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# Corridors Construction and Development Strategies for Intangible Cultural Heritage: A Study about the Yangtze River Economic Belt

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**Abstract:** At present, there is obvious regional segmentation in the protection of intangible cultural heritage (ICH) in the Yangtze River Economic Belt. ArcGIS spatial analysis method and minimum cumulative resistance (MCR) models are used to investigate the distribution characteristics of ICH and the suitability of corridor construction in this region. On this basis, the strategies for heritage corridor construction are proposed. (1) The results show that the density and distribution of ICH in the Yangtze River Economic Belt have distinct regional characteristics: most of the high-density areas are in the eastern region, yet the low-density areas are mainly in the western region. (2) The suitability of heritage corridor construction decreases from west to east, and the unsuitable areas are mainly distributed in the western region. (3) According to the spatial characteristics of heritage distribution and the suitability of regional corridor construction, the ArcGIS spatial analysis method is used to determine 37 heritage corridors in the Yangtze River Economic Belt. (4) On this basis, a corridor construction method that uses linear landscape as the corridor theme and connects individual heritage points is proposed. The development strategy of heritage corridors should be in line with local conditions in different regions so as to realize regional collaborative development. Furthermore, the influence domain of heritage corridors should be further increased.

**Keywords:** intangible cultural heritage; heritage corridor; MCR model; Yangtze River Economic Belt

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## 1. Introduction

Intangible cultural heritage (ICH) refers to the various social practices, concepts, forms of expressions, knowledge, skills and related tools, objects, handicrafts, and cultural sites that are considered by communities, groups, and sometimes individuals to be an integral part of their cultural heritage, according to the Convention for the Safeguarding of the Intangible Cultural Heritage issued by UNESCO in 2003 [1]. Research on ICH has made considerable progress, mainly focusing on the legal protection of ICH [2,3], cultural connotation exploration [4], intellectual property protection of ICH [5–7], digital protection [8–11], tourism development [12–17], etc. At present, the research on ICH focuses on the protection and development of theoretical aspects but ignores the discussion of its sensitivity to the impact of nature and the social environment [18,19]. ICH originates in a specific human-natural environment, and its inheritance requires the nourishment of regional cultural environments, demonstrating typical cultural ecological characteristics [20]. ICH is highly vulnerable to the impact of modern culture and the lack of inheritors, and natural disasters can also affect the living environment of ICH [21]. It is, therefore, crucial to guide the

development strategy of heritage corridors by cultural ecology. cultural ecology theory was first proposed by Julian Steward, and it emphasizes the relationship between humans and the natural ecological environment [22]. ICH is transmitted and passed on through human beings [23]. As the product of human behavior and spirit, ICH is closely related to the regional environment. Therefore, the protection of ICH should not only protect the heritage itself but also the cultural space and survival environment in which it exists [24].

Heritage corridor theory, which originated in 1887, is a method to achieve regional revitalization through the protection and proper development of large-scale linear cultural landscapes. It is also an important method for the overall protection of ICH itself and its living environment. Heritage corridor values the cultural and natural significance of heritage and emphasizes the protection of both cultural heritage and natural landscape. It is a multi-objective protection planning method that pursues heritage protection, regional revitalization, local residents' leisure, cultural tourism, and education in heritage protection areas [25]. In this field, foreign research mainly focuses on national canal heritage corridors [26,27], transnational heritage corridors [28], and cultural heritage tourism development [29–31]. Relevant domestic research began with the construction of the Grand Canal Heritage Corridor by Yu K.J. et al. and currently focuses on the value assessment and cognition of heritage corridors [32–35] and corridor construction from the perspective of cultural routes. Li, Y. et al. used the suitability analysis method of corridor construction to construct the cultural heritage corridor in the Daxing Fenghe River Basin of Beijing [36]. Li, W.X. et al. guided by the concept of heritage corridor, used the MCR model to analyze the corridor construction of the traditional settlements in the Ming Dynasty Great Wall area of Shanxi Province and extracted the potential corridors in the study area [37]. Li, H. et al. used suitability analysis methods to construct the corridor with the ICH of Guizhou Province as the research object and proposed a three-layer protection system of "point-line-surface" [38].

Most of the existing studies focus on the construction of ICH corridors at small and medium scales. There are few studies on spatial suitability analysis and heritage corridor construction based on large-scale linear regions. The protection of ICH needs to be included in China's major development strategies, according to the Opinions on Further Strengthening the Protection of Intangible Cultural Heritage issued by the General Office of the State Council in 2021. The Yangtze River Economic Belt is a major national strategic development region covering 11 provinces in eastern, central and western China. It is a cultural complex composed of minority culture (in Yunnan and Guizhou), Ba-Shu culture (in Sichuan and Chongqing), Chu culture (in Hunan and Hubei), Wuyue culture (in Shanghai, Zhejiang, Jiangsu, Anhui, and Jiangxi), with abundant eastern and western cultural resources. As a long-term, continuous and stable factor affecting the distribution of ICH, the historical evolution makes ICH spread and develop among regions [39]. In ancient times, the ancestors of ethnic minorities in the western part of the Yangtze River Economic Belt developed a large number of ICH closely related to life and belief [40]. Later, due to the war, plenty of the Han population migrated westward, and ICH of the Han nationality appeared in the western minority areas. With the continuous development of the ancient economy and society and the economic and social rise of the central region, civil society life gave birth to many ICH. After the Eastern Han Dynasty, Chinese political and economic center and population continued to move southeastward. The increasingly prosperous culture in the eastern region, combined with superior natural and geographical conditions, formed abundant ICH [41,42]. The Yangtze River Economic Zone has a dense water system, and the historical human activities and cultural transportation are mostly linearly distributed along the water system, and the distribution of ICH is also characterized by linear or band distribution, with obvious links between ICH in various regions. However, the traditional protection methods of ICH show obvious regional segmentation [43]. They can no longer meet the requirements of regional protection of ICH, cultural inheritance and regional economic development. Therefore, integrating ICH protection into the trans-regional national major development strategy will be the top priority of regional ICH protection.

This paper, therefore, based on large-scale spatial analysis, discusses the spatial distribution characteristics of ICH types in the Yangtze River Economic Belt and uses the minimum cumulative resistance (MCR) model to study the corridor suitability of the study area. The ArcGIS spatial analysis tool is used to analyze the location of the heritage corridor in the study area. On this basis, the corridor construction strategy considering linear landscape, individual heritage points, and influence domain is proposed. This paper attempts to integrate the regional collaborative protection mechanism of ICH into the national major strategy of the Yangtze River Economic Belt. It aims to provide a scientific foundation for the preservation of heritage resources through the establishment of thematic corridors and the promotion of cross-provincial cultural exchanges and communication. Furthermore, this paper offers a novel approach to the construction of an overall collaborative protection mechanism for ICH in the Yangtze River Economic Belt.

## 2. Methods and Data

### *2.1. Study Area*

The Yangtze River is the golden waterway of China, with a network of rivers and lakes forming an important ecological barrier and connecting 19 provincial-level administrative regions in southern China. The Yangtze River Economic Belt, spanning from western to central and eastern China, covers nine provinces and two municipalities, including Yunnan, Sichuan, Guizhou, Chongqing, Hunan, Hubei, Jiangxi, Anhui, Jiangsu, Zhejiang, and Shanghai. It is a significant inland economic belt in China and a development zone for coordinated interaction among the western, central and eastern regions [44]. The terrain of the Yangtze River Economic Belt is high in the west and low in the east, featuring diverse landforms and various ethnic groups, as well as abundant natural and cultural resources. By December 2021, there were 1473 ICH items in the Yangtze River Economic Belt, accounting for 40.8% of China's total (Figure 1). It is not only an area rich in ICH resources but also a pilot area for constructing intangible cultural heritage corridors due to its complex geographical space and historical and cultural elements.

The Yangtze River Economic Belt is selected as the research area, not only because of its uniqueness in the regional natural and cultural environment but also because of the unique cultural and regional characteristics of various intangible cultural heritages in the Yangtze River Economic Belt. The Yangtze River Economic Belt has a vast territory, many ethnic groups and rich cultural connotations, forming an ICH with unique cultural genes. The western region of the Yangtze River Economic Belt is the most important agglomeration area of ethnic minorities in China, forming an ICH with ethnic minority characteristics and rich cultural connotations of ethnic minorities. The central region is the birthplace of Jingchu culture, forming a large number of ICHs related to Jingchu culture and River culture. The eastern region is not only the birthplace of Wuyue culture but was an important world commercial and trade center in ancient and modern times. The ICH of the eastern region has unique characteristics of maritime culture and commercial culture. The establishment of ICH corridors will have a positive and far-reaching impact on protecting and exploring the ICH of the Yangtze River Economic Belt, enhancing the cultural influence of the Yangtze River, and promoting the new leap of internal regional economies.

### *2.2. Data Sources*

All the ICH items in this study were collected from the List of Representative National Intangible Cultural Heritage Items (https://www.ihchina.cn/, accessed on 1 September 2023). By December 2021, the list has included 1557 items in 10 categories (traditional drama, folk literature, traditional music, traditional dance, quyi (Chinese folk art forms, including ballad singing, storytelling, etc.), traditional sports, entertainment and acrobatics, traditional arts, traditional skills, traditional medicine and folk customs), with a total of 3610 sub-items. Vector data of provincial administrative regions, river data, geological disasters, rainfall data and highway data were from the Resources and Environmental Science and Data Center (https://www.resdc.cn/, accessed on 15 August 2023), Chinese

Academy of Sciences. Land use data were from GlobeLand30 (http://globallandcover.com/, accessed on 1 November 2022). Elevation data comes from geospatial data cloud (https://www.gscloud.cn/, accessed on 17 September 2022).

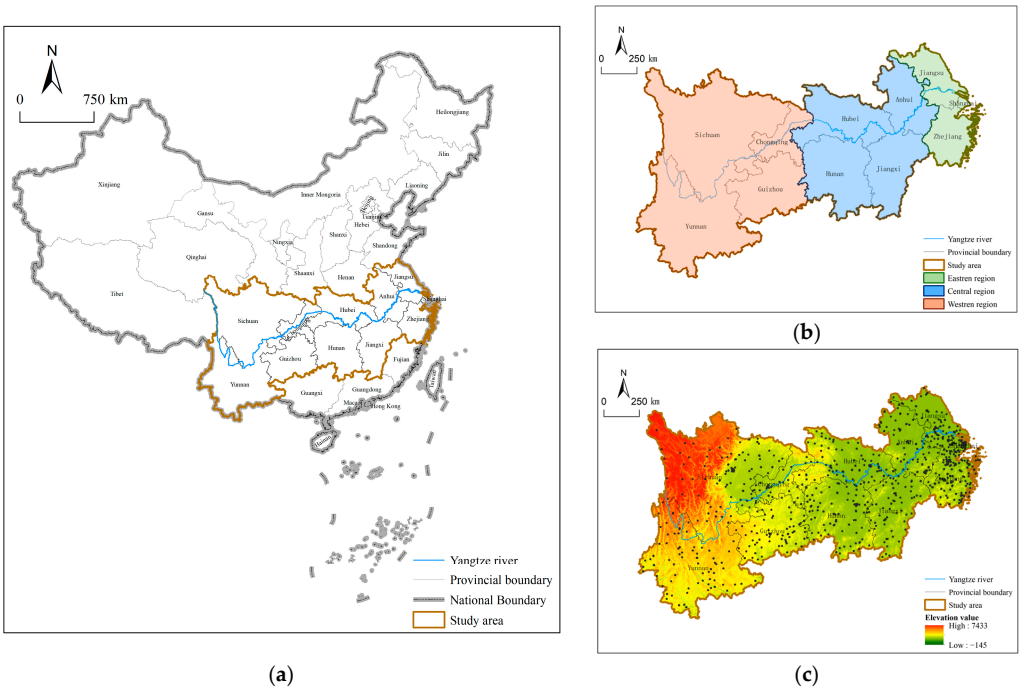



**Figure 1.** Study area. (**a**) Location of the Yangtze River Economic Belt in China. (**b**) The eastern, central, and western regions of the Yangtze River Economic Belt. (**c**) The distribution of ICH in the Yangtze River Economic Belt.

### *2.3. Research Methods*

#### 2.3.1. Kernel Density Analysis

Kernel density analysis can directly reflect the concentration area and concentration degree of ICH in the Yangtze River Economic Belt. The higher the kernel density value, the more concentrated the distribution of heritage points in this area. In the construction of an intangible cultural heritage corridor (hereinafter referred to as heritage corridor), the area with high kernel density is the key area for connecting ICH resources. The kernel density can be calculated by the following formula:

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

where $K$ is the kernel function, $h > 0$ is the preset radius, and $x - x_i$ is the distance from $x$ to $x_i$.

#### 2.3.2. Standard Deviational Ellipse Analysis

Standard deviational ellipse analysis is a common method to measure the trend of a group of points or regions. It summarizes the spatial distribution characteristics of geographical elements by creating a standard deviation ellipse. The results can reflect the central trend, dispersion, and direction of various ICHs. The mean center of the standard deviational ellipse is calculated by

$$X = \frac{\sum_{i=1}^{n} x_i}{n} \quad (2)$$

$$Y = \frac{\sum_{i=1}^{n} y_i}{n} \quad (3)$$

2.3.3. Geological Hazard Susceptibility Evaluation

The information quantity method reflects the susceptibility to geological disasters by the amount of entropy when geological disasters occur [45]. The corridor of the ICH is a kind of heritage protection area to meet the needs of residents 'leisure, tourism and research. The Yangtze River Economic Belt is a region seriously affected by geological disasters in China. Therefore, the impact of geological disasters should be considered in the selection of residents' activity areas. The total amount of information on geological disasters is given by:

$$I = \sum_{i=1}^{n} \ln \frac{N_i/N}{S_i/S} \tag{4}$$

where $I$ is the total information amount, $N_i$ is the number of geological disasters under the condition of specific factors and state $i$; $S_i$ is the number of grid cells distributed under the condition of specific factors and state $i$; $N$ is the total number of geological disasters; $S$ is the total number of grid cells.

2.3.4. AHP

The analytic hierarchy process is a combination of quantitative and qualitative methods [46]. The analytic hierarchy process is used to weigh the resistance factors of the construction of non-heritage corridors in the Yangtze River Economic Belt, and the influence of different factors on the selection of corridor construction locations can be integrated. AHP is given by:

$$CI = \frac{\lambda max - n}{n - 1} \tag{5}$$

$$CR = \frac{CI}{RI} \tag{6}$$

where $CI$ is the Consistency Index, $\lambda max$ is the maximum eigenvalue; $CR$ is the Consistency Ratio; when $CR < 0.1$, The matrix satisfies the consistency test. Otherwise, the matrix does not satisfy the consistency check. $RI$ is the Random Index, which is only related to the matrix order $n$.

2.3.5. Suitability Analysis

The minimal cumulative resistance (MCR) model and GIS technique are used to analyze the suitability of heritage corridor construction. The suitability analysis of the heritage corridor aims to determine the area suitable for constructing a heritage corridor in the Yangtze River Economic Belt by considering various factors. The MCR model was first proposed by Knappen, an ecologist from the Netherlands [47]. Yu et al. first used this model in the study of heritage corridor construction. Various geographical elements in a region have different resistance to heritage activities. The smaller the resistance, the more suitability for the construction of heritage corridors in this region; the greater the resistance, the less suitability for heritage corridor construction [48,49]. The $MCR$ model is given by:

$$MCR = f_{min} \sum_{j=n}^{i=m} \left( D_{ij} \times R_i \right) \tag{7}$$

where $D_{ij}$ is the distance between an ICH point and any point in a resistance factor; $R_i$ is the resistance value of the position of $i$ to corridor construction.

2.3.6. Point Density Analysis

With the point density analysis tool, the density of points around each output picture element can be calculated from the points falling into the neighborhood around each element. Given the wide scope of the Yangtze River Economic Belt and the large number of ICH resources, the point density analysis is used to determine the high-density areas of

ICH distribution. These areas are the key positions along the routes of heritage corridors in the Yangtze River Economic Belt.

## 3. Results and Analysis

### *3.1. Spatial Distribution Characteristics of ICH*

#### 3.1.1. Overall Pattern of ICH Distribution

The distribution of ICH in the eastern, central, and western regions of the Yangtze River Economic Belt and each provincial-level administrative region is shown in Figure 2. No significant difference is observed in the number of ICHs among the three regions, with slightly more in the western region and the least in the central region. There are 494 items in the eastern region, accounting for 33.54%; 469 items in the central region, accounting for 31.83% and 510 items in the western region, accounting for 34.63%. However, the number of ICH items varies significantly among different provinces. Specifically, Zhejiang has over 200 items, making it the province with the largest number of ICH items, accounting for 17.45% of the total. The number of heritage items in Jiangsu, Sichuan and Guizhou falls between 150 and 200, accounting for 32.12% of the total. The number of ICH items in Hunan, Hubei and Yunnan ranges from 100 to 150, accounting for 28.98% of the total. Provincial-level administrative regions with fewer than 100 items are Shanghai, Anhui, Jiangxi and Chongqing, accounting for 21.45 of the total. The number of items in Chongqing is the smallest, with 53 items, accounting for only 3.60% of the total.

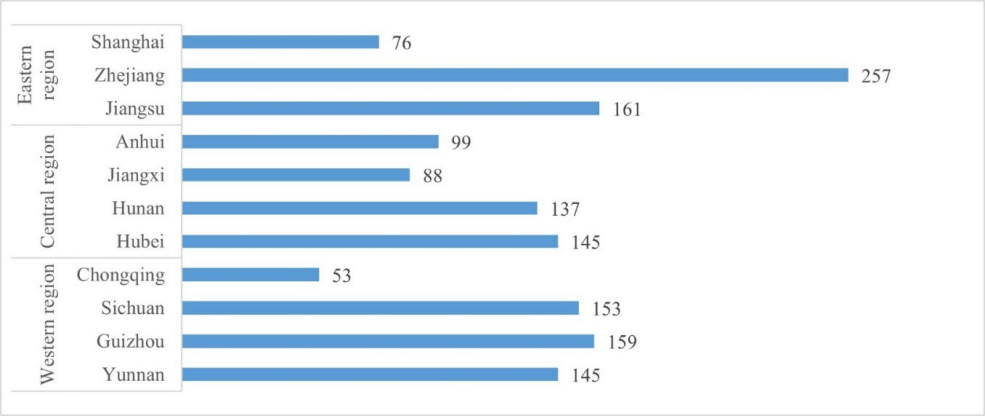



**Figure 2.** Quantity distribution of national ICH items.

The quantity distribution of ICH in the Yangtze River Economic Belt is roughly even. However, due to economic development, diverse cultures, and the size of the administrative region, the spatial distribution of ICH shows great differences. To explore the overall characteristics of ICH distribution, the ArcGIS kernel density analysis tool was used to analyze the overall spatial distribution pattern of ICH in the Yangtze River Economic Belt, as shown in the kernel density map of ICH in Figure 3. In general, the spatial distribution of ICH has distinct core areas and sparse marginal areas. It has an obvious coupling relationship with the regional economic development level. Obviously, the intangible heritage resources are more densely distributed in the eastern coastal areas than in the central and western regions, forming two high-density, three medium-density and several low-density areas. Specifically, the eastern high-density area is centered on the Yangtze River Delta, influencing southern Jiangsu, Shanghai, Zhejiang, and eastern and southern Anhui. By contrast, the western high-density area is centered on Guizhou. The three medium-density areas are the ICH distribution area centered on Chengdu of Sichuan Province, the medium-density area centered on Wuling Mountain at the junction of Hunan, Chongqing, Hubei and Guizhou, and the medium-density core area centered on Wuhan in eastern Hubei Province. The low-density areas are mainly distributed in northeastern Hunan, central Hubei, southwest Chongqing, southern Sichuan, and northern and central Yunnan.

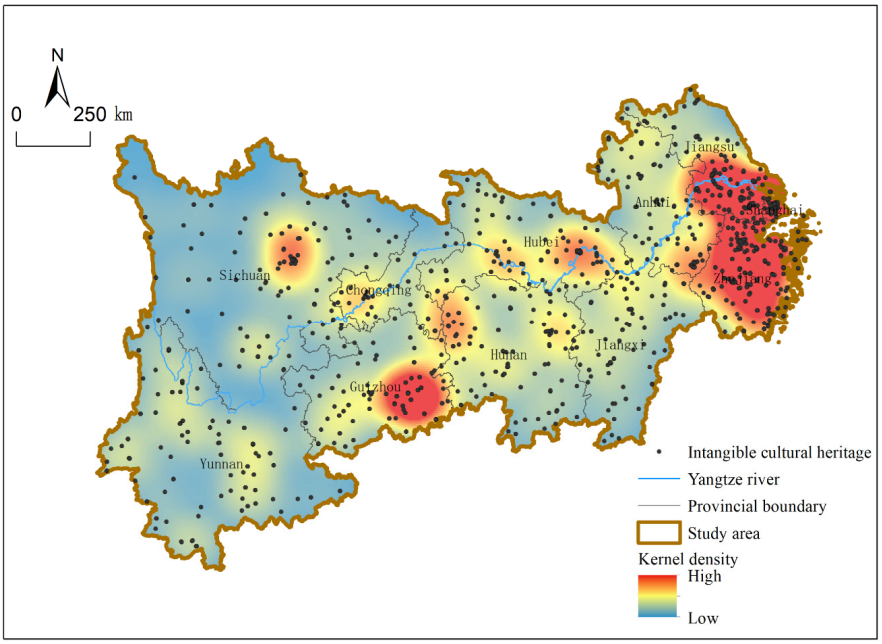



**Figure 3.** Overall pattern of ICH distribution.

3.1.2. Regional Distribution Differences of ICH Types

The Yangtze River Economic Belt consists of 11 provincial-level administrative regions, including nine provinces and two municipalities directly under the Central Government. The quantity and type of ICH vary among administrative regions.

There are many types of ICH in the Yangtze River Economic Belt, but their distribution has obvious spatial differences. As for traditional drama items, Hunan has the largest number of 32; Zhejiang, Jiangsu, Anhui and Hubei has littler difference in quantity; Shanghai and Chongqing have the smallest quantity. Folk literature is mainly distributed in Zhejiang, Hubei and Yunnan, among which Zhejiang has the largest number of 24 items, while Jiangxi has the least number of items. There is little difference in the number of traditional music items among provinces, with Jiangsu, Hubei, Sichuan and Guizhou having more than 20 items. Yunnan has the most traditional dance items of 30, while Shanghai and Chongqing have the smallest, with four items for each. The quantity of quyi and traditional sports, entertainment and acrobatics varies significantly among the provinces, with Zhejiang having the largest number. Traditional art is more concentrated in Zhejiang, Jiangsu and Sichuan, and Yunnan has the smallest quantity, with six items. The quantity of traditional skills varies significantly among provinces. Among them, 54 items are distributed in Zhejiang, more than 30 items are distributed in Jiangsu, Sichuan and Guizhou, and Chongqing is the least. The number of traditional medicine items is small in all provinces, with little difference in distribution. There is a great difference in the number of folk custom items, with more than 30 distributed in Zhejiang and Guizhou, and less than 10 in Shanghai, Anhui and Chongqing (Table 1).

**Table 1.** Quantity and geographical distribution of national ICH items.

| Geographic Region | Provincial Administrative Region | Folk Literature | Traditional Music | Traditional Dance | Traditional Drama | Quyi | Traditional Sports, Entertainment and Acrobatics | Traditional Arts | Traditional Skills | Traditional Medicine | Folk Customs | Total | Proportion (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Eastern Region | Shanghai | 2 | 9 | 4 | 7 | 5 | 4 | 10 | 19 | 11 | 5 | 76 | 5.16% |
| | Zhejiang | 24 | 15 | 18 | 25 | 28 | 12 | 30 | 54 | 12 | 39 | 257 | 17.45% |
| | Jiangsu | 11 | 21 | 9 | 22 | 10 | 2 | 31 | 38 | 6 | 11 | 161 | 10.93% |
| | Total | 37 | 45 | 31 | 54 | 43 | 18 | 71 | 111 | 29 | 55 | 494 | 33.54% |
| Central Region | Anhui | 5 | 9 | 10 | 25 | 2 | 4 | 9 | 25 | 3 | 7 | 99 | 6.72% |
| | Jiangxi | 1 | 7 | 11 | 17 | 6 | 1 | 11 | 21 | 1 | 12 | 88 | 5.97% |
| | Hunan | 9 | 16 | 13 | 32 | 6 | 4 | 15 | 19 | 6 | 17 | 137 | 9.30% |
| | Hubei | 21 | 28 | 12 | 25 | 13 | 4 | 14 | 10 | 6 | 12 | 145 | 9.84% |
| | Total | 36 | 60 | 46 | 99 | 27 | 13 | 49 | 75 | 16 | 48 | 469 | 31.83% |
| Western Region | Chongqing | 3 | 14 | 4 | 3 | 6 | 1 | 7 | 7 | 4 | 4 | 53 | 3.60% |
| | Sichuan | 7 | 23 | 20 | 11 | 6 | 4 | 25 | 38 | 3 | 16 | 153 | 10.39% |
| | Guizhou | 11 | 20 | 17 | 14 | 3 | 4 | 12 | 31 | 9 | 38 | 159 | 10.80% |
| | Yunnan | 19 | 14 | 30 | 17 | 2 | 2 | 6 | 24 | 6 | 25 | 145 | 9.84% |
| | Total | 40 | 71 | 71 | 45 | 17 | 11 | 50 | 100 | 22 | 83 | 510 | 34.63% |

The quantity distribution of various types of ICH varies significantly among provinces. A kernel density estimation analysis is conducted to identify the concentration features of each type of ICH (see Figure 4), providing references for constructing theme corridors. Overall, the Yangtze River Delta region is the primary concentration area for all types of ICH. Folk art, traditional sports, traditional skills, and traditional medicine are concentrated in this area only, while other types of ICH are distributed in clusters or bands in other areas. Traditional drama shows a strip-shaped distribution. Its high-density areas include the Yangtze River Delta region and spread to the west in a W-shaped pattern, and influencing southern Anhui, northern Jiangxi, eastern Hubei, and northeastern and central Hunan. Folk literature shows a V-shaped distribution and its medium-density areas, including Hubei, northwestern Hunan, and southeastern Guizhou. The high-density areas of traditional music ICH are located in western Hubei, southeastern Chongqing, and southern Guizhou. Traditional dance is concentrated in the Yangtze River Delta region, forming a high-density area. In other regions, such as the Wuling Mountain area at the junction of Hubei, Hunan, and Chongqing, southeastern, southern, southwestern, and southeastern Guizhou, southeastern and northwestern Yunnan, it shows a strip-shaped distribution with medium density. These areas are densely populated by ethnic minorities. The medium-density areas of traditional arts show a strip-shaped distribution in eastern Hubei, western Hunan and southeastern Guizhou, as well as Sichuan centered on Chengdu. The high-density area of folk customs in the western region is centered on southeastern Guizhou, affecting most areas of Guizhou.

#### 3.1.3. Direction Distribution Characteristics of ICH

The standard deviational ellipse analysis in the ArcGIS10.7 software can reveal the directional trend and centripetal degree of distribution of various ICH in the Yangtze River Economic Belt.

As shown in Figure 5, the standard deviation ellipses of various types of ICH are oriented in the northeast-southwest direction, with the centers of the ellipses mostly near the central part of the Yangtze River Economic Belt. The centers of the ellipses for folk literature, traditional skills, traditional drama, and ICH are located in northeastern Hunan, and these types of ICH are evenly distributed in the northeast and southwest Traditional medicine has the strongest directional tendency, with the elliptical center of ICH located in the southwestern part of Hubei. Its standard deviation ellipse has the shortest minor axis, indicating the strongest centripetal force and the most concentrated distribution. Traditional medicine is mainly distributed in Zhejiang and Shanghai, with a focus on non-pharmacological treatment methods of traditional Chinese medicine, playing an important role in fostering traditional Chinese medicine culture. To the east of the elliptical center of traditional medicine, there are also centers for traditional arts, traditional sports, entertainment and acrobatics, as well as quyi. These types of ICH are mostly distributed in the eastern provinces, with quyi being the most concentrated in Zhejiang, and traditional arts in Zhejiang and Jiangsu. These three types of ICH are mainly distributed in the western region with many ethnic minorities, where diverse ethnic cultures have given rise to a wide variety of ethnic music, dance, and unique folk customs. For example, the Peacock Dance of the Dai ethnic group in Yunnan, the Achimu Gu of the Lisu ethnic group, the Dage (Grand Songs) of the Dong ethnic group in Guizhou, the Tujia folk song, the Qiang Calendar New Year in Sichuan, and the Torch Festival are all expressions of the spiritual beliefs of ethnic minorities, reflecting their unique ethnic features.

### *3.2. Identification of Heritage Corridor*

#### 3.2.1. Construction of Overall Resistance Surface

Land use types and environmental factors have different resistance coefficients to cultural heritage leisure and protection activities. The overall resistance surface obtained by comprehensive analysis of various resistance factors is an important basis for measuring the suitability of heritage leisure and protection activities in a certain area [50]. Considering the

natural and cultural environment of the Yangtze River Economic Belt, as well as the function of the heritage corridor in cultural heritage protection, ecological protection, regional development, leisure and entrainment, cultural tourism, research, etc., four indexes of land-use type, elevation, slope and geohazard susceptibility are selected, with the resistance values set to 1–500. The higher the score, the greater the resistance to the construction of the heritage corridor (Table 2).

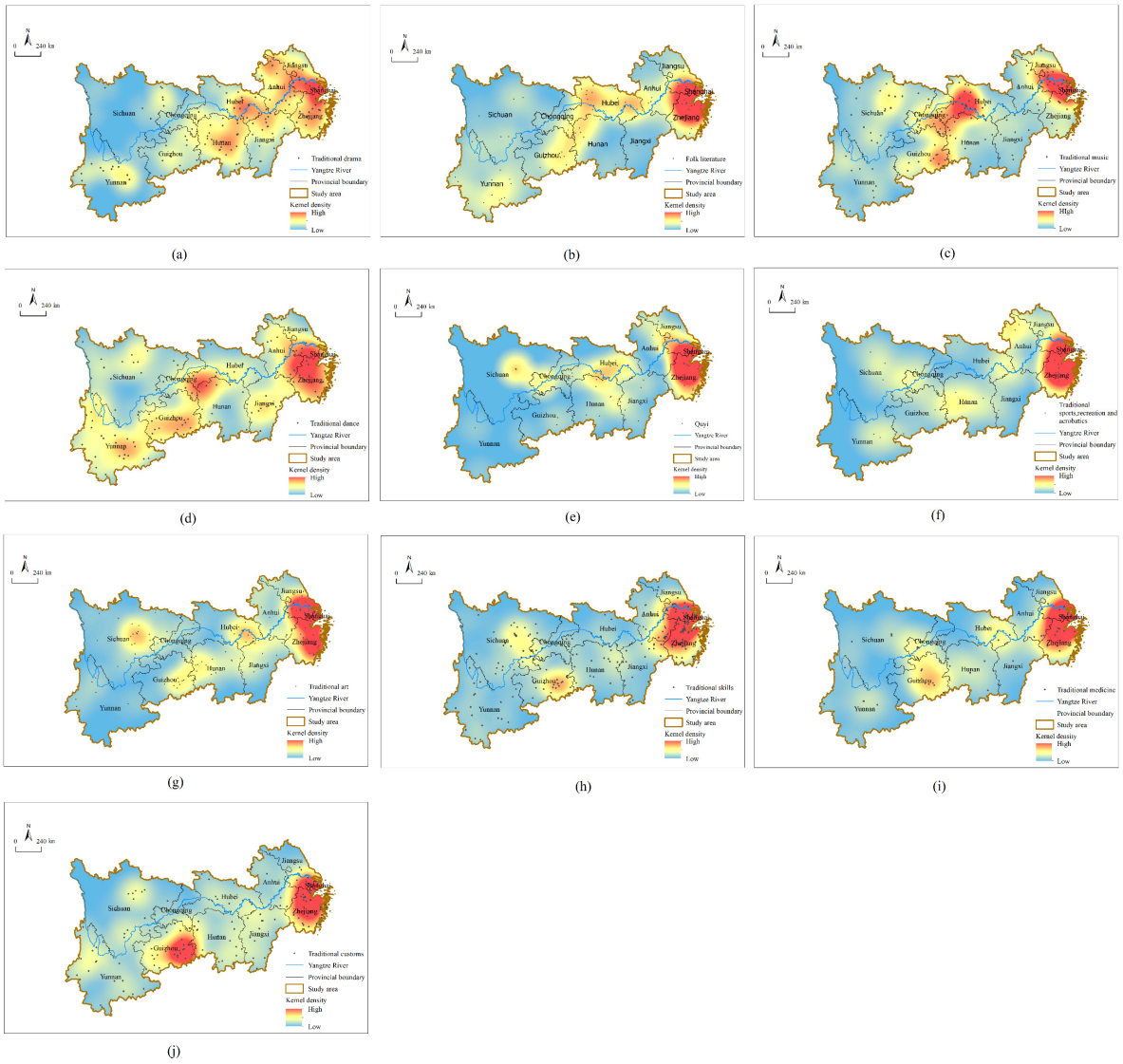



**Figure 4.** Density distribution of various types of ICH (**a**) Traditional drama (**b**) Folk literature (**c**) Traditional music (**d**) Traditional dance (**e**) Quyi (**f**) Traditional sports, entertainment and acrobatic (**g**) Traditional art (**h**) Traditional skills (**i**) Traditional medicine (**j**) Traditional customs.

According to the characteristics of GlobeLand30 data, the current land use situation, and the requirements of corridor construction, the land use types in the Yangtze River Economic Belt are divided into shrubland, wetland, waters, forests, grassland, arable land, construction land, bare land, glacier, and firn field, highways, etc. The Yangtze River Economic Belt runs from eastern to western China, with complex terrain and great elevation differences. Therefore, two topographic factors of elevation and slope are selected as influential factors for heritage corridor construction in the Yangtze River Economic Belt. Given the different impacts of each resistance factor on heritage corridor construction, as well as the compatibility of regional natural conditions to corridor construction, the elevation of the study area are divided into 5 levels: below 500 m, 500–1500 m, 1500–2500 m,

2500–3500 m, and above 3500 m. Additionally, referring to previous research [51], the slope is divided into five levels: 0–3°, 3–8°, 8–15°, 15–25°, and above 25°. The susceptibility of geological disasters in the Yangtze River Economic Belt is evaluated and divided into five grades: highly susceptible, roughly susceptible, moderately susceptible, susceptible and highly unsusceptible. The values of the above resistance factors are mainly determined based on previous studies [52–54]. The analytic hierarchy process (AHP) is used to assign weight to land use type, elevation and slope. Finally, the spatial superposition analysis in ArcGIS 10.7 is applied to obtain the weighted sum of each resistance factor so as to generate the overall resistance surface (Figure 6).

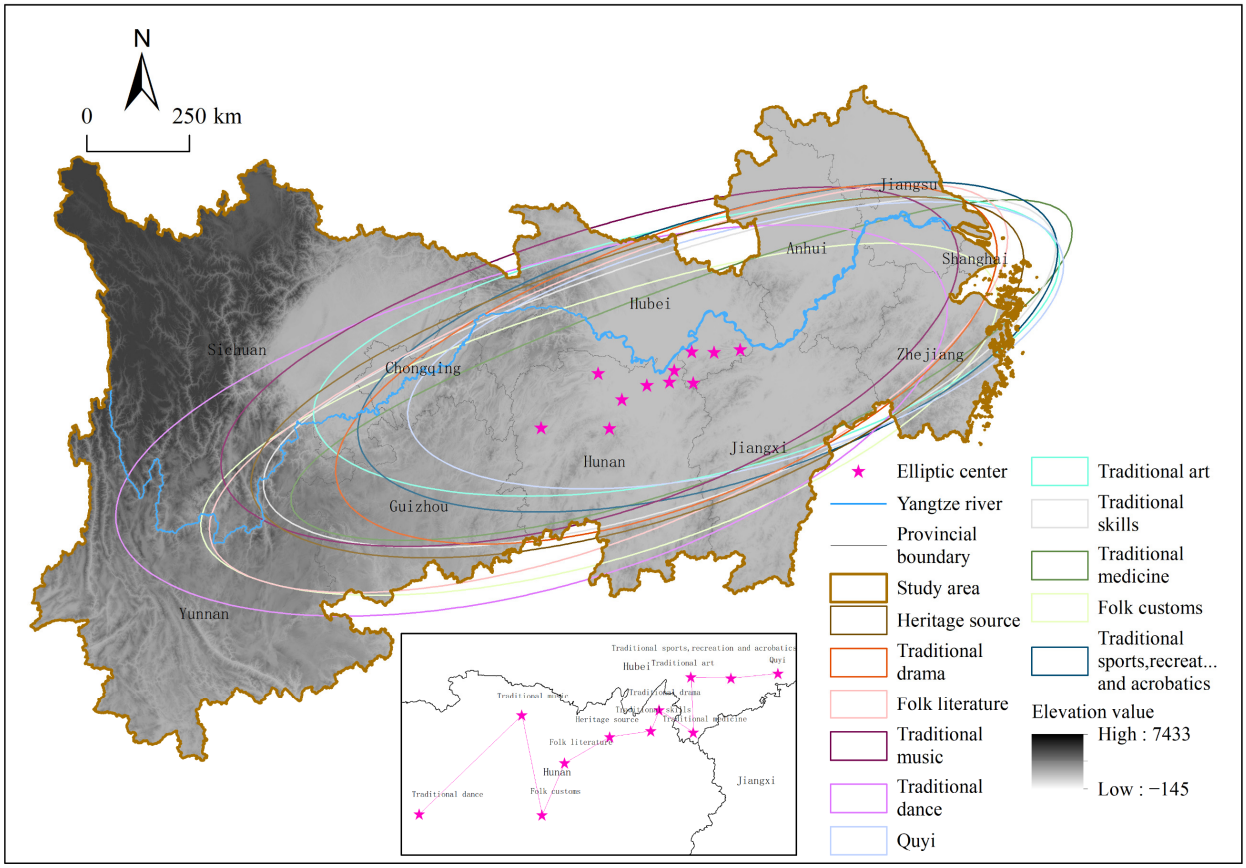



**Figure 5.** Standard deviational ellipse of ICH resources in different provinces.

**Table 2.** Values and weights of resistance factors.

| Resistance Factor | Resistance Classification | Resistance Value (0–500) | Weight |
|---|---|---|---|
| Land-use type | Shrub land/Wetland | 20 | 0.4665 |
| | Waters | 40 | |
| | Forests/grasslands | 60 | |
| | Arable land | 150 | |
| | Bare land/glaciers and firn field | 160 | |
| | Construction land | 200 | |
| | National and provincial highways | 200 | |
| | Highways and railways | 500 | |
| Elevation (m) | <500 | 30 | 0.2020 |
| | 500–1500 | 70 | |
| | 1500–2500 | 100 | |
| | 2500–3500 | 300 | |
| | >3500 | 500 | |

**Table 2.** *Cont.*

| Resistance Factor | Resistance Classification | Resistance Value (0–500) | Weight |
|---|---|---|---|
| Slope (°) | <3 | 5 | 0.2113 |
| | 3–8 | 10 | |
| | 8–15 | 30 | |
| | 15–25 | 100 | |
| | >25 | 500 | |
| geohazard susceptibility | Highly unsusceptible | 30 | 0.1202 |
| | roughly unsusceptible | 70 | |
| | moderately susceptible | 100 | |
| | susceptible | 300 | |
| | Highly susceptible | 500 | |

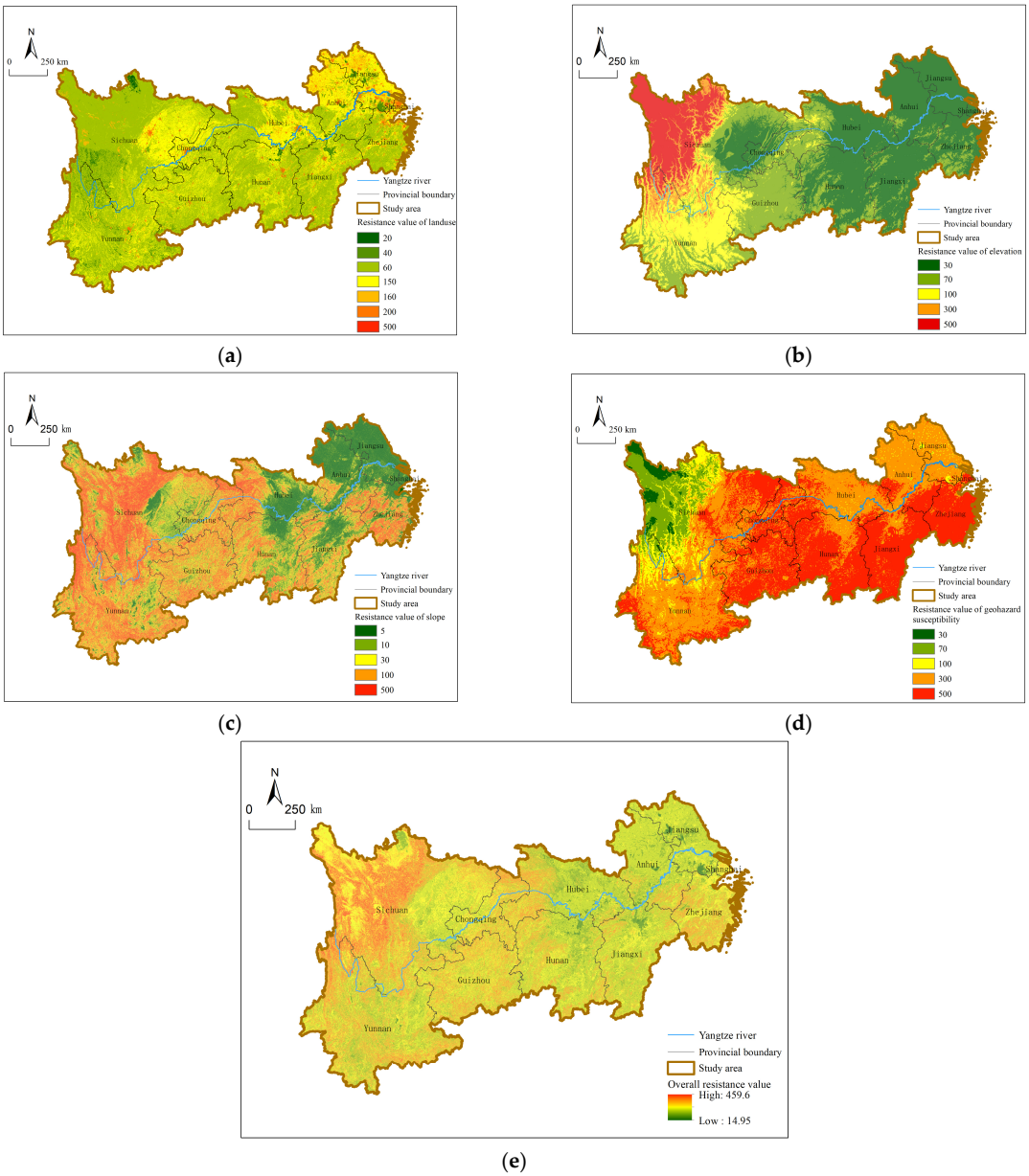



**Figure 6.** Spatial distribution of resistance value of heritage corridor construction (**a**) Resistance value of land-use (**b**) Resistance value of elevation (**c**) Resistance value of slope (**d**) Resistance value of geohazard susceptibility (**e**) overall resistance value.

3.2.2. Suitability Analysis of Heritage Corridor Construction

The ICH points in the Yangtze River Economic Belt are taken as "sources". Based on the overall resistance surface data, the MCR model, the cost distance tool and the reclassification tool in ArcGIS 10.7, the Natural Breaks is used to divide the study area into five levels: highly suitable, suitable, moderately suitable, roughly unsuitable and highly unsuitable. Then the suitability analysis of the heritage corridor construction in the Yangtze River Economic Belt is obtained, as shown in Figure 7.

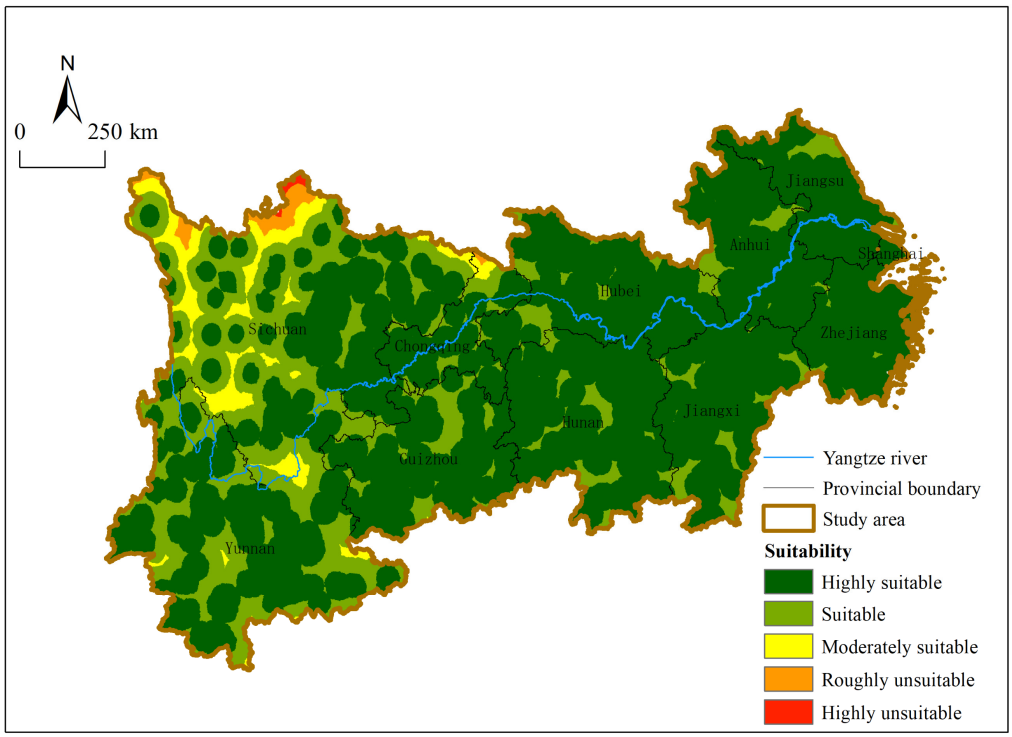



**Figure 7.** Suitability analysis of heritage corridor construction.

Figure 7 shows that the suitability of heritage corridor construction gradually decreases from east to west in the Yangtze River Economic Belt. The unsuitable areas are mainly distributed in the western provinces, among which the highly unsuitable areas are mostly in the northern part of Sichuan. This region is adjacent to Tibet, with high altitude, complex terrain and sparse distribution of ICH, so it is not suitable for the construction of a heritage corridor. The roughly unsuitable areas are mainly distributed in the ethnic minority inhabited areas such as Ganz and Aba prefectures in western Sichuan. These areas are mainly the Hengduan Mountainous Region, with high mountains, steep slopes, vast land and a small population. The ICH sources are sparsely distributed and mostly related to ethnic minorities, so they are not suitable for heritage corridor construction. The other roughly unsuitable areas are located in the border area of Liangshan Prefecture of Sichuan and Yunnan, as well as parts of northern Chongqing. Most of the highly suitable areas are distributed continuously in Zhejiang, Shanghai, Jiangsu, Anhui, Jiangxi, Hunan, Hubei and other eastern and central provinces or cities. Differently affected by complex geographical conditions, the highly suitable areas in the western region are distributed discretely.

## 4. Discussion

### *4.1. Generation of Spatial Features of ICH*

Intangibility is the distinctive feature of ICH, cultural nature is its property, and ethnic identity reflects its belonging. The spatial distribution pattern of ICH is the result of the combined influence of natural and socio-cultural environments [55]. Intangibility of ICH means that its transmission and development requires human beings as carriers.

Therefore, its dense distribution areas are highly consistent with population distribution areas. From the perspective of land use, construction land and agricultural land are the results of human selection and the transformation of the natural environment in the process of human survival and development. These are also areas with intense human activities [39,42] and dense distribution of ICH. The distribution of ICH in the Yangtze River Economic Belt exhibits spatial heterogeneity, with obvious clustered and band-shaped aggregation areas. Moreover, different provinces differ significantly in the quantity of ICH. The clustered ICH areas are located in the eastern Yangtze Delta, which has high economic and cultural development levels, a large population, effective cultural development and protection policies, and a high distribution density of ICH. The band-shaped ICH areas are mainly found on both sides of large rivers, where water resources are essential to human activities, resulting in densely distributed ICH areas.

The distribution of ICH exhibits clear patterns of concentration in plains and along rivers, while the types of ICH present are influenced by regional and ethnic factors [41,56]. From a topographical perspective, the Yangtze River Economic Belt crosses three tiers of terrain, with distinct differences in natural environments among the eastern, central, and western regions. The western region is mostly located in level-one terrain, characterized by high mountains and deep valleys, where many ethnic minorities reside. The high degree of geographical isolation has led to independent evolution and strong local ethnic characteristics of ICH. The central region is located in level-two terrain, rich in river systems, and has been an important economic and political center in history. It is also the birthplace of Jing-Chu culture, with a long history of development and unique cultural features. The eastern region is located in level-three terrain and is adjacent to the sea. It was an important area for ancient trade and communication. The distinct natural environments of the three major regions have given rise to distinctive socio-cultural environments, resulting in significant differences in the distribution of ICH types across the regions. The western region has a large population of talented ethnic minorities. It boasts a diverse range of ICH types, including traditional music, traditional dance, and folk customs. The central and eastern regions, with a long history of development and deep cultural roots, have an abundance of traditional drama and quyi. The eastern region is close to the sea and has given birth to a large number of regionally specific and vibrant ICH, such as fishing songs and boat-building techniques.

### *4.2. Construction Strategy of Heritage Corridor Considering Regional Factors*

#### 4.2.1. Heritage Corridor Construction

Since the Yangtze River Economic Belt covers a wide area of land and is rich in ICH, the ArcGIS point density analysis tool is used. Then, the area with a high density of ICH distribution is selected by kernel density analysis as the key "source" for heritage corridor construction. Finally, the cost path tool is used to generate the heritage corridor. By eliminating redundant corridors, and considering the distribution characteristics of ICH in the study area, 37 heritage corridors are finally obtained (Figure 8).

Considering the suitability of corridor construction, the size of the high-density distribution area, the characteristics of heritage density distribution, and the value of the heritage itself, the 37 corridors are divided into 13 primary corridors, 11 secondary corridors and 13 tertiary corridors. The primary corridors are mainly located in the areas with high suitability for corridor construction and dense distribution of ICH in the central and eastern parts of the Yangtze River Economic Belt. The primary corridors are as follows: four corridors connecting the junction of Jiangsu, Shanghai and Zhejiang with central Zhejiang, southern Zhejiang and southern Anhui; two corridors connecting southern Anhui with eastern Hubei and northeastern Hunan; four corridors connecting the eastern Hubei with southern Hubei, southwestern Hubei, and the junction of Hunan and Chongqing; two corridors connecting the junction of Hunan and Chongqing with southwest Hubei and southeast Guizhou. Most secondary corridors are distributed in the west and central regions, connecting Sichuan with Chongqing and western Hubei, Chongqing with central

Guizhou, central Guizhou with southeast Guizhou, and southeast Guizhou with central Hunan. In the east, by contrast, the secondary corridors connect the northeastern part of Anhui with the junction of Jiangsu, Shanghai and Zhejiang and the western part of Hubei. Considering the suitability of corridor construction, the tertiary corridors are located in the western region, connecting Yunnan, Guizhou and Sichuan provinces.

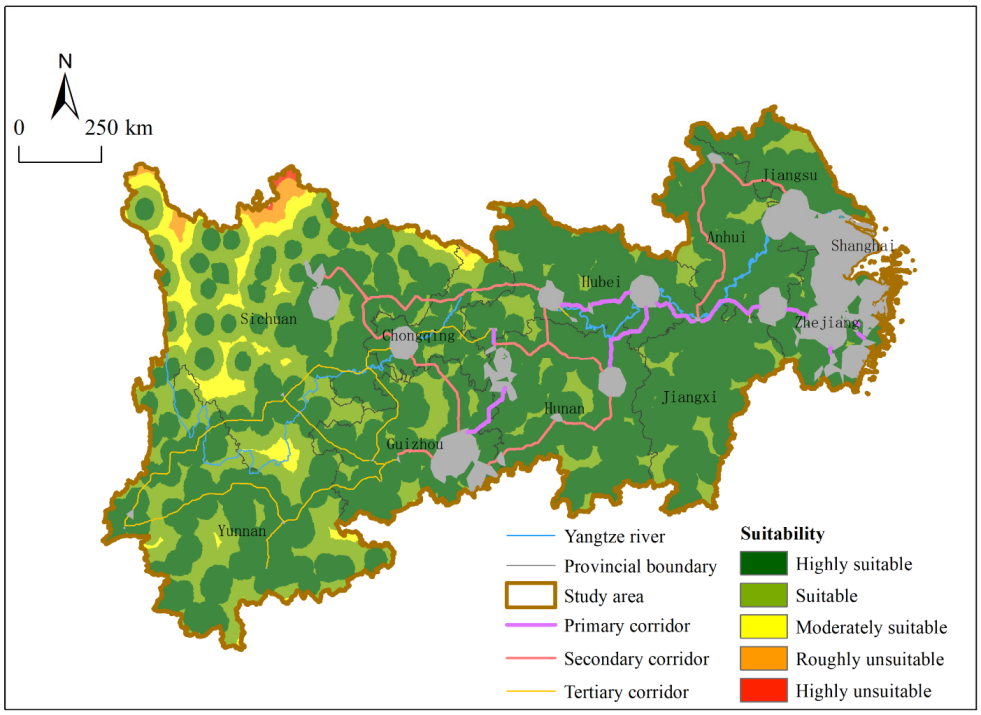



**Figure 8.** Distribution of heritage corridors.

The distribution of potential corridors is closely related to the level of social and economic development and the degree of social civilization. A developed economy, technology, and a developed social civilization system are favorable conditions for the construction of ICH corridors. The eastern region with dense primary corridors has developed economy and technology, complete ICH legislation and superior natural conditions. The central region, which has a rich number of secondary corridors, has a high degree of economic development. Close to the eastern region, it is vulnerable to the radiation of a developed economy, and the suitability of corridor construction is strong. In the western region, except for the eastern part of Guizhou, the western part of Chongqing and the eastern part of Sichuan, the area of high-density areas of other ICH sites is very small. In addition, social and economic development is slow, and the suitability of corridor construction is low, mostly distributed as tertiary corridors.

There are a large number of ICH resources in the Yangtze River Economic Belt. It is difficult to identify all heritage corridors based on suitability analysis. It is, therefore, necessary to develop other corridors based on the identified corridors. A heritage corridor is a linear cultural heritage protection area [57], where the linear landscape constitutes the "skeleton" of the heritage corridor. Therefore, ICH resources can be connected by linear transportation lines, engineering facilities, ethnic corridors, mountains, mountains and valleys. It can not only connect individual heritage points with concentrated heritage areas but also realize the cross-regional integration of heritage sources. For the marginal areas of high-density distribution areas or areas lacking linear landscape, the integration method can be adopted to form small-scale heritage corridors with certain themes by connecting single heritage points [58]. Themed heritage corridors can be built by connecting individual ICHs according to the distribution characteristics and types of ICH. It is an important way to incorporate individual heritage into regional heritage protection.

4.2.2. Development Strategy of Heritage Corridors Based on Regional Differences

The suitability of heritage corridor construction in the Yangtze River Economic Belt declines from west to east. Moreover, the quantity and types of ICH are also significantly different in western and eastern regions. In view of the overall status of ICH in the Yangtze River Economic Belt and the economic conditions of each region, different corridor development strategies should be adopted.

The eastern region is rich in the quantity and type of ICH and has developed a social economy, which is quite suitable for heritage corridor construction. Therefore, it is necessary to strengthen the deep integration of ICH into tourism (resorts, scenic spots, etc.) while avoiding excessive commercialization and loss of its unique characteristics. At the same time, ICH should also be deeply integrated with cultural education to promote the integrated development of ICH and multi-industries, thereby enhancing the dissemination and social influence of ICH. In addition, the heritage corridors in the eastern region are large in quantity, most of which are primary or secondary ones. In this region, Zhejiang, Anhui and Jiangsu are the three provinces where the ancient Grand Canal of China flows through, forming the Caoyun (water transport of grain to the capital in feudal times) Culture and Hui Merchant Culture with strong local characteristics. Therefore, corridors themed with Caoyun Culture and Hui Merchant Culture can be built along the Grand Canal Cultural Zone to realize the regional coordinated development of ICH. Furthermore, Shanghai, as an international city, has more opportunities for international communication than other provinces and cities. So the heritage corridors in Shanghai should emphasize international cooperation and exhibition of ICH, and promote the development of ICH through the Internet, campus, tourism, etc. The corridor theme should highlight the unique urban cultural landscape that integrates Chinese and Western cultures with Shanghai style.

The central region has a profound history and distinct cultural characteristics, which is suitable for heritage corridor construction. The corridors in the interior are mostly primary and secondary corridors, and the areas connected by them have high density, large quantity and diverse types of ICH. The heritage corridors connecting southern Hubei, southwestern Hubei, the junction of Hunan and Chongqing, and southeastern Guizhou are located in the dense distribution area of folk literature and traditional music. It is suitable for constructing the cultural heritage corridor themed with Chinese mythology, ethnic ancient songs, local music, and ethnic traditional music. The secondary corridors connecting western Hunan and southeast Guizhou are surrounded by a dense distribution of traditional arts (dominated by ethnic embroidery, paper-cutting, clay sculpture and carving). It is suitable for constructing corridors themed with national cultural and aesthetic displays, so as to promote the development of cultural and creative products of traditional arts and realize the innovative interpretation of traditional arts.

The western region has a large number of ICH, especially traditional music and dance, with prominent ethnic characteristics. Affected by the complex geographical environment, this region is not suitable for heritage corridor construction. The heritage corridors are dominated by the secondary and tertiary ones. Among them, the corridors connecting southern Yunnan, southwest Guizhou, southeast Guizhou, and the Wuling Mountain area is a high-density distribution area of traditional dance. Therefore, the corridor theme should highlight the characteristics of the diversified and beautiful ethnic culture. The heritage corridor between Sichuan and Chongqing is situated in areas with rich quyi. It is suitable for constructing a quyi heritage corridor with Sichuan and Chongqing characteristics such as Sichuan surd and Sichuan dulcimer. The secondary heritage corridor connecting Sichuan, western Chongqing and southeast Guizhou is surrounded by dense distribution of traditional skills. This secondary corridor is suitable for themes such as clothing weaving, clothing dyeing, building construction, and food manufacturing, thereby promoting the revitalization of traditional skills.

There are obvious differences in cultural background and social and economic development among the eastern, central and western regions of the Yangtze River Economic Belt. Integrating ICH protection into the major strategy of national development is the primary

way to achieve cross-regional cooperation in intangible cultural heritage protection. The eastern part of the Yangtze River Economic Belt has a developed economy and high-tech technology, which can provide economic and technological support for the western and central underdeveloped regions. The western region can promote the spread of the original ICH culture in the eastern and central regions, promote cultural exchanges, and promote national unity.

#### 4.2.3. Expansion Strategy of Heritage Corridors Based on Influence Domain

The influence domain refers to the integrated influence range of heritage points and corridors [59]. The construction of the heritage corridor aims to protect ICH from natural and cultural aspects, not only to protect the cultural heritage itself but also to protect the natural environment of cultural heritage. Expanding the influence domain of heritage points and corridors is also to further expand the boundary of ICH protection so that more social organizations and individuals can participate in the protection, development and inheritance of ICH. Heritage corridor width plays an important role in its planning, which determines the comprehensiveness and efficiency of the protection and development of ICH [60]. The influence domain of heritage corridors is limited, and its distribution and area are affected by the spatial distribution characteristics of the ICH points, the suitability of corridor construction, the direction of the corridor, the social economy and other factors. Therefore, in addition to heritage resource development and heritage corridor construction, it is necessary to increase the influence domain and strengthen regional cooperation with all sectors of society in ICH protection.

In the eastern and central areas with strong suitability for heritage corridor construction, it is necessary to strengthen the integration of ICH with tourism, cultural and education industries to expand the influence domain of heritage corridors. The popularity of regional ICH should be enhanced while ensuring its authenticity. Additionally, the cultural and economic value of ICH should be further explored and increased. It is necessary to enhance the cultural connotation of tourism development and promote ICH exhibition sites as tourist destinations, according to the 14th Five-Year Plan for Cultural and Tourism Development [61]. Therefore, the influence domain of heritage corridors can be expanded by developing tourism. The possible measures include strengthening the publicity of ICH exhibition sites, expanding the tourism market of ICH resources, designing ICH tourism products, and improving tourism transportation and environment. The construction of a heritage corridor will further connect ICH resources and create ICH tourism routes with different themes, and realize integrated and high-quality development of ICH and tourism. Tourism also is an important impetus for regional economic development. The transportation accessibility and tourism suitability of areas with poor ecological environments but rich cultural heritage resources can be improved by developing tourism. Cultural resources, especially ICH resources, can be transformed into tourism resources, and then into economic resources to promote the local economy. The influence domain of a heritage corridor in a region can be increased by further exploring the ICH resources and improving transportation.

The value of ICH has not been fully explored in unsuitable areas in the western region, owing to the poor geographical environment, high resistance to corridor construction and low popularity of ICH. Therefore, the inheritance of ICH is extremely difficult. The influence domain of heritage corridor is concentrated in the urban areas with developed economy and transportation. Therefore, it is necessary to strengthen the development of ICH resources, especially in border areas and ethnic minority areas. Meanwhile, the construction of heritage corridors should be promoted in low-suitability areas like western Sichuan, so that these areas can better participate in the protection of ICH. In this way, the influence domain of heritage corridors can be further expanded, and the vast rural areas become important places for the protection of ICH.

Community participation in cultural heritage management is an important way to expand the impact of cultural heritage [18]. Promoting ICH into the community is an im-

portant aspect of realizing the integration of ICH into people's lives, and also an important way to realize the protection of ICH. It is an important way to expand the influence of ICH at the community level by using the concept of community brand [62], extracting the cultural value of the region, giving full play to the value of inheritors, building a multi-level community-based ICH protection and development system, and promoting the participation of community people in ICH activities. Through the concept of a community brand, "ICH + education" is realized, and the development of ICH into campus activities is promoted to promote the spread of ICH [63].

### *4.3. Contributions and Limitations*

From the perspective of the overall protection of ICH: The Yangtze River Economic Belt has been a region of cultural prosperity and development since ancient times, which carries rich historical information. The ICH of the Yangtze River Economic Belt has a unique historical origin and regional characteristics, which contains profound cultural value [64]. The Yangtze River Economic Belt is not only an important inland river economic belt in China but also an important carrier for the continuation of the Yangtze River culture. However, at this stage, there is less overall research on the ICH of the Yangtze River Economic Belt. A heritage corridor is a linear heritage protection area, and corridor theory is a comprehensive method of heritage protection and utilization. Therefore, combined with the corridor theory, the overall study of the ICH of the Yangtze River Economic Belt, the suitability analysis of the corridor construction, and the extraction of potential ICH corridors, to promote cross-regional communication and collaboration for the Yangtze River Economic Belt, is an important way for the coordinated protection and development of intangible cultural heritage in the eastern, central and western regions of the Yangtze River Economic Belt. This is also an important way to continue the Yangtze River culture.

From the perspective of cultural ecological protection of ICH: As a national development strategy region, the Yangtze River Economic Belt has experienced rapid economic growth and accelerated industrialization. This results in partial damage to the original environment for ICH and the loss of living space for traditional ICH in modern cities [65,66]. Therefore, strengthening the comprehensive protection of ICH from a cultural ecology perspective is an important way to achieve sustainable development of ICH and avoid ICH extinction due to shrinking cultural and natural environments. This paper studies the construction of ICH corridors and identifies spatial characteristics of ICH in the Yangtze River Economic Belt. It conducts a suitability analysis for corridor construction by comprehensively considering natural and human factors and uses spatial analysis methods to build corridors. Furthermore, it provides a new perspective for the overall protection of ICH in the region and a new research direction and protection strategy for the cultural ecological protection of ICH and its living environment.

The limitations of this study are as follows. First, this paper analyzes the construction of a heritage corridor in the Yangtze River Economic Belt based on land use type, elevation and slope. The index system needs to be further improved. In addition, due to the unique and dispersed nature of the data in the study area, this paper fails to carry out a detailed description of corridors in internal regions or smaller regions, which needs to be further discussed in subsequent research.

## 5. Conclusions

By analyzing the suitability and strategies for heritage corridor construction, as well as the spatial distribution characteristics of 1473 national ICH items in the Yangtze River Economic Belt, this paper draws the following conclusions.

(1) The density and distribution of ICH in the Yangtze River Economic Belt have distinct regional characteristics: most of the high-density areas are in the eastern region, yet the low-density areas are concentrated in the western region. The quantity and type of ICH vary among provinces. There is little difference in the quantity of ICH in the east, central and west regions, but obvious difference in the type.

(2) The suitability analysis based on the MCR model shows that the suitability of heritage corridor construction in the Yangtze River Economic Belt decreases from east to west. The unsuitable areas are mainly located in western Sichuan, northern Chongqing, and the junction of Liangshan Prefecture of Sichuan and Yunnan Provinces. The suitable areas are distributed in central and western regions such as Zhejiang, Shanghai, Jiangsu, Anhui, Jiangxi, Hunan and Hubei.

(3) Through the ArcGIS point density analysis tool, the high-density distribution areas of ICH in the Yangtze River Economic Belt are extracted as the key source area for constructing heritage corridors. Finally, a total of 37 main corridors are obtained through screening and identification with the cost path tool. Then these corridors are divided into 16 primary corridors, 12 secondary corridors and 9 tertiary corridors according to the suitability of corridor construction and the size of source areas. Among them, the primary corridors are mostly distributed in the eastern and central regions, the secondary corridors are mainly in the central and western regions, and the tertiary corridors are in the western region. In addition to corridor identification by spatial analysis, linear landscape and integration of single heritage are also important corridor construction methods.

(4) Regional differences should be taken into account in the development of heritage corridors. The Yangtze River Economic Belt runs from east to west, and the characteristics of ICH types in the eastern, central and western regions are distinct. The three regions differ significantly in the suitability of heritage corridor construction. Therefore, different corridor development strategies should be adopted according to the situation of ICH and the regional socio-economic conditions. Due to the limited width of the heritage corridor, it is also necessary to increase the corridor's influence domain, so that more government departments and industries can participate in the protection of ICH.

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