SSRG International Journal of Civil Engineering
ISSN: 2348-8352/ https://doi.org/10.14445/23488352/IJCE-V10I10P104

Volume 10 Issue 10, 35-44, October 2023

Original Article

Analysis of the Spatial Distribution and Influencing Factors for National Folk Settlement of Shaanxi Province in China

Tian Haining[1,2*], Esmawee Haji Endut[1], Rohaslinda Ramele Ramli[1]

[1]*College of Built Environment, University Technology MARA, Shah Alam, Selangor, Malaysia.*
[2]*Research Center of Livable Construction of Human Settlements in Qinling-Daba Mountains, Shaanxi University of Technology, Hanzhong, China.*

**Corresponding Author : 2020668806@student.uitm.edu.my*

Received: 15 August 2023 Revised: 29 September 2023 Accepted: 17 October 2023 Published: 31 October 2023

Abstract - *The purpose of the influencing elements contributing to the spatial arrangement of national folk settlements in Shaanxi province of China. One hundred thirteen national folk settlements in the Shaanxi province of China were picked as the research objects in the paper. The spatial distribution characteristics for the selected national folk settlements located in the Shaanxi province of China were carried out to reveal the interconnection between the placement of folk settlements and the natural environment, social economy, history and culture, river distribution, and so forth by using the image registration technology of arcgis. The study found: There are apparent regional variances in the geographic arrangement of national folk settlements in Shaanxi, and two sizeable high-density agglomeration areas have been formed. There are differences in the preservation and protection of national folk settlements in different altitudes, and there are more national folk settlements in low-altitude areas. The existing national folk settlements are primarily distributed along the riverbanks or in the developed water system areas, closely related to production and life. Regional economic development and the protection of national folk settlements are not contradictory in theory, and localities should find suitable paths to protect national folk settlements.*

Keywords - *National folk settlement, Spatial distribution, Influencing factors, Shaanxi province, Image registration technology of ArcGIS.*

1. Introduction

National folk settlements refer to villages with early construction limits and rich traditional resources in the town. The folk settlements in the village have complete architectural features and a complete location layout [1]. To retain the legacy of Chinese culture, it is a top priority to protect and inherit traditional villages effectively. From 2012 to 2019, 5 batches of Chinese folk settlements list selection activities organized by the ministry of housing and urban-rural development and other units were conducted. 6,819 folk settlements were included in the list, and all were included in the scope of protection, forming the world's most significant farming the protection pattern of civilized heritage groups.

The protection of traditional villages has played a substantial role in promoting. Although national folk settlements possess great value in research about the history, ethnic groups, regional culture and architectural art, their development and renewal have been hindered for specific reasons. In recent years, those villages have experienced a gradual decrease from 9,707 to 5,709, with an average decline of 7.3% per year. National folk settlements, especially valuable ones, are still in continuous recession. Therefore, activating the federal folk settlements with history and culture is becoming arduous. With the proposal and practice of rural revitalization strategy, the inheritance, protection and development of national folk settlements have aroused great concern in society.

The research was done in the following three aspects. Firstly, the protection, development and construction of federal folk settlements were studied from developing tourism values and resources [2-8]. Secondly, internal spatial forms, historical elements, and architectural layout and characteristics of the villages were analyzed from the micro perspective [9-15]. Thirdly, village cluster distribution patterns and influencing factors were analyzed from the macro level. The current research on national folk settlements primarily explores regions such as Hunan, Guizhou, Anhui, Shanxi, and Yunnan because those provinces have more federal folk settlements [16-24]. Few studies focus on the distribution characteristics of national folk settlements of

Shaanxi. To further explore and reveal the distribution characteristics of national folk settlements in Shaanxi province,113 federal folk settlements in Shaanxi province of China were chosen as the subjects of the study in this paper; this study adopts the method of quantitative geography and GIS technology to specifically analyse the spatial distribution characteristics of the selected research target national folk settlements and reveals the main factors affecting their distribution.

It has specific reference and support for the protection, inheritance and development of Chinese federal folk settlements. Definition of national folk settlements: It is also known as ancient village, refers to the town formed earlier, has rich cultural and natural resources, has specific historical, cultural, scientific, artistic, economic and social values, and should be protected. National folk settlements are rich in historical information and cultural landscape, the most significant legacy of China's agricultural civilization.

National folk settlements identified specific references compiled by the housing urban-rural development and other departments of the traditional village evaluation index system; specific requirements are as follows: the existing buildings have a certain long degree, cultural relics protection unit level standard, national folk settlements scale, existing traditional buildings (group) and surrounding environment has certain integrity, building modelling, structure, materials and decoration has a certain aesthetic value, and has the inheritance of traditional skills. Regarding site selection and planning, national folk settlements represent the typical characteristics of their regions, ethnic groups and specific historical periods, have certain scientific, cultural, historical and archaeological value, coordinate with the surrounding natural environment and carry a certain intangible cultural heritage.

2. Research Methods and Data Sources

2.1. Study Area

Shaanxi province is along the Yellow River's middle course in China's heartland, between 105°29 'E and 111°15' E and 31°42 'N -- 39°35' N. Its unique climate conditions, diverse landforms, and historical and cultural values have laid good foundations for preserving national folk settlements. The natural economic zones of southern Shaanxi, Guanzhong and Northern Shaanxi span the north and the south of Shaanxi province, with different natural and cultural environments giving birth to completely different national folk settlements. By June 2019, 113 national folk settlements approved by the traditional village protection and development committee existed in the Shaanxi national folk settlements in Shaanxi province, with 40 in the first batch, 51 in the second batch and 35 accounting in the third batch, accounting for about 1.9% of the total national folk settlements.

2.2. Data Source

The ministry of housing and urban-rural development, PRC, has identified five batches of 6,891 national folk settlements from 2012 to 2019. This paper summarizes the published federal folk settlements, using the spatial distribution-related information of 113 national-level folk settlements (such as longitude and dimension) to determine the coordinate positions, and establishes the corresponding spatial database with ArcGIS 10.8. The data sources in the study were mainly obtained from the official website of national folk settlements (shown in Table 1).

Table 1. Geospatial statistics of national traditional villages in Shaanxi province

City CN	Location	X, Y, A Latitude	Year	Total
Yulin	SuIDe-HeYi	(110.3877044;37.46000243;915)	2012	North of Shaanxi Province 46
Yulin	Jia-YangJiaGou	(110.4391982;37.99853484;916)	2012	
Yulin	MiZhi-YangJiaGou	(110.3263352;37.75721729;1034)	2012	
Yulin	Jia-Zhangzhuang	(110.472425;38.04539894;921)	2012	
Yulin	SuIDe-AiJiagou	(110.1697009;37.6372038;926)	2013	
Yulin	SuIDe-ChangJiagou	(110.4355221;37.53906741;988)	2013	
Yulin	SuIDe-GuoJiagou	(110.4159126;37.52939335;929)	2013	
Yulin	Jia-ShaPing	(110.5943446;37.71013999;913)	2013	
Yulin	Jia-YuKou	(110.516603;37.94920004;710)	2013	
Yulin	Jia-NiHeGou	(110.4940329;38.18694536;729)	2013	
Yulin	ZiZhou-ZhangZhai	(109.9990614;37.62198847;934)	2013	
Yulin	SuIDe-LiangJiaJia	(110.5399674;37.65199187;1145)	2014	
Yulin	MiZhi-HeiGeDa	(110.4085868;37.75300861;1068)	2014	
Yulin	MiZhi-SiGou	(110.3384762;37.75165606;1071)	2014	
Yulin	MiZhi-YueJiaCha	(110.3155379;37.73612776;993)	2014	

Yulin	MiZhi-BaiXingZhuang	(109.9744152;37.88109837;939)	2016	
Yulin	Jia-MuTouYu	(110.5843522;37.91946175;704)	2016	
Yulin	QingJian-GaoJie	(110.4524209;37.11027255;750)	2016	
Yulin	ZiZhou-MianHu	(109.8733015;37.33990219;1036)	2016	
Yulin	SuIDe-HuYan	(110.5748752;37.49358951;1126)	2016	
Yulin	MiZhi-Tao	(110.3642588;37.80208999;1035)	2016	
Yulin	MiZhi-GaoMiaoShan	(110.2265129;37.82458813;1014)	2016	
Yulin	YuY-LuoJian	(109.8445591;38.1341332;1153)	2016	
Yulin	YuYang-JiaDaMao	(109.2823018;37.91536023;1095)	2018	
Yulin	HengShan-XiangShui	(109.6681484;38.03041699;1007)	2018	
Yulin	HengShan-WuLongShan	(109.5121486;37.96737126;1055)	2018	
Yulin	HengShan-WangPiZhuang	(109.2309563;37.84239696;1092)	2018	
Yulin	JingBian-ZhenJing	(108.7963541;37.52093643;1359)	2018	
Yulin	SuIDe-ZhongJiao	(110.516101;37.59788634;1006)	2018	
Yulin	Jia-HeYePing	(110.6768389;37.78238168;711)	2018	
Yulin	Jia-LiuJiaPing	(110.6926951;37.71811744;681)	2018	
Yulin	ZiZhou-YuanZePing	(109.9924086;37.371714;967)	2018	
Yulin	Jia-HeYePing	(110.675808;37.78328;696.64)	2018	
Yulin	Jia-YuKou	(110.512766;37.949031;749.17)	2018	
YanAn	HuangLong-ZhangFeng	(110.1787717;35.53693922;803)	2012	
YanAn	ZiChang-AnDing	(109.5127179;37.17499601;1121)	2012	
YanAn	BaoTa-ShiCun	(109.9575621;36.35176059;929)	2012	
YanAn	YanChang-LiangShuiAn	(110.4750327;36.39296121;540)	2013	
YanAn	YanChuan-ZhaoJiaHe	(109.8632763;36.97469213;963)	2013	
YanAn	YanChuan-LiangJiaHe	(110.0588284;36.8201669;944)	2013	
YanAn	YanChuan-MaJiaWan	(109.9865815;36.99389992;905)	2014	
YanAn	YanChuan-TianJiaChuan	(109.9243066;37.04055868;944)	2013	
YanAn	YanChuan-ZhenJiaWan	(110.058439;36.91235085;858)	2016	
YanAn	YanChuan-TaiXiangSi	(110.0440804;36.91273682;877)	2018	
YanAn	MiZhi-LiuJiaMao	(110.3310707;37.80822094;1050)	2018	
YanAn	MiZhi-ZiWan	(110.1274205;37.81034481;882)	2018	
Xi’an	LanTian-ShiChuanGou	(109.5120643;33.94027045;1091)	2012	Central Shaanxi Province 45
Xi’an	ZhouZhi-LaoXianCheng	(107.7529259;33.79660974;1770)	2012	
Weiman	HanCheng-DangJia	(110.4716923;35.52665714;418)	2012	
Weiman	FuPing-LianHu	(109.1632447;34.75529898;452)	2012	
Weiman	HeYang-LingQuan	(110.3065893;35.17355793;567)	2013	
Weiman	ChengCheng-YaoTou	(109.845399;35.16621645;577)	2013	
Weiman	HeYang-NanChangYi	(110.2706871;35.30758832;702)	2013	
Weiman	HanCheng-QingShui	(110.3127874;35.35684129;508)	2013	
Weiman	Hua-Xin	(109.6663503;34.51993079;344)	2013	
Weiman	DaLi-DongGaoYuan	(109.7898979;34.86833685;479)	2013	
Weiman	PuCheng-ShanXi	(109.6862502;35.02468043;543)	2014	
Weiman	HeYang-DongGongCheng	(110.3254528;35.25263044;565)	2014	

Weiman	HanCheng-XiangLiBao	(110.4594208;35.42655906;425)	2014	
Weiman	HanCheng-WangFeng	(110.4810147;35.70631193;575)	2014	
Weiman	HanCheng-LiuZhi	(110.4547518;35.54081032;469)	2016	
Weiman	HanCheng-Liu	(110.462683;35.51970113;458)	2016	
Weiman	HanCheng-Xue	(110.5009929;35.53161248;382)	2016	
Weiman	HanCheng-XiYuan	(110.4975308;35.58272754;459)	2016	
Weiman	DaLi-DaZhai	(110.1187192;34.78901841;338)	2016	
Weiman	HanCheng-GuoZhuangZhai	(110.4665419;35.5478251;457)	2016	
Weiman	HanCheng-ZhangDai	(110.4965116;35.49993253;416)	2016	
Weiman	DaLi-DongBaiChi	(110.1520361;35.01833199;508)	2016	
Weiman	DaLi-JieCao	(110.145424;34.90193688;384)	2018	
Weiman	HeYang-XingJiaZhuang	(110.2881196;35.1493256;570)	2018	
Weiman	HeYang-NanShe	(110.2170756;35.08030128;537)	2018	
Weiman	HeYang-HeiDong	(110.2176284;35.07334587;528)	2018	
Weiman	HeYang-YangJiaPo	(110.2203724;35.27042532;722)	2018	
Weiman	ChengCheng-JiAnCheng	(109.7777871;35.35426016;819)	2018	
Weiman	PuCheng-CaoJia	(109.4447276;34.91581167;449)	2018	
Weiman	PuCheng-TaoChi	(109.5895718;35.02365235;524)	2018	
Weiman	BaiShui-KangJiaWei	(109.5164945;35.1990941;853)	2018	
Weiman	BaiShui-YangWu	(109.5688349;35.35371918;830)	2018	
Weiman	FuPing-DuHu	(109.4075264;34.97480292;545)	2018	
Weiman	HanCheng-ZhouYuan	(110.4755385;35.48243863;417)	2018	
Weiman	HuaYin-ShuangQuan	(110.1639853;34.609135;350)	2018	
Xianyang	SanYuan-BaiShe	(108.8620158;34.80346356;717)	2012	
Xianyang	LiQuan-YuanJia	(108.5318138;34.60813686;573)	2012	
Xianyang	YongShou-DengJiaPo	(108.1064352;34.71526404;1032)	2012	
Xianyang	Bin-ChengJiaChuan	(108.2077066;34.94592094;806)	2013	
Xianyang	SanYuan-DongLi	(108.9495212;34.67007397;435)	2013	
Xianyang	LiQuan-FengHuo	(108.6327207;34.58342883;432)	2013	
TongChuan	YaoZhou-SunYuan	(109.0291039;34.94431884;829)	2014	
TongChuan	YinTai-LiDiPo	(109.1449093;35.00226136;1319)	2014	
TongChuan	YaoZhou-Yi	(108.7905665;34.89093834;921)	2014	
BaoJi	LinYou-WanJiaCheng	(107.4349592;34.85250821;1296)	2016	
Ankang	XunYang-ZhongShan	(109.1992694;32.9897936;522)	2012	Southern Shaanxi 22
Ankang	Ziyang-YinLiang	(108.4453888;32.51871984;513)	2012	
Ankang	XunYang-WanFu	(109.6568719;32.637961;1102)	2013	
Ankang	XunYang-ZhanJiaWan	(109.2618628;32.74361767;483)	2013	
Ankang	ShiQuan-ChangXing	(108.1405251;32.88378556;927)	2013	
Ankang	XunYang-QiLiCunMiaoWan	(109.4784507;33.0791048;597)	2013	
Ankang	HanBin-TianBao	(108.9170311;32.45336074;727)	2013	
Ankang	HanBin-ShuangBai	(108.586313;32.71728424;771)	2016	
Ankang	HanBin-WangZhuang	(109.1397106;32.86660039;888)	2016	
Ankang	HanBin-GaoShan	(109.0356399;32.87834911;638)	2016	

Ankang	HanBin-MaHe	(108.9042773;32.89874792;576)	2018	
Ankang	HanBin-ShuangQiao	(108.6782429;33.17898531;963)	2018	
Ankang	XunYang-NiuJiaYinPo	(109.63625;32.63041;741)	2018	
Ankang	ShiQuan-ChangLing	(108.1591349;32.79696876;448)	2018	
Ankang	HanBin-QianHe	(108.9014641;32.88222983;571)	2018	
HanZhong	Ning Qiang-QingMuChuan	(105.5787703;32.82996167;670)	2012	
HanZhong	ChengGu-LeFeng	(107.2307925;33.0883496;486)	2012	
HanZhong	LiuBa-ChengGuan	(106.9301906;33.61069906;952)	2013	
HanZhong	LiuBa-MiaoTaiZi	(106.8327354;33.67993206;1276)	2014	
HanZhong	LiuBa-MoPing	(107.0966596;33.81234943;1106)	2016	
ShangLuo	Zhen'an-YunZhen	(109.0162758;33.48632742;818)	2016	
ShangLuo	ShanYang-GuZhenSheQu	(110.0567108;33.23335429;304)	2018	

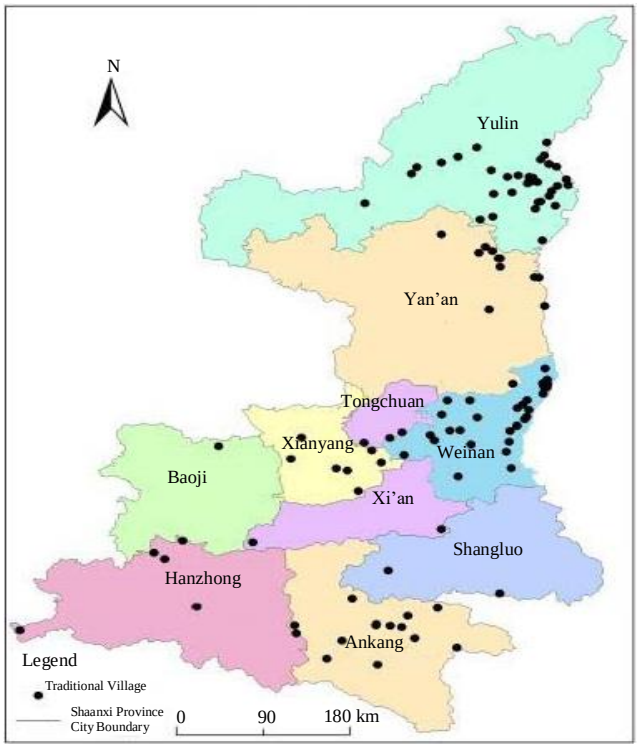

Fig. 1 Spatial distribution of national folk settlements in Shanxi province

The study used the spatial distribution data set of 6,891 national folk settlements in China. One hundred thirteen federal folk settlements were taken as a sample in the research. The vector map 1: 500,000 in Shaanxi province was represented as the foundational map.

The spatial attribute database of the selected national folk settlements located in the Shaanxi province of China was constructed, and the spatial distribution map of the chosen federal folk settlements located in the Shaanxi province of China was drawn by using ArcGIS 10.8 as the technology platform which is shown in Figure 1.

2.3. Research Methods

ArcGIS10.8 spatial analysis tool was employed. The selected national folk settlements (113) located in the Shaanxi province of China were chosen as the subject of the study.

Quantitative analysis of the established federal folk settlements located in the Shaanxi province of China was conducted with the spatial distribution index, including the index of nearest point, disparity, and regional clustering to uncover the spatial distribution features at the national level. of folk settlements and the influencing factors that caused such distribution.

3. Results and Discussion

3.1. Assessment of the Spatial Dispersion Types of the Selected National Folk Settlements Located in Shaanxi Province

Folk settlements belong to point-like elements. The spatial distribution of those villages presents three distribution patterns: discrete, random, and clustered. The nearest point index (R) represents the spatial distribution characteristics of point-like things, which can reveal the distribution type analysis of points in spatial locations. The analysis principle of R is as follows: measure the distance between each element and its nearest neighbour, and then calculate the average of all these most relative neighbour distances.

In this paper, the geographic coordinate points of national folk settlements in Shaanxi province are defined as point elements, and the distribution characteristics of settlements are quantitatively analyzed to obtain their spatial clustering characteristics. It is calculated by Equation (1):

$$R = \frac{\bar{r}_1}{r_E} = 2\sqrt{D} \quad (1)$$

In Equation (1), $\bar{r}$ is the nearest actual distance; r_E is the closest theoretical neighbour distance; D is the density of points. If R=1, it is indicated that the dots are distributed randomly; if R> 1, the dots tend to be discrete; If R <1, the dots tend to be clustered.

With the above formula and ArcGIS10.8, the results are as follows: $\bar{r}_1$ =23.48 (the nearest neighbour distance in theory), r_E=16.11km ($\bar{r}_1$ =23.48), namely R=0.68 (the nearest neighbouring point index).

It demonstrates that the selected national folk settlements (113 national folk settlements) in the Shaanxi province of China are distributed in a clustered pattern.

3.2. Analysis of the Concentration Degree of National Folk Settlements in Shaanxi Province

3.2.1. Analysis of Concentration Degree

The geographic concentration index is an essential indicator for studying national folk settlements' distribution and density, which is used to analyze the concentration and distribution degree of certified federal folk settlements in Shaanxi province. It is calculated by Equation (2):

$$G = 100\sqrt{\sum_{i=1}^{n}\left(\frac{X_i}{T}\right)^2} \quad (2)$$

In Equation (2), G is the geographic conation index of national folk settlements in Shaanxi province; n is the total number of prefecture-level cities in Shaanxi province; x is the number of federal folk settlements in a city; T is the total number of national folk settlements in Shaanxi province.

It is assumed that when the national folk settlements in Shaanxi province are evenly distributed, the conclusion is x=T / n, G=100 1 / n. If G <G1, it can be seen that the selected national folk settlements (113 national folk settlements) located in the Shaanxi province of China are distributed in a scattered pattern; otherwise, they are distributed in a clustered way. Equation (2) is used as support to judge the aggregation of selected national folk settlements (113 national folk settlements) located in the Shaanxi province of China. Based on equation 2, the result is n=10, T=113. Table 2 shows the specific figures of national folk settlements in different cities of Shaanxi province.

The calculating result is G, =31.62, G1=45.92, G> G1. Therefore, the selected 113 national folk settlements in the Shaanxi province of China are concentrated in prefecture-level cities. Table 1 also shows that Weinan and Yulin have a higher proportion of federal folk settlements on the list identified by prefecture-level towns, accounting for about 60% of the total and about 30%, respectively, so Weinan and Yulin are the key areas where national folk settlements are distributed in a concentrated pattern.

Table 2. Statistics of spatial distribution of the selected as national folk settlements

City	Number	City	Number
Xi'an	2	Yanan	12
Xian yang	6	Ankang	15
Weinan	33	Hanzhong	5
Baoji	1	Shangluo	2
Tongchuan	3	Yulin	34

3.2.2. Analysis of the Equilibrium Degree

According to the natural climate conditions, cultural environment, and economic development, ten cities are dispersed across three geographic regions within Shaanxi province: Northern Shaanxi, Guanzhong, and Southern Shaanxi. Northern Shaanxi comprises Yan 'an and Yulin; Guanzhong comprises Xi'an, Xianyang, Baoji, Weinan and Tongchuan; Southern Shaanxi comprises Hanzhong, Ankang and Shangluo. The spatial distribution of national folk settlements shows significant differentiation in the different areas. The selected 113 federal folk settlements in the Shaanxi province of China are mainly located in Northern Shaanxi and Guanzhong. The specific figures for the selected villages in the three geographical areas are shown in Table 3.

Table 3. Regional distribution statistics of the selected national folk settlements

Region	North of Shaanxi Province	Central Shaanxi Province	Southern Shaanxi Province
Number of National Folk Settlements (Individual)	46	45	22
Ranking	1	2	3
Percentage (%)	40.71	39.82	19.47
Accumulated Percentage (%)	40.71	80.53	100

The imbalance index (S) can be used to reflect the equilibrium degree of distribution of selected 113 national folk settlements located in the Shaanxi province of China in different regions of Shaanxi province. In this paper, the formula for calculating the concentration index in the rentz curve is used to calculate the imbalance index (S), which is Equation (3):

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

In Equation (3), n is the total number of cities in Shaanxi province. Yi is the cumulative percentage of the i th after ranking the proportion of the number of national folk settlements in a town in a province. The imbalance index S is between 0 and 1; if S=0, it can be indicated that federal folk settlements are evenly distributed in each urban area; if S=1, it can suggest that national folk settlements are concentrated in one metropolitan area.

The imbalance index shows the distribution of national folk settlements in Shaanxi province. It is measured to be S=0.60, indicating that the selected federal folk settlements in the Shaanxi province of China are unevenly located in the whole province. It can be seen from the Lorentz curve (Figure 2) that the selected national folk settlements located in the Shaanxi province of China are mainly distributed in Yulin, Weinan, Ankang and Yan'an, accounting for 83.18% of the chosen federal folk settlements positioned in the Shaanxi region of China.

To sum up, the selected national folk settlements in the Shaanxi province of China are mainly concentrated in Northern Shaanxi and Guanzhong. Federal folk settlements in the north of Shaanxi account for 40.71% of the whole province, 39.82% in Guanzhong and 19.47% in Southern Shaanxi.

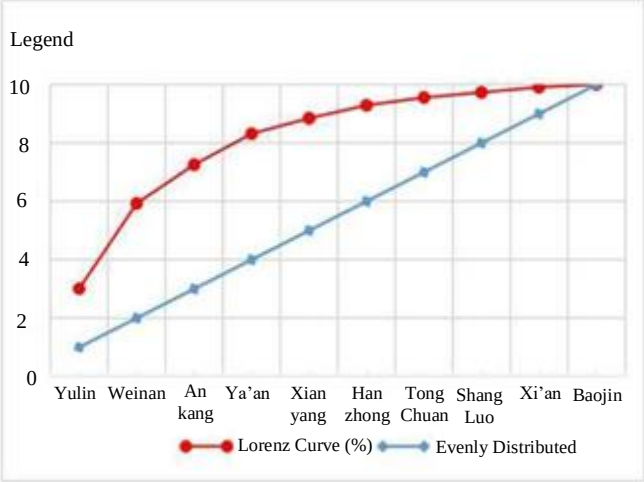

Fig. 2 Lorenz curve of the spatial distribution of national folk settlements in Shaanxi province

3.3. Study on Geographic Distribution and Cluster Areas

Geographic distribution clustered areas are measured mainly by distribution density and then analyzed with the nuclear density estimation method. The atomic density estimation method suggests that while geographical events can occur at any spatial location, probabilities of occurrence are different in different places. Therefore, areas with denser points have a higher likelihood of geographic events and vice versa. The software named ArcGIS 10.8 was used to analyze the nuclear density for the national folk settlements of Shaanxi province and to generate the atomic density distribution map (Figure 3). It shows two high-density clusters: Yulin on the western side of the yellow river and Weinan City in Guanzhong plain. Yulin has unique regional architecture, such as Plateau cave dwellings. Guanzhong has a flat terrain, a developed water system, and a solid historical and cultural atmosphere, providing a good foundation for developing national folk settlements in this region.

Regarding the regional distribution in geography, the national folk settlements in Shaanxi province generally show high density in the east and north and sparsity in the south and west. Federal folk settlements in Guanzhong and Northern Shaanxi of the north of the Qinling mountains account for 80.53% of the total in Shaanxi province, while only 19.47% of national folk settlements in Southern Shaanxi. The main reason is that the Guanzhong plain, north of the Qinling mountains, is an essential birthplace of farming culture. The superior water conservancy system of the yellow river and the Han river provides a fundamental guarantee to form national folk settlements in the region.

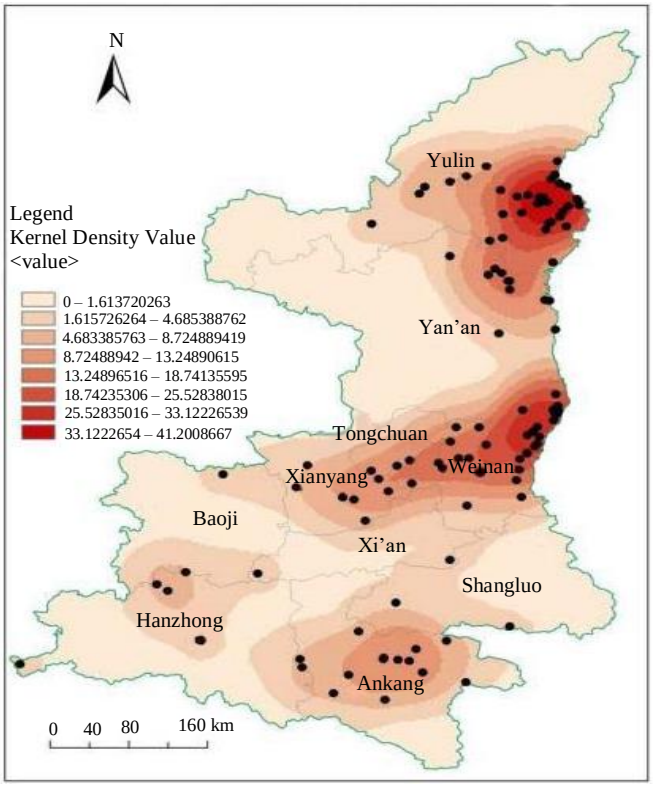

Fig. 3 Kernel density of national folk settlements in Shaanxi province

4. Factors Affecting the Spatial Distribution of Federal Folk Settlements

4.1. Natural Environmental Factors

Shaanxi has a long stretch of land, with elevated terrain in the Northern and Southern areas and lower elevation in the central region. At the same time, the terrain slopes to the east.

As a result, there are various terrains like plateaus of 45%, plains of 19%, and mountains of 36%, respectively (Figure 4). The selected national folk settlements in the Shaanxi province of China are mainly in the Northern Shaanxi plateau and Guanzhong plain. The Northern Shaanxi plateau's federal folk settlements (cave dwellings) have prominent characteristics.

They are located along the yellow river. Therefore, convenient transportation is beneficial for developing and preserving the national folk settlements in this region. Meanwhile, the expanded water system, convenient transportation, and rich geographical resources in the Guanzhong Plain are conducive to agricultural farming, enhancing settlement clusters' stability.

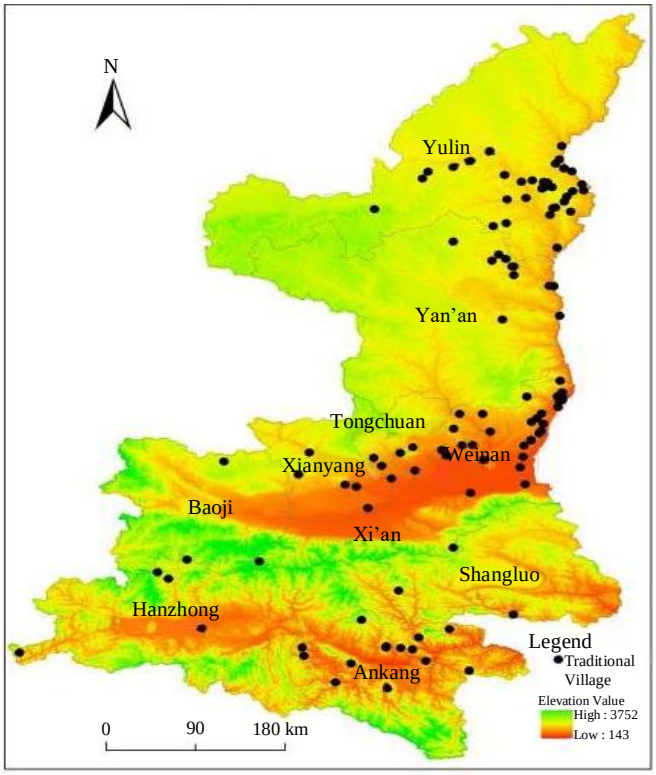

Fig. 4(a) The distribution of different heights of national folk settlements in Shaanxi province

4.2. Social and Economic Factors

The selected national folk settlements located in the Shaanxi province of China are mainly located in economically developed areas (Table 4). As seen from its distribution areas, the spatial distribution of national folk settlements is closely related to the development degree of regional economy.

Being one of the most affluent agricultural areas in the history of China, Guanzhong plain has a developed water system, fertile lands, and superior natural and economic conditions, for which it enjoyed the world reputation of "well-guarded fertile land full of natural resources" in China. The rich coal, oil, natural gases, and other resources in Northern Shaanxi provide a strong guarantee for the economic development of north Shaanxi. At the same time, the unique residential building cave clusters in Northern Shaanxi provide congenital favourable conditions for the development of national folk settlements. In sharp contrast, Southern Shaanxi is lagging economically. Therefore, the original ecology of some federal folk settlements is still preserved due to inconvenient transportation, the little impact caused by urbanization, and the stable relationship between human beings and land in this region.

From the perspective of the overall distribution of national folk settlements in Shaanxi province, Xi'an and Yulin will have the highest GDP in 2021, and the number of folk settlements has the most significant distribution page. Due to its convenient transportation and closer proximity between cities, the Guanzhong region provides conditions and a foundation for forming an economic circle. In addition to Tongchuan's relatively backward GDP number in 2021, the other four cities in Guanzhong ranked in the top five. The overall ranking is low because Southern Shaanxi is close to Chengdu city, Sichuan province, and far away from Guanzhong economic circle. However, there are a total of 22 traditional villages. From this point of view, the number of traditional villages is not linear and related to economic development but also to urban development and construction and villagers' cognition.

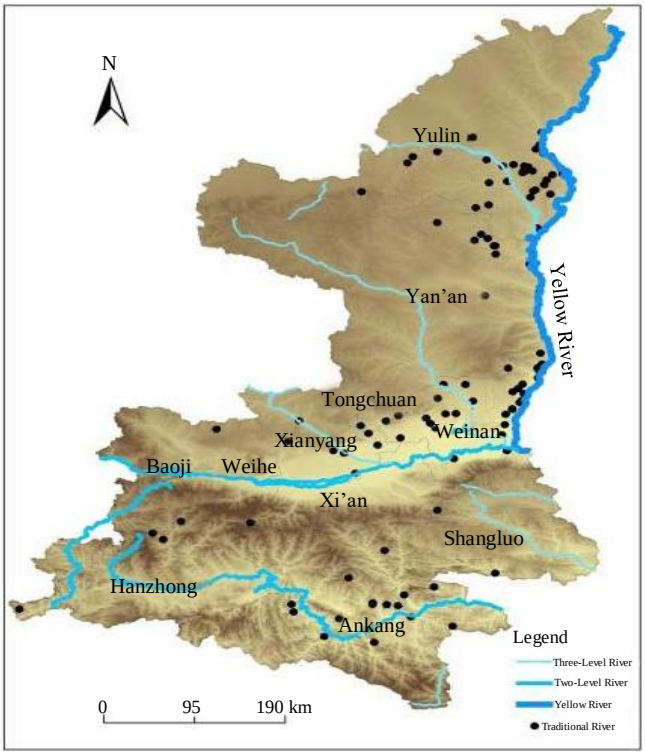

Fig. 4(b) Distribution of water system and national folk settlements in Shaanxi province

Table. 4 The GDP of different cities in Shaanxi province in 2021

Region	No. of National Folk Settlements	City	Total GDP (RMB: 100 Million Yuan)	GDP Speed Increase (%)	Total GDP Ranking
North of Shaanxi Province	46	Yu Lin	5435.18	7.9	2
		Yan'an	2004.58	8.1	6
Central Shaanxi Province	45	Xi'an	10688.28	4.1	1
		Xian yang	2581.32	8.5	3
		Bao ji	2548.71	6	4
		Wei nan	2087.21	8.2	5
		Tong Chuan	439.41	7.5	10
Southern Shaanxi Province	22	Han Zhong	1768.72	8.2	7
		An kang	1209.49	7.5	8
		Shang luo	852.29	9.5	9

4.3. Historical and Cultural Factors

The division of cultural areas in Shaanxi province is consistent with the division of the administrative regions. Influenced by the climate and geomorphic conditions, settlement areas, especially cave settlements, have been formed.

Agriculture and animal husbandry coexist in those areas. Meanwhile, being one of the chinese revolutionary bases, Northern Shaanxi possesses tourism resources about revolutionary culture. It was recorded in the records of the grand historian that the guanzhong area enjoyed the reputation of "fertile lands extending thousands of miles" and "land of abundance". Since the discovery of lantian 1.15 million years ago, the ancestors have multiplied here for generations.

Guanzhong has a long history of witnessing the rise and fall of 11 historical dynasties. Historical and cultural relics rich in cultural deposits still exist in guanzhong. Southern Shaanxi is bordered by bashu culture, jingchu culture and qin and han dynasties culture. Thus, the integration of multi-culture from north to south in china has been displayed. Two major clustered areas of national folk settlements have been formed in Guanzhong and Northern Shaanxi, and one less clustered area in Southern Shaanxi.

5. Conclusion

Using ArcGIS (geographic information technology), this paper analysed spatial distribution types, distribution density and spatial distribution gathering areas of 113 selected national folk settlements in the Shaanxi province of China. The conclusion was as follows:

- The spatial distribution of selected 113 national folk settlements in the Shaanxi province of China is clustered. The selected villages are mainly located in Yulin and Weinan. They are not evenly distributed in three geographical regions of Shaanxi province, forming two high-density regions in Northern Shaanxi and Guanzhong and an inferior high-density area in Southern Shaanxi.
- The natural environment, social economy, history and culture influence national folk settlements in Southern Shaanxi. The results show that Guanzhong and Northern Shaanxi have the most significant number of national folk settlements due to good economic development, flat terrain, profound historical and cultural heritage and prominent architectural features in the regions.

The paper explored the spatial distribution patterns and factors influencing the chosen 113 national traditional settlements located in the Shaanxi province of China from the macro level, which provided a reference to protect and develop regional and national folk settlements. However, several issues remain to be discussed:

- How is the architectural layout of villages impacted by the internal spatial composition of historical and cultural elements from a micro perspective?
- There are few research results about national folk settlements in different areas. What are the standards for classifying national folk settlements by the geographical environment, climate conditions, and economic foundation?
- Future research will focus on establishing the traditional village database and providing digital protection and modern translation of national folk settlements.

Funding Statement

This research received funding from the China natural science foundation project (52078419) and the Shaanxi provincial social science foundation project (2021J029).

References

[1] R. Alazab, and Y. Khader, "Telenephrology Application in Rural and Remote Areas of Jordan: Benefits and Impact on Quality of Life," *Rural & Remote Health*, vol. 16, no. 1, pp. 1-9, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[2] B. Chen, "Analysis on the Transformation and Development of Rural Tourism: Taking Anshun Traditional Village as an Example," *Sociological Science*, no. 4, pp. 82-46, 2019.

[3] B.K. Chen et al., "Research on the Protection and Development of Traditional Villages in Jiangxi Province," *Architecture and Culture*, no. 5, pp. 213-214, 2022.

[4] J. Kang et al., "Analysis on the Spatial Distribution Characteristics of Chinese Traditional Villages," *Progress in Geography*, vol. 35, no. 7, pp. 839-850, 2016.

[5] H.R. Tan et al., "Research on the Paths of Differentiated Protection and Revitalization of Traditional Villages from the Perspective of 'Three-Wheel Drive': A Case Study of Four Typical Traditional Villages in Hunan Province," *Journal of Natural Science of Hunan Normal University*, vol. 45, no. 193 (02), pp. 53-64, 2022.

[6] Sh. Zh. Jiang, and Sh. B. Zheng, "The Development and Protection of Chinese Traditional Villages in the View of Ecosystem: Taking Tunbao in Guizhou Province as an Example," *Guangxi Ethnic Studies*, no. 1, pp. 1221-129, 2022.

[7] S.H. Wang, and J.X. Zhang, "Evaluation of Regional Protection Level and Influencing Factors of Traditional Villages in Southwest China," *Journal of Geography*, vol. 775, no. 2, pp. 474-491, 2022.

[8] B. Yang, "The Concept of Traditional Village and Its Philosophical Connotation," *Yellow River Civilization and Sustainable Development*, no. 2, pp. 168-177, 2021.

[9] Sun Chunyuan et al., "Village Planning Should Advocate the Concept of 'One Village, One Policy' Reflection on the Current Situation of the Current 'Traditional Village' Protection Planning Compilation," *Proceedings of the Rational Planning for Sustainable Development*, pp. 754-763, 2017.

[10] Y. Hu et al., "The Concept and Cultural Connotation of Traditional Villages," *Research on Urban Development*, vol. 21, no. 1, pp. 10-13, 2014. [Google Scholar]

[11] Lu lin, Chen Huifeng, and Fu Linrong, "Process and Mechanism of Function Evolution of Traditional Villages under the Background of Tourism Development: A Case Study of Xixinan Village, Huangshan City," *Scientia Geographica Sinica*, vol. 42, no. 5, pp. 874-884, 2022. [CrossRef] [Publisher Link]

[12] H.J. Huang, H. Miao, and Y. Wang, "Research on Tourism Development Potential Evaluation of Traditional Villages in Northwest China," *Regional Research and Development*, vol. 40, no. 6, pp. 106-110, 2021.

[13] X.B. Zhu, X.J. Yu, J.Q. Zhang, "A Study of Tourism Development Spatial Structure of Traditional Villages in Underdeveloped Area from the Perspective of Rural Revitalization: A Case Study of Xiangxi Autonomous Prefecture," *Journal of Jiangxi University of Finance and Economics*, no. 5, pp. 96-105, 2021. [Google Scholar] [Publisher Link]

[14] L.W. Cheng, "Development and Utilization of Traditional Village Architecture under the Background of Rural Revitalization - Evaluation 'Research on Architectural Landscape of Southwest Ethnic Minority'," *Industrial Buildings*, vol. 51, no. 5, 2021.

[15] F. Yan, G.F. Li, and Sh.B. Liu, "Study on the Spatial Distribution and Formation Mechanism of Traditional Villages in Henan Province from a Multi-Dimensional View," *Regional Research and Development*, vol. 41, no. 3, pp. 38-42, 2022.

[16] Y.W. Shi et al., "Study on the Spatial Distribution Characteristics and Their Influencing Factors of Traditional Villages in Yunnan Province," *Resource Development and Marketing*, vol. 7, no. 5, pp. 1-12, 2022.

[17] X.X. Ju et al., "Spatial Distribution Characteristics and Influencing Factors of Traditional Villages in Zhejiang, Anhui, Shaanxi and Yunnan provinces," *Economic Geography*, vol. 42, no. 2, pp. 222-230, 2022.

[18] J.G. Yuan, Y. Liu, and M.D. Zhang, "Spatial Distribution and Activation of Traditional Villages in Henan Province," *Land and Natural Resources Research*, no. 1, pp. 60-64, 2022.

[19] Samson Boadi et al., "Using Spatial Distribution of Termite Mounds to Support Subsurface Geological Imaging in A Complex Regolith Terrain of Sefwi-Bibiani Gold Belt, SW Ghana," *SSRG International Journal of Geoinformatics and Geological Science*, vol. 6, no. 3, pp. 40-47, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[20] A. Liu et al., "Spatial Distribution Characteristics of Traditional Villages in Yunnan, Guizhou and Guangxi and Their Relationship with Tourism Development," *China Agricultural Resources and Regionalization*, vol. 42, no. 9, pp. 166-177, 2021.

[21] J.H. Xu et al., "The Spatial Distribution Characteristics and Protection System Scheme of Chinese Traditional Villages," *Journal of Hunan University*, vol. 35, no. 2, pp. 152-160, 2021.

[22] G.L. Yang, Zh. Li, "Study on the Distribution and Evolution Law of Traditional Villages in Southeast Guizhou under Social Changes," *Southern Architecture*, no. 6, 2022.

[23] Z. Li et al., "The Correlation Law between Street Space and Residential Passage in Huizhou Traditional Villages," *Journal of Architecture*, no. S1, pp. 24-32, 2021.

[24] Z. Cui et al., "Study on Spatial Distribution of Traditional Villages in Southeast Shaanxi," *Journal of Changchun Normal University*, vol. 38, no. 2, pp. 87-90, 2019.