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Abstract: Rural residential land is the main space of a farmer's life, rural culture, and social relations. Prior research of rural residential land has focused more on its evolvement in plain and traditional agricultural areas. Yet, there is no clear picture of rural residential land expansion, especially in ecologically fragile areas. This study analyzed the characteristics of rural residential land expansion based on 30 m spatial resolution land-use datasets of the Baota District of Yan'an City, Shannxi Province, and further explored the influencing factors and mechanisms of rural residential land expansion through binary logistic regression (BLR) modeling. Our findings indicated that the area of rural residential land in the Baota District increased by 116.16% during 1990–2015. More than 75% of the residential land expansion came from the occupation of cropland. Moreover, rural residential land expansion was heterogeneous in the rural regional system. The expansion scale, speed, and mode diversity of rural residential land decreased with the increased distance to urban built-up areas. Geographical conditions and resource endowments are the primary internal driving factors; urbanization and policy implementation are two major external driving forces. The authors suggest that the realization of regional sustainable development in ecologically fragile areas should strengthen urban–rural integration, focus on constructing central towns, and ensure ecological protection measures.

Keywords: rural residential land expansion; sustainable regional development; urban–rural integration; spatiotemporal evolution; influencing factors; Loess Plateau

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1. Introduction

Rural residential land is the main space of a farmer's life, rural culture, and social relations [1], reflecting the human–land relationship, historical background, and socio-political relations in rural areas [2,3]. Since the 19th century, geographers have carried out a range of research on rural residential land [4]. Prior research mainly focused on the spatial distribution of rural residential land and the impact on the natural environment [5,6]. Researchers gradually explored rural residential land's spatiotemporal evolving patterns, influencing factors, and dynamic modeling [7–9] with the rapid development of "3S" technology and mathematical models. The structural equation model, geographic detector, and logistic regression are the methods most frequently used to detect influencing factors [10–12]. Meanwhile, attention has also been paid to rural landscape characteristics [13,14], the impact of rural residential land change on the ecosystem [15], the evolution of rural residential land's function [16,17], and rural residential land reconstruction [18,19]. Researchers generally agree that significant changes have taken place in rural residential land over the past decades.

The hyper-fast change of rural residential land leads to the saliency of sustainable development and urban–rural integration, which have become the focal points for decision-makers and rural planners [20,21]. The rapid growth of residential land is usually at the cost of occupying cultivated land and ecological land [22,23], which requires land planners to tradeoff the conflicts among the human living, production, and ecological land. For instance, the expansion of residential land provides residents with more living space, but this might also result in a deficiency of industrial development and job opportunity [24]. Therefore, decision-makers and rural planners strive to achieve sustainable growth and urban–rural integration through effective management of rural residential land expansion.

To achieve sustainable regional development and urban–rural integration, it is crucial to recognize the evolution progress and formation mechanism of rural residential land expansion. However, extant research has only explored rural residential land spatial distribution and area change [25,26], ignoring the change characteristics and mechanisms of newly added residential land [27]. In addition, most of these studies focused on plain areas [28,29] and traditional agricultural areas [30], but less on mountainous areas and ecologically fragile areas [31].

As the world's largest developing country, China's rapid urbanization has driven unprecedented rural residential land changes over the past few decades. From 2007 to 2015, China experienced a 257.27 million hectare increase in rural residential land [25]. Some problems such as population outflow, eco-environmental pollution, and economic recession, appeared in rural development with the rapid progress of urbanization [32,33]. More importantly, the contradiction between population outflow and rural residential land expansion is becoming increasingly prominent, which seriously restricts sustainable regional development in rural areas. In 2012, China implemented ecological civilization construction as a national development strategy. Therefore, the question of how to realize urban–rural integrated development in ecologically fragile areas has become an urgent problem to be addressed. This paper aims to examine the spatiotemporal evolution of rural residential land expansion in the Baota District of Yan'an City, Shannxi Province, and explore how and why the expansion differs across rural areas. This research's findings help deepen our understanding of rural residential land expansion and its formation mechanism, especially in ecologically fragile areas. Further, this research makes strategic recommendations for sustainable regional development and urban–rural integrated development in ecologically fragile regions.

2. Research Background and Analytical Framework

2.1. The Context of the Chinese Rural Homestead System

Rural residential land reflects the socio-political relations in rural areas, and the rural homestead system also affects the development of rural residential land [2]. The current Chinese rural homestead property rights system originates from rural land reform in the 1950s and can be divided into four stages [34]. From 1949 to 1962, after the completion of rural land reform, the central government confirmed that rural homesteads and houses were owned by farmers, allowing farmers to buy, sell, inherit, and rent homesteads and houses freely. During this period, dwellers mainly applied for homesteads to meet their own housing needs, and the area of residential land increased slowly. From 1963 to 1981, People's Communes were established in rural areas. The central government recognized farmers' long-term ownership and the use rights of their homesteads, and allowed homesteads to be sold and leased. Meanwhile, the Economic Reform and Open up policy in 1978 promoted a house-building craze in the countryside due to farmers' increased farming incomes and their accompanying demand for better living conditions [35]. This house-building craze triggered the phenomenon of occupying cropland for newly added rural residential land. From 1982 to the end of 1996, the central government stipulated that both urban and rural residents could obtain the right to use rural homesteads, but mainly rural residents. During this period, a large amount of high-quality cropland was occupied and thus threatened national food security. For this reason, the Chinese central government implemented strict policies to protect the limited cropland. After 1997, the national law stipulated that rural collectives own rural residential land, and only rural dwellers have the right to use it [36]. Consequently, all rural residential land transactions between urban dwellers and village collectives were outlawed [35]. However, the rapid urbanization process had brought challenges to the implementation of the rural housing system. Many rural dwellers and even rural collectives were lured by the substantial income from renting or selling their houses on collective land to urban dwellers [37]. This challenge resulted in the development of the informal land markets, including small-property-rights housing and "urban villages".

In addition, the poor operation of the rural homestead withdrawal mechanism had led to a prominent problem of building new houses without demolishing old ones. Statistics showed that there were 287 million migrant workers in China [38]. A large proportion of these migrant workers' rural houses were either under-used or entirely left idle before they return to rural areas. Under the current rural house system, the redistribution and circulation of abandoned or under-used houses were discouraged. Therefore, eligible new households were more inclined to apply for new residential land. As a result, the abandonment and expansion of residential land, which coexisted in China's rural areas, exacerbated the human–land relationship conflicts.

2.2. An Explanatory Framework for Rural Residential Land Expansion

Rural residential land change is affected by a variety of factors, including geographical conditions, resource endowments, urbanization, industrialization, urban–rural relations, and policy systems [28–31], etc. (Figure 1). Topography and physiognomy are the primary factors affecting rural settlements′ size and location choice [39], especially in mountainous and hilly areas. In general, the scales of residential land in plain areas are large, and the scales of residential land in mountainous areas are relatively small. Elevation and slope have greatly influenced the safety and convenience of residents′ living and production conditions [40]. Resource endowments include natural resources (light, temperature, cropland, etc.) and social resources (population, technology, knowledge, etc.). Cropland and human resources play a vital role in the change of residential land. Cropland resources determine the upper limit of the population carrying capacity in a particular area, thus restricting the development scale of residential land [41]. Human resources directly affect the changes in residential land through housing demand [42]. Additionally, the effect of natural resources such as light, temperature, and precipitation on residential land changes is mainly reflected on the macro scale [43].

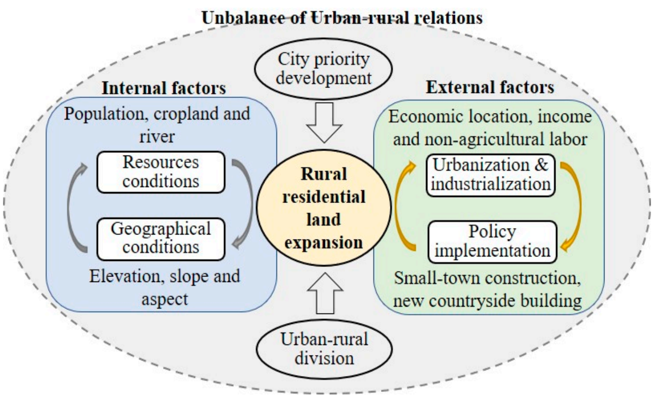

Figure 1. A framework of rural residential land expansion.

The relationship between rural living and production space has changed with the advance of urbanization, industrialization, and the enhanced level of economic development [39]. Firstly, the rapid development of urbanization and industrialization provide more employment opportunities for rural residents and attract laborers to concentrate in cities and towns. Villages near cities have been affected more significantly [7,44]. Consequently, farmers' willingness to renovate and expand their original houses has gradually increased with the non-agriculturalization of the employment structure and increased family income. However, some factories and enterprises began to move to rural areas due to rising urban land rents. The rapid expansion of urban areas will also encroach on surrounding rural areas, resulting in a decrease in rural residential land [45].

With the transformation of urban–rural relations and the strengthening of rural supporting policies, China's rural residential land has entered a new transformation stage. The long-standing urban–rural dual system in China has led to an imbalance of urban–rural relations, with rural development elements flowing unidirectionally to cities and many villages beginning to decline and die [46]. Since the Third Plenary Session of the 16th Central Committee of the Communist Party of China proposed the coordinated development of urban and rural areas in 2003, the State has successively implemented rural supporting policies such as small-town construction, new countryside building, and rural revitalization. Implementing these policies is conducive to enhancing rural development's vitality and realizing the reasonable flow of urban and rural elements [47].

3. Materials and Methods

3.1. Study Area

Baota District (36°10′ N–37°02′ N, 109°14′E–110°50′ E) locates in the middle of the Loess Plateau. With the national strategy of western regional development and ecological civilization construction, this district has become one of the most typical cities in China's fragile ecological areas [19]. The district covers approximately 3539 km^2 (0.55% of the Loess Plateau's whole). With its perennial average sediment transportation at 1.6 × 10^8 t (4.33% of the Loess Plateau's whole), this city is recognized as a typical fragile ecological area for severe soil erosion in China's Loess Plateau (Figure 2). It is also considered a typical valley city. The gully density of the Baota District is 3.04–5.01 km per km^2, and the geographical area of the valley accounts for 41–46% of its total coverage. Compared with the plain area, the development space of the Baota District is very limited.

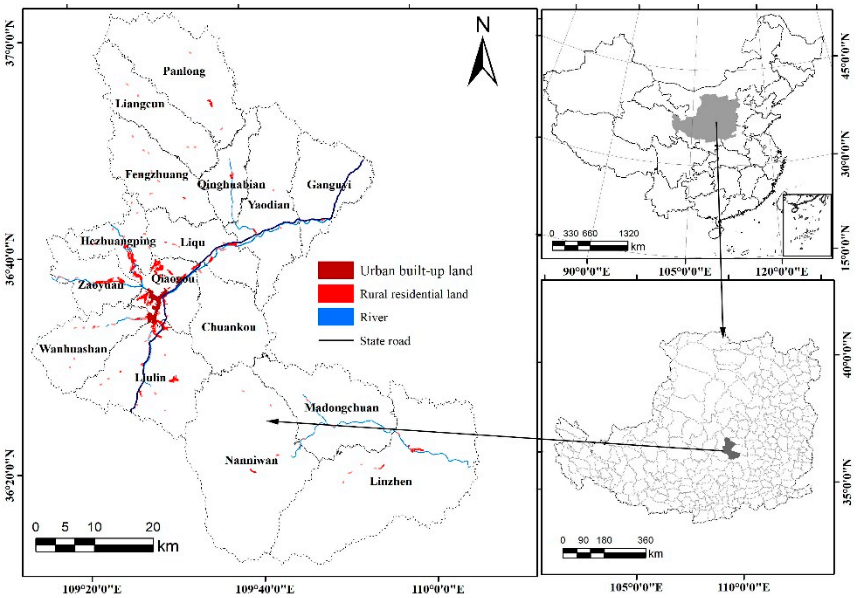

Figure 2. Location of the Baota District.

The district contains 5 streets, 12 towns, and 623 administrative villages, with a population of 478,782. During the process of urbanization and industrialization, the conflicts between population growth and land supply in Baota have intensified. From 1990 to 2015, the average annual growth rate of the rural population in Baota was 0.7%, while the average annual growth rate of rural residential land was 3.1%. The growth rate of rural residential land was much faster than the population growth rate, which restricted sustainable regional development. Hence, the Baota District is a good sample for studying the rural residential land expansion of ecologically fragile areas.

3.2. Data Sources and Preprocessing

The land-use datasets of Baota (1990, 1995, 2000, 2005, 2010, and 2015; 30 m spatial resolution) were acquired from the Data Center for Resources and Environmental Sciences, Chinese Academy of Sciences (RESDC) [48]. Land-use types were classified as cropland, forestland, grassland, water bodies, urban built-up land, rural residential land, industrial land, and unused land. We also adopted field survey and image interpretation to verify the precision of the classified land-use map by randomly selecting 600 points (100 points each year) from the classified land-use map. Rural residential land in this paper is defined as the land for building houses, other constructions for living needs, and the necessary infrastructure.

Socio-economic data referring to labor employment structure, farmer income, and rural population, etc., were mainly collected from the 2015 Statistical Yearbook of Baota District, village statistical data, and partly from the practical survey. Digital elevation model (DEM) data was collected from the International Scientific Data Mirroring Website of the Computer Network Information Center of the Chinese Academy of Sciences (http://www.datamrror.csdb.cn, at 16 October 2018). Elevation, slope, and aspect were obtained based on DEM with ArcGIS 10.2 software (Redlands, CA, USA).

3.3. Methods

3.3.1. Rural Residential Land Expansion Modes

This paper used the landscape expansion index (LEI) to identify rural residential land expansion modes [27,49]. The LEI of each new rural residential land patch was calculated using Equation (1).

$$\mathrm{LEI} = \frac{\mathrm{A}_1}{\mathrm{A}_1 + \mathrm{A}_2} \times 100 \quad (1)$$

where A_1 was the intersection area between the buffer zone and the previously existing rural residential land patch, and A_2 was the intersection area between the buffer zone and previously non-rural residential land. Based on the LEI, rural residential land expansion could be defined into three modes: edge expansion, leapfrog, and infilling. The edge expansion mode was defined as a new patch of rural residential land spreading from an edge, and the LEI was between 0 and 50. If a new patch was isolated from an old patch and the LEI was equal to 0, we defined this mode as leapfrog. The infilling mode referred to the gaps among existing rural residential land being filled with newly added rural residential land, and the LEI was between 50 and 100.

3.3.2. Getis-Ord Gi*

The Getis-Ord Gi* model was used to analyze the spatial agglomeration characteristics of the rural residential land expansion scale. The Euclidean distance was selected as the spatial distance calculation method. The null hypothesis for the pattern analysis tool was complete spatial randomness of either the features themselves or the values associated with those features. The resultant Z(*Gi**) and *p*-values indicate where the features with high or low values were spatially clustered [50].

$$G^*(d) = \sum_{j=1}^{n} w_{ij}(d) x_j / \sum_{j=1}^{n} x_j \quad (2)$$

$$\mathrm{Z}(G_i^*) = (G_i^*(d) - \mathrm{E}(G_i^*)) / \sqrt{\mathrm{var}(G_i^*)} \quad (3)$$

*Gi**(*d*) was normalized to obtain Z(*Gi**). E(*Gi**) and var(*Gi**) were the mathematical expectation and variance of *Gi**(*d*), respectively. If Z(*Gi**) was positive and statistically significant, it indicated location *i* as a hot area of high-value clustering. If Z(*Gi**) was negative and statistically significant, it indicated location *i* as a cold area of low-value clustering.

3.3.3. Potential Influencing Factors Selection

The above analysis about rural residential land evolution in the Baota District found that rural residential land evolution was driven by the interaction between internal and external factors, which could be categorized as basic geographical conditions, resource endowment, urbanization industrialization, and policy regulation (Table 1).

Table 1. Definitions of potential variables.

Category	Potential Variables	Abbr.	Explanation
Basic geographical conditions	Elevation	x_1	
	Slope	x_2	
	Aspect	x_3	
	Distance to cropland	x_4	
	Distance to rivers	x_5	
Resources conditions	Total area of cropland	x_6	
	Per capita cropland	x_7	Total cropland/rural resident population
	Total population	x_8	
	Population density	x_9	Rural resident population/total area of rural
Urbanization & industrialization	Distance to state road	x_{10}	
	Distance to provincial road	x_{11}	
	Distance to urban area	x_{12}	
	Proportion of non-agricultural labors	x_{13}	Number of labors in industry or tertiary/total number of labors
	Per capita income	x_{14}	
Policy implementation	Small-town construction	x_{15}	Is there a "Small-town construction" project in village? Yes = 1, No = 2
	New countryside building	x_{16}	Is there a "New countryside building" project in village? Yes = 1, No = 2

Existing research indicated that topography and resource endowment were the main internal driving factors that affected the change of rural residential land [51], given the effect of light, temperature, precipitation, technology, and knowledge on residential land changes is mainly reflected on the macro scale [43]. Therefore, the topography (elevation, slope, and aspect), geographical location (distance to cropland, distance to rivers), and resource endowment (total area of cropland, per capita cropland, total population, population density) were selected as internal driving factors of rural residential land expansion. In a similar vein, urbanization, industrialization, and policy implication were the main external factors that affect the evolution of rural residential land [52]. As the Baota District is a typical valley city in China's Loess Plateau, traffic conditions play a crucial role in the process of rural development. Besides, the Baota District has successively implemented the policies of small-town construction and new countryside construction since 2003. The implementation of these policies is conducive to enhancing the vitality of rural development, but they were scantly noticed in previous research. Therefore, we selected economic locations (distance to urban area, distance to state road, distance to provincial road), rural industrial transformation (proportion of non-agricultural labor), economic output (per capita income), and policy implementation (small-town construction and new countryside building) as external factors of rural residential land expansion.

3.3.4. Binary Logistic Regression (BLR)

The BLR model is suitable for categorical variables whose dependent variable is binary [53]. In this paper, we defined whether the land patch was an expansion patch of rural residential land as a dependent variable (Yes = 1, No = 0). The formula of BLR is as follows:

$$\ln \frac{P}{1-P} = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k \quad (4)$$

where P was the probability of rural residential land expansion; x_k was the influencing factor; β_k was the undetermined parameters; and β_0 was the intercept.

4. Results

4.1. Temporal Change of Rural Residential Land

As shown in Figure 3, the rural residential land area in Baota increased significantly during 1990–2015. The rural residential land area increased by 116.16% from 1990 to 2015 with an average annual change rate (AACR) of 3.13%, and 84.3% of the newly added rural residential land was distributed below a slope of 15°. Specifically, edge expansion was the primary pattern of rural residential land expansion in Baota during 1990–2015, at over 2.5 times the total area of leapfrog and infilling. The edge expansion pattern amounted to 757.34 ha, accounting for 71.76% of the total expanded area in rural residential land. Leapfrog and infilling patterns were 211.92 ha and 86.05 ha, accounting for 20.08% and 8.16% of the total expanded area in rural residential land, respectively. Besides, the residential areas with leapfrog and infilling patterns increased significantly from 5.17 ha during 1990–2000 to 206.55 ha during 2010–2015.

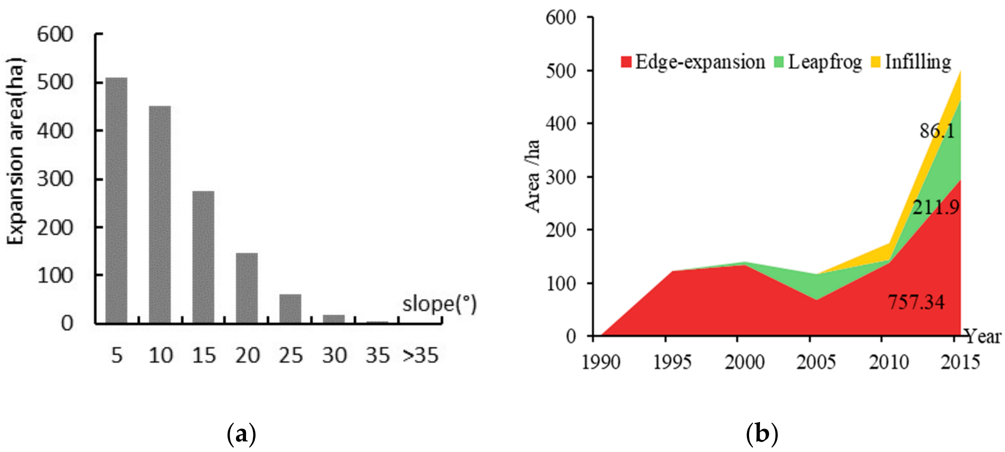

Figure 3. Rural residential land growth in Baota during 1990–2015. Subfigure (**a**) showed the relation between rural residential land expansion and slope in Baota; subfigure (**b**) showed an area-stacked chart of rural residential land expansion patterns in Baota.

Cropland was the main land-use type transferred to rural residential land in Baota, accounting for 75.52% of the total area of rural residential land expansion between 1990 and 2015 (Table 2). The area of grassland transformed to rural residential land was 161.65 ha, or 15.32% of the total expansion in rural residential land. Areas of woodland were reduced by approximately 67 ha, or about 6% of the total rural residential land expansion. Less than 28 ha of river and pond were transferred to rural settlement land, accounting for nearly 3% of the total area of rural residential land expansion. Edge expansion, leapfrog, and infilling modes of rural residential land in Baota caused a cropland loss of 556.16 ha, 163.01 ha, and 77.76 ha, accounting for 73.44%, 76.92%, and 90.36% of the total area of each expansion modes, respectively.

Table 2. Land-use transfer of rural residential land expansion between 1990 and 2015.

Land Type	Total Rural Residential Land Expansion		Edge Expansion		Leapfrog		Infilling	
	Area (ha)	Percentage * (%)	Area (ha)	Percentage ** (%)	Area (ha)	Percentage ** (%)	Area (ha)	Percentage ** (%)
Cropland	796.93	75.52	556.16	73.44	163.01	76.92	77.76	90.36
Woodland	66.71	6.32	63.22	8.35	2.10	0.99	1.39	1.62
Grassland	161.65	15.32	120.18	15.87	35.44	16.72	6.04	7.02
River	22.73	2.15	12.44	1.64	9.42	4.45	0.86	1.00
Pond	5.12	0.49	5.12	0.68	0.00	0.00	0.00	0.00
Grassy marsh	2.16	0.20	0.21	0.03	1.95	0.92	0.00	0.00

* The area of occupied land type as a percentage of the total area of rural residential land expansion. ** The area of occupied land type as a percentage of the total area of each expansion mode.

4.2. Spatial Change of Rural Residential Land

4.2.1. Spatial Agglomeration Changes

Using the Getis-Ord Gi* method, we analyzed the spatial agglomeration change characteristic of rural residential land expansion in Baota during 1990–2015. The spatial agglomeration of rural residential expansion was different during each period (Figure 4). In 1990–2005, only large-scale expanded rural residential land formed agglomeration characteristics, and there were no cluster areas of small-scale expanded rural residential land (Figure 4a–c). Specifically, in 1990–1995 the cluster area of large-scale expanded rural residential land was only distributed around the urban built-up area. In 1995–2000, the cluster areas of large-scale expanded rural residential land shifted to the northwest of the county areas. This may be caused by the small-town construction of Hezhuangping and Zaoyuan receiving development support from the local government. By contrast, the southern villages of the county area developed slower than villages in Hezhuagnping and Zaoyuan. In 2000–2005, southern areas of the county also formed a cluster area of large-scale expanded rural residential land, and it showed typical characteristics of leapfrog development. In 2005–2015, the cluster area of small-scale expanded rural residential land appeared and increased fast (Figure 4d,e). Specifically, in 2005–2010 small-scale newly added rural residential land formed a cluster area in the northeast villages of the Baota District. This indicated that rural residential land expansion in township areas had begun to develop from dispersion to agglomeration. In 2010–2015, the cluster area of small-scale expanded residential land increased from 48 villages to 178 villages.

Overall, the expansion of rural residential land was mainly concentrated around the city and in the river valley, and there was very little expansion of residents in deep gullies.

4.2.2. Uneven Expansion of Rural Residential Land

To further explore expansion characteristics, this paper analyzed the change of scale, speed, and expansion mode diversity of rural residential land in buffer zones with different distances to urban areas (Figure 5). With the increase of buffer distance, the expansion scale, speed, and expansion mode diversity of rural residential land showed the characteristics of decreasing volatility, especially in expansion scale. The reason for the sudden increase of rural residential land expansion scale within the 30–35 km buffer zone may be ascribed to the implementation of the population concentration project in Nanniwan Town, which stimulated the increase of rural residential land. Specifically, the newly added rural residential land was mainly concentrated within the buffer zone's 10 km range and accounted for 80% of the total expansion scale. In terms of expansion speed, the AACR of rural residential land within 10 km of the buffer zone was 5.3%, which was more than twice the AACR of the whole study area. From the perspective of expansion mode, the expansion mode of residential land gradually changed from diversification (edge expansion, infilling, leapfrog) to single (edge expansion).

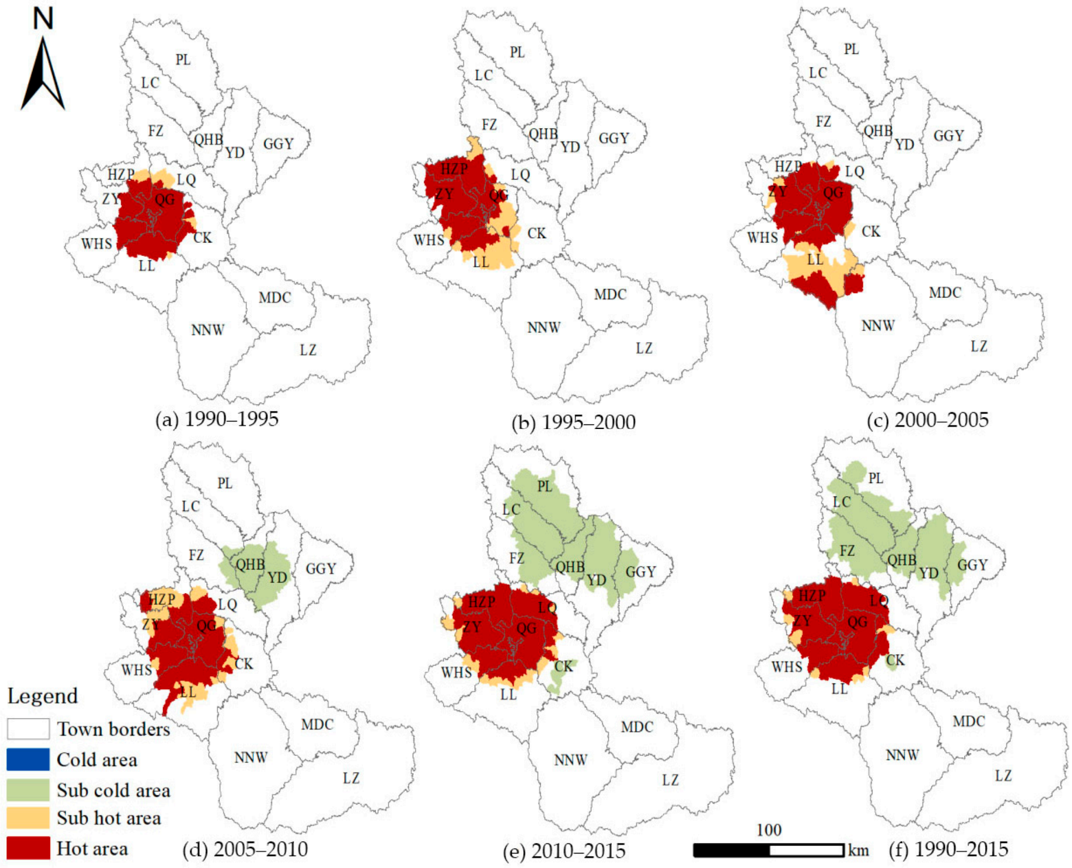

Figure 4. Spatial distribution of rural residential land expansion hotspot areas for the years (**a**) 1990–1995; (**b**) 1995–2000; (**c**) 2000–2005; (**d**) 2005–2010; (**e**) 2010–2015; (**f**) 1990–2015. (Notes: PL: Panlong, LC: Liangcun, FZ: Fengzhuang, QHB: Qinghuabian, YD: Yaodian, GGY: Ganguyi, LQ: Liqu, QG: Qiaogou, HZP: Hezhuangping, ZY: Zaoyuan, WHS: Wanhuashan, LL: Liulin, MDC: Madongchuan, NNW: Nanniwan, LZ: Linzhen).

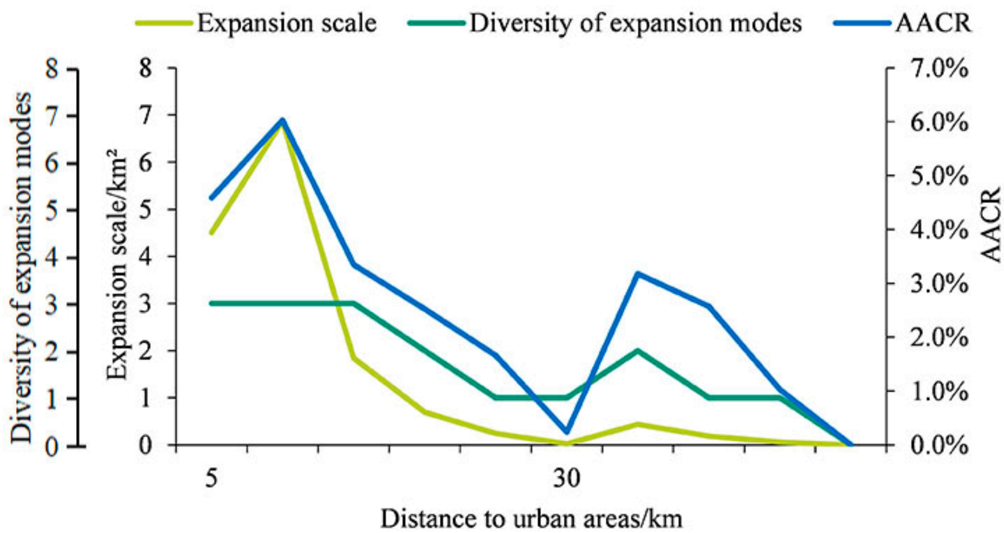

Figure 5. Rural residential land expansion characteristics within different buffer distances.

4.3. Identifying the Driving Factors of Rural Residential Land Expansion

The regression results of the BLR of rural residential land expansion were presented in Table 3. The results showed good explanatory power of the model for rural residential land expansion. The adjusted value of R^2 was more than 0.5, and the *p*-value of the Hosmer–Lemeshow test was more than 0.5.

Table 3. Coefficients of driving factors of rural residential land expansion.

Category	Potential Variables	Coefficients
Basic geographical conditions	Elevation	−1.145 **
	Slope	−0.323 **
	Aspect	−0.045
	Distance to cropland	0.241 *
	Distance to rivers	0.169
Resources conditions	Total area of cropland	−0.764 **
	Per capita cropland	−0.105
	Total population	2.013 **
	Population density	5.855 **
Urbanization & industrialization	Distance to state road	−1.38 **
	Distance to provincial road	−0.607 **
	Distance to urban area	−3.129 **
	Proportion of non-agricultural labors	0.964 **
	Per capita income	1.097 **
Policy implementation	Small-town construction	2.158 *
	New countryside building	0.16
Constant	−0.54 **	
Adjusted R-square	0.79	

One-way ANOVA (** = $p < 0.01$; * = $p < 0.05$).

Table 3 demonstrated that elevation and slope had a significant negative effect on the rural residential land expansion ($p < 0.01$), which indicates that mountain landform had insufficient space for rural residential land expansion and limited their development. The variable "total area of cropland" had a negative effect on the rural residential land expansion ($p < 0.01$), and the "distance to cropland" had a positive effect on it ($p < 0.05$). These findings appeared to confirm that the restriction of agricultural resource conditions on newly added rural residential land had weakened [54]. Besides, the coefficient signs of the total population and population density were positive ($p < 0.01$). This result was in line with the findings that larger villages tend to have more services than smaller villages [55], and this was also the case in villages with higher population density.

The variable "distance to urban areas" had a negative effect on the rural residential land expansion ($p < 0.01$), whereas "proportion of non-agricultural labor" and "per capita income" had a positive effect on it ($p < 0.05$). These findings suggested that the rising urbanization rate has caused a change in demographic structure, especially the increase in non-agricultural employment opportunities, which have significantly promoted the non-agricultural transition of the rural population. Also, there was a strong correlation between rural residential land expansion and economic locations, whereas the sign of the coefficient was the opposite, which implied that the location advantage showed a significant distance attenuation effect. The transportation network was the bridge for the flow of production factors between urban and rural areas. Better traffic conditions effectively promoted the flow of elements between urban and rural areas, thereby promoting rural development. For convenient transportation and more job opportunities, most of the newly added residential land was located near urban areas and main roads. Moreover, the "small-town construction" implementation had positive effects ($p < 0.05$) on rural residential land expansion, though the effect of the "new countryside building" variable was not significant ($p > 0.05$). This finding indicated that government policies and assistance had facilitated rural residential land expansion, and townships played a crucial central role in rural areas [43].

5. Discussion

5.1. Analysis of the Formation Mechanism of Rural Residential Land Expansion

The above analysis confirmed that rural residential land expansion was driven by internal and external factors. On the one hand, the geographical conditions are direct, stable, and primary internal influencing factors of rural residential land expansion. On the other hand, rural resource conditions are another type of main internal driving factors, especially land resources and human resources. Urbanization, industrialization, and policy implementation are major external driving forces. In addition, the imbalance of urban–rural development exacerbates the gap between urban and rural areas and strengthens the impact of urbanization on rural residential land expansion. However, given that rural residential land expansion's formation mechanism is a complicated and systematic process, this paper focuses on the economic location, rural society, rural support policies, and planning.

As a spatial feature, economic location is closely related to urbanization's influence intensity on rural residential land expansion. Benefiting from economic location advantages, the dual effect of urbanization and policy implementation prompts the radical shift of demographic and employment structure in the villages [47]. Residents earn more income through non-agricultural work and realize wealth accumulation, especially in peri-urban areas [56,57]. This also provides an economic guarantee for residents to pursue better living conditions [58]. For example, the proportion of the non-agricultural employment population in suburban villages of the Baota District was 13.2 percentage points higher than the average level, and the per capita net income in suburban villages was 1367 CNY (Chinese yuan) higher than the average level. Furthermore, the regional income disparities attract residents to gather in high-income areas [59]. China's urban–rural division and city priority development policy further increase the income gap. Thus, 80% of new rural residential land was distributed within 10km of the urban built-up area.

Population growth and family structure miniaturization increase the demand for residential land. From 1990 to 2015, the total population of the Baota District increased by 1.48 times, and the total number of households by 2.41 times. Rural population growth inevitably leads to residential land expansion [60]. This view was also confirmed by the BLR regression results on rural residential land expansion. With the advancement of people's viewpoints on family size, the rural family structure gradually turns to miniaturization. The average household size in the Baota District decreased from 4.1 in 1990 to 2.5 in 2015. This family structure's miniaturization trend accelerates the growth of numbers of rural households and intensifies rural residential land expansion [52].

The implementation of national and local rural development policies has different effects on rural residential land expansion. In 1979, the State Council promulgated the "Provisions on Several Issues Concerning the Development of Communal Enterprises", which provided supporting policies for communal enterprises' development. In terms of tax policy, the State applied low tax rates and tax exemption policies, which also promoted the development of communal enterprises. During this period, the township enterprise number in the Baota District grew from 536 in 1979 to 5384 in 1993, and the rural residential land increased from 908.46 hm^2 in 1980 to 1113.21 hm^2 in 1995. Before 2002, the local government occupied a large amount of dam land for construction land development and achieved farmland balance through the reclamation of slope farmland. On 6 December 2002, the 66th executive meeting of the State Council adopted the Regulations on Conversion of Farmland to Forests to strengthen ecological and environmental protection. This policy limited the reclamation of sloping land and reduced the new farmland source. As a result, the rate of rural residential land expansion slowed. In addition, small-town construction promoted surrounding residents from villages to towns by supporting industrial parks and improving infrastructures such as transportation, education, and medical care. Although these new countryside infrastructures obviously improved rural residents' living and production conditions, they also accelerated the rural population loss due to the development gap among regions [61]. Compared with townships, small villages' endogenous development motivation is insufficient, especially in terms of industry. Therefore, the implementation of new countryside construction renders the difficulty of attracting or even retaining residents in rural villages due to the lack of employment opportunities [62].

Rural planning decisions guide the direction of new rural residential land distribution. As a result of the severe rainfall disaster in 2013, traditional dwellings (cave dwellings) in the Baota District were seriously damaged. Local policymakers strictly control the housing structures and the new residential land location to cope with potentially heavy rainfall disasters in the future. On the one hand, it restricts the approval and construction of the homestead in gully areas; on the other hand, it encourages rural residents to live in the new communities. This planning decision facilitates the centralized distribution of new residential land.

5.2. Implications for Sustainable Regional Development

The comprehensive impact of internal and external environmental factors stimulated the uneven expansion of rural residential land. This spatial difference is more salient, especially in the context of unbalanced urban–rural relations. China implemented a series of rural support policies such as new countryside construction, and these policies have not changed the decline in some rural areas. Hence the rural residential land change is the result of the spatial reorganization process among various factors, ranging from population, land, to the industry in the rural regional system. It is difficult to rebuild the declining countryside, especially in China. However, innovative ways could be explored based on rural development trends for the purpose of sustainable regional development. In light of this, this current research suggests policy implications for sustainable regional development in ecologically fragile areas as follows: urban–rural integration, central towns reconstruction, and ecosystem protection.

- New urban–rural integration. Speeding rural modernization cannot only depend on rural areas. Urban–rural integration is the only way to realize rural modernization [46]. Previous understandings surrounding the urban–rural relationship present a kind of antagonistic and unequal relationship. In fact, the urban–rural relationship is similar to a mother-child relationship, i.e., the countryside gave birth to a city, and the city is contained in the countryside. Urban and rural are closely related to each other in people, goods, capital, and other social transactions. Rural development needs to be supported by urban markets and services. However, the expected trickle-down effect remains dissatisfied [63], and industrial support was also absent in the practice of new countryside construction. Policymakers are encouraged to employ pertinent intervention to create a long-term mechanism for urban areas helping rural areas: for instance, (1) promoting urban–rural integration planning and realizing the complementary functions in urban and rural areas; (2) facilitating the integration of urban–rural infrastructure and public facilities, improving the production and living conditions of farmers; and (3) advancing the integration of urban–rural industries and employment, and realizing the balance of housing and work.
- Central town reconstruction. Central towns play significant prominent roles in the rural regional system, providing necessary public services for surrounding areas, and they are also the gathering centers of regional resource elements [43,64]. The results of this study also indicated that the "small-town construction" implementation had positive effects on rural residential land expansion. However, the construction progress of central towns in the Baota District is slow, and the central towns in the southern area of the Baota District have not yet been formed. On the one hand, due to the dualistic structure system of urban and rural areas, migrant workers entering the city cannot settle down, and their empty homesteads remain in the village [58], which hinders the relocation and integration of villages. On the other hand, the currently paid exit mechanism for rural homesteads needs to change, and the circulation of the rural land element of the market is not frictionless [65]. Moreover, the construction and management of central towns require talented people, but the loss and shortage of rural talents cannot support the construction of central towns [66]. Therefore, central town construction in the Baota District should first break the institutional bottleneck and achieve a reasonable flow of urban and rural elements. Secondly, policies should be introduced to attract talents back to villages so as to improve the capacity of endogenous development of villages. Finally, multi-center town structures should be

set up, especially for central town construction in the south of the Baota District. In addition, in the process of multi-center town construction, decision-makers also need to ensure the employment supply in central towns [67].

- Ecological conservation area construction. Loess Plateau is one of the regions most seriously affected by soil erosion in the world [68,69]. The Chinese government implemented the "grain for green" projection to protect the local eco-environment. However, a large amount of grassland and woodland is still used for residential land construction. There were 161.65 ha of grassland and 66.71 ha of woodland transformed into residential land in the Baota District during 1990–2015. Therefore, it is necessary to construct ecological conservation areas. The results of this study indicated that the expansion of rural residential land was mainly concentrated around the city and in the river valley, and 84.3% of the newly added rural residential land was distributed below a slope of 15°. Previous studies have found that the soil erosion-sensitive areas on the Loess Plateau mainly occur in the zones with a slope of 8°–15° and 15°–25° [70]. Therefore, rural planners could plan rural life and ecological space according to the spatial difference characteristics of residential land expansion. Specifically, strict control measures such as residential land boundaries should be implemented in areas with a slope of 8° to 15°. The ecological protection region should concentrate on the regions with a slope above 15°.

6. Conclusions

This research analyzed the spatiotemporal changes of rural residential land in a typical ecologically fragile area: the Baota District. It also examined the driving factors of these changes based on the BLR modeling. To further explore the expansion characteristics, we analyzed the change of rural residential land in buffer zones with different distances. The results indicated that: (1) rural residential land increased significantly in the Baota District, and cropland was the primary land-use type transferred to rural residential land. (2) Rural residential land expansion was imbalanced in the rural regional system. The expansion scale, speed, and expansion mode diversity of rural residential land decreased, along with the increase in distance to urban built-up areas. (3) The uneven expansion of rural residential land was driven by the interaction and reorganization of external and internal factors. The geographical conditions and resource endowment were the main internal driving factors, while urbanization and policy implementation were two major external driving forces. Additionally, the imbalance of urban–rural relations exacerbated the gap between urban and rural areas and strengthened the impact of urbanization on rural residential land expansion. Furthermore, we argued that the realization of sustainable regional development in ecologically fragile areas should strengthen the urban–rural integration, focus on the construction of central towns, and ensure ecological protection measures. These findings and implications are applicable to a large number of ecologically fragile cities in mountainous areas.

Previous studies mainly focused on rural residential land spatial distribution and area change, ignoring the spatial difference of newly added residential land, and the research on ecologically fragile areas was also insufficient. Theoretically, this research adds to the literature regarding the formation mechanism of rural residential land expansion in ecologically fragile areas. We also found that "small-town construction" had a very prominent impact on rural residential land expansion, which was seldom examined in previous studies. Practically, a deep, quantifiable understanding of rural residential land expansion characteristics offers important insights for the strategic planning of a specific region to stimulate sustainable regional development. Additionally, there are still some limitations for this research: we analyzed only a limited number of policy driving factors due to data acquisition limitation at the village-scale. Potential policy determinants should be incorporated in the following studies to advance the knowledge of the driving forces of rural residential land expansion. Furthermore, the land-use data resolution in this research is 30 m, which can meet mesoscale and macro-scale research. The empirical study of residential land changes at a micro-scale in small watersheds is merited.

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References

1. Yang, R.; Liu, Y.; Long, H.; Qiao, L. Spatio-temporal characteristics of rural settlements and land use in the Bohai Rim of China. *J. Geogr. Sci.* **2015**, *25*, 559–572. [CrossRef]
2. Robinson, P.S. Implications of rural settlement patterns for development: A historical case study in Qaukeni, Eastern Cape, South Africa. *Dev. S. Afr.* **2003**, *20*, 405–421. [CrossRef]
3. Palmisano, G.O.; Govindan, K.; Loisi, R.V.; Sasso, P.D.; Roma, R. Greenways for rural sustainable development: An integration between geographic information systems and group analytic hierarchy process. *Land Use Policy* **2016**, *50*, 250–429.
4. Peucker, T.K. Johann Georg Kohl, a Theoretical Geographer of the 19th Century. *Prof. Geogr.* **2010**, *20*, 247–250. [CrossRef]
5. Christaller, W. *Die Zentralen Orte in Süddeutschland*; Gustav Fischer: Jena, Germany, 1933.
6. Semple, E. *Influences of Geographic Environment: On the Basis of Ratzel's System of Anthropo-Geography*; Henry Holt: New York, NY, USA, 1911.
7. Bański, J.; Wesołowska, M. Transformations in housing construction in rural areas of Poland's Lublin region-Influence on the spatial settlement structure and landscape aesthetics. *Landsc. Urban Plan.* **2010**, *94*, 116–126. [CrossRef]
8. Bella, K.P.; Irwin, E.G. Spatially explicit micro-level modelling of land use change at the rural-urban interface. *Agric. Econ.* **2002**, *27*, 217–232. [CrossRef]
9. Yin, J.; Zhao, X.; Zhang, W.; Wang, P. Rural Land Use Change Driven by Informal Industrialization: Evidence from Fengzhuang Village in China. *Land* **2020**, *9*, 190. [CrossRef]
10. Yang, R.; Xu, Q.; Long, H. Spatial distribution characteristics and optimized reconstruction analysis of China's rural settlements during the process of rapid urbanization. *J. Rural Stud.* **2016**, *47*, 413–424. [CrossRef]
11. Zhao, X.; Sun, H.; Chen, B.; Xia, X.; Li, P. China's rural human settlements: Qualitative evaluation, quantitative analysis and policy implications. *Ecol. Indic.* **2019**, *105*, 398–405. [CrossRef]
12. Zhou, Y.; Li, X.; Liu, Y. Land use change and driving factors in rural China during the period 1995–2015. *Land Use Policy* **2020**, *99*, 105048. [CrossRef]
13. Lee, C.H. Understanding rural landscape for better resident-led management: Residents' perceptions on rural landscape as everyday landscapes. *Land Use Policy* **2020**, *94*, 104565. [CrossRef]
14. Sevenant, M.; Antrop, M. Settlement models, land use and visibility in rural landscapes: Two case studies in Greece. *Landsc. Urban Plan.* **2007**, *80*, 362–374. [CrossRef]
15. McKenzie, P.; Cooper, A.; McCann, T.; Rogers, D. The ecological impact of rural building on habitats in an agricultural landscape. *Landsc. Urban Plan.* **2011**, *101*, 262–268. [CrossRef]
16. Dahms, F.; Janine, M. 'Counterurbanization', Interaction and Functional Change in a Rural Amenity Area—A Canadian Example. *J. Rural Stud.* **1999**, *15*, 129–146. [CrossRef]
17. Zhu, F.; Zhang, F.; Li, C.; Zhu, T. Functional transition of the rural settlement: Analysis of land-use differentiation in a transect of Beijing, China. *Habitat Int.* **2014**, *41*, 262–271. [CrossRef]
18. Liu, Y.; Yang, R.; Li, Y. Potential of land consolidation of hollowed villages under different urbanization scenarios in China. *J. Geogr. Sci.* **2013**, *23*, 503–512. [CrossRef]
19. Li, Y.; Li, Y.; Fan, P.; Long, H. Impacts of land consolidation on rural human-environment system in typical watershed of the Loess Plateau and implica-tions for rural development policy. *Land Use Policy* **2019**, *86*, 339–350.
20. Gorbenkova, E.; Shcherbina, E. Historical-Genetic Features in Rural Settlement System: A Case Study from Mogilev District (Mogilev Oblast, Belarus). *Land* **2020**, *9*, 165. [CrossRef]

21. Ancuța, C.A.; Olaru, M.; Popa, N.; Isfanescu-Ivan, R.; Jigoria-Oprea, L. Evaluation of the Sustainable Development of Rural Settlements. Case Study: Rural Settlements from Romanian Banat. *Carpath J. Earth Environ.* **2015**, *3*, 67–80.
22. Cao, Y.; Bai, Z.; Sun, Q.; Zhou, W. Rural settlement changes in compound land use areas: Characteristics and reasons of changes in a mixed mining-rural-settlement area in Shanxi Province, China. *Habitat Int.* **2017**, *61*, 9–21. [CrossRef]
23. Conrad, C.; Rudloff, M.; Abdullaev, I.; Thiel, M.; Löw, F.; Lamers, J.P.A. Measuring rural settlement expansion in Uzbekistan using remote sensing to support spatial planning. *Appl. Geogr.* **2015**, *62*, 29–43. [CrossRef]
24. Cheng, M.; Liu, Y.; Zhou, Y. Measuring the symbiotic development of rural housing and industry: A case study of Fuping County in the Taihang Mountains in China. *Land Use Policy* **2019**, *82*, 307–316. [CrossRef]
25. Li, H.; Song, W. Expansion of Rural Settlements on High-Quality Arable Land in Tongzhou District in Beijing, China. *Sustainability* **2019**, *11*, 5153. [CrossRef]
26. Liu, Y.; Yang, Y.; Li, Y.; Li, J. Conversion from rural settlements and arable land under rapid urbanization in Beijing during 1985–2010. *J. Rural. Stud.* **2017**, *51*, 141–150. [CrossRef]
27. Li, Y.; Li, Y.; Karácsonyi, D.; Liu, Z.; Wang, Y.; Wang, J. Spatio-temporal pattern and driving forces of construction land change in a poverty-stricken county of China and implications for poverty-alleviation-oriented land use policies. *Land Use Policy* **2020**, *91*, 104267. [CrossRef]
28. Liu, Y.; Yang, R.; Long, H.; Gao, J.; Wang, J. Implications of land-use change in rural China: A case study of Yucheng, Shandong province. *Land Use Policy* **2014**, *40*, 111–118. [CrossRef]
29. Li, H.; Song, W. Evolution of rural settlements in the Tongzhou District of Beijing under the new-type urbanization policies. *Habitat Int.* **2020**, *101*, 102198. [CrossRef]
30. Wang, J.; Zhang, W.; Zhang, Z. Quantifying the Spatio-Temporal Dynamics of Rural Settlements and the Associated Impacts on Land Use in an Undevel-oped Area of China. *Sustainability* **2018**, *10*, 1490. [CrossRef]
31. Ma, L.; Guo, X.; Tian, Y.; Wang, Y.; Chen, M. Micro-Study of the Evolution of Rural Settlement Patterns and Their Spatial Association with Water and Land Resources: A Case Study of Shandan County, China. *Sustainability* **2017**, *9*, 2277. [CrossRef]
32. Liu, Y.; Li, Y. Revitalize the world's countryside. *Nature* **2018**, *548*, 275–277. [CrossRef]
33. Zou, L.; Liu, Y.; Wang, Y.; Hu, X. Assessment and analysis of agricultural non-point source pollution loads in China: 1978–2017. *J. Environ. Manag.* **2020**, *263*, 110400. [CrossRef] [PubMed]
34. Ding, G.L. Study on the Evolvement of the Rural Homestead' System since 1949. *J. Hunan Agric. Univ.* **2008**, *4*, 9–21.
35. Wang, H.; Su, F.; Wang, L.; Tao, R. Rural Housing Consumption and Social Stratification in Transitional China: Evidence from a National Survey. *Hous. Stud.* **2012**, *27*, 667–684. [CrossRef]
36. Rosato-Stevens, M. Peasant land tenure security in China's transitional economy. *Boston Univ. Int. Law J.* **2008**, *26*, 97–141.
37. Lin, G.C.S. *Developing China: Land, Politics and Social Conditions*; Routledge: New York, NY, USA, 2009.
38. NBS Migrant Workers Monitoring Survey Report. *Constr. Archit.* **2018**, *11*, 31–35.
39. Zhou, G.; He, Y.; Tang, C.; Tao, Y.; Zhong, T. Dynamic mechanism and present situation of rural settlement evolution in China. *J. Geogr. Sci.* **2013**, *23*, 513–524. [CrossRef]
40. Luo, G.; Wang, B.; Luo, D.; Wei, C. Spatial Agglomeration Characteristics of Rural Settlements in Poor Mountainous Areas of Southwest China. *Sustainability* **2020**, *12*, 1818. [CrossRef]
41. Chen, Z.; Liu, Y.; Feng, W.; Li, Y.; Li, L. Study on spatial tropism distribution of rural settlements in the Loess Hilly and Gully Region based on natural factors and traffic accessibility. *J. Rural. Stud.* **2019**. [CrossRef]
42. Shi, M.; Xie, Y.; Cao, Q. Spatiotemporal Changes in Rural Settlement Land and Rural Population in the Middle Basin of the Heihe River, China. *Sustainability* **2016**, *8*, 614. [CrossRef]
43. Yang, R. An analysis of rural settlement patterns and their effect mechanisms based on road traffic accessibility of Guangdong. *J. Geogr. Sci.* **2017**, *72*, 1859–1871.
44. Li, Y.; Liu, Y.; Long, H. Spatio-temporal Analysis of Population and Residential Land Change in Rural China. *J. Nat. Resour.* **2010**, *25*, 1629–1638.
45. Li, D.; Wang, D.; Li, H.; Zhang, S.; Zhang, X.; Ye, T. The Effects of Urban Sprawl on the Spatial Evolution of Rural Settlements: A Case Study in Changchun, China. *Sustainability* **2016**, *8*, 736. [CrossRef]
46. Liu, Y. Introduction to land use and rural sustainability in China. *Land Use Policy* **2018**, *74*, 1–4. [CrossRef]
47. Ma, W.; Jiang, G.; Zhang, R.; Li, Y.; Jiang, X. Achieving rural spatial restructuring in China: A suitable framework to understand how structural transitions in rural residential land differ across peri-urban interface? *Land Use Policy* **2018**, *75*, 583–593. [CrossRef]
48. Liu, J.; Ning, J.; Kuang, W.; Xu, X.; Zhang, S.; Yan, C.; Li, R.; Wu, S.; Hu, Y.; Du, G.; et al. Spatio-temporal patterns and characteristics of land-use change in China during 2010–2015. *J. Geogr. Sci.* **2018**, *73*, 789–802.
49. Xu, M.; He, C.; Liu, Z.; Dou, Y. How Did Urban Land Expand in China between 1992 and 2015? A Multi-Scale Landscape Analysis. *PLoS ONE* **2016**, *11*, e154839. [CrossRef] [PubMed]
50. Ma, X.; Zhu, C.; Ma, R.; Pu, Y. Urban spatial pattern and its evolution in Suzhou, Jiangsu province, China. *Acta Geogr. Sin.* **2008**, *63*, 405–416.
51. Ariti, A.; Van Vliet, J.; Verburg, P.H. Land-use and land-cover changes in the Central Rift Valley of Ethiopia: Assessment of perception and adaptation of stake-holders. *Appl. Geogr.* **2015**, *65*, 541–542. [CrossRef]
52. Tan, M.; Li, X. The changing settlements in rural areas under urban pressure in China: Patterns, driving forces and policy implications. *Landsc. Urban Plan.* **2013**, *120*, 170–177. [CrossRef]

53. Lever, J.; Krzywinski, M.; Altman, N. Points of significance: Logistic regression. *Nat. Methods* **2016**, *13*, 541–542. [CrossRef]
54. Zhou, X.; Liu, Y. Peasants' Income Structure Evolution and Its Enlightenment. *Chin. Agric. Sci. Bull.* **2012**, *28*, 210–213.
55. Kim, J.H.; Pagliara, F.; Preston, J. The Intention to Move and Residential Location Choice Behaviour. *Urban Stud.* **2005**, *42*, 1621–1636. [CrossRef]
56. Ilaria, Z.; Artemi, C.; Filippo, G.; Gianluca, E.; Luca, S. Industrial Sprawl and Residential Housing: Exploring the Interplay between Local Development and Land-Use Change in the Valencian Community, Spain. *Land* **2019**, *8*, 143.
57. Zambon, I.; Serra, P.; Sauri, D.; Carlucci, M.; Salvati, L. Beyond the 'Mediterranean city': Socioeconomic disparities and urban sprawl in three Southern European cities. *Geogr. Ann. Ser. B Hum. Geogr.* **2017**, *99*, 319–337. [CrossRef]
58. Su, S.; Zhang, Q.; Zhang, Z.; Zhi, J.; Wu, J. Rural settlement expansion and paddy soil loss across an ex-urbanizing watershed in eastern coastal China during market transition. *Reg. Environ. Chang.* **2011**, *11*, 651–662. [CrossRef]
59. Feng, J.; Tang, S.; Yang, Z. Determinants of entrepreneurial behavior of rural migrants in urban society: From the perspective of 'human-environment relationship'. *Geogr. Res.* **2016**, *35*, 148–162.
60. Guo, X.; Niu, S.; Wu, W.; Ma, L. Characters of rural settlement spatial distribution and its influencing factors in Loess hilly area of Gansu Province: A case of Qinan County, Gansu Province. *J. Arid Land Resour. Environ.* **2010**, *24*, 27–32.
61. Li, M.; Zhang, G.; Lan, H.; Zhou, J. A study on the Change of Chinese New Countryside Construction at the Provincial Level: Based on a Comparative Analysis of the Tracking Survey Data of "100 Villages and 1000 Households" in 2006 and 2015 in Liaoning Province. *Issues Agric. Econ.* **2017**, *38*, 36–45.
62. Gao, J.; Jiang, W.; Chen, J.; Liu, Y. Housing-industry symbiosis in rural China: A multi-scalar analysis through the lens of land use. *Appl. Geogr.* **2020**, *124*, 102281. [CrossRef]
63. Tacoli, C. Rural-urban interactions: A guide to the literature. *Environ. Urban* **1998**, *10*, 147–166. [CrossRef]
64. Baker, J. Small town Africa: Studies in rural-urban interaction. *Int. J. Afr. Hist. Stud.* **1990**, *1*, 284–290.
65. Tu, S.; Long, H.; Zhang, Y.; Ge, D.; Qu, Y. Rural restructuring at village level under rapid urbanization in metropolitan suburbs of China and its implications for in-novations in land use policy. *Habitat Int.* **2018**, *77*, 143–152. [CrossRef]
66. Li, Y.; Fan, P.; Liu, Y. What makes better village development in traditional agricultural areas of China? Evidence from long-term observation of typical villages. *Habitat Int.* **2019**, *83*, 111–124. [CrossRef]
67. Yang, T.; Jin, Y.; Yan, L.; Pei, P. Aspirations and realities of polycentric development: Insights from multi-source data into the emerging urban form of Shanghai. *Environ. Plan. B Plan. Des.* **2019**, *7*, 1264–1280. [CrossRef]
68. Yuan, X.; Han, J.; Shao, Y.; Li, Y.; Wang, Y. Geodetection analysis of the driving forces and mechanisms of erosion in the hilly-gully region of northern Shaanxi Province. *J. Geogr. Sci.* **2019**, *29*, 779–790. [CrossRef]
69. Li, Y.; Zhang, X.; Cao, Z.; Liu, Z.; Lu, Z.; Liu, Y. Towards the progress of ecological restoration and economic development in China's Loess Plateau and strategy for more sustainable development. *Sci. Total Environ.* **2021**, *756*, 143676.
70. Fu, B.J.; Liu, Y.; Lu, Y.H.; He, C.S.; Zeng, Y.; Wu, B.F. Assessing the soil erosion control service of ecosystems change in the Loess Plateau of China. *Ecol. Complex* **2011**, *8*, 284–293. [CrossRef]