [1], among which immaterial elements such as socio-culture, were more important than material elements in the choice of building forms. In the late 19th century, the study of rural settlements started in Europe and North America and then accelerated in the second half of the 20th century. Bernard Rudowsky (1964) held the exhibition "Architecture without Architects" at the New York Museum of Art and published a book of the same name [2]; Japanese architects Akira Fujii and Hiroshi Hara investigated a large number of rural dwellings in Asia, Africa and Europe and proposed a basic spatial schematic of settlements [3]. Paul Oliver (1997) edited the Encyclopedia of Vernacular Architecture of the World, which discussed vernacular architecture in several regions of the world and explored the research methods of vernacular architecture. After 2000, the regional perspective of rural settlements research in the world has gradually formed, such as Oliver's seven regional cultural divisions of global vernacular architecture [4]. The international regional perspective on rural settlements research has provided a guiding direction and inspiration for China's conservation of rural settlements.

International research on the application of Geographic Information Technology (GIS) [5,6] to rural cultural heritage mainly focuses on two aspects. One is the establishment of a database of rural cultural heritage. For example, architecture (Cano, M. et al., 2013; Cillis, G. et al., 2020) [7,8], architectural decoration (Spano, A. 2013) [9], rural underground architectural heritage (Kaimaris, D. et al., 2011) [10] and historic environment elements (Garcia-Esparza, J.A. et al., 2020) [11] cataloging and management. In addition, database creation involves using a combination of GIS, historical heritage and 3D models, such as the construction of a Heritage Information System (HIS) (Dominguez-Ruiz, V. 2020) [12], the combination of GIS and BIM for the conservation and evaluation of rural cultural heritage (Bianco, I. 2013) [13], the creation of a 3D heritage building model (HBIM) applied to architectural heritage restoration practices (Tsilimantou, E. 2020) [14], etc. The other is GIS, a foundation and technical tool for research on rural tourism, landscape studies, ecological studies and disaster monitoring, as well as heritage planning and management decisions. In rural cultural heritage tourism, researchers focused on the identification of rural tourism routes and tourism services (Sanchez-Martin, J.M. 2020, Masot, A.N. 2021) [15,16] and the impact of rural tourism accommodation prices (Bilbao-Terol, C. 2017) [17]. Rural landscape studies focused on landscape visibility (Prus, B. et al., 2020; Demir, S. et al., 2019; Sevenant, M. et al., 2007) [18–20] and landscape evolution (Statuto, D. et al., 2019; Cillis, G. et al., 2021; Wang, J.Y. et al., 2021) [21–23]. In the area of rural ecological research and disaster early warning, research focuses on rural heritage ecological perception (Nora Fagerholm, et al., 2019) [24], ecological value assessment (Vlami, V. et al., 2017) [25], ecological vulnerability (Merlin-Uribe, Y. et al., 2013; Donoso, M.E. et al., 2021) [26,27] and disaster early warning (Alexakis, D.D. et al., 2014) [28], among other things. The research of GIS in heritage conservation planning, planning management and the decision making of rural heritage is more extensive and can be applied in the comparison of planning options (Tena, P.A. et al., 2018) [29] and the comprehensive assessment of decision making (Giard, L.F. et al., 2007) [30], conservation planning (Koutsi, D. et al., 2019) [31], planning management (Gaveau, D.L.A. et al., 2009; Rovelli, R. et al., 2020; Ottomano Palmisano, G. et al., 2016) [32–34], etc.

The study of rural settlements in China has roughly gone through four stages (Figure 2), and the scope of it has started from architecture and has extended to multidisciplinary perspectives such as urban planning, landscape architecture, historical geography, anthropology, etc. The scale of research subjects has evolved from microscopic to macroscopic, from individual buildings to individual cases of historical towns and villages, followed by regional village clusters. In the past decade, along with the rapid development of information technology, the application of GIS to rural settlements study, especially Chinese traditional villages, has become increasingly mature. The research scale has been formed in four levels, including the nation (Wu, B.H. et al., 2011; Tong, Q.Y. 2014; Liu, D.J. et al., 2014) [35–37], cross-provincial region (Lu, S. et al., 2018; Li, J.L. et al., 2018; Zhang, Z.R. et al., 2020) [38–40], provincial domain, city and county. At the provincial level, there have been studies on Hunan Province (Hu, Z. et al., 2013; Liu, B.H., et al. 2015) [41,42], Guizhou Province (Tong, Y.Q. et al., 2015) [43], Gansu Province (Jin, J.L., et al. 2018) [44], Henan Province (Huang, R.J. et al., 2019; Wang, Y.X. et al., 2019) [45,46], Fujian Province (Chen, Y.Q. et al., 2019) [47], Jiangxi Province (Wei, X.Y. et al., 2018) [48], Shanxi Province (Gong, S.S. et al., 2017) [49], Guangdong Province (Feng, Y.F. et al., 2017) [50] and Hubei Province (Peng, J. et al., 2020; Hu, J. et al., 2022) [51,52], which have produced fruitful results in terms of spatial distribution characteristics and influencing factors [53] and spatial and temporal evolution patterns and types [41–52] of provinces' traditional villages. However, there are still three shortcomings in these studies: (1) few studies have applied GIS to FHCTV, which are at a higher level of conservation than traditional villages; (2) the existing studies have focused on the use of GIS to analyze physical environment elements, particularly in relation to geographical elements such as topography, landforms and water systems, and this lacks a deeper analysis of social-culture aspects such as ethnic cultures at

the provincial scale; (3) the findings of the GIS analysis lack planning recommendations for the conservation and development of historical and cultural heritages.

The study of rural settlements in Hubei Province began in the late 1980s. The representative studies included Zhang Guoxiong's investigation of the influenence of immigration events on the geographical distribution of the population of Hubei over a period of 400 years from the late Yuan dynasty to the Qing dynasty (14th to 19th centuries A.D.), which laid the foundation for the study of migrant culture in Hubei province's heritage conservation [54]. In the 1990s, Zhang Lianggao studied the Diaojiaolou of Tujia ethnic group in Enshi Prefecture from an architecture perspective and called for the conservation of ancient villages in southwest Hubei province, which was the prelude to the conservation of ancient villages in Hubei Province [55]. After the selection of the Chinese FHCTV in 2003, Li Baihao's team [56] and Li Xiaofeng's team [57] carried out a series of studies on ancient towns and villages in Hubei, laying the foundation for the study of spatial forms, architectural types and construction techniques of FHCTV in Hubei Province. However, most of the existing studies are based on the qualitative research of individual cases, and the quantitative research is weak. In addition, the study of groups of FHCTV is still blank, and the spatial relationship of groups is not clear.

Therefore, this work uses GIS technology as a quantitative analysis tool to extract the spatial distribution characteristics of FHCTV in Hubei Province and analyzes the causes, rules and zoning of the distribution of them in combination with the historical environment (material) and historical ethnic migration culture (immaterial), which provides a reference for the construction of a historical and cultural protection system in the territory spatial planning of Hubei Province.

2. Materials and Methods

2.1. Research Area and Data Sources

Hubei province is located in central China, bordered by Anhui to the east, Chongqing to the west, Shaanxi to the northwest, Jiangxi and Hunan to the south and Henan to the north (Figure 3). It is also located in the transitional zone from the second ladder to the third ladder in China, with a high terrain in the west and a low terrain in the east. China's terrain is in three steps descending step-by-step; the first step is mainly located near the Qinghai-Tibet Plateau, over 4000 m above sea level; the second step is located on major plateaus, such as the Inner Mongolia Plateau, the Loess Plateau and the Yunnan-Guizhou Plateau, 1000 to 2000 m above sea level; the third pole step is located on major plains, less than 500 m above sea level. The dividing line between the second and third terraces is the Daxinganling—Taihang Mountains—Wushan Mountains—Xuefeng Mountains. The east, southeast, west and north of Hubei Province are surrounded by mountains. The Jianghan Plain is in the middle and south part, which connects Dongting Lake with a wide and flat terrain. It can be divided into seven geomorphic types, including mountainous areas in northwestern Hubei Province, Three Gorges Valley, mountainous areas in the southwest, plain hills in the north, low mountains and hills in the northeast, low mountains and hills in southeastern Hubei Province and Jianghan Plain. The whole province forms a basin sloping from the northwest to the southeast. The region is rich in water resources, forming a river network structure with the Yangtze River and Han River as the main stream.

Hubei Province comprises 13 prefectural-level administrative regions and 103 county-level administrative regions. China's administrative regions are divided into four levels: national, provincial, prefectural, county; the prefectural-level administrative regions include prefecture-level cities and autonomous prefectures, such as Wuhan City and the Enshi Tujia and Miao Autonomous Prefecture in Hubei Province; county-level administrative regions include municipal districts, county-level cities, counties and autonomous counties. Huangpi District of Wuhan City, Jianli City, Yangxin County and Changyang Tujia Autonomous County are all county-level administrative regions, while the four county-level administrative regions of Xiantao City, Qianjiang City, Tianmen City and Shenlongjia Forestry District of Hubei Province are province-administered county-level administrative

regions. This study analyzes the precision of both prefecture-level and county-level administrative regions, respectively, and for the sake of completeness of the provincial scope, the four province-administered administrative regions are included in the prefecture-level administrative region study. The analysis maps of nuclear density, the river buffer zone, the urbanization level superimposed analysis, the road density network superimposed analysis and the ecological condition index superimposed analysis are all studied at the prefectural level, while the distribution of FHCTV, the population density superimposed analysis and the ancient waterways—ancient landways—nuclear density overlay analysis diagram are studied at the county level.

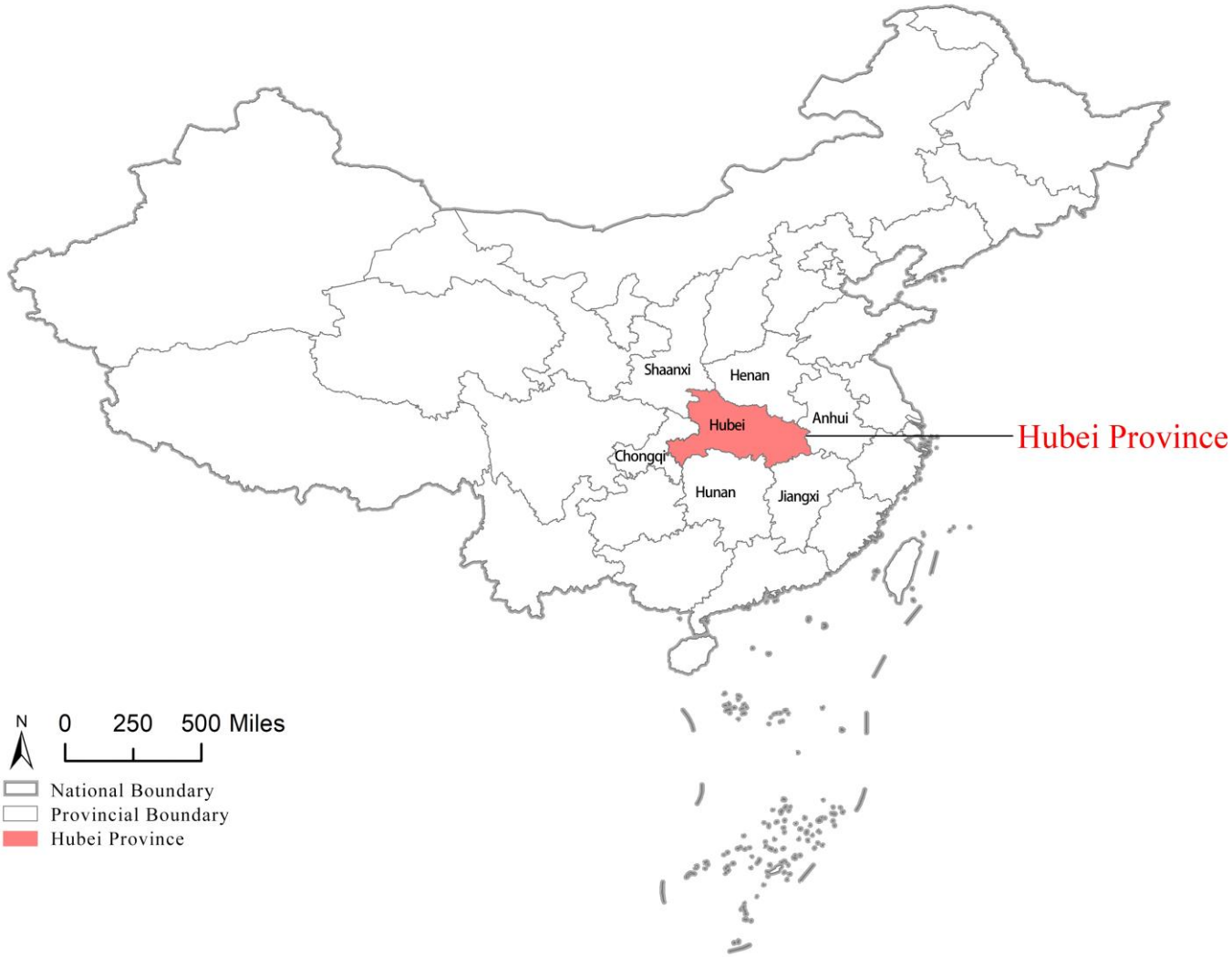


Figure 3. Location of Hubei Province.

This study is based on Chinese national (the first batch to the sixth batch) and provincial (the first batch) FHCTV in Hubei Province, and the data are obtained from official websites such as the Central People's Government of the People's Republic of China, the website of Hubei Provincial Cultural Heritage Administration and websites of Hubei Provincial local governments. There are 44 FHCTV in Hubei Province, including 13 Chinese Famous Historical and Cultural Towns, 15 Chinese Famous Historical and Cultural Villages, 6 Hubei provincial Famous Historical and Cultural Towns and 10 Hubei provincial Famous Historical and Cultural Villages. The social-economic development data such as the land area, population, road mileage and Gross Domestic Product (GDP) of Hubei Province are from the Hubei Statistical Yearbook 2020 and the 2020 statistical yearbooks of cities and prefectures in Hubei Province. The annual statistical data of Hubei Province are as of the

end of the previous year, that is, the annual statistical data of Hubei Province in 2020 are up to December 2019. The Hubei Provincial Ecological Index is from Wei Chao's PhD thesis [58]. The geographical coordinates of FHCTV are obtained from the Baidu map and converted into Global Positioning System (GPS) coordinates by a universal coordinate converter. The data of China's administrative divisions, elevation, river system and road are obtained from the Planning Cloud website, the National Basic Geographic Information Center and the Geospatial Data Cloud. The elevation, river system and road vector data are obtained from the National Basic Geographic Information Center, and the DEM raster data are obtained from the Geospatial Data Cloud. The vector data obtained from the National Basic Geographic Information Center is the national 1:1 million basic geographic information data for 2020 (2019 for overall presentability), the elevation datum is the 1985 national elevation datum and the geodetic datum is the 2000 National Geodetic Coordinate System. The DEM raster data obtained from the Geospatial Data Cloud are ASTER GDEM V3, with a spatial resolution of 30 m, which are the latest data of the global DEM released by NASA and METI in 2019.

The distribution map of FHCTV in Hubei Province is drawn by integrating the above data and using ArcGIS 10.5 software as follows (Figure 4), which is the base map for subsequent analysis. The coordinate systems for the point elements of FHCTV, the line elements, which are the river system and the traffic routes, and the surface elements, which are the Hubei boundary, the prefecture-level city and the county-level city, are unified using the coordinate system projection conversion to the geographic coordinate system GCS_WGS_1984 and the datum D_WGS_1984.

2.2. Data Analysis and Interpretation Methods

2.2.1. Digital Elevation Model (DEM) Elevation Analysis

In the study of regional terrain, the DEM is the basis of the digital ground model, and by using the contour map in the DEM and the coordinates of FHCTV for superposition analysis, the elevation distribution pattern of FHCTV in the regional scope can be analyzed.

2.2.2. Nearest Neighbor Analysis

FHCTV are point elements, and their distribution types can be analyzed by the nearest neighbor distance analysis method. Their distribution patterns can be divided into three types: random, uniform and agglomerative. The indexes used are the nearest neighbor distance and the nearest neighbor point index, and the calculation formula is:

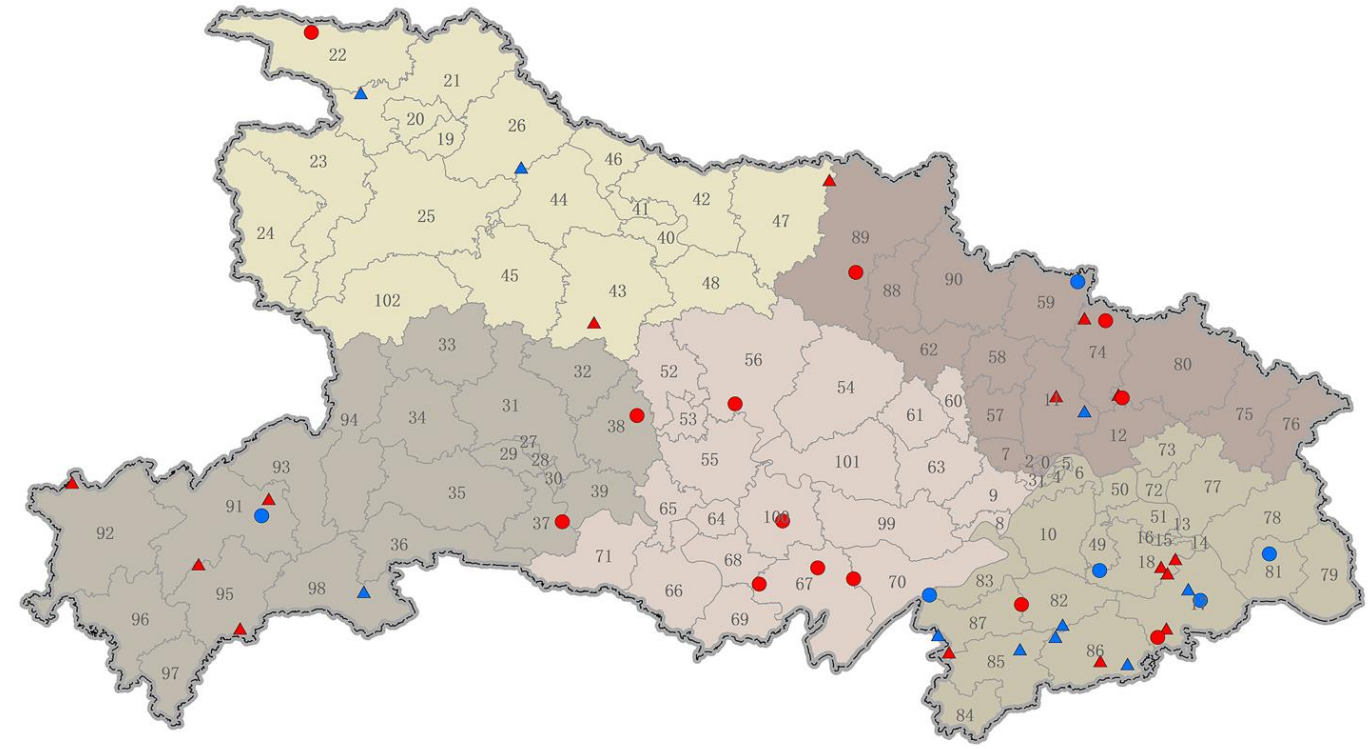
$$R = \frac{R_0}{R_r} = \frac{R_0}{\frac{1}{2}\sqrt{\frac{n}{A}}} = 2R_0\sqrt{\frac{n}{A}} \quad (1)$$

where: R is the nearest neighbor index, R_0 is the average observation distance, R_r is the expected average distance, n is the number of point elements and A is the area of the province where the point element is located. When R < 1, it means that FHCTV tend to be cohesively distributed, when R = 1, FHCTV tend to be randomly distributed and when R > 1, FHCTV tend to be uniformly distributed.

2.2.3. Buffer Zones Analysis

A buffer polygon is created within a specified distance around the input element to form a buffer zone. A river system or a road can then be abstracted as a line element, followed by establishing a polygon with a certain width, with the line element as the center. Thereafter, the point elements of FHCTV can be overlaid with the generated buffer zones of the current elements for analysis to obtain the number of FHCTV within different buffer radii so as to study the relationship between the point and line elements.

Geographical Area/Number of counties included	County-level city serial number and name
Northwest Hubei/18	19 (Maojian District) 、 20 (Zhangwan District) 、 21 (Yunyang District) 、 22 (Yunxi County) 、 23 (Zhushan County) 、 24 (Zhuxi County) 、 25 (Fang County) 、 26 (Danjiangkou City) 、 40 (Xiangcheng District) 、 41 (Fancheng District) 、 42 (Xiangzhou District) 、 43 (Nanzhang County) 、 44 (Gucheng County) 、 45 (Baokang County) 、 46 (Laohekou City) 、 47 (Zaoyang City) 、 48 (Yicheng City) 、 102 (Shennongjia forest District)
Northeast Hubei/17	0 (Jiangan District) 、 1 (Jianghan District) 、 2 (Qiaokou District) 、 7 (Dongxihu District) 、 11 (Huangpi District) 、 12 (Xinzhou District) 、 57 (Xiaonan District) 、 58 (Xiaochang County) 、 59 (Dawu County) 、 62 (Anlu City) 、 74 (Hong'an County) 、 75 (Luotian County) 、 76 (Yingshan County) 、 80 (Macheng City) 、 88 (Zengdu District) 、 89 (Sui County) 、 90 (Guangshui City)



Geographical Area/Number of counties included	County-level city serial number and name
Southwest Hubei/21	27 (Xiling District) 、 28 (Wujiagang District) 、 29 (Dianjun District) 、 30 (Xiaoting District) 、 31 (Yiling District) 、 32 (Yuan'an County) 、 33 (Xingshan County) 、 34 (Zigui County) 、 35 (Changyang Tujia Autonomous County) 、 36 (Wufeng Tujia Autonomous County) 、 37 (Yidu City) 、 38 (Danyang City) 、 39 (Zhijiang City) 、 91 (Enshi City) 、 92 (Lichuan City) 、 93 (Jianshi County) 、 94 (Badong County) 、 95 (Xuan'en County) 、 96 (Xianfeng County) 、 97 (Laifeng County) 、 98 (Hefeng County)
Jianghan Plain/22	3 (Hanyang District) 、 8 (Hannan District) 、 9 (Caidian District) 、 52 (Dongbao District) 、 53 (Duodao District) 、 54 (Jingshan County) 、 55 (Shayang County) 、 56 (Zhongxiang City) 、 60 (Yunmeng County) 、 61 (Yingcheng City) 、 63 (Hanchuan City) 、 64 (Shashi District) 、 65 (Jingzhou District) 、 66 (Gong'an County) 、 67 (Jianli County) 、 68 (Jiangling County) 、 69 (Shishou City) 、 70 (Honghu City) 、 71 (Songzi City) 、 99 (Xiantao City) 、 100 (Qianjiang City) 、 101 (Tianmen City)
Hubei Southeast/25	4 (Wuchang District) 、 5 (Qingshan District) 、 6 (Hongshan District) 、 10 (Jiangxia District) 、 13 (Huangshigang District) 、 14 (Xisaishan District) 、 15 (Xialu District) 、 16 (Tieshan District) 、 17 (Daye City) 、 18 (Yangxin County) 、 49 (Liangzihu District) 、 50 (Huarong District) 、 51 (Echeng District) 、 72 (Huangzhou District) 、 73 (Tuanfeng County) 、 77 (Xishui County) 、 78 (Qichun County) 、 79 (Huangmei County) 、 81 (Wuxue City) 、 82 (Xian'an District) 、 83 (Jiayu County) 、 84 (Tongcheng County) 、 85 (Chongyang County) 、 86 (Tongshan County) 、 87 (Chibi City)

Figure 4. Distribution of FHCTV by county-level city in Hubei Province.

2.2.4. Nuclear Density Analysis

Nuclear density estimation is used to calculate the density of point elements in their surrounding neighborhood, and this index can clearly reflect the distribution pattern of FHCTV in the provincial space, calculated by the formula:

$$f(x) = \frac{1}{nh}\sum_{i=1}^{n} K\left(\frac{x - x_i}{h}\right) \quad (2)$$

where K is the kernel function, n is the number of point elements, h is the search bandwidth of the kernel density calculation, X and X_i are the spatial sample points and $(X - X_i)$ represents the distance from the evaluation point x to the event point xi. The larger the nuclear density is, the more densely distributed the FHCTV are.

2.2.5. Imbalance Index Analysis

The imbalance index (S) reflects the degree of balance in the distribution of FHCTV.

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

In the equation, n represents the number of prefecture-level cities and province-administered county-level cities in Hubei Province, Y_i represents the proportion of the number of Historical and Cultural Towns and Villages in each prefecture-level city and province-administered county-level city in relation to the total number in the province in descending order, along with the cumulative percentage of its position. S values range from 0 to 1, with larger S values indicating a higher imbalance. When S = 0, FHCTV are evenly distributed among the cities, and when S = 1, all FHCTV are concentrated in one city. The imbalance index can be expressed as a Lorenz curve.

2.2.6. Correlation Analysis

In terms of testing the correlation between the number of FHCTV and social-economic indicators, the Pearson correlation coefficient test is used. The Pearson correlation coefficient is a linear correlation coefficient which is used to describe the correlation degree between two statistical variables, X and Y, usually expressed as r. The specific formula is as follows:

$$r = \frac{\mathrm{Cov}\ (X,\ Y)}{\sigma_x \sigma_y} = \frac{E[(X - \mu_x)(Y - \mu_Y)]}{\sigma_x \sigma_y} \quad (4)$$

In the equation, the Pearson correlation coefficient r is equal to the product of their covariance Cov divided by their respective standard deviation σ; the value of r is taken between −1 and 1. If r is greater than 0, it means there is a positive correlation; if r is less than 0, it means there is a negative correlation; if r is equal to 0, it means there is no correlation. r with an absolute value greater than 0.5 means there is a high correlation; r being between 0.3 and 0.5 means there is a moderate correlation; r being between 0.1 and 0.3 means there is a low correlation.

2.3. Significance of Research Methodology and Framework

From the perspective of geography, the distribution and preservation of FHCTV are spatially related and trended in some way to the geographic environment elements and modern socio-economic elements, which also have an implied relationship with historical and cultural elements. GIS spatial analysis visually shows the relationship between geographic environment elements, modern socio-economic elements and the distribution and preservation of FHCTV. By combining the data of spatial analysis and historical and cultural elements, we can understand the causes, characteristics, current situation preservation vulnerability issues and conservation strategies of the formation of FHCTV. Therefore, GIS spatial analysis is an important technology and method in the study of FHCTV conservation and eventually returns to the actual problems and solutions of FHCTV conservation, which is the significance of using GIS spatial analysis in the study of FHCTV conservation. The methodology framework of the study is as follows (Figure 5):

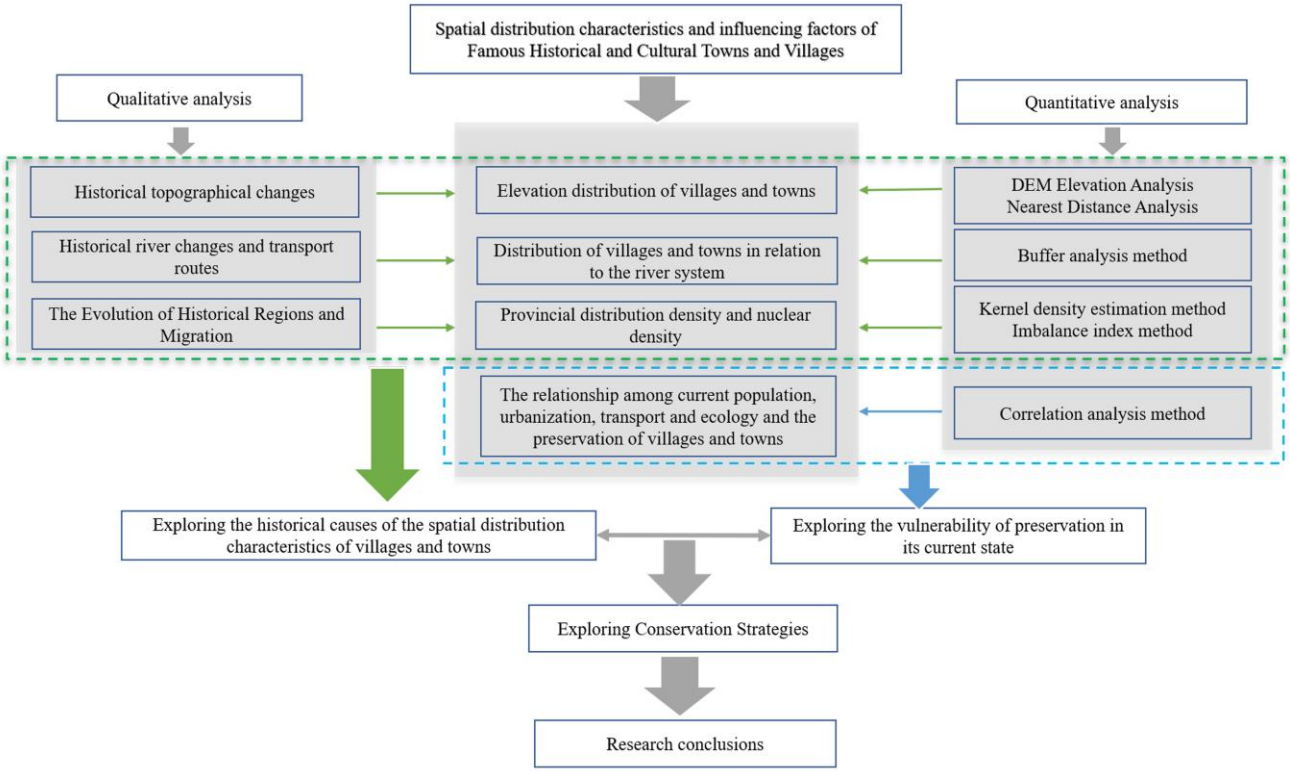


Figure 5. The methodology framework of the spatial distribution characteristics and influencing factors of FHCTV.

3. Results

3.1. Elevation Distribution Pattern

The elevation of terrain in Hubei Province ranges from −135 to 3108 m. According to the contour map, 34 of the FHCTV in Hubei Province are distributed in the plains with an elevation of less than 200 m, 31 are concentrated in the Jianghan Plain in southeastern and northeastern Hubei Province and 3 are distributed in the transition zone from northwestern and southwestern Hubei Province to the Jianghan Plain. Three are distributed in the hills with an elevation of 200~500 m, which are mainly located in northeastern Hubei Province, four are distributed at low mountains with an elevation of 500 to 1000 m and three are distributed in middle mountain areas with an elevation above 1000 m, which are mainly concentrated in southwestern Hubei Province. In summary, FHCTV that are distributed in plain areas with an altitude less than 200 m account for 77.3% of the total FHCTV, and they are mainly concentrated in the plain areas of southeastern and northeastern Hubei Province, while the distribution rates in the Jianghan Plain with a low terrain are the lowest (Figure 6).

3.2. Nearest Neighbor Index

The related parameters of 44 FHCTV in Hubei Province are measured through nearest neighbor distance analysis. The average observed distance R_0 = 30.449 km, the expected average distance R_r = 37.561 km, the nearest neighbor index R = 0.811, z = −2.4 and p = 0.016. R = 0.811 < 1, indicating a cohesive distribution of FHCTV in Hubei Province. The z-score and p-value are measures of statistical significance, and the higher (or lower) the z-score, the higher the degree of clustering. If the z-score is close to zero, it indicates that there is no obvious clustering in the study area. A positive z-score indicates a high-value cluster (HH), and a negative z-score indicates a low-value cluster (LL). Because the z-score is measured to be −2.4, the FHCTV in Hubei Province showed a low-value cluster (LL). The significance index p-value is 0.016, indicating that the aggregation is significant. In

conclusion, the results show that the spatial distribution type of FHCTV in Hubei Province is a significant low-value agglomeration distribution.

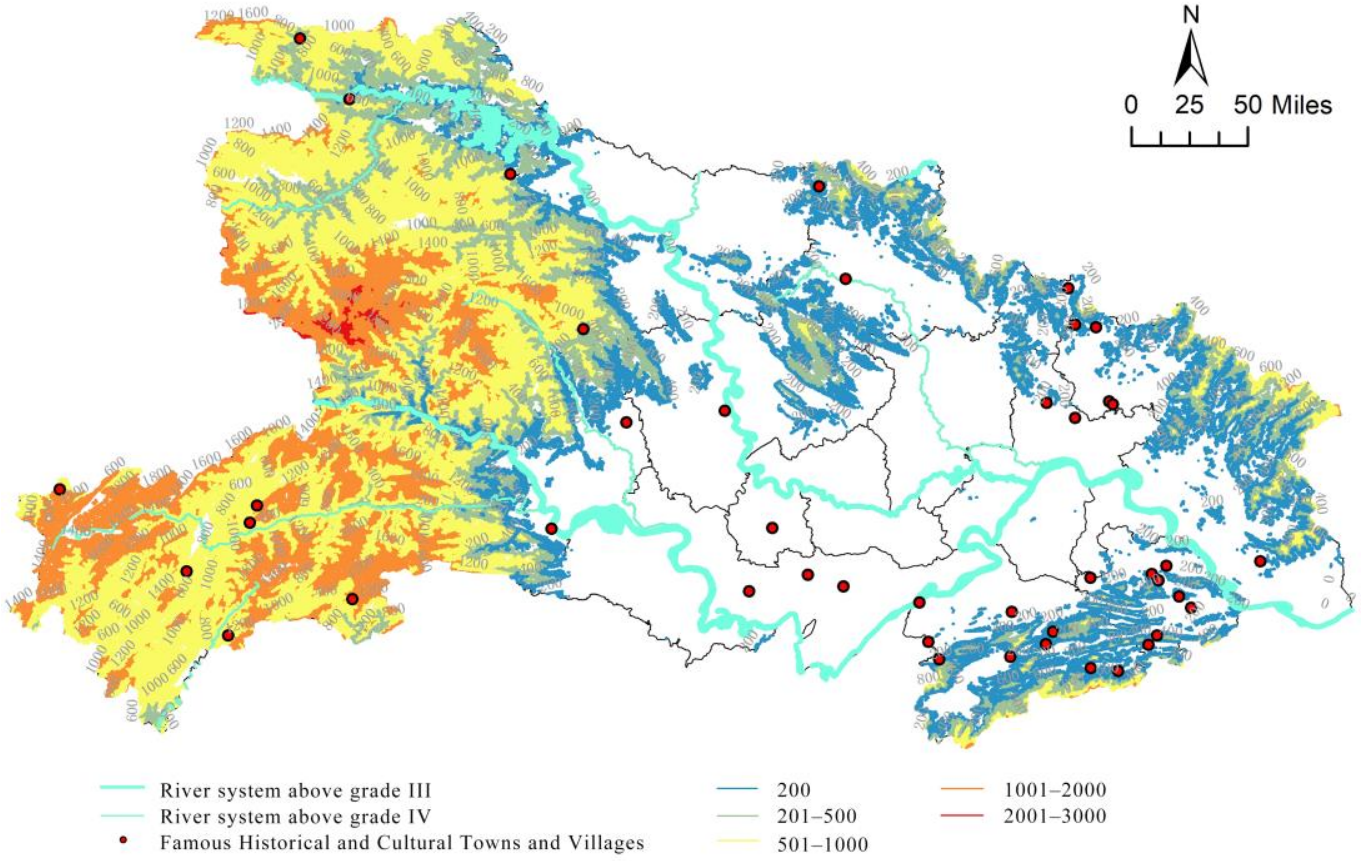


Figure 6. Elevation distribution of FHCTV by prefecture-level city in Hubei Province.

3.3. River Buffer Zone

The analysis results of the river buffer zone in Hubei Province (Table 1 and Figure 7) show that the number of FHCTV located in the 5 km buffer zone of rivers of grade 5 and above is 32, accounting for 73% of the total FHCTV, the number of FHCTV located in the 10 km buffer zone is 36, accounting for 82% of the total FHCTV, and the number of FHCTV within the 15 km buffer zone is 40, accounting for 91% of the total FHCTV. Most of the FHCTV in southwest, northeast and southeast Hubei are distributed in the river system above grade V. Table 1 shows the distribution of FHCTV in the buffer zone of river systems above grade V in Hubei Province.

Table 1. Distribution of FHCTV in the buffer zone of river systems above grade V in Hubei Province.

The Range of Buffer Regions	5 km	10 km	15 km	20 km	25 km	30 km	>30 km
River system above grade III	3	5	6	8	13	17	21
River system above grade IV	2	4	6	9	10	10	13
River system above grade V	23	32	34	37	42	44	44

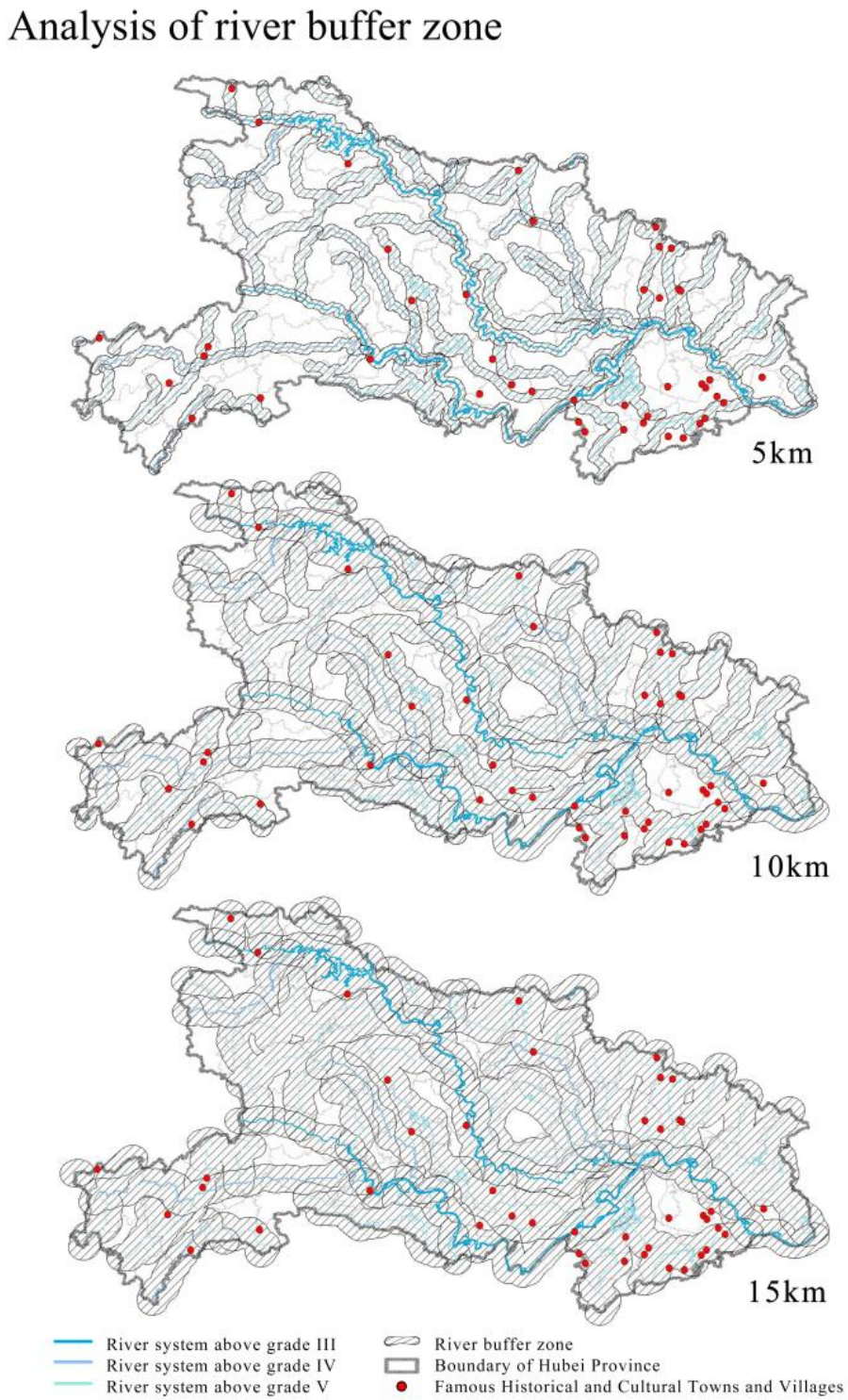


Figure 7. 5 km, 10 km and 15 km overlay distribution of buffer zones for river systems above grade V.

3.4. Density and Imbalance Analysis of FHCTV

The land area of Hubei Province is 185,900 km^2, and the distribution density of the FHCTV is 2.37 per 10,000 km^2, with large differences in distribution density among cities and prefectures. Xianning City has the highest distribution density of 9 per 10,000 km^2, followed by Huangshi City, with 7.46 per 10,000 km^2, Enshi prefecture, with 2.5 per 10,000 km^2, and Huanggang City, with 2.87 per 10,000 km^2.

Combined with the results of the nuclear density analysis, the spatial distribution pattern of FHCTV in Hubei Province can be graphically summarized as "one belt, two clusters and many scattered points". It refers to the planar structure characteristics of the gathering of FHCTV in Hubei Province, as reflected by the nuclear density. "One belt" refers to the belt-shaped distribution area enclosed by Huangshi City, Xianning City, Qianjiang City and Jingzhou City. The "two clusters" refer to the two clusters from the north of Huanggang City to the north of Wuhan City and the Enshi Prefecture, and the "many scattered points" refer to the scattered distribution of villages and towns without an obvious gathering. The high-density area of the belt is Yangxin County, Tongshan County, Xianan District, Daye City as the core, radiating to Jianli County, Qianjiang City, Huangmei County, etc.; the medium-density areas of the two clusters are Hongan County as the core, radiating to Huangpi District, Dawu County and Enshi City as the core, radiating to Jiansi County, Lichuan City, Xuanen County and Hefeng County (Figure 8).

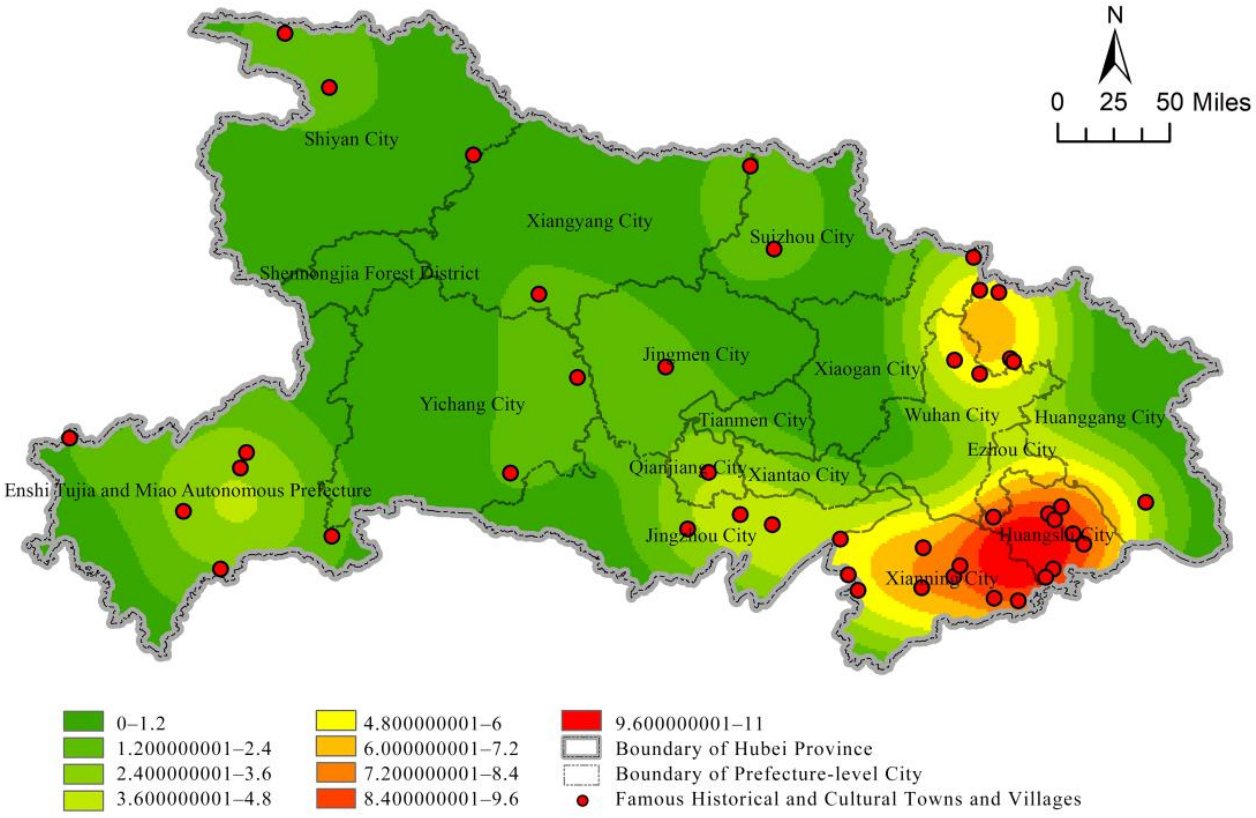


Figure 8. Nuclear density analysis of FHCTV by prefecture-level city in Hubei Province.

The distribution of FHCTV in 13 prefecture-level cities and 4 province-administered county-level cities in Hubei Province exhibited an uneven distribution at the municipal level (Table 2). The FHCTV are mainly concentrated in Xianning City, Huangshi City, Huanggang City and the Enshi Tujia and Miao Autonomous Prefecture, accounting for 20.45%, 18.18%, 13.64% and 11.36%, respectively. The distribution quantity proportion in these cities is more than 10%. This is followed by Shiyan City, Jingzhou City, Wuhan City, Yichang City, Xiangyang City, Jingmen City, Xiaogan City, Suizhou City and Qianjiang City, accounting for 0~10%. There are no FHCTV located in Ezhou City, Xiantao City, Tianmen City and Shenlongjia Forest District.

Table 2. Distribution of FHCTV of prefecture-level cities and province-administered county-level cities in Hubei Province.

	City	Famous Historical and Cultural Towns	Proportion	Famous Historical and Cultural Villages	Proportion	Total	Proportion
Prefecture-level city	Wuhan City	0	0	2	8.00	2	4.55
	Huangshi City	3	15.79	5	20.00	8	18.18
	Shiyan City	1	5.26	2	8.00	3	6.82
	Yichang City	2	10.53	0	0.00	2	4.55
	Xiangyang City	0	0	2	8.00	2	4.55
	Ezhou City	0	0	0	0	0	0
	Jingmen City	1	5.26	0	0	1	2.27
	Xiaogan City	1	5.26	0	0	1	2.27
	Jingzhou City	3	15.79	0	0	3	6.82
	Huanggang City	3	15.79	2	8.00	5	11.36
	Xianning City	2	10.53	7	28.00	9	20.45
	Suizhou City	1	5.26	0	0	1	2.27
	Enshi Tujia and Miao Autonomous Prefecture	1	5.26	5	20.00	6	13.64
Province-administered county-level city	Xiantao City	0	0	0	0	0	0
	Qianjiang City	1	5.26	0	0	1	2.27
	Tianmen City	0	0	0	0	0	0
	Shennongjia Forest District	0	0	0	0	0	0
Total		19	100.00	25	100.00	44	100.00

The imbalance index of the FHCTV in Hubei Province is 0.59, which indicates that the distribution of them is uneven among the 17 prefecture-level cities and province-administered county-level cities. The Lorenz curve (Figure 9) shows an upward trend in the distribution, with 64% of the total FHCTV being located in Xianning City, Huangshi City, the Enshi Miao and Tujia Autonomous Prefecture and Huanggang City.

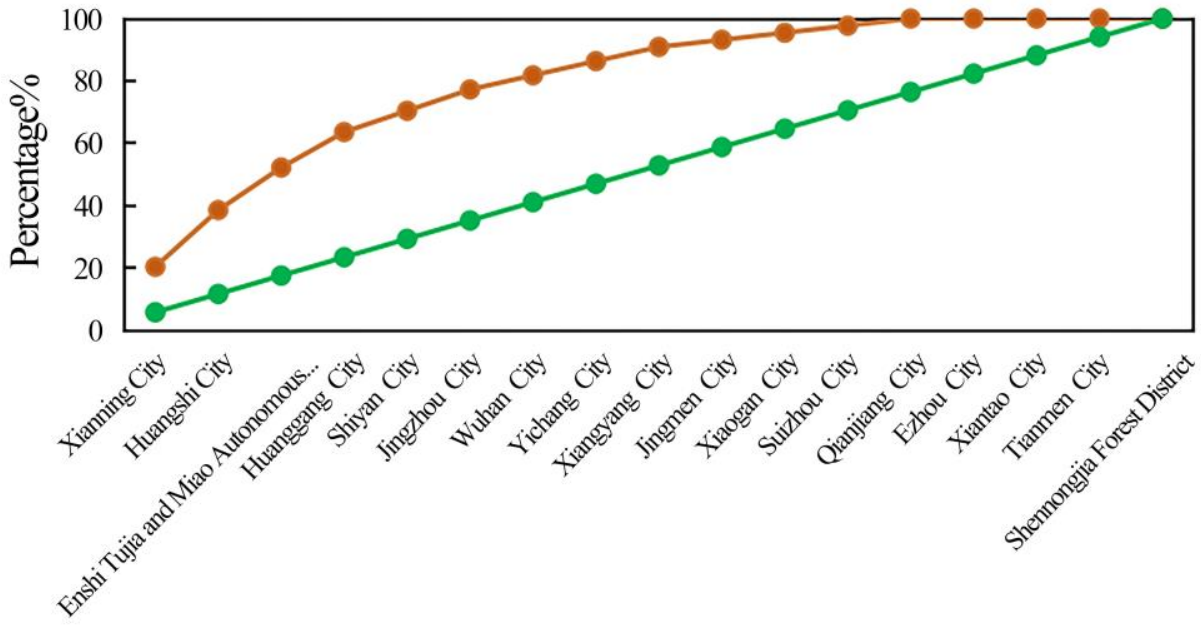


Figure 9. Lorentz Curve of FHCTV in Hubei Province.

In terms of geographical regions (Table 3), the proportion of FHCTV in southeastern Hubei Province is the largest, accounting for 40.91%, which is over 40% of the whole province. The next are those of northeastern and southwestern Hubei Province, both accounting for 18.18%. The proportions in northwestern Hubei Province and the Jianghan

Plain are the lowest, both accounting for 11.36%. It can be seen that the FHCTV are distributed in all geographical regions of Hubei Province, but the distribution is uneven and shows an obvious aggregation pattern. FHCTV are mainly located in southeastern Hubei Province, followed by northeastern and southwestern Hubei Province, and the proportion in northwestern Hubei Province and the Jianghan Plain is the least.

Table 3. Distribution of FHCTV in various geographical regions of Hubei Province.

Area	Famous Historical and Cultural Towns	Proportion	Famous Historical and Cultural Villages	Proportion	Total	Proportion
Northwest Hubei	1	5.26	4	16.00	5	11.36
Southwest Hubei	3	15.79	5	20.00	8	18.18
Jianghan Plain	5	26.32	0	0	5	11.36
Northeast Hubei	4	21.05	4	16.00	8	18.18
Southeast Hubei	6	31.58	12	48.00	18	40.91
Total	19	100.00	25	100.00	44	100.00

3.5. Correlation between Modern Social-Economic Influencing Factors and Preservation of FHCTV

3.5.1. Correlation of Current Demographic Influencing Factors

The distribution map of population density in Hubei Province (Table 4 and Figure 10) shows that Hubei Province still presents three population clusters with Wuhan City, Xiangyang City and Jingzhou City as the core from history to present. After overlaying the population density map with the distribution map of FHCTV, we find that these Towns and Villages are generally distributed in the low- and medium-population-density areas with Wuhan City, Xiangyang City and Jingzhou City as the core, as well as the low-population-density areas in southwestern Hubei Province. There is a negative correlation between the preservation of FHCTV and the population density, and the weak correlation coefficient is $r = -0.15$ (Table 5).

Table 4. Statistics of economic and social indicators of prefecture-level cities and province-administered county-level cities in Hubei Province.

City	Density of Population (person/km)	Urbanization Level (%)	Density of Highway Network (km/km^2)	Ecological Index
Wuhan City	1308.44	80.49	211.2	60.43
Huangshi City	540.13	64	168.32	70.63
Shiyan City	143.58	56.51	135.18	76.69
Yichang City	194.91	61.76	156.43	78.91
Xiangyang City	287.92	61.7	160.62	68.53
Ezhou City	663.97	66.3	247.94	63.1
Jingmen City	233.59	60.1	128.48	66.9
Xiaogan City	552.67	58.3	197.65	60.3
Jingzhou City	391.1	56.41	171.61	61.95
Huanggang City	362.78	48.22	184.02	69.64
Xianning City	261.32	54.4	168.82	75.09
Suizhou City	231.02	52.7	113.41	69.75
Enshi Tujia and Miao Autonomous Prefecture	140.9	45.86	116.08	79.14
Xiantao City	449.21	59.4	177.27	57.7
Qianjiang City	482.09	57.8	176.89	57.32
Tianmen City	475.74	54.7	184.45	56.43
Shennongjia Forest District	24.4	49.2	60.5	81.17

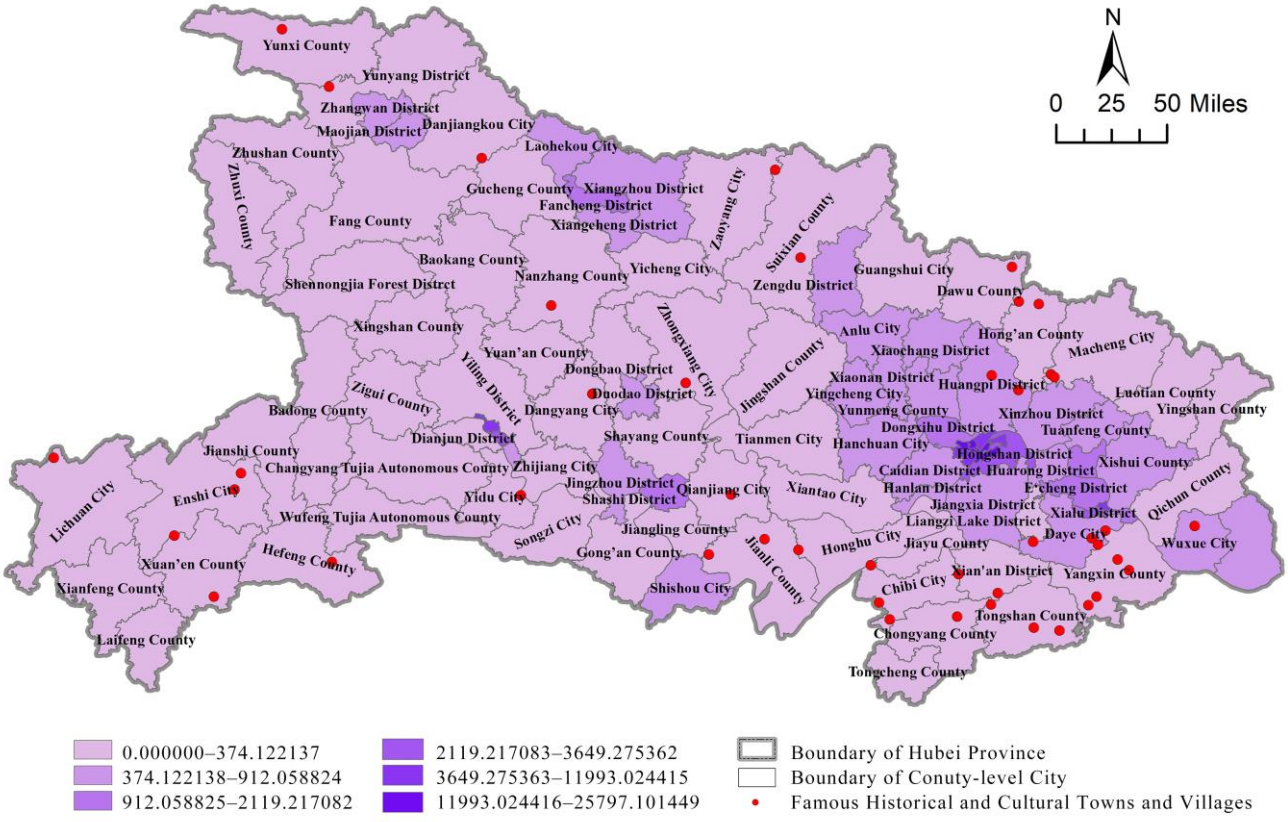


Figure 10. Superimposed distribution of population density by county-level city in Hubei Province.

Table 5. Results of Pearson correlation coefficient calculation.

Y	Y = Density of population	Y = Urbanization level	Y = Density of highway network	Y = Ecological Index
r	r = −0.15	r = −0.18	r = −0.03	r = 0.44
Correlation	Negative correlation Weak correlation	Negative correlation Weak correlation	Negative correlation Extremely weak correlation	Positive correlation Moderate correlation

3.5.2. Correlation of Influencing Factors of the Urbanization Level

There is also a negative correlation between the preservation of FHCTV and the urbanization of Hubei Province (Table 4 and Figure 11), with a weak correlation coefficient of r = −0.18 (Table 5). The promotion of new urbanization has led to a nationwide impact on the preservation of FHCTV. The Wuhan City central districts, with the highest urbanization level in the province, have no FHCTV. Only the Huangpi District, one of the six Wuhan City suburbs, has two FHCTV, located in the northern mountainous area of Huangpi District, which were conserved in the 1990s by the discovery of experts. The Enshi Prefecture, Huanggang City and Xianning City, whose levels of urbanization are lower than the provincial average, are the main distribution areas of FHCTV in Hubei Province.

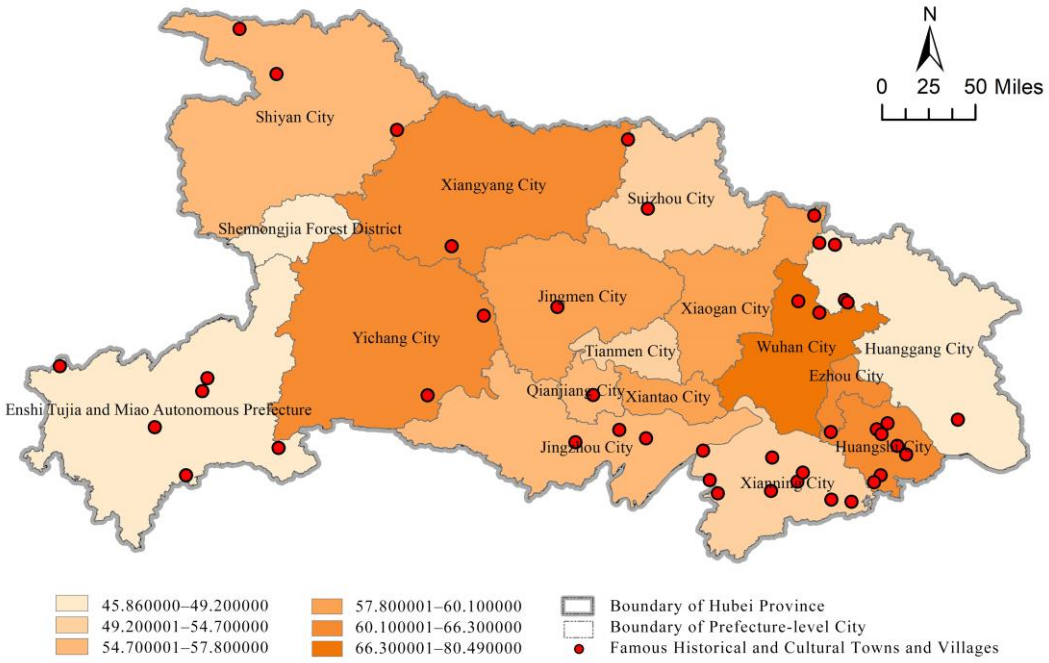


Figure 11. Overlay analysis of urbanization level by prefecture-level city in Hubei Province.

3.5.3. Correlation of Modern Traffic Influencing Factors

Modern transportation shows a negative correlation with the preservation of FHCTV, with a weak correlation coefficient of r = −0.03 (Table 5 and Figure 12). Historical transportation is one of the main factors in the formation of towns and villages in Hubei Province, which also affects the spatial characteristics of towns and villages. The development of modern transportation has affected the accessibility of FHCTV. According to the road network density of cities in Hubei Province, FHCTV are located in the low- to medium-road-network-density area.

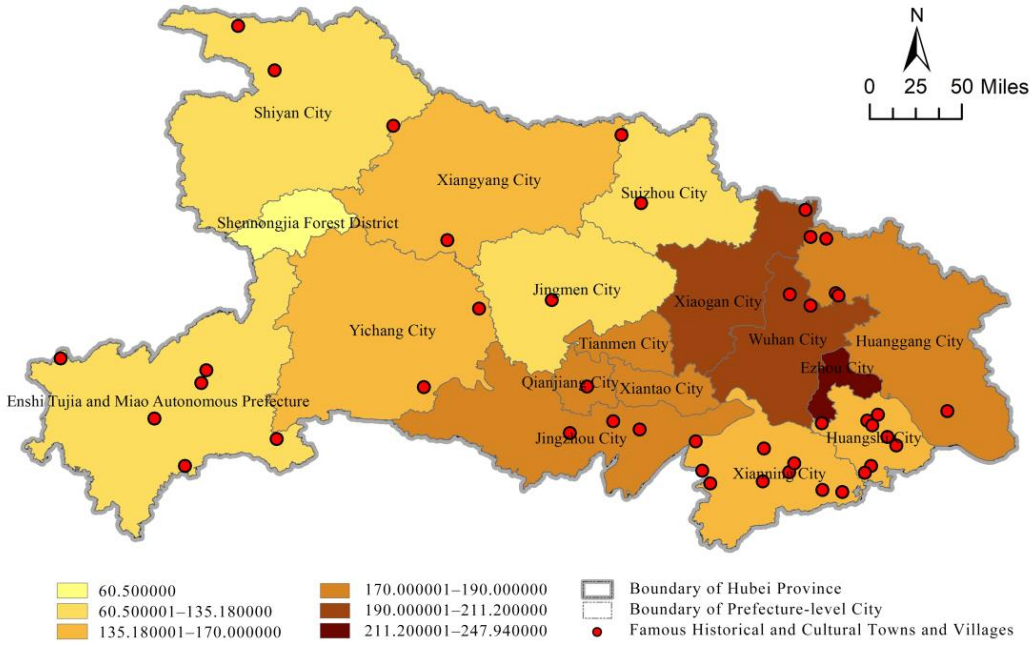


Figure 12. Superimposed analysis of road network density by prefecture-level city in Hubei Province.

3.5.4. Correlation of Ecological Environment Influencing Factors

The ecological environment is positively correlated with the state of preservation of FHCTV, with a moderate correlation coefficient of r = 0.44 (Table 5). The ecological environments in which the FHCTV are located are also their natural protective barriers. A good ecological environment reflects that these areas are less affected by urbanization to a certain extent, and people have a harmonious relationship with the land as well as an emotional attachment to the environment, which is more conducive to the retention and inheritance of the material and intangible culture of FHCTV. According to the Ecological Index of Hubei cities (Figure 13 and Table 4), FHCTV are located in areas with an excellent Ecological Index.

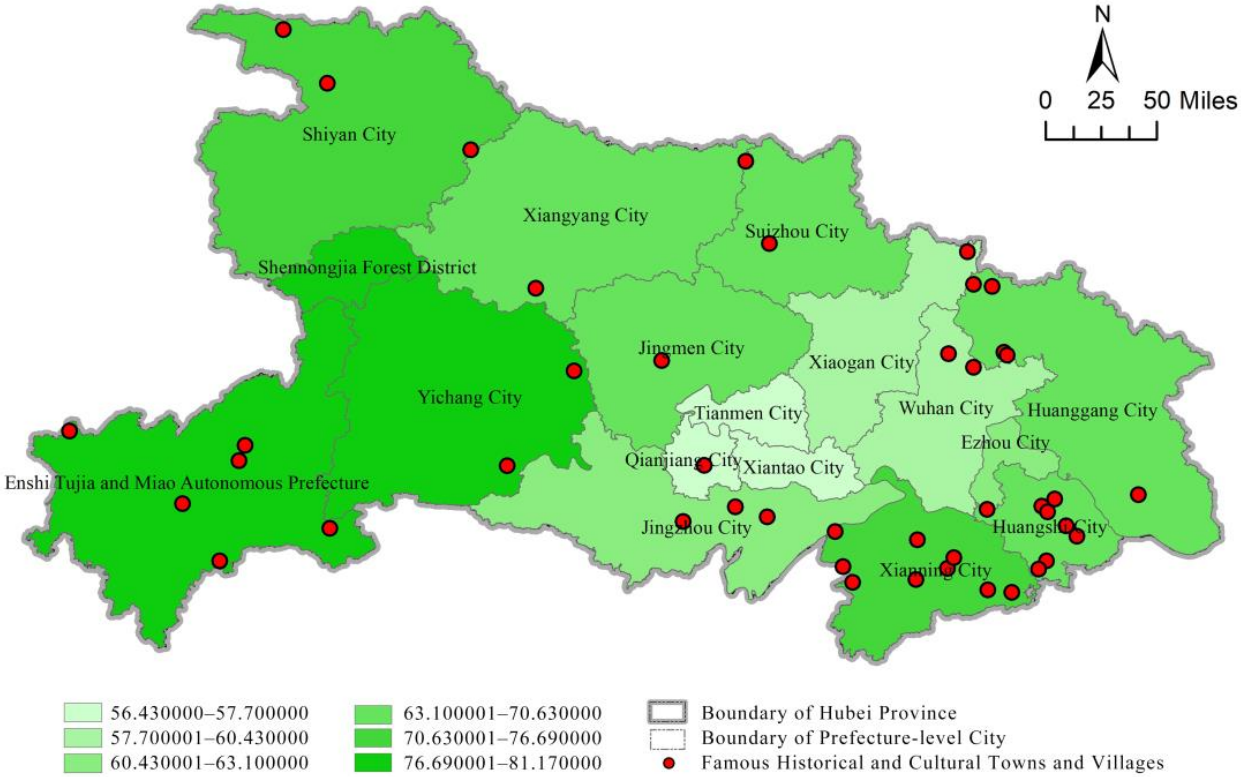


Figure 13. Superimposed analysis of the Hubei Ecological Index by prefecture-level city.

4. Discussion

4.1. The Historical Causes of the Spatial Distribution of Points, Lines, Areas and Bodies of FHCTV in Hubei Province

4.1.1. Point-Settlement Site Selection Concentrated in Plain Areas

Jing barbarians, the middle classes of the state of Chu (223 B.C.), lived from the late Xia and early Shang dynasties to the early Zhou dynasty (16th to 11th centuries B.C.) in the mountainous regions of the border among Hubei, Henan and Shaanxi Provinces and in the plains of the middle Han River valley [59]. The area around the present-day Jianghan Plain was Yunmengze, a plain lake landform with few towns and villages before the Tang dynasties (6th century A.D.). The towns began to flourish due to the continuous accumulation of sediment, forming the onshore delta of the Han River, which was then filled and silted up, eventually forming land with fertile soil. During the Yuan, Ming and Qing dynasties (13th to 19th centuries A.D.), the Jianghan Plain was densely populated, and towns and villages grew in large numbers [60]. However, due to the low terrain with an average altitude of only 27 m, as well as the large number of rivers and lakes, the residents near the water suffered from floods for many years, forming migratory water settlements and "migratory bird type" settlements [60]. After modern times, this kind of

settlement form has nearly died out, which was also one of the natural influencing factors for the small number of existing FHCTV in this region. In northeastern and southeastern Hubei Province, bordered by Jiangxi Province and Anhui Province, a large number of towns and villages were formed in the plain areas of low mountains and hills in northeastern and southeastern Hubei Province during the migration from east to west from the Song to Ming and Qing dynasties.

4.1.2. Line-Belt Space Form of Main River Tributaries and Ancient Roads

Hubei Province has two main river systems, the Yangtze River and the Han River, as well as many tributaries and lakes. The hydrological conditions of Hubei province are well developed. Living near water is a natural choice of ancient people. The rich water resources also make Two Lakes Basin (referring to Hunan Province and Hubei Province), including the Jianghan Plain and Dongting Lake Plain, the most important rice-producing area since the Tang and Song dynasties. In the Ming and Qing dynasties, there was a saying that "the Empire is rich when the rice in Hubei and Hunan Province is ripe". The well-developed hydrological conditions led to the development of "cities" at important nodes of the main stream and "towns" and "villages" along many tributaries. Hanjiang River was the main traffic artery in the whole country before the Song dynasty. When the national political and economic center moved southward after the Song dynasty, the Han River and the ancient road from Jingzhou to Xiangyang lost their national main traffic status, and the Yangtze River connected with the Beijing Hangzhou Grand Canal became the main traffic artery in Hubei Province. Zhicheng Town and Chibi Town, located on the Yangtze River, Shipai Town, located on the Han River, and Shadi Village, located on the Qingjiang River, were all developed due to the transportation of the new trunk water, while as many as 17 towns and villages were developed due to the transportation on the tributaries, such as Yangloudong Village and Yezhuqiao Town, which were located on the section of the Old Tea-horse Road in Hubei Province (Figure 14). Towns and villages developed in a belt along the river, and the main streets and lanes were parallel or perpendicular to the river [23] (Figure 14).

In addition to the water transportation formed by the trunk and tributaries, Hubei Province is also supplemented by important land transportation. For example, the Jingxiang ancient road, which went through the south and north via Jingzhou, Jingmen and Xiangyang City, was the most important land transportation, as well as secondary land transportation lines such as the ancient corridor of Suizhou to Zaoyang City and the section of the ancient Sichuan Salt Road in Hubei Province. Anju Town, located on the ancient corridor of Suizhou to Zaoyang, and Qingyangba Village and Lianghekou Town, located on the section of the ancient Sichuan Salt Road in Hubei Province [61], were all promoted due to the ancient post or business road (Figure 15). The waterways of the ancient Sichuan Salt Road in Hubei Province intersected with the Yangtze River from the Enshi Prefecture and then overlapped with the Old Tea-horse Road in Hubei, so the ancient Sichuan Salt Road in Hubei Province (Figure 15) mainly refers to the ways within the Enshi Prefecture in this study. Traffic routes not only dominated the location of towns and villages but also shaped the spatial form of them. Most towns and villages developed in a linear pattern along major traffic roads and commercial streets.

4.1.3. Area with Chu Culture as the Base, the Development of "Three Centers" Towns and Village Cultural Zones

Chu Culture is the brilliant native culture in Hubei Province, which is integrated by multiple cultures in historical evolution due to its special geographical location. A native, Gu Zuyu of the Qing dynasty, once said: "in terms of talents in Hubei, Chu was the first in the Spring-and-Autumn Period, followed by the Three Kingdoms Period and Ming Dynasty." [62]. It was relatively late for Hubei Province to be integrated into the same high-level administrative region. Hubei Province became an independent high-level administrative region in the early Qing dynasty after the establishment of the Chief Secretary of Hubei Province (commonly known as Hu Guang Province) in the Ming dynasty.

During the early Qing dynasty, Hubei Province became an independent high-level political region; however, there were also regional differences within the province, including the east, south and north regions centered on Wuchang, Jiangling and Xiangyang. Therefore, there were different cultural regions centered on Jingzhou, Xiangyang and Wuchang, which was the reason for the diverse culture of Hubei Province.

From the relationship with the cultural centers of the historical periods, the FHCTV in Hubei Province are distributed in the hinterland centered on Wuchang, Xiangyang and Jingzhou. There are three cultural areas centered on Wuchang, Jiangling and Xiangyang, of which the hinterland of Wuchang has the highest density. This phenomenon is consistent with the eastward relocation of the Hubei political and cultural center to Wuchang after the Song dynasty and the developed culture of the Ming dynasty.

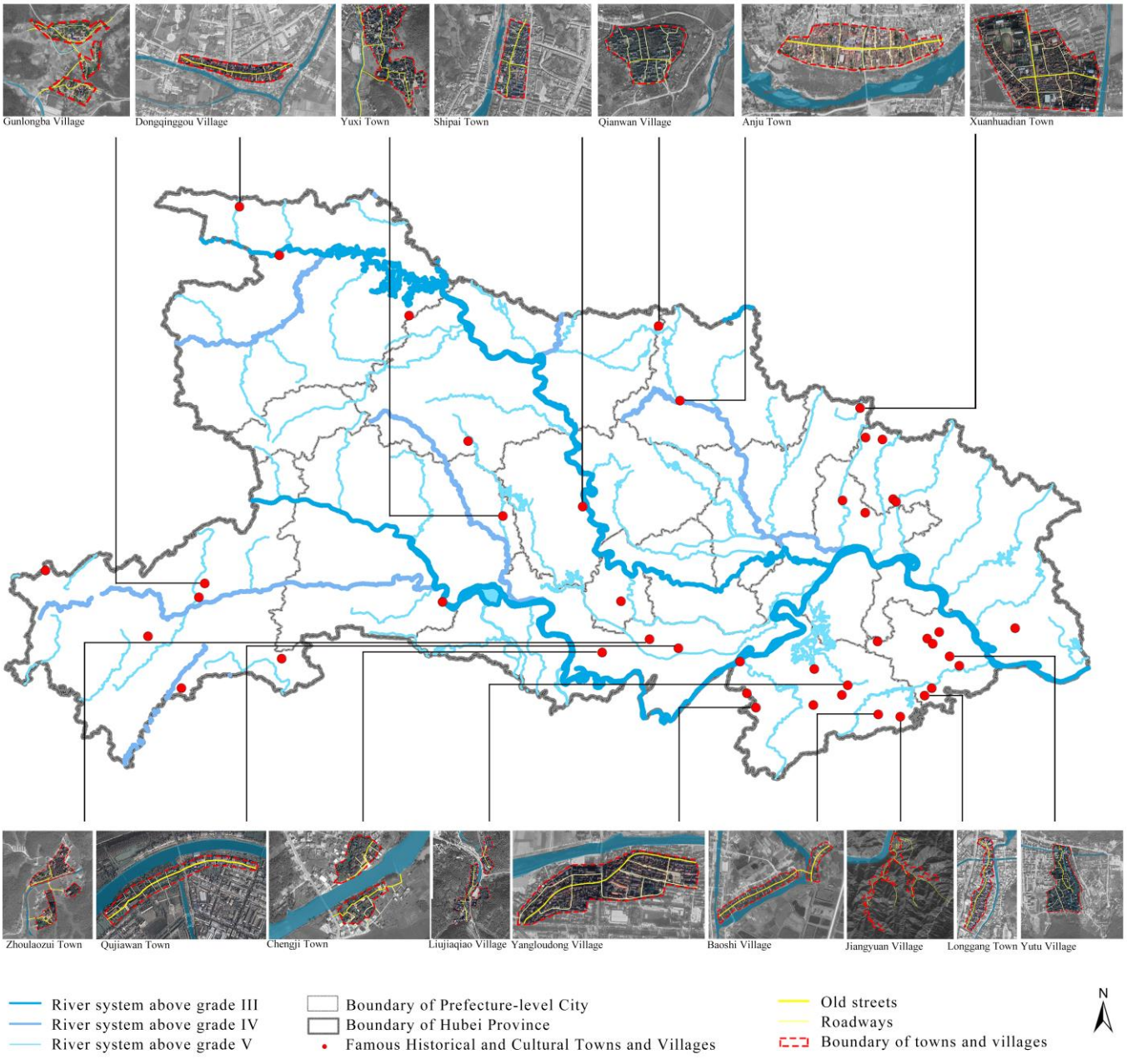


Figure 14. Spatial pattern of some FHCTV along the river system above grade V in Hubei Province.

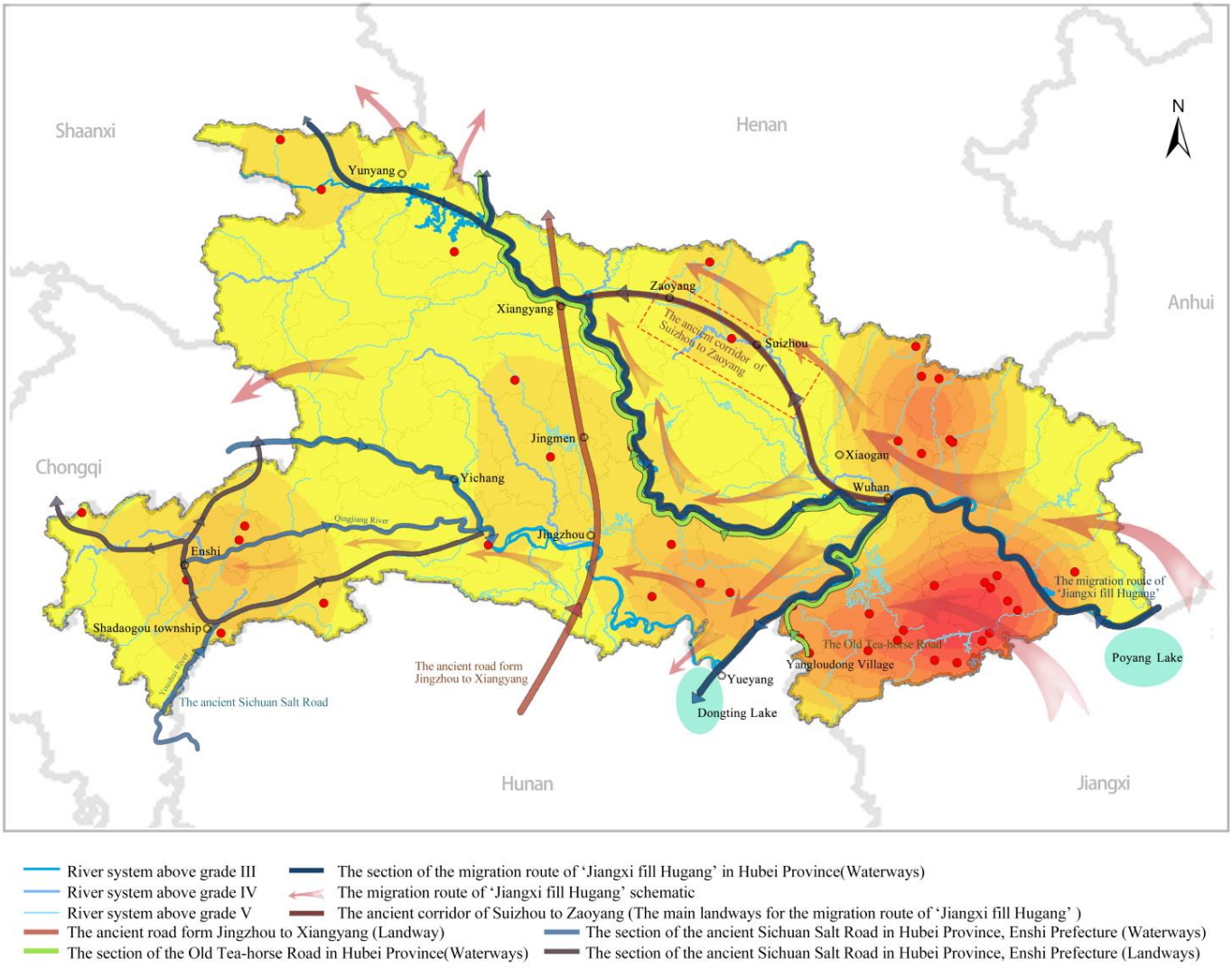


Figure 15. Ancient Waterways—Ancient Landways—FHCTV in Hubei Province Nuclear Density Overlay Analysis Diagram.

4.1.4. Body—The Distribution of Architectural Heritage with Immigrant Culture as the Main Body and the Presentation of Regional Local Settlement Integrating Chu Culture

Hubei Province has been an important channel for immigrants since ancient times. Before the Zhou dynasty (11th century B.C.), the earliest people living in Hubei Province were barbarian natives. From the Zhou dynasty to the Qing dynasty, wars, dynasty changes and natural disasters led to the continuous migration of Han people to Hubei Province. Before the Five Dynasties and Ten Kingdoms (10th century A.D.), immigrants migrated to northwestern Hubei Province along the ancient Jingxiang road. After the Song dynasty, they migrated from Jiangxi to southeastern, northeastern and southwestern Hubei Province along the Yangtze River, the Han River and the ancient corridor of Suizhou to Zaoyang City. Among the immigrants in the Ming and Qing dynasties, the number of immigrants from Jiangxi Province was the largest, which showed a decreasing trend from east to west in Hubei Province. Combining the nuclear density analysis with the Hubei section of the migration route in the Ming and Qing dynasties [54], this showed that the southeastern Hubei Province in the banded high-density area was an important channel for "Jiangxi fills Hubei and Hunan" in the Ming and Qing dynasties. Northeastern Hubei Province, a medium density cluster centered on Macheng and Xiaogan City, was one of the eight gathering points and an important transit station of ancient Chinese immigrants. Southwestern Hubei Province was an important channel for "Hubei and

Hunan fills Sichuan". The "One belt and two clusters" area derived from nuclear density was located on the main channel of large-scale migration from east to west, which was closely related to the immigrants in the Ming and Qing dynasties (Figure 15).

Among the Famous Historical and Cultural Towns, Shangjin Town is located at the junction of Hubei and Shanxi Province, which has been known as "the throat of Qin and Chu and the crossing of the Son of Heaven" since ancient times. Shangjin Town has gathered a large number of guild halls, such as the Shanxi and Shaanxi Guild Hall, the Henan Guild Hall and the Sichuan Guild Hall, which are the carriers of immigrant architectural culture. Qiting Town was once the distribution center of "Jiangxi fills Hubei and Hunan and Hubei and Hunan fills Sichuan" in the late Ming and early Qing dynasties. The ancient ferry of Zhangjiazhou Wharf in the ancient town is an important witness of the immigration route of "Jiangxi—Poyang Lake—Yangtze River—JuShui—Zhangjiawan wharf landing—Zhangjiawan wharf boarding—Yangtze River Three Gorges—Chongqing". Among the Famous Historical and Cultural Villages, there are as many as 17 immigrant villages, accounting for 68% of the Famous Historical and Cultural Villages in Hubei Province. Up to now, Dayuwan Village in Huangpi District of Wuhan City, Shangfeng Village in Daye District of Huangshi City, Kedaxing Village in Dajipu Town of Huanggang City, Qianwan Village in Zaoyang City, Zhujialou Village in Hong'an County and Liujiaqiao Village in Xian'an District of Xianning City maintained the clan culture and characteristics of one village and one surname. It can be seen that the immigrant culture has a profound impact on the FHCTV in Hubei Province (Figure 15).

The immigrant culture made the architectural form, skills and culture of the FHCTV in Hubei Province, which are mainly characterized by the residential buildings of the Ming and Qing dynasties and carried the genes of the Middle Kingdom culture, Hui culture and Gan culture.

The unique natural environment, the historical location and the cultural characteristics of the fusion of diverse cultures with Chu Culture have had a profound impact on the formation of FHCTV in Hubei Province. From the traditional architectural research perspective, it is difficult to categorize Hubei Province's traditional dwelling into a certain architectural pedigree, since the regional traditional dwelling does not possess typical characteristics. This phenomenon is also closely related to the multiculturalism of Hubei Province. Combining the nuclear density analysis with the historical and cultural analysis of Hubei Province, there are three areas of FHCTV in Hubei Province: southwestern Hubei Province and Jianghan Plain, with Jinzhou City as the center, northwestern Hubei Province, with Xiangyang City as the center, and southeast and northeast Hubei Province, with Wuchang as the center (Figure 16).

The southwest area of Hubei Province, centered on Jingzhou City, has been full of barbarians since ancient times. Because it is located in the Wuling mountain area and connects with northwestern Hunan Province, it is now a place where Tujia and Miao people live together. People in these areas have preserved their unique culture despite the infiltration of Han culture and the wooden dry appendage architecture that is adapted to the mountainous humid climate of Diaojiao lou, which form the main landscape of the FHCTV. Jianghan Plain, a lake plain formed by the Yangtze River and its tributaries, is a famous Yunmengze with a low terrain in history, and the hinterland centered on Jiangling was once the center of Chu Culture. However, due to the terrain, it was sparsely populated before the six dynasties. In the Song dynasty, the two lake areas developed rapidly, and a considerable number of Yuantian town and village landscapes have been retained. At the same time, a large number of immigrants from Jiangxi Province settled here during the Ming and Qing dynasties. In the historical and cultural towns and villages, the architectural forms are retained [57], including Patio, Tiandou and the combination of Patio and Tiandou.

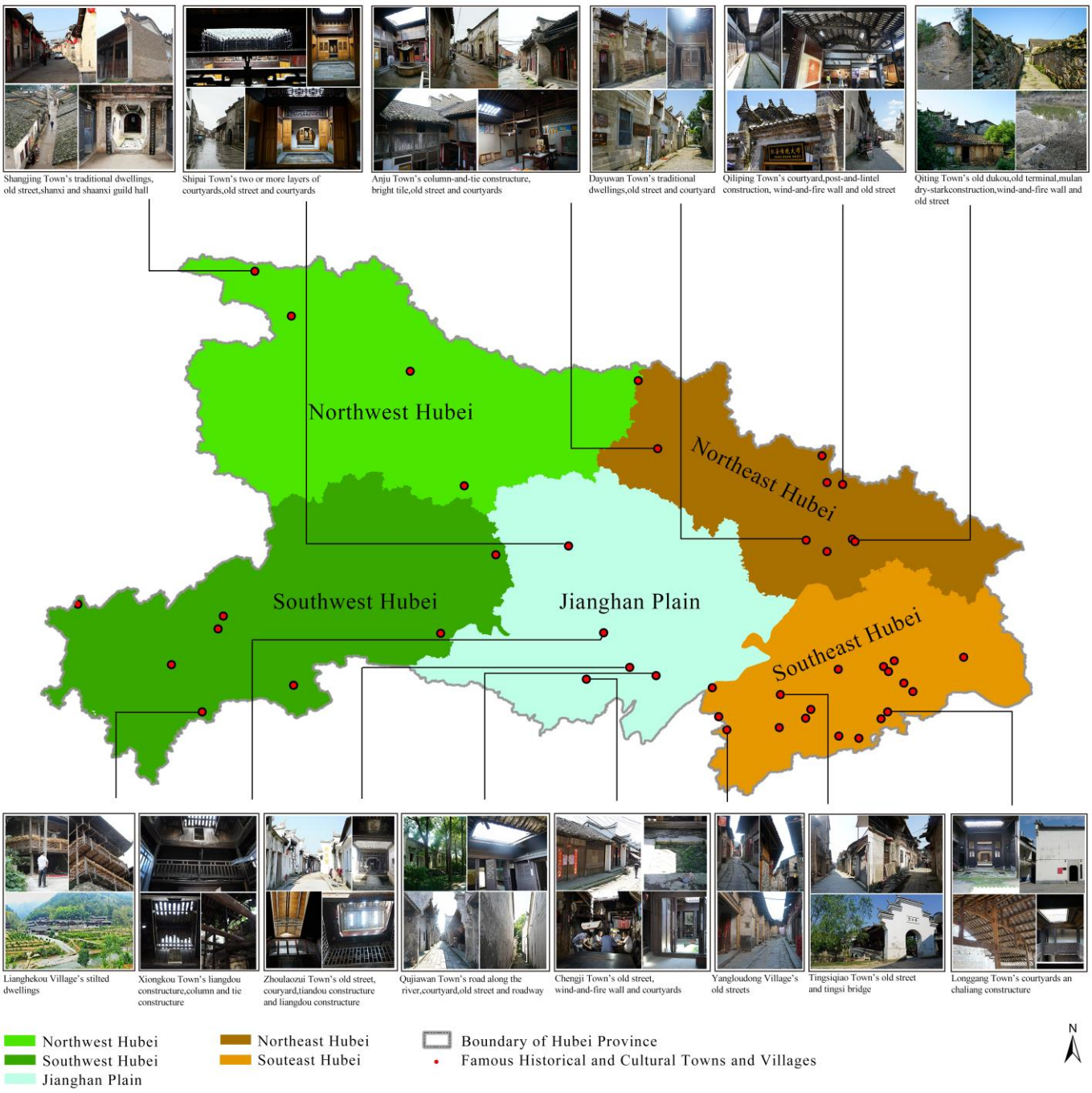


Figure 16. Distribution of traditional dwelling features in selected FHCTV in Hubei Province by geographical regions.

The northwest area of Hubei Province, centered on Xiangyang City, is one of the birthplaces of Chu culture. Because it is on top of the north-south migration corridor of China, it became the place where the Chu culture intermingled with the Central Plains culture and other diversified cultures. Influenced by the culture of the Central Plains, the residential architecture of the FHCTV in northeastern Hubei Province is a multi-way and multi-entry quadrangle style with a patio courtyard style adapted to the local climate, but it isquite different from the north of China [57].

The southeast area of Hubei Province, centered on Wuchang, is located in a mountainous and hilly area with a complex topography, which is the most typical area radiated by Jiangxi immigrant culture. The FHCTV in this area retain the layout form of the court-

yard, while the wind and fire wall, stone carvings and wood carvings are in line with Jiangxi architectural culture. Northeastern Hubei Province is a hilly area, which is influenced by Chu Culture, Wu culture and Jiangxi immigrant culture. Most of the traditional dwellings in FHCTV have a courtyard style, commonly including a four-combined patio, three-combined patio or two-combined patio, and they retain the characteristics of Huizhou houses, such as the wind and fire walls [57].

4.2. Correlation between the Four Modern Social-Economic Impact Factors and the Preservation of FHCTV and the Issues of Their Conservation Vulnerability

The historical natural environment, the accumulation of historical culture and the ethnic groups are reasons for the formation of FHCTV, while the modern social-economic development and the preservation of FHCTV in Hubei Province have a population gathering, economic development, modern transportation development ("three negative") and ecological environment ("a positive") preservation correlation.

Combining the historical causes of the spatial distribution characteristics of the FHCTV in Hubei Province and the relevant factors of modern economic and social influences, this shows the problems of the stability and fragility of the conservation of FHCTV in the provincial scope.

The stability of the location of the FHCTV is related to the topography, geomorphology, river systems and other natural environments. As a result of the historical topographical evolution of Hubei Province, most of the villages and towns affected by the natural environment have disappeared, such as the early "migratory bird style" settlements located in the lower terrain of the Jianghan Plain. The villages and towns of historical and cultural value that remain today have been tested over a long period of time and are compatible with the surrounding natural environment. The relationship between the modern ecological condition index and the villages and towns also shows the adaptability of the FHCTV to the natural environment at the provincial scale and their ability to continue to provide a livable environment for population clustering.

The vulnerability of Hubei Province's vernacular architectural culture is caused by an unclear perception. When talking about the culture of Hubei, it is inevitable to mention the Chu culture before the pre-Qin dynasty or the red culture of the important revolutionary of China's new democratic period (1919–1949) base areas in modern times, but the Chu culture, as an important royal culture of Hubei, is mostly buried underground and has a long history. The new democratic revolution led by the Communist Party of China is recorded throughout Hubei Province, which covers almost the entire province. Therefore, the red cultural resources are rich in Hubei Province. The immigrant culture of Hubei Province is a link between the Chu culture and the red culture in the long history, a regional culture that people can see and perceive. However, it cannot be covered by the grand Chu culture or the red culture. The neglect of the cultural paths of immigrants in Hubei Province will result in the loss of evidence of the material carriers that served as nodes and transit points along the cultural route of the Ming and Qing immigrants, which, in turn, will weaken the richness and hierarchy of the historical culture of the Hubei region.

The urbanization or hollowing out of villages and towns leads to vulnerability in the conservation of vernacular architectural. The FHCTV include towns with an urban character and villages with a rural character. Both cities and villages in China are facing the problem of urbanization and shrinkage [63], and the same is true of FHCTV. Over the course of our research, we identified are some Famous Historical and Cultural Towns, such as Xiongkou Town and Zhicheng Town, which are in urgent need of urbanization, while, at the same time, Dayuwan village and Lianghekou village have seen their population shrink due to the mass exodus of young and middle-aged people [63]. The concentration of population due to urbanization and the population loss due to hollowing out have led to the constructive destruction or natural decay of the vernacular architectural heritage.

The vulnerability of the conservation of vernacular architectural heritage is due to transportation. Due to their special geographical location, most of the FHCTV in Hubei

Province were formed and developed because of ancient waterways or landways. Ancient transportation led to their prosperity, but modern transportation construction-led development has led to an accelerated decline in their historical and cultural value. The FHCTV in Hubei Province now have two kinds of transportation situations. In one case, the traffic is convenient, and the speed of urbanization has benefited from well-developed transportation. The other situation is one of accessibility, with most of them being located in mountainous areas with serious population outflow. In future conservation and development, the double-edged sword of transport needs to be deeply understood and grasped. Without intervention, the vernacular architectural heritage in both scenarios will disappear, one by urbanization and the other by natural decay.

4.3. An Exploration of Conservation Strategies for the FHCTV in Hubei Province

4.3.1. Carrying out the Evaluation of the Resource and Environmental Carrying Capacity of FHCTV, Combining Water Resources Planning and Ecological Conservation Planning

Under the premise of maintaining the good ecological environment of the FHCTV, the characteristics, upper and lower limits for the use of resources and environment elements are considered comprehensively [27]. We could combine water system planning and ecological conservation planning with traffic routes to create ecological corridors to reduce the threat of rainfall and flooding to traditional rural settlements along the water in Hubei Province. The abundance of water resources can lead to a population build-up in some Famous Historical and Cultural Towns in the process of accelerated urbanization, and the development of population and industry can bring about vulnerability in the conservation of vernacular architectural heritage. We can control the scale of land, population and industry in their development by means of water resources, combining the environmental carrying capacity of cities, land, people and production [27]. In response to the shrinking population of Famous Historical and Cultural Villages, we should develop a "Culture + Ecology" industrial development model to cope with the vulnerability of heritage conservation caused by the population exodus. In addition, we should explore the relationship between the slope orientation and village layout groups and cases in the context of the province's topography and slope. Hubei Province has historically been a flood-prone region, but the FHCTV in Hubei Province have rarely been subject to flooding, and their symbiotic relationship with rivers is a subject worthy of in-depth study to inform the continuation of the wisdom of the ancients, as well as future conservation.

4.3.2. Strengthening the Construction of the Transport Network of Provincial FHCTV Combined with Provincial Transport Planning

The geographical location of Hubei Province, which is a thoroughfare through nine provinces, has created its inclusive regional cultural characteristics and is the main reason for its rich historical and cultural layers. Strengthening inter-provincial and city-county transport networks will play a positive and important role in the acceptance of external resources, conservation techniques and new cultures for the FHCTV in Hubei Province.

4.3.3. Constructing Culture-Themed Conservation Routes and Cultivating Clustered and Tandem Cultural Heritage Display Sites of Fhctv Combined with the Provincial, Historical and Cultural Resources Conservation Planning

The diverse cultures formed in Hubei Province, such as immigrant culture, Chu culture, red culture, tea ceremony culture and salt transport culture, should be combined with the topography and water system to form a display system of historical and cultural heritage. For example, the most typical migrant culture possesses typical core areas, propagation strongholds and propagation routes in the migration from southeast Hubei to northeast Hubei and northwest Hubei. It should be cultivated into a "cluster + linear" cultural heritage display site in conjunction with tourism planning, and the provincial–city–county–township relationship should be coordinated with the transmission mechanism of territorial spatial planning to cope with the vulnerability caused by heritage fragmentation.

5. Conclusions

The spatial distribution of FHCTV in Hubei Province is agglomerative, with the pattern of "One belt and two clusters with multiple scattered points". The "One belt and two clusters" are the banded high-density areas, with Yangxin County, Tongshan County, Xian'an District and Daye City as the core, and the medium-density areas, with Hong'an County and Enshi City as the core. The trend of concentration is also in terms of geographical areas. The largest total is found in southeastern Hubei, followed by northeastern and southwestern Hubei Province, while the Jianghan Plain has the least distribution. Their spatial distribution is mainly influenced by the topography and geomorphology, river systems, historical culture and migration culture. In terms of topography and geomorphology, most of the FHCTV in Hubei Province are distributed in the plain areas. In terms of hydrological characteristics, they have obvious hydrophilicity and a significant correlation with the river system above grade V. The siting of settlements in mountainous areas, low hills and near-water areas is a traditional Chinese art of geomancy, which reflects the building wisdom of the ancients. At the same time, the diverse cultures of Hubei Province based on Chu Culture, as well as the migrant culture brought by the geographical location, have had a profound impact on the formation and development of the FHCTV in Hubei Province. The migrants staying on the migration route brought material cultural heritage such as residential architecture and intangible cultural heritage originating from the place of residence, which is one of the main objects of the heritage conservation of the Famous Historical Towns and Villages in Hubei Province.

The preservation of the FHCTV in Hubei Province is negatively correlated with the modern population density, urbanization level and highway network density, and it is positively correlated with the ecological environment condition index. The good natural conditions provide a stable natural environment for the location of the FHCTV in Hubei Province. However, the lack of awareness of the provincial vernacular culture has led to the vulnerability of vernacular architectural heritage conservation. The different scenarios of urbanization leading to the gathering or loss of population and the accessibility and inaccessibility of the transport network all contribute to the vulnerability of the conservation of FHCTV in Hubei Province.

In order to cope with the vulnerability brought about by dynamic changes, on the basis of the evaluation of the carrying capacity of the resources and environment, we should formulate control measures and a development mode of conservation combined with special planning such as ecological conservation planning, water resources planning, transport planning and historical and cultural preservation resources protection planning in provincial territorial spatial planning. On the basis of a good river system and ecological environment, rely on the transport network to establish "Culture + Ecology" corridors and seek development under the premise of conservation. Conservation strategies such as "Clusters + Linear" cultural heritage exhibition sites should be cultivated in line with the linear nature of the province's culture.

The research is at the forefront of current development issues in China and takes the lead in exploring the protection of provincial historical and cultural resources in territorial spatial planning as a way of integrating local research results into a national spatial development strategy for consideration at the planning level. Meanwhile, the study uses GIS quantitative analysis tools (such as nuclear density analysis) to corroborate major historical events (migration routes) recorded in historical documents and to explore the characteristics of regional vernacular settlement heritage groups caused by historical events. This is an innovative attempt to provide a research example for the study of similar types of vernacular settlement groups worldwide. However, the thesis also has some limitations: it does not analyze the evolution of FHCTV protection elements (architectural heritage, surrounding land use, roads, water systems, vegetation, fields, etc.) over the years through GIS; it does not use GIS to collect and collate provincial vernacular heritage data and it does not study ecological protection and disaster monitoring, as well as planning decision making and management, which are the next steps to be taken.

Author Contributions: Conceptualization, Q.W. and Q.X.; Methodology, Q.W. and Q.X.; Software, Q.W.; Validation, Q.W. and Q.X.; Investigation, Q.W. and H.B.; Data curation, Q.W. and H.B.; Writing—original draft preparation, Q.W. and Q.X.; Writing—review and editing, Q.W. and Q.X.; Visualization, S.W. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by (1) the National Social Science Foundation Art Project of China, 'Value Interpretation and Synergy of Rural Planning in China's World Heritage Cultural Landscapes Sites', Grant Number 21BH167; (2) research on the heritage value of Chinese Famous Historical and Cultural Districts in Wuhan based on the conservation of the Urban Historical Landscape; (3) the Hubei Construction Science and Technology Program Project 'Research on the heritage value system of Wuhan's Famous Historical and Cultural Districts based on the conservation of the Historical Urban Landscape'.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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