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Tourism Development of Cultural Heritage Resources Through Conservation Concepts: A Case Study of Ningxia, China

Shengrui Zhang [1], Tianyi Hu [1], Tongyan Zhang [1,*], Hongrun Ju [2,*] and Yingjie Wang [3]

[1] Management College, Ocean University of China, Qingdao 266100, China; zhangshengrui@ouc.edu.cn (S.Z.); hutianyi@stu.ouc.edu.cn (T.H.)
[2] School of Environment and Geography, Qingdao University, Qingdao 266071, China
[3] Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China; wangyj@lreis.ac.cn
* Correspondence: zhangtongyan@ouc.edu.cn (T.Z.); juhr@qdu.edu.cn (H.J.)

Abstract: Cultural heritage resources represent a vital aspect of tourism in the Ningxia Hui Autonomous Region, an area characterized by its ethnic minority heritage. This study innovatively proposes a classification framework for cultural heritage based on the principles of protection and the demands of tourism development. For the first time, it combines kernel density analysis and spatial autocorrelation methods to conduct a quantitative study on the geographical distribution of cultural heritage in Ningxia, covering aspects such as scale, structure, distribution characteristics, and influencing factors. The findings reveal: (1) Religious and Ceremonial Sites: Ningxia boasts the highest number of religious and ceremonial sites, totaling 1741. (2) Geographical Distribution: Resources are distributed in a multicore pattern, concentrated in Longde and Zhongning Counties, while the central and western areas are less rich. (3) Regional Concentration: The eastern region shows a high concentration of resources, contrasting with the low concentration in the north. (4) Influencing Factors: Social factors like GDP per capita, urbanization, and population density significantly affect this spatial pattern, although natural factors like altitude are also important. Consequently, the paper recommends increased government investment in cultural heritage tourism; enhanced integration of heritage tourism between urban core areas and countryside zones; increased investment in the protection and development of cultural heritage in high-altitude and remote areas. These findings aim to promote the sustainable growth of Ningxia's cultural heritage and offer insights for similar regions.

Keywords: cultural heritage resources; heritage tourism; spatial autocorrelation; influencing factors; sustainable development; Ningxia

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1. Introduction

Cultural heritage is increasingly recognized as a vital treasure of human civilization, especially in the context of globalization. It serves as a repository of historical information, a source of cultural self-assurance, and a cornerstone of national identity. Often, it becomes an emblem of a region or country [1]. As a unique tourism resource, cultural heritage attracts global visitors with its deep historical significance and distinctive cultural appeal. Consequently, preserving cultural heritage is a priority in many countries, as it supports not only tourism but also serves as a foundation for related research and cultural understanding.

To better comprehend and harness this valuable resource, in-depth research on cultural heritage is particularly crucial. The micro and macro levels are the two primary categories into which contemporary cultural heritage research can be classified.

1.1. Cultural Heritage Research at the Micro Level

Microstudies, encompassing a broad spectrum of disciplines, were initially the primary focus. Micro-level research examines cultural heritage itself, including its concept [2,3], connotation and characteristics [4], and classification [5,6]. As studies evolved, scholars explored cultural heritage from various perspectives, such as its value [7–12] and protection [13,14]. Andrea Báez and Luis César Herrero used a willingness survey and cost-benefit analysis to evaluate cultural heritage value after condition assessments in Valdivia, supporting revitalization policies [15,16].

When combined with tourism, construction, and other sectors, cultural heritage plays a sustainable socioeconomic role through various evaluation methods [17–19]. Scholars have refined value assessment methods, emphasizing cultural heritage's significance. These resources enrich people's spirit, protect national cultures, shape cultural identity [20], and contribute significantly to economic value [21]. Sustainable cultural tourism based on cultural heritage can support the circular economy [22], and specific cultural heritage labels can boost local commercial activities [23]. Future research should continue to delve deeper into these areas, particularly in terms of the concept and connotations of cultural heritage, and further explore its transformation and integration within the context of globalization. This suggests that we should continually seek out new assessment methods and tools to more comprehensively measure the multiple values of cultural heritage.

1.2. Preservation Concepts in Cultural Heritage Research

The preservation of cultural heritage is vital for maintaining cultural diversity, promoting economic development, and protecting the environment. Scholars have defined cultural heritage protection concepts both internationally and in China. Domestically, He proposed that protecting intangible cultural heritage involves viewing it as a living entity, enhancing its vitality, and improving its sustainability [24]. Quan et al. described systematic protection by considering its entirety, hierarchical elements, openness, and stability [25].

Internationally, recognizing "authenticity" in heritage protection, Winter compared Asian and Western practices, emphasizing regional, cultural, religious, and local differences, advising caution in cultural conceptualization [26]. Dai and colleagues supported previous findings on authenticity's role in heritage conservation and tourism [27]. UNESCO's Convention for the Safeguarding of the Intangible Cultural Heritage (2003) defined "safeguarding" as measures to ensure intangible cultural heritage viability, including identification, documentation, research, preservation, protection, promotion, enhancement, transmission, and revitalization.

In summary, scholars regard "authenticity" as fundamental in cultural heritage protection, focusing on originality, integrity, regional characteristics, and vitality. Microstudies have expanded to include transmission and utilization [28]. For instance, Jonathan et al. highlighted the economic value of cultural heritage in conservation using museums as examples [19]. These concepts emphasize the comprehensiveness and dynamism of cultural heritage conservation, indicating that, in the process of preservation, we should not only focus on the static existence of cultural heritage but also pay attention to its transmission, development, and innovative processes.

1.3. Macro Level of Cultural Heritage Research

Recent cultural heritage research has evolved significantly, shifting focus from conservation philosophy to practical application [29], from traditional methods to digital

technology conservation [30], and from local to multi-level national policies [31,32] due to globalization and Internet advancements. Institutions like the United Nations have increasingly recognized cultural heritage as crucial for sustainable development throughout the twentieth century.

Scholars are developing evaluation indicators and exploring the link between cultural heritage and sustainable development. Ferretti et al. laid the groundwork for evaluating the sustainable use of cultural heritage [33]. Gravagnuolo et al. created a tool for assessing heritage buildings, highlighting their circular applicability [34]. Bosone et al. developed a 40-criteria framework for adaptive reuse of cultural heritage, covering social, cultural, economic, and environmental sustainability dimensions [35]. At the micro level, research predominantly focuses on intangible cultural heritage, employing diverse qualitative analyses and multifaceted assessments. The current research on cultural heritage is increasingly focusing on long-term benefits, encompassing the sustainability of social, cultural, economic, and environmental aspects.

Macrolevel studies of cultural heritage provide comprehensive spatial analyses across multiple locations using various analytical methodologies. Geographic Information Systems (GIS) and geospatial tools have introduced new methods and perspectives for cultural heritage research, especially with advancements in technology and the Internet. Researchers have used tools like Geo-detector to explore factors influencing spatial distribution [36], enhancing the comprehensiveness of studies and offering new insights for policymakers. With the advancement of digital technology, the methodologies for the conservation and research of cultural heritage are continually being updated.

For example, Wang et al. used GIS software to investigate the spatial distribution of intangible cultural heritage (ICH) and its influencing factors in Shanxi Province, China, employing techniques like nearest-neighbor indices and kernel density analysis. They highlighted the significant impact of the geographic environment on the spread of ICH but did not establish a comprehensive evaluation index system for geographic factors [37].

Nie et al. visualized and analyzed the spatial distribution of national ICH sites in the Yellow River Basin using ArcGIS and kernel density analysis, identifying influencing factors with the Geo-detector tool. They developed an evaluation index system with primary indicators like social, humanities, and geographic environment factors [38]. Pang et al. found that economic level and literacy were key factors affecting ICH distribution in the Beijing–Tianjin–Hebei region, contrasting with previous studies. This indicates that the characteristics and influencing factors of cultural heritage distribution vary by region [39].

Overall, macro research has become prevalent in cultural heritage studies, focusing on quantitative assessment and analysis. The evaluation system for influencing factors is being refined, making the spatial distribution and influencing factors of cultural heritage a research hotspot. In recent years, China's government has emphasized cultural heritage conservation alongside economic and cultural development, leading to increased research supported by relevant policies and initiatives.

1.4. Limitations in the Current Chinese Cultural Heritage Research

In many regions around the world that are similar to Ningxia, scholars have identified pathways for the protection of their cultural heritage after conducting research. By transforming the cultural center of Bordeaux wine, Bordeaux has not only preserved and passed on its rich wine cultural heritage but also enhanced the city's tourism appeal and international image and promoted regional economic development through the construction of cultural tourism centers [40]. Alberts and Hazen discussed the challenges and strategies for protecting the "authenticity" and "integrity" of cultural heritage sites on a global scale [41]. Nogué and Vicente emphasized the importance of landscape in the construction of national

identity in Catalonia, particularly highlighting the role of mountain landscapes and the impact of romantic and utilitarian cultural discourses [42]. The cultural heritage protection efforts in similar regions around the world underscore the urgency of cultural heritage protection work in Ningxia.

Research on Chinese cultural heritage often prioritizes economically developed regions, overlooking ethnic minorities and underdeveloped areas. This focus limits the research scope and affects the sustainable development and preservation of unique heritage. The Ningxia Hui Autonomous Region, with its rich geographical and cultural resources, exemplifies this issue. Despite its distinctive and diverse cultural heritage, influenced by economic challenges and a multiethnic composition, the region remains underdeveloped and unequal. In China, research on Ningxia's intangible cultural heritage has grown, especially in sports [43,44], red heritage [45], and industry and agriculture. Internationally, studies have concentrated on conserving and utilizing specific elements like the Silk Road [46] and analyzing the spatial distribution of cultural forms [47].

In summary, providing universal and comprehensive guidance for safeguarding and utilizing Ningxia's unique cultural heritage is challenging due to the lack of studies examining the spatial distribution and influencing factors of cultural heritage resources in the entire Ningxia region. Therefore, it is necessary to conduct a comprehensive review of the attributes related to the cultural heritage of Ningxia.

This paper addresses this research gap by compiling and analyzing these resources, drawing on field research and existing studies. It employs kernel density analysis, spatial correlation, and other methods to thoroughly examine the spatial distribution of cultural heritage in Ningxia. Geo-detector methods are also used to identify the factors influencing this distribution. Lastly, it offers specific recommendations on the challenges and current state of sustainable development and cultural heritage protection, providing scientific guidance and theoretical support for the preservation and promotion of Ningxia's cultural heritage (Figure 1).

This study aims to address the underexplored issue of the spatial distribution and influencing factors of cultural heritage resources in Ningxia, a region rich in cultural diversity yet understudied in the context of systematic conservation and tourism development. The research focuses on bridging the gap between the preservation of cultural heritage and its sustainable utilization for tourism, with an emphasis on the unique challenges posed by Ningxia's geographic and socioeconomic conditions. The paper innovatively employs a comprehensive classification framework grounded in conservation principles while simultaneously addressing the demands of tourism development. By integrating advanced methods such as kernel density analysis, spatial autocorrelation, and the Geo-detector tool, this research provides a novel and systematic exploration of the spatial characteristics of Ningxia's cultural heritage. Furthermore, it highlights the interplay between natural and social factors, offering tailored recommendations for the sustainable development of these resources.

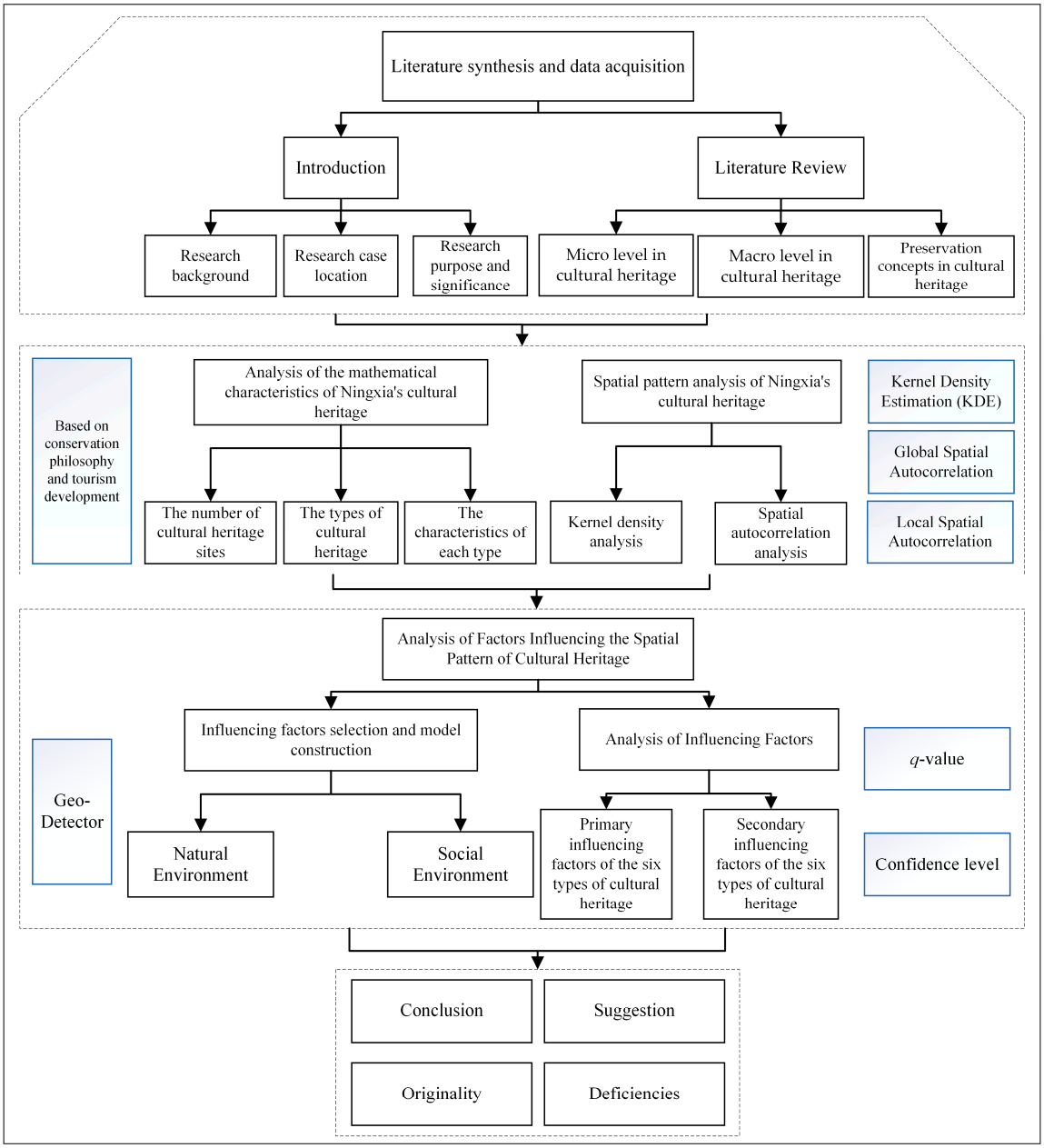


Figure 1. Research framework and methodology flowchart.

2. Materials and Methods

2.1. Overview of the Study Area

Ningxia Hui Autonomous Region (hereinafter referred to as "Ningxia"), located in Northwestern China, is notable for its unique geographic environment and rich cultural heritage, especially due to its multiethnic coexistence. Ningxia is the primary habitat of the Hui ethnic group and is one of the five autonomous regions for ethnic minorities in China. The region is home to 55 ethnic groups, with the Miao and Manchu being the largest minority populations apart from the Hui, each exceeding 10,000 individuals. This diversity offers significant potential for cultural heritage tourism. For instance, the Western Xia Tombs represent one of the largest and most completely preserved imperial tomb complexes in China. Their significance lies in the illustration of the resplendent history of the Western Xia Dynasty, with the multiethnic characteristics reflected in the organic integration of Han Chinese culture, Buddhist culture, and the culture of the Tangut people. However, as an economically underdeveloped area, Ningxia faces challenges in securing

adequate financial resources for the protection and promotion of its cultural heritage. This limitation results in a lack of systematic investigation and analysis of its cultural heritage resources, hindering their preservation and sustainable tourism development. Ningxia consists of five prefecture-level cities: Yinchuan, Shizuishan, Wuzhong, Guyuan, and Zhongwei. Additionally, it includes 22 county-level administrative districts (Figure 2).

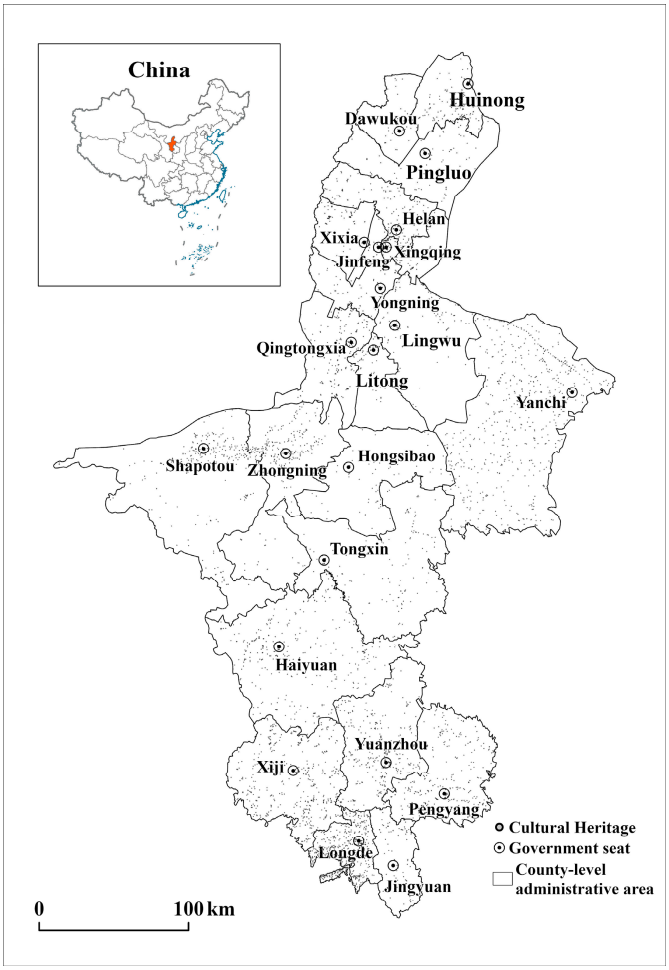


Figure 2. Ningxia county-level administrative regions (On the map of China, the Ningxia Hui Autonomous Region is shown in red, while the coastline of China is shown in blue. data source: "Ningxia Hui Autonomous Region Cultural and Tourism Resources Survey Project" database).

2.2. Research Methodology

In order to comprehensively analyze the spatial distribution characteristics and influencing factors of cultural heritage in Ningxia, this study employs a combination of kernel density analysis, spatial autocorrelation, and the Geo-detector method. These techniques were selected due to their proven effectiveness in examining spatial patterns and relationships (Table 1). Kernel density analysis provides a precise depiction of the spatial agglomeration and distribution [48,49]. Spatial autocorrelation, particularly the global Moran's Index and local Moran's *I*, is crucial for understanding the spatial dependencies and clustering of these resources [50]. Lastly, the Geo-detector method, through its factor detection model, allows for a quantitative assessment of the impact of various factors on the spatial distribution of heritage tourism resources [51–53]. By integrating these methods, this study aims to offer a holistic understanding of the spatial dynamics and determinants of cultural heritage in Ningxia.

Table 1. The methods and their functions.

Methodology	Fuction
Kernel density analysis	intuitively display the degree of spatial agglomeration of cultural heritage
Global spatial autocorrelation	describe the overall characteristics of the spatial distribution of cultural heritage and determine whether there is spatial clustering
Local spatial autocorrelation	precisely identify the specific locations of spatial agglomeration of cultural heritage, namely the "hotspot" or "cold spot" areas
Geo-detector	reveal the various influencing factors behind the spatial distribution of cultural heritage and their relative importance

2.2.1. Kernel Density Analysis

Kernel density analysis is a non-parametric statistical density estimation technique that does not rely on the specific mathematical distribution of the data or any modeling assumptions. It accurately describes the spatial relationships between elements by calculating the density of each point's position on a map and assigning a weight to each point. This method not only quantifies the spatial agglomeration characteristics of heritage tourism resources but also reveals their distribution patterns and degree of aggregation in space. Consequently, it provides a more comprehensive understanding of their geographical distribution. Numerous scholars have employed kernel density estimation to visualize the spatial distribution within the tourism sector, validating the feasibility and scientific validity of this approach [54–58]. The equations for calculation are as follows:

$$f(s) = \sum_{i=1}^{n} \frac{1}{nh^2} K\left(\frac{d_{is}}{n}\right) \quad (1)$$

where $f(s)$ is the kernel density value at s, h is the bandwidth, and n is the number of heritage tourism resources in the region. d_{is} is the distance between i and s. The kernel function is represented by the K-function. The density value of the tourism resources decreases continuously as the distance d_{is} increases, and the richness of the heritage tourism resources increases as $f(s)$ increases.

2.2.2. Spatial Autocorrelation

- Global spatial autocorrelation

In tourism research, the global Moran's Index is a key method for analyzing the spatial distribution characteristics of study subjects. In this study, it was used to examine the spatial autocorrelation of heritage tourism resources in China's land border areas [57,58]. The findings indicate that the various categories of tourism resource types exhibit a global correlation, as determined by the subsequent formula:

$$\text{Global Moran's } I = \frac{n}{\sum_{i=1}^{n}\sum_{j=1}^{n}\omega ij} \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}\omega ij\left(Xi-\overline{X}\right)\left(Xj-\overline{X}\right)}{\sum_{i=1}^{n}\left(Xi-\overline{X}\right)^2} \quad (2)$$

The global Moran's I Index, which serves as a metric for factor correlation between territories, ranges from -1 to $+1$ [59]. The index is positive when it is greater than zero, indicating that heritage tourism resources are spatially clustered. Conversely, a negative value indicates a negative spatial correlation of elements between two territories, implying a significant spatial difference. If the index is close to zero, it may suggest a random distribution of elements. In this instance, n is the total number of administrative units that were examined; Xi and Xj are the number of cultural heritage resources in the ith and jth administrative units, respectively; X is the mean value of the individual resources; and ωij indicates their relative significance in space.

- Local spatial autocorrelation

Local autocorrelation can describe the clustering status of heritage tourism resources in border areas, which encompasses a total of four cases: H-H Cluster, H-L Outlier, L-H Outlier, and L-L Cluster [60]. The following are the expressions:

$$\text{Local Moran's } I = \frac{X_i - \overline{X}}{S_i^2} \sum_{j=1, j \neq i}^{n} \omega ij \left(X_j - \overline{X}\right) \tag{3}$$

The degree of agglomeration of heritage tourism resources in the region is reflected in S_i^2, which is the variance index of Ningxia's cultural heritage resources. The phenomenon of high-high clustering or low-low clustering is observed when the statistical value is greater than 0, indicating that the number of heritage tourism resources in the region and its neighboring areas exhibit a significant correlation in geospatial terms. This implies that there are interconnections or dependencies between them.

2.2.3. Geo-Detector

This paper establishes a systematic indicator system that incorporates both the natural and social environmental dimensions. To comprehensively analyze how various factors influence the spatial distribution characteristics of different categories of heritage tourism resources, the study employs the factor detection model within Geo-detector as an analytical tool [61]. This model effectively evaluates the intensity and contribution of each influencing factor to the spatial distribution pattern of heritage tourism resources by calculating the quantitative index known as the q-value. The magnitude of the q-value directly reflects the relative importance and impact of different factors in shaping the spatial layout of heritage tourism resources. The following formula is used to derive this evaluation:

$$q = 1 - \frac{\sum_{h=1}^{L} \sigma^2 N_h}{N \sigma^2} \tag{4}$$

The total Y is composed of L layers (h = 1,2..., L), where N and σ^2 represent the number of cells in the studied area and the variance of Y, respectively. The explanatory ability of each influence factor on Y is denoted by the value of q, which is precisely within the range of [0, 1]. The explanatory ability of the independent variable X on the dependent variable Y is stronger when the value of q is larger and weaker when the value of q is smaller.

2.3. Data Sources

2.3.1. Data on Cultural Heritage Resources

From July 2021 to October 2022, we took part in the "Ningxia Hui Autonomous Region Cultural and Tourism Resources Survey Project". During the project, the research team actively interacted with local communities, cultural heritage management agencies, and stakeholders. They collected their opinions and suggestions on the protection and development of cultural heritage through interviews and seminars. These communications provided an important basis for the classification optimization of heritage resources, especially in terms of balancing the tourism development and protection needs of heritage resources. Community members emphasized the importance of religious and sacrificial sites and their core position in local cultural identity during the research, which promoted a more detailed analysis of the spatial distribution characteristics of resources. This initiative developed a comprehensive database of cultural and tourism resources within the Ningxia Hui Autonomous Region, detailing the types, quantities, and spatial distribution characteristics of these resources, including cultural heritage assets. The database's data sources include a combination of data and literature collation, as well as field investigations

(Figure 3). The database has been accepted by, and is owned by, the Department of Culture and Tourism of the Ningxia Hui Autonomous Region. Currently, it is not publicly accessible online. Those interested can contact the department directly for access.

Figure 3. Field investigation photo of cultural heritage resources in Ningxia (The photo was taken during the field research in July 2021.).

The database encompasses 4873 distinct heritage tourism resources. The spatial coordinate information of the border heritage tourism resources was collected through a series of fieldwork using the Baidu coordinate selector. The data were subsequently converted to the WGS_1984 grid coordinate system and imported into ArcGIS software version 10.8 to obtain the spatial point data.

2.3.2. Basic Data

The Resource and Environmental Science Data Centre of the Chinese Academy of Sciences provided the vector data of Ningxia, municipal administrative boundaries, and governmental sites that were utilized in this paper. The 1:250,000 basic geographic database serves as the primary source of vector data, encompassing major transportation routes and river networks. The Geospatial Data Cloud (www.gscloud.cn) was used to acquire DEM raster data for the study area. The Ningxia 2023 Statistical Yearbook was used to acquire data on the population density, urbanization rate, number of ethnic minorities, and GDP of each city.

3. Results

3.1. Classification of Cultural Heritage Types Based on Conservation Concepts and Tourism Development Needs

The national cultural sector has established relatively well-developed heritage classification criteria. However, these criteria exhibit certain limitations when directly applied to tourism development. To better serve tourism development in the Ningxia region, the classification system was optimized and adjusted through a comprehensive analysis of the tourism market's characteristics and tourists' requirements. According to the World Cultural Heritage Convention, historical and cultural heritage is classified into categories such as urban planning or artistic aesthetics for items with scientific, aesthetic, and cultural value and national symbols or religious beliefs for items with sentimental value. This paper refines the original classification of cultural heritage into six primary categories, emphasizing tourism development value and spatial function, including sightseeing value and tourism attraction. The categories are remains of living and residential sites, political and military sites, religious and sacrificial sites, sites of production and economic activities, sites and memorials of significant modern events, and locations that promote spirituality.

This paper refines the subcategories of each type of cultural heritage resource in alignment with the primary category divisions. For example, the primary category of living

and habitation sites and monuments is further subdivided into numerous subcategories, such as prehistoric human activity sites and monuments, ancient city sites and settlement monuments, and historical and cultural neighborhoods. Special emphasis is placed on the resources of old sites and memorial sites with significant tourist attractions and educational value within the category of important modern and contemporary events. This approach aims to fully exploit their unique value for tourism development. This refinement not only enhances the accuracy of characterizing cultural heritage resources but also provides more precise guidance for the subsequent development and conservation of tourism. Table 2 details the specifics of the cultural heritage classification scheme employed in this paper.

Table 2. Number and types of cultural heritage resources in Ningxia.

Main Category			Subcategory		
Category	**Amount**	**Percentage (%)**	**Category**	**Amount**	**Percentage (%)**
Remains of living and residential sites	1578	32.4%	Prehistoric human activity sites and monuments	160	3.3%
			Ancient City Sites and Settlement Remains	1342	27.5%
			Historic and cultural district	8	0.2%
			ruins of a palace building	17	0.3%
			former residence of famous person	18	0.4%
			Family residence	15	0.3%
			Ancestral hall	16	0.3%
Political and military sites	1219	25.0%	Places and sites of major political events	20	0.4%
			Places and sites of major military events	67	1.4%
			Great Wall site (monument)	57	1.2%
			Military and civil defence fortress sites (monuments)	286	5.9%
			Beacon mounds for beacons	736	15.1%
			site of a relay station	53	1.1%
Sites of production and economic activities	196	4.0%	Agricultural heritage sites	11	0.2%
			Industrial and mining pits and caves site	76	1.6%
			Transport site	20	0.4%
			Water conservancy site	49	1.0%
			Trade ruin	17	0.3%
			Government granary and treasury	11	0.2%
			Sites of traditional craftsmen's workshops	14	0.3%
Religious and sacrificial sites	1741	35.7%	Religious buildings	294	6.0%
			Place of religious activity	1398	28.7%
			Rock cave	49	1.0%
Sites and memorials of important events in modern times	68	1.4%	Sites of important historical events and institutions	50	1.0%
			Sites commemorating important historical figures and events	18	0.4%
Places for the promotion of spirituality	71	1.5%	Site for the promotion of revolutionary culture	39	0.8%
			Sites for the promotion of building culture	16	0.3%
			Sites for the promotion of a culture of reform	16	0.3%

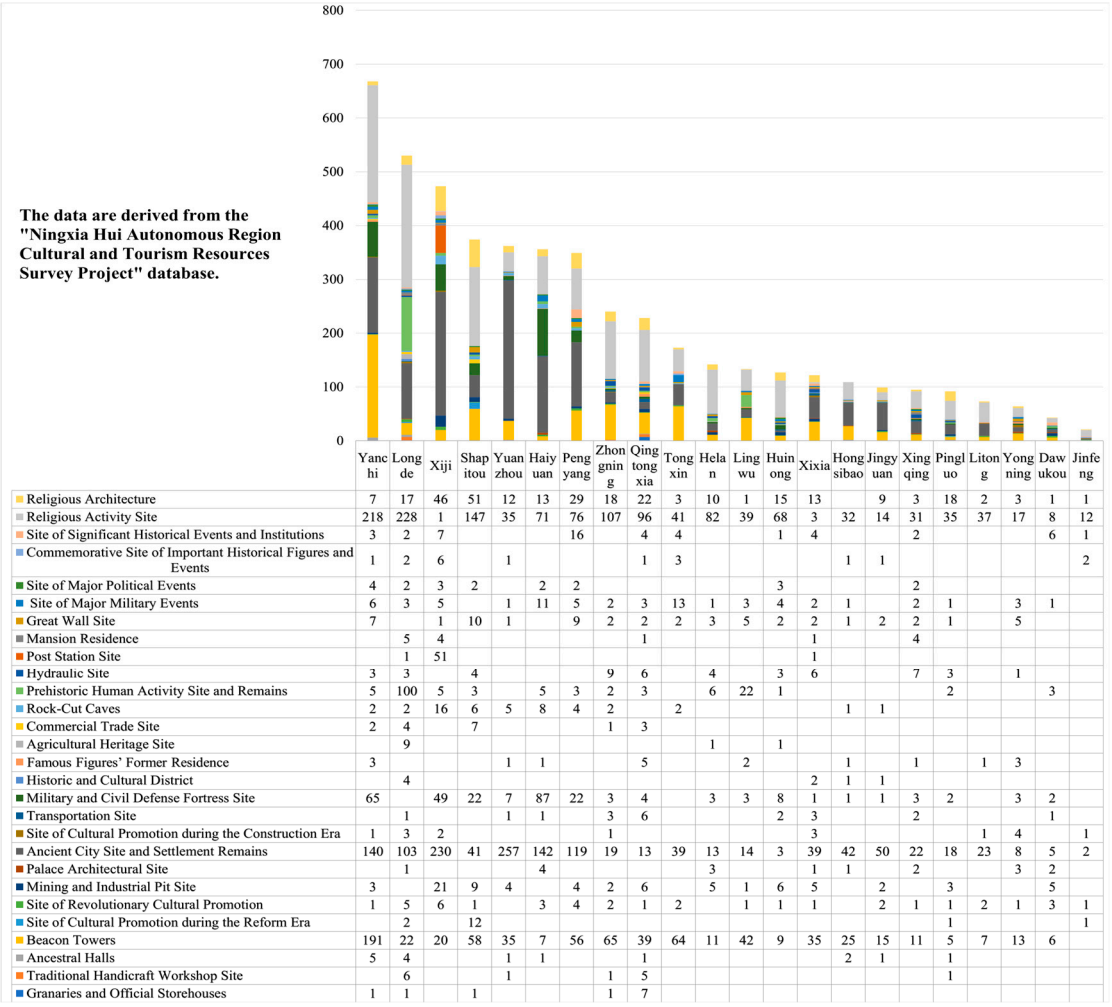
3.2. Comparative Analysis of the Quantity of Cultural Heritage in Different Regions of Ningxia

3.2.1. The Mathematical Characterization of Ningxia's Cultural Heritage Resources

The cultural heritage tourism resources of Ningxia currently consist of 4873 units, divided into six main categories and 28 subcategories. The six main categories are the remains of living and residential sites, political and military sites, sites of production and

economic activities, religious and ceremonial sites, old sites of modern and important events, and memorial sites.

Table 2 and Figure 4 demonstrate that the quantity of distinct categories of cultural heritage resources in Ningxia is highly variable. The most prevalent classification within the primary category is religious and ceremonial sites, which comprise 1741 resource units or approximately 35.7% of the total. The primary categories of cultural heritage resources in Ningxia—living and residential sites, political and military sites, and religious and sacrificial sites—collectively account for approximately 93.1% of the total.



	Yanchi	Longde	Xiji	Shapitou	Yuanzhou	Haiyuan	Pengyang	Zhongning	Qingtongxia	Tongxin	Helan	Lingwu	Huinong	Xixia	Hongsibao	Jingyuan	Xingqing	Pingluo	Litong	Yongning	Dawukou	Jinfeng
Religious Architecture	7	17	46	51	12	13	29	18	22	3	10	1	15	13		9	3	18	2	3	1	1
Religious Activity Site	218	228	1	147	35	71	76	107	96	41	82	39	68	3	32	14	31	35	37	17	8	12
Site of Significant Historical Events and Institutions	3	2	7				16		4	4			1	4			2				6	1
Commemorative Site of Important Historical Figures and Events	1	2	6		1				1	3					1	1						2
Site of Major Political Events	4	2	3	2		2	2						3				2					
Site of Major Military Events	6	3	5		1	11	5	2	3	13	1	3	4	2	1		2	1		3	1	
Great Wall Site	7		1	10	1		9	2	2	2	3	5	2	2	1	2	2	1		5		
Mansion Residence		5	4						1					1			4					
Post Station Site		1	51											1								
Hydraulic Site	3	3		4				9	6		4		3	6			7	3		1		
Prehistoric Human Activity Site and Remains	5	100	5	3		5	3	2	3		6	22	1					2			3	
Rock-Cut Caves	2	2	16	6	5	8	4	2		2					1	1						
Commercial Trade Site	2	4		7				1	3													
Agricultural Heritage Site		9									1		1									
Famous Figures' Former Residence	3				1	1			5			2			1		1		1	3		
Historic and Cultural District		4												2	1	1						
Military and Civil Defense Fortress Site	65		49	22	7	87	22	3	4		3	3	8	1	1	1	3	2		3	2	
Transportation Site		1			1	1		3	6				2	3			2				1	
Site of Cultural Promotion during the Construction Era	1	3	2					1						3					1	4		1
Ancient City Site and Settlement Remains	140	103	230	41	257	142	119	19	13	39	13	14	3	39	42	50	22	18	23	8	5	2
Palace Architectural Site		1				4					3			1	1		2			3	2	
Mining and Industrial Pit Site	3		21	9	4		4	2	6		5	1	6	5		2		3			5	
Site of Revolutionary Cultural Promotion	1	5	6	1		3	4	2	1	2		1	1	1		2	1	1	2	1	3	1
Site of Cultural Promotion during the Reform Era		2		12														1				1
Beacon Towers	191	22	20	58	35	7	56	65	39	64	11	42	9	35	25	15	11	5	7	13	6	
Ancestral Halls	5	4			1	1			1						2	1		1				
Traditional Handicraft Workshop Site		6			1			1	5									1				
Granaries and Official Storehouses	1	1		1				1	7													

Figure 4. Quantity and structure of cultural heritage resources of each county-level administrative unit in Ningxia (data source: "Ningxia Hui Autonomous Region Cultural and Tourism Resources Survey Project" database).

The total number of sites dedicated to the promotion of spirituality, memorials of significant modern and contemporary events, and sites of productive and economic activities is comparatively low, making up less than 7% of the total.

The subcategories of places of religious activity and ancient city sites and settlement remains contain the most resource units, with 1398 and 1342 units, respectively, respectively, accounting for 28.70% and 27.50% of the total. These are followed in numerical order by religious buildings, military and civil defense fortress sites (monuments), prehistoric human activity sites and monuments, industrial and mining pit and cave sites, sites and monuments of major military events, Great Wall sites (monuments), stagecoach station sites, sites of important historical events and institutions, water conservation sites, and

grottoes resources. Lastly, the proportion of resources, including sites for the propagation of revolutionary culture and transportation sites, is approximately 5% for a single unit.

3.2.2. The Spatial Pattern of Cultural Heritage Resources in Ningxia

The multicore aggregation and distribution patterns of various cultural heritage resources across the Ningxia region are evident in the overall kernel density analysis, with the aggregation area primarily expressed in the form of a block and belt (Figure 5). In particular, the cultural heritage resources of Ningxia can be broadly classified into one primary core area, two secondary core areas, and numerous tertiary core areas.

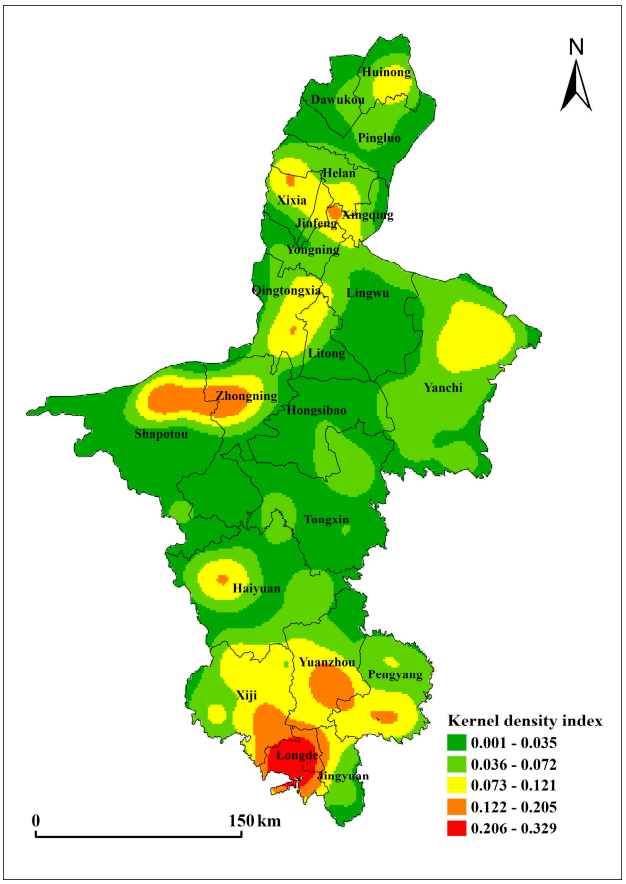


Figure 5. Overall kernel density of cultural heritage resources in Ningxia (data source: "Ningxia Hui Autonomous Region Cultural and Tourism Resources Survey Project" database).

The principal core area is primarily situated in Longde County, which hosts the second-largest concentration of cultural heritage resources in Ningxia. The resource monolith of religious activity sites is particularly prominent among them, occupying 43% of the total number of resources in Longde County. This completely demonstrates the profound heritage of Longde County in terms of religious culture. Furthermore, Longde County is endowed with a wealth of cultural heritage resources, including primordial human activity sites and relics, ancient city sites, and settlement relics, which collectively comprise 38.3% of the total. This underscores the county's distinctive position in the realms of history and culture. In the center of Longde County, the kernel density index can reach 0.369.

The two primary distribution areas in the secondary core area are the southern portion of Yuanzhou District and the junction of Shapotou District and Zhongning County. Ancient city ruins and settlement remains are predominant in the secondary core area located in the southern part of Yuanzhou District, comprising 71.0% of the district's total resources. This reflects the district's profound historical and cultural deposits. In contrast, the secondary

core area, which is situated at the border of Shapotou District and Zhongning County, exhibits a dispersed distribution, with religious and sacrificial sites serving as its primary resource. The Shikongsi Grottoes were a significant cultural and religious center along the Silk Road during the Tang Dynasty, with Shapotou District and Zhongning County serving as significant locations.

Several tertiary core regions are present in the Ningxia region, in addition to these core areas. These regions extend from Panyang County to Xiji County, Haiyuan County, Yanchi County, Qingtongxia City, Xixia District, and Jinfeng District. Their primary resources include locations for the cultivation of spirituality, sites of production and economic activities, and political and military sites. In these tertiary core areas, there is a relatively discrete distribution and a diverse array of resource types (Figure 5).

The remains of living and residential sites in the Ningxia region are primarily characterized by two significant primary core areas and three more distinct secondary core areas, as demonstrated by an in-depth kernel density analysis (Figure 6a). Longde County and Yuanzhou District, which are Level 1 core areas, are home to a significant number of ancient city ruins, settlement remains, and prehistoric human activity sites. These rich cultural heritages completely illustrate the long-lasting culture and history of the Ningxia region.

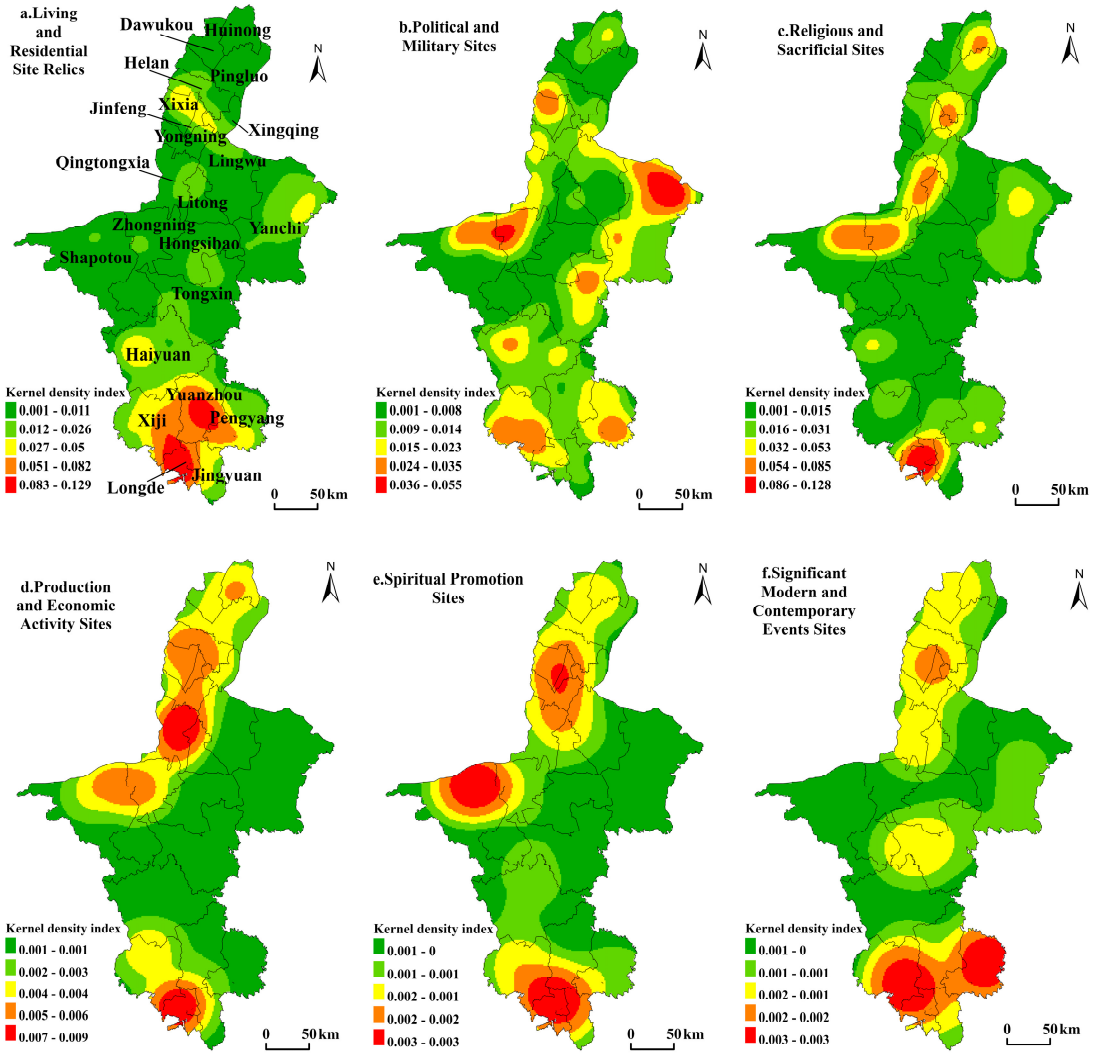


Figure 6. Kernel density distribution of different types of cultural heritage resources in Ningxia (data source: "Ningxia Hui Autonomous Region Cultural and Tourism Resources Survey Project" database).

The distribution of resources for political and military sites in the Ningxia region is characterized by a relatively decentralized distribution and multiple primary areas, resulting in a distribution pattern of "east, west, and south" (Figure 6b). The primary core area in Yanchi County is home to beacon towers and military and civil defense fortress ruins, which are the primary resource types. This reflects the fact that Yanchi County, as a significant military stronghold on the eastern border in ancient times, played a critical role in the preservation of the region's stability and rule.

Furthermore, the distribution of the four secondary core areas is indicative of the significant importance that the ancient rulers of successive dynasties placed on the border defense and internal security of Ningxia. These areas are situated in Xixia District in the north, Zhongning County in the west, Xiji and Panyang Counties in the south, and Tongxin County in the center. Ningxia exhibits a concentrated distribution and a high number of religious and sacrificial site resources (Figure 6c). The significance of religious activities in the Ningxia region and its profound religious and cultural heritage are highlighted by the presence of one primary core area, one secondary core area, and three tertiary core areas. Longde County is a critical geographical area for the Level 1 core area due to its high concentration and abundance of religious activity. The index range for the Level 1 core area is 0.086–0.128.

The secondary and tertiary core areas exhibit a general trend of banding from north to south, whereas they are characterized by block distribution when viewed individually. This distribution pattern not only illustrates the diversity and complexity of religious culture in Ningxia but also the unevenness of religious activities in their geographical development.

In a horizontal comparison, locations with a dense distribution and a high number of religious and sacrificial sites are frequently the core areas of other cultural heritage resources. This suggests that these sites are not only responsible for religious ceremonies but also closely associated with social functions such as education, medical care, and community services, resulting in a composite space that integrates religion, culture, and economy. Furthermore, as illustrated in Figure 6d,e, the distribution of core areas of sites of production and economic activities and the promotion of spirituality are comparable to the distribution of core areas of religious and sacrificial sites. This implies that, in ancient times, religion and rituals were more prevalent, particularly in regions with large populations and developed economies, and that economy and culture were closely intertwined. The kernel density index for religious and sacrificial sites is considerably higher than that of both, which may be attributed to the dense population and religious traditional beliefs of the Hui people in Ningxia. It is important to consider this. Simultaneously, spirituality-promoting locations are often linked to specific historical events and figures, resulting in a more sporadic distribution and scarcity compared to religious and sacrificial site.

In conclusion, Ningxia has a limited number of resources for sites and memorials commemorating significant events from the modern era; however, their distribution is somewhat predictable (Figure 6f). The primary core area is primarily situated in Xiji and Panyang Counties in the southern region, while the secondary and tertiary core areas are primarily situated in Xixia and Jinfeng Districts in the northern region, as well as other geographical regions. The distribution of cultural heritage resources in Ningxia is comparatively dispersed, as evidenced by the fact that the highest index of the Level 1 core area is only 0.003, which is a result of the small number of such resources in the overall scale.

In the investigation of spatial distribution characteristics, the global Moran's Index (Moran's *I*) of cultural heritage resources in Ningxia is 0.472. This value indicates that these resources are not randomly distributed in a spatial layout but exhibit significant aggregation characteristics. Additionally, the index's z-score is 16.821, and it passes the test

at the 0.01 significance level, further substantiating the spatial aggregation and distribution status of Ningxia's cultural heritage resources.

Moreover, the Moran's I Index for the six categories of cultural heritage resources varies: 0.477, 0.389, 0.088, 0.405, 0.096, and 0.020, respectively. Except for locations for the promotion of spirituality, which do not exhibit aggregation characteristics, the other categories show a tendency to cluster. This discovery is of immense importance for gaining a comprehensive understanding of the spatial organization of cultural heritage resources and the mechanisms that underlie their formation in the Ningxia region (Table 3).

Table 3. Indicator system of influencing factors on spatial patterns of Ningxia cultural heritage.

Categories \ Indicator	Moran's *I*	*Z*-Value
Total	0.472	16.821
Remains of living and residential sites	0.477	16.783
Political and military sites	0.389	14.594
Sites of production and economic activities	0.088	3.296
Religion and Places of Worship	0.405	14.299
Sites and memorials of important events in modern times	0.096	3.686
Places for the promotion of spirituality	0.020 *	0.850

* Indicates that the indicator is not significant.

The high values of Moran's I for most categories indicate that similar cultural heritage resources tend to be found near each other, rather than being uniformly spread across the region. This clustering can be influenced by a variety of factors, including historical settlement patterns, geographical features, and socioeconomic conditions.

For example, living and residential remains might cluster in areas that were historically significant for population settlements. Political and military sites may be found in regions that were strategically important during different historical periods. Commercial and trade-related sites could cluster along historical trade routes or market centers.

On the other hand, the relatively low Moran's *I* Index for locations promoting spirituality suggests a more dispersed distribution for this type of cultural heritage. This could be due to the distinct nature of spiritual sites, which often follow unique pathways of development influenced by cultural, religious, and individual community factors.

Understanding these spatial patterns is crucial for effective cultural heritage management and preservation. It allows for more targeted conservation efforts, ensuring that areas with a high concentration of valuable resources receive appropriate protection and maintenance. Additionally, recognizing the spatial aggregation of these resources can help in planning sustainable tourism, educational programs, and community engagement initiatives that are respectful of the historical and cultural significance of these sites.

To conduct a more precise investigation into the spatial distribution pattern of cultural heritage resources in Ningxia, this study employs ArcGIS software version 10.8 to perform a local spatial autocorrelation analysis. Through this methodology, a cluster distribution map of Ningxia's cultural heritage resources was generated (Figure 7). This map visually illustrates the aggregation and dispersion of these resources across geographical space.

The analysis indicates that the "high-high cluster" areas for overall cultural heritage are primarily located along the eastern boundary of Wuzhong City and the southern boundary of Guyuan City. This observation suggests that the eastern and southern border regions of Ningxia are relatively concentrated in cultural heritage resources. These areas could potentially develop into tourism hubs with a specific scale and distinctive characteristics focused on cultural heritage.

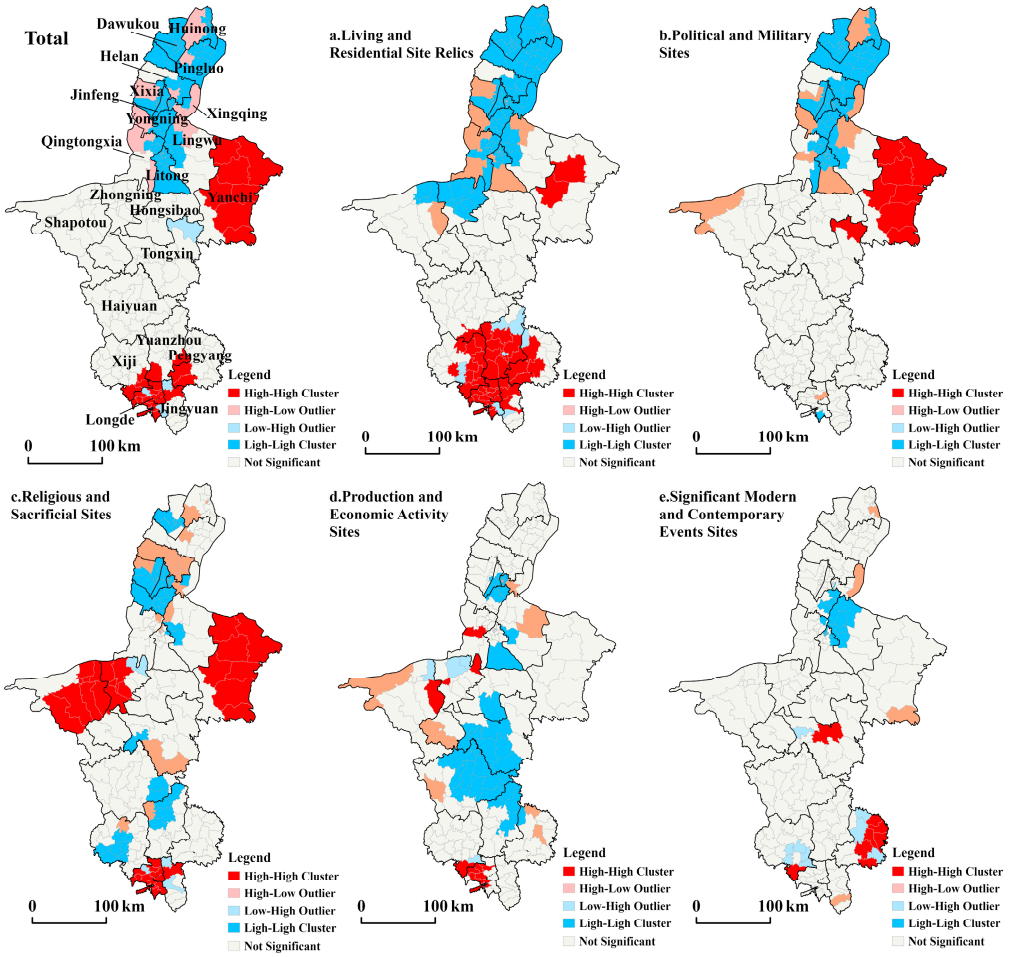


Figure 7. Analysis of the local spatial autocorrelation of different types of cultural heritage resources in Ningxia (data source: "Ningxia Hui Autonomous Region Cultural and Tourism Resources Survey Project" database).

These clusters not only facilitate the preservation and transmission of cultural heritage but also provide substantial support for the development of cultural tourism in the Ningxia region. The concentrated areas of cultural heritage resources are well positioned to attract tourists, thereby promoting both the economic development of the region and the safeguarding of its cultural legacy. The northern regions of Shizuishan City, Yinchuan City, and Wuzhong City are the primary locations of "low-low cluster" areas, which are characterized by a longitudinal strip distribution. The cultural heritage resources in this region are relatively scarce and dispersed, and they are likely to be influenced by a variety of factors, including history, topography, and economy. To enhance the overall competitiveness of cultural tourism, prioritizing resource integration and regional cooperation is crucial for the future development and utilization of cultural heritage resources.

It is important to note that the eastern and western portions of Yinchuan City exhibit a "high-low outlier" phenomenon, which occurs when cultural heritage resources exhibit greater concentration in the outskirts compared to the city center. This attribute may be linked to the urban planning, historical development, and cultural tourism strategies of Yinchuan City. Yinchuan City can establish a distinctive local cultural tourism brand by leveraging this advantage to improve the preservation of cultural heritage and tourism development in these boundary areas.

The local spatial autocorrelation analysis results for living and residential site remains and political and military sites reveal similar patterns, as illustrated in Figure 7a,b. However, the distribution of these two categories of cultural heritage in the southern region of Ningxia

is not uniform. Specifically, there is no substantial large-scale agglomeration of political and military sites, despite the southern region having a broader area and a higher density of living and residential remains.

This discrepancy can be attributed to several factors. The southern region of Ningxia has historically been a significant area for population migration and settlement. This history of human movement and habitation likely contributes to the higher number of living and residential cultural heritages. In contrast, the political center of Ningxia has not been consistently located in the southern region over the long term, and its military significance has not been particularly prominent. As a result, political and military sites are more dispersed in the southern region.

The high density of living and residential remains in the southern region reflects its historical role as a hub for population settlement. People have lived and established communities in this area for centuries, leading to the accumulation of a rich tapestry of cultural heritage related to daily life and residence. On the other hand, the relatively dispersed distribution of political and military sites can be explained by the region's historical political dynamics. Since the political center of Ningxia has shifted over time and has not been consistently anchored in the southern region, fewer political and military structures have been established there. Additionally, the southern region's military importance has been limited, contributing to the lack of concentrated military sites.

In summary, while the southern region of Ningxia has a higher density of living and residential remains due to its role as a significant area for population migration and settlement, its political and military sites are more widely dispersed due to the region's historical political and military dynamics.

The local spatial autocorrelation analysis results for living and residential site remains and political and military sites are comparable, as illustrated in Figure 7a,b. However, the distribution of these two categories of cultural heritage in the southern region is not evenly distributed. There is no substantial large-scale agglomeration of political and military sites, even though the southern region has a broader area and a higher density of living and residential remains. This may be since the southern region of Ningxia is a significant area for population migration and settlement, which may result in a higher number of residing and residential cultural heritages. Nevertheless, the political center of Ningxia has not been consistently situated in the southern region over the long term, and its military significance is not particularly significant. Consequently, the southern region has a relatively dispersed distribution of political and military sites.

The western region is characterized by a dense and abundant distribution of religious and sacrificial sites, while the other five categories of cultural heritage do not demonstrate significant aggregation (Figure 7c). The Xihaigu region in the western region of Ningxia is a popular destination for ethnic minorities, including the Hui people, who have constructed a significant number of religious structures. Factors such as economic underdevelopment and complex terrain may contribute to the dispersed distribution of resources. It is crucial to note that all resource classes in the northern region of Ningxia exhibit a pattern of low-low clustering, as evidenced by the spatial autocorrelation analysis results of the five categories of cultural heritage, both overall and locally (Figure 7). The Yellow River Oasis Belt encompasses this northern region, which is situated on both sides of the river and features level terrain. This geographical condition provides a specific basis for the formation and distribution of cultural heritage.

Interestingly, even though the northern region of Ningxia, including Yinchuan City and Wuzhong City, may have a higher level of economic development compared to the southern region, the degree of aggregation of cultural heritage is paradoxically lower. This

finding suggests that economic development alone does not necessarily lead to a higher concentration of cultural heritage resources.

Nevertheless, some county-level administrative districts, such as Xixia District and Lingwu City within the jurisdictions of Yinchuan City and Wuzhong City, have exhibited high-low disparity results. This could be attributed to the fact that economic development-driven processes, such as urbanization and industrialization, can inflict specific harm on cultural heritage. As urban areas expand and industries develop, they may encroach upon or even displace cultural heritage sites, leading to their degradation or loss.

In comparison, economically developed regions may exhibit superior cultural heritage preservation capabilities due to their more robust economic foundation, superior technological capabilities, ample human resources, and well-established regulatory frameworks. These factors can support more effective preservation and management practices, ensuring that cultural heritage is safeguarded against the pressures of modern development. Consequently, while economic development can pose challenges to cultural heritage preservation, it also provides the tools and resources necessary for effective conservation efforts.

3.3. Influencing Factors and Optimization Strategies for the Spatial Pattern of Cultural Heritage Resources in Ningxia

3.3.1. Selection of Influencing Factor Indicators and Model Construction

The construction of the evaluation index system for the influencing factors of the spatial distribution pattern of cultural heritage resources in Ningxia is based on the following two key considerations. Firstly, a meticulous review and summary of the relevant literature on tourism resources and cultural heritage have been conducted, revealing a large number of overlapping indicators that significantly affect the distribution of cultural heritage [48,49]. Secondly, in view of the particularities of Ningxia's own situation, it has been found that the following elements have significantly influenced the layout of cultural heritage in various aspects:

Natural factors: The natural factors in Ningxia, such as altitude, slope, and water source distribution, have exerted complex influences on the distribution of cultural heritage resources within the region. On the one hand, the high-altitude mountainous areas, the loess plateau margins with moderate slopes, and the Ningxia Plain with abundant water sources provide favorable conditions for the formation and preservation of cultural heritage, making them significant agglomeration areas for cultural heritage, for instance, the Yaoheyuan site in Liupan Mountain, the Shuidonggou site at the edge of the loess plateau, and the Western Xia Mausoleum on the Ningxia Plain. On the other hand, these natural factors also bring about some negative impacts. In high-altitude areas, there are inconvenient transportation and harsh climates; in areas with steep slopes, there are soil erosion and construction difficulties; and in areas with abundant water sources, there are flood threats and climate change.

Social factors: Based on the literature and the actual situation in Ningxia, the distribution of cultural heritage resources is influenced by social factors such as transportation accessibility, distance from major cities, and population density. In areas with convenient transportation, cultural heritage is more likely to be developed. Resources around cities are driven by urban development. Areas with dense populations have abundant labor force and consumer markets. Regions where ethnic minorities live in compact communities have unique cultures. Urbanization affects the protection and utilization of resources. In areas with high per capita GDP, there are sufficient funds for protection and development. In the future, improvements in transportation, urban radiation, population movement, cultural inheritance, urbanization upgrading, and economic development will jointly promote the protection and development of Ningxia's cultural heritage resources.

Considering the reasons, this paper constructs an evaluation index system for the influencing factors of the spatial distribution pattern of cultural heritage resources in Ningxia (Table 4). The indicator system comprises two dimensions: social factors and natural factors. Various indicators are used to collectively discuss the influencing factors on the overall spatial pattern of Ningxia's cultural heritage resources, elucidating each dimension.

Table 4. Ningxia cultural heritage resource spatial pattern influence factors indicator system.

System of Indicators	Detection Factors	Explanation of Indicators
Natural factors	X_1: Altitude	Altitude of cultural heritage resources
	X_2: Slope	Slope of cultural heritage resources
	X_3: Water distribution	Distance of cultural heritage resources from the nearest water system
	X_4: Accessibility	Distance of cultural heritage resources from the nearest major road
Social factors	X_5: Distance to major cities	Nearest distance of cultural heritage resources to prefecture-level municipal government sites
	X_6: Population density	Population density in prefecture-level cities
	X_7: Proportion of population belonging to Ethnic minorities	Percentage of ethnic minorities in prefecture-level cities
	X_8: Urbanization process	Urbanization rate
	X_9: GDP per capita	GDP per capita in prefecture-level cities

3.3.2. The Influencing Factors on the Spatial Pattern of Cultural Heritage Resources in Ningxia

The analysis results of Geo-detector indicate that the explanation of the distribution of cultural heritage resources in Ningxia is significantly different for each detected factor (Table 5). The dominant propelling factors for the overall cultural heritage are the influential social factors. The spatial pattern of cultural heritage resources is somewhat influenced by natural factors such as altitude, slope, and water system distribution; however, the impact is relatively superficial. Conversely, the spatial distribution of cultural heritage resources is more significantly influenced by social factors.

The per capita GDP of the prefecture-level city where the resource site is situated is the primary factor that influences the overall spatial pattern of cultural heritage resources in Ningxia. At a significance level of 0.01, this factor can account for 23.05% of the spatial differentiation phenomenon, suggesting that the spatial aggregation of cultural heritage resources is significantly positively influenced by the per capita GDP of the prefecture-level city. This is likely, since a higher level of economic development is associated with the preservation and advancement of cultural heritage resources.

The spatial pattern of cultural heritage resources in Ningxia is significantly influenced by the level of urbanization (q = 0.230). This factor is second only to per capita GDP, with its q statistic indicating a substantial impact on the spatial aggregation of cultural heritage resources. Regions with higher urban population densities tend to have a greater concentration of heritage tourism resources. As urbanization progresses, more attention and resources are directed towards developing cultural heritage tourism, whereas rural areas with limited resources and slower economic development struggle to support such initiatives.

Table 5. Detection results of spatial pattern factors of cultural heritage resources in Ningxia (*q*-value).

System of Indicators	Detection Factors	Overall Resources	Remains of Living and Residential Sites	Political and Military Sites	Sites of Production and Economic Activities	Religious and Sacrificial Sites	Sites and Memorials of Important Events in Modern Times	Places for the Promotion of Spirituality
Natural factors	X_1: Altitude	0.115	0.248	0.010	0.379	0.160	0.103	0.200
	X_2: Slope	0.012	0.071	0.004 *	0.018	0.012	0.060	0.006
	X_3: Water distribution	0.068	0.049	0.029	0.083	0.056	0.070	0.083
	X_4: Accessibility	0.057	0.015	0.014	0.048	0.068	0.016	0.031
	X_5: Distance to major cities	0.092	0.036	0.010	0.357	0.119	0.072	0.329
Social factors	X_6: Population density	0.228	0.506	0.076	0.087	0.020	0.550	0.164
	X_7: Proportion of population belonging to Ethnic minorities	0.067	0.149	0.063	0.075	0.012	0.029	0.145
	X_8: Urbanization process	0.230	0.509	0.049	0.046	0.018	0.543	0.149
	X_9: GDP per capita	0.231	0.512	0.097	0.051	0.021	0.489	0.155

* Indicates that the indicator is not significant.

Population density also plays a crucial role, accounting for 22.82% of the spatial differentiation of cultural heritage resources at a significance level of 0.01. Densely populated areas often serve as historical and cultural hubs, where diverse human activities have fostered heritage tourism. Increased population density not only boosts local tourism demand and market potential but also promotes the consolidation of cultural heritage resources.

On the other hand, factors such as altitude, slope, water system distribution, transportation accessibility, distance from major cities, and the proportion of ethnic minority populations have low q-values, indicating a minimal contribution to the spatial differentiation of cultural heritage resources in Ningxia. Overall, the spatial pattern of cultural heritage resources in Ningxia is characterized by a distinct economic orientation, urban dependency, and population reliance. The primary factors influencing the distribution of living and residential site relics are the process of urbanization (q = 0.509) and population density (q = 0.506). These artifacts are primarily located in regions with a higher degree of urbanization, particularly near major cities. This is indicative of the historical close relationship between human settlement activities and relics from living and residential sites. Yinchuan City and Wuzhong City in Ningxia have been significant historical centers of population aggregation, with early urbanization and developed economies and a wide variety of dwelling sites.

The distribution of these resources is most significantly influenced by the proportion of ethnic minority populations (q = 0.063) and per capita GDP (q = 0.097) for political and military sites. Military sites, including beacon towers and the Great Wall, are widely distributed in regions with substantial ethnic minority populations, including Yanchi County and Lingwu City. On the other hand, the lower q-values suggest that these factors do not offer a thorough explanation for the distribution patterns of political and military sites. Nevertheless, ethnic diversity has a distinctly positive impact on tourism appeal. The traditional festivals and religious activities of the Hui ethnic group in Yanchi County offer visitors a unique cultural experience. Moreover, the handicraft market in Yanchi County also attracts many tourists, thereby promoting local economic development. The promotion of tourism appeal by ethnic diversity is multifaceted, including the richness of cultural experiences, social interaction and communication, and the diversification of tourism products. Ethnic diversity is an important social factor that deserves further in-depth exploration in cultural heritage tourism research.

The distribution of production and economic activity sites is primarily influenced by altitude (q = 0.379) and distance from significant cities (q = 0.357). Production activities in Ningxia exhibit distinct regional characteristics across various locations due to differences in geographical environments. For example, the agricultural sites in the Liupan Mountain area are indicative of the adaptive evolution of ancient agriculture in high-altitude regions. Conversely, remote mountainous regions that are located further from cities, such as Guyuan and Zhongwei, have maintained more traditional production sites.

The primary factors influencing the spatial distribution of religious and sacrificial sites include altitude (q = 0.160) and distance from main cities (q = 0.119). These sites are predominantly located in higher altitude areas, particularly in the southern regions of Longde County and Guyuan City, which are known for their rich collection of religious sites, including Buddhist grottoes and Taoist sacred lands. Historically, high-altitude areas have been perceived as closer to the divine, making them ideal for religious activities.

Additionally, there is a significant negative correlation between proximity to cities and the distribution of these sites. Ancient religious sites were often constructed in remote, secluded areas, away from the distractions of everyday life. This is evident in locations such as the mountainous regions of Zhongwei City and Guyuan City. The distance from major economic centers like Yinchuan City and Wuzhong City allows these religious sites

to preserve their original atmosphere and cultural value. The primary factors that influence the spatial distribution of modern and contemporary significant event sites and memorials are the process of urbanization (q = 0.543) and population density (q = 0.550). The Western Xia Tombs in Yinchuan City are an example of a site that is predominantly concentrated in areas with denser populations and is the site of modern and contemporary historical events. These regions are not only the sites of significant historical events, they are also the hubs of contemporary political and economic activities.

Per capita GDP (q = 0.155) and altitude (q = 0.200) are the primary factors that influence the spatial distribution of spiritual promotion sites. The distinctive ethnic culture and historical events of Ningxia are frequently intertwined with sites of spiritual significance. For example, the Liupan Mountain region in Ningxia, which is renowned as one of the origins of China's red culture, is home to a plethora of revolutionary historical sites.

4. Discussion

4.1. Recommendations

Based on the discussion of the influencing factors presented above, this paper offers recommendations for the optimization and protection of Ningxia's cultural heritage resources, as well as their development and utilization, from the perspective of sustainable development:

(1) Economic support and cultural heritage tourism chain development

The protection and development of cultural heritage resources will be directly influenced by the substantial increase in Ningxia's per capita GDP. The government should prioritize investment in the cultural heritage tourism sector, particularly in regions with a higher degree of urbanization, such as Wuzhong and Yinchuan. Simultaneously, the economic transformation of cultural heritage can be achieved by integrating the preservation of heritage with contemporary economic development through the promotion of the cultural heritage tourism value chain.

To be more precise, the government can create a cultural tourism development fund in order to motivate local businesses, cultural institutions, and communities to collaborate on tourism projects and the preservation of cultural heritage. In the interim, the construction of infrastructure, including transportation, accommodations, and cultural facilities, will be expedited in order to draw in a greater number of visitors. In regions with concentrated populations and rapid urbanization processes, it is possible to further develop higher value-added cultural tourism products, including cultural and creative products, cultural festivals, and events, in order to improve the economic role of cultural heritage.

(2) Enhancement of urban–rural cultural heritage development and integration of cultural heritage in urban and rural areas

Urbanization and population density play pivotal roles in shaping the spatial distribution of cultural heritage, including modern historical sites and residential and living sites. Consequently, in order to avert the devastation of heritage resources during urbanization, Ningxia should prioritize the coordinated development of cultural heritage resources in both urban and rural areas.

To prevent the destruction of cultural heritage because of urban expansion, the government should enhance the preservation of cultural sites in areas with rapid urbanization, particularly central cities like Yinchuan. Simultaneously, in sparsely populated rural and remote areas, the development of cultural heritage should be integrated with the rural revitalization strategy to foster the organic integration of cultural heritage protection with rural tourism, thereby establishing an urban–rural cultural tourism development pattern. For example, the development of communities that are based on Hui and Western Xia

cultures can contribute to the preservation of rural cultural heritage in conjunction with economic development.

(3) Increased investment in the protection and development of cultural heritage in high-altitude and remote areas

The distribution of cultural heritage, which encompasses production and economic activity sites, as well as religious and sacrificial sites, is significantly influenced by altitude and distance from major cities. These sites are frequently located in remote or high-altitude regions, which are distant from the main cities.

To safeguard the integrity of the original cultural landscape while moderately developing tourism resources, sustainable development should be promoted for sites located in remote and high-altitude areas by optimizing transportation infrastructure and promoting ecotourism. The economic value of these sites can be transformed while preserving their unique religious and historical values by fostering ecotourism that integrates culture and nature.

4.2. The Development Strategy for Cultural Heritage Resources in Ningxia

This comprehensive strategy demonstrates a thoughtful approach to balancing cultural heritage preservation with sustainable tourism development in Ningxia. Below, we provide a summary and additional insights into each proposed action:

(1) Infrastructure Development

By improving transportation and visitor facilities, the accessibility and convenience of visiting Ningxia's cultural heritage sites can be significantly enhanced. The use of digital kiosks and multilingual guides is especially forward-thinking, as it can provide a modern, inclusive experience for domestic and international tourists alike. Aligning these efforts with green and sustainable infrastructure principles would further support long-term development.

(2) Cultural Tourism Promotion

Organizing flagship events like the Ningxia Hui Culture Festival and Western Xia History Week can create strong cultural branding for Ningxia. Thematic routes, such as the proposed "Silk Road Religious Heritage", are a creative way to integrate local culture into larger narratives, attracting diverse audiences while encouraging cultural exchange.

(3) Urban–Rural Integration

Revitalizing urban heritage areas with heritage-themed commercial zones not only preserves historical spaces but also generates economic benefits for local communities. The promotion of rural homestay programs and agritourism further bridges the gap between urban and rural development, offering visitors immersive cultural experiences while supporting rural livelihoods.

(4) Support for Remote and High-Altitude Areas

Encouraging eco-friendly lodging and training local residents as certified guides helps integrate economic and educational opportunities for communities in remote areas. These initiatives ensure that tourism benefits are equitably distributed while safeguarding fragile ecosystems and cultural sites in these regions.

(5) Policy Support and Legal Framework

The establishment of a Cultural Heritage Development Fund and strong legal protections are essential for maintaining a balance between development and conservation. These measures can provide financial resources and regulatory oversight, especially in urban areas like Yinchuan, where rapid development can pose threats to heritage sites.

By aligning these strategies with the Sustainable Development Goals, Ningxia can position itself as a leader in cultural heritage preservation and tourism innovation. These

efforts not only celebrate the region's rich history and culture but also create economic opportunities and foster social cohesion for future generations.

4.3. Comparison with Other Authors' Research

The scope and perspective of this paper are distinctive. This study adopts a classification framework that seamlessly integrates the concept of cultural heritage conservation with the demands of tourism development, addressing both the developmental value of cultural heritage in tourism and its preservation needs. Unlike many other studies that tend to focus solely on one aspect—either conservation or development—this research bridges the gap. For instance, some studies concentrate exclusively on conservation strategies for cultural heritage [62,63], while others explore the role of tourism in driving development [64,65]. Furthermore, this paper selects Ningxia as the focal area of research. Ningxia's rich multiethnic cultural heritage and distinctive geographical features provide a unique lens for analysis. In contrast, a significant number of previous studies have focused on economically developed regions, often overlooking the specific needs and challenges faced by areas with diverse ethnic backgrounds, such as Ningxia.

The methodology employed in this paper is highly comprehensive and integrative. It combines kernel density analysis, spatial autocorrelation analysis, and the Geo-detector method to investigate the spatial distribution characteristics and influencing factors of cultural heritage. This multimethod approach offers a more nuanced and in-depth understanding of the subject. In contrast, much of the existing literature often relies solely on GIS technology [66,67] or traditional statistical methods, which may provide more limited insights.

This study significantly refines the research process. Guided by the principles of conservation and aligned with the demands of tourism development, it redefines and optimizes the classification criteria for cultural heritage. Specifically, cultural heritage is categorized into six major categories and 28 subcategories, offering a more detailed and practical framework compared to previous studies. This nuanced classification better meets the practical needs of regional tourism development. Furthermore, the study is supported by extensive field surveys conducted between 2021 and 2022, ensuring the data's high level of authenticity, reliability, and timeliness. The inclusion of comprehensive field research addresses gaps that some other studies may have overlooked, further enhancing the rigor and applicability of the findings.

In terms of research conclusions, this paper provides unique insights into the distribution patterns of cultural heritage resources in Ningxia. It identifies a multicenter distribution pattern, along with "high-high aggregation" and "low-low aggregation" areas. This localized and detailed analysis contrasts with other studies that often focus on broader, nationwide cultural heritage distribution patterns [68]. Moreover, the study highlights the predominant role of social factors—such as per capita GDP, urbanization rate, and population density—in influencing the distribution of cultural heritage. Natural factors, such as altitude, are found to be of secondary importance. This conclusion notably differs from some previous studies, which emphasize the dominant influence of natural geographical environments [69]. By shifting focus toward social variables, this study reveals new perspectives on the factors shaping cultural heritage distribution, making it particularly valuable for regional planning and development.

5. Conclusions

This study develops a categorization framework for local cultural heritage sites, grounded in protection principles and tourism development needs. A database of Ningxia's cultural heritage resources was created using pertinent literature and field survey data.

The spatial pattern characteristics of Ningxia's cultural heritage resources were systematically revealed through methods such as kernel density analysis, spatial difference analysis, spatial autocorrelation analysis, and geographical detectors. The findings confirm the characteristic clustered distribution of cultural heritage [70]. The research delves into the primary factors influencing this spatial pattern from both natural and social perspectives. It employs various analytical methods to examine the spatial distribution of cultural heritage in Ningxia, revealing the driving factors behind it. This comprehensive understanding significantly contributes to the conservation of cultural heritage and advances the field substantially. The primary conclusions are summarized as follows:

(1) The cultural heritage resources of Ningxia are both abundant and diverse, consisting of a total of 4873 individual resource units that have been meticulously categorized into six primary categories and 28 subcategories. The category of religious and sacrificial sites is the most abundant, comprising 1741 individual units, which account for 35.7% of the total. The most numerous categories are ancient city ruins and settlement remains, as well as religious activity sites, with 1342 and 1398 individual units, respectively. In general, the vast majority of the total resources are accounted for by the categories of living and residential site remains, political and military sites, and religious and sacrificial sites. Production and economic activity sites, modern and contemporary significant event sites and memorials, and spirit promotion sites are relatively rare.

(2) The spatial distribution of cultural heritage resources in Ningxia exhibits a unique polycentric pattern, forming multiple core areas primarily as blocks and belts. These areas can be categorized into a single first-level core area, two second-level core areas, and numerous third-level core areas, with the highest kernel density value being 0.129. These core areas are interconnected, managing various forms of cultural heritage resources. Longde County stands out as the first-level core area with significant religious cultural heritage. The second-level core areas display a combination of historical and religious significance, while the third-level core areas, which are more dispersed, encompass a diverse array of resource types. Kernel density analysis reveals distinct characteristics for different resource categories, such as living sites, political and military sites, and religious and sacrificial sites. Notably, religious and sacrificial sites are the most concentrated, highlighting the strong influence of religion in Ningxia. The distribution of spirit promotion sites, production and economic sites, and religious sites shows a close relationship between the economic and cultural factors. Although sites and memorials of significant modern and contemporary events are less numerous, their distribution follows a discernible pattern.

(3) The spatial distribution of cultural heritage resources in Ningxia is notably concentrated. Most resources, except for spirit promotion sites, exhibit aggregation characteristics. Local spatial autocorrelation analysis shows that the eastern part of Wuzhong and the southern part of Guyuan are "high-high cluster" areas, which are beneficial for cultural tourism development. In contrast, the northern parts of Shizuishan and Yinchuan are "low-low cluster" areas, indicating a need for better resource integration. The "high-low outlier" areas near Yinchuan City reflect the impact of cultural tourism strategies and urban planning. In the western region, the concentrated distribution of religious and sacrificial sites highlights ethnic settlement characteristics. The complex interplay between conserving cultural heritage and promoting economic development is evident in some counties and cities, despite the overall lower aggregation in the northern part of Ningxia.

(4) Further analysis indicates that the spatial distribution of cultural heritage resources in Ningxia is significantly influenced by various factors, predominantly social ones. Economic indicators such as per capita GDP and urbanization levels play a major role in determining the distribution of these resources. While natural factors like altitude and slope also have an impact, their influence is comparatively minor. Each category of heritage

is shaped by distinct factors: urbanization and population density are key for living sites, per capita GDP and the distribution of ethnic minorities affect political and military sites, altitude and distance from cities influence production and economic activity sites, religious and sacrificial sites are typically found at higher altitudes and in more remote areas, sites of modern and contemporary significant events and memorials are mainly concentrated in densely populated and highly urbanized areas, and spirit promotion sites show some correlation with economic levels and altitude. Overall, the distribution of cultural heritage resources in Ningxia demonstrates clear characteristics of economic orientation, urban dependency, and population reliance. Finally, this paper provides detailed recommendations for the optimization of Ningxia's government policies on cultural heritage from three aspects: economy, urbanization, and altitude.

The innovative aspects of this study are primarily reflected in the following areas: In the first place, this paper employs a heritage research approach based on the concept of conservation, focusing not only on the tourism development value of cultural heritage but also taking into full consideration the protection needs of such heritage. This comprehensive research perspective provides a theoretical basis and practical guidance for the sustainable development of cultural heritage. By conducting a detailed classification and analysis of the spatial distribution characteristics of cultural heritage resources in Ningxia, this paper demonstrates how to maximize the tourism value of cultural heritage while ensuring its protection. In the second place, the selection of Ningxia as a case study is both typical and distinctive. As an autonomous region of ethnic minorities in Northwest China, Ningxia boasts a wealth of cultural heritage resources, especially a large number of religious and ceremonial sites that exhibit a polycentric distribution pattern. This unique geographical and cultural backdrop makes Ningxia an ideal region for studying the relationship between cultural heritage conservation and tourism development. The findings of this study not only provide a scientific basis for the protection and development of cultural heritage in Ningxia but also offer valuable experiences for other similar regions.

However, the study acknowledges certain limitations. The database of cultural heritage resources in Ningxia, developed for this research, could benefit from further supplementation due to the timing of field research and constraints in data continuity. The scientific rigor and precision of the analysis could be enhanced by incorporating more comprehensive and detailed data on roads, water systems, and other factors in future research. This would further refine the system of indicators that influence the distribution of cultural heritage resources. Additionally, it is crucial to conduct a thorough examination of the sustainability of the current tourism development models. This involves scientifically defining the appropriate scope of development for heritage tourism resources to ensure that both development and preservation are pursued concurrently. Such an approach will jointly promote the sustainable development of cultural heritage tourism in Ningxia.

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